

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

Native American tribes see opportunity in renewable energy

Renewable energy harnesses and directs nature's power instead of extracting or removing it, making renewable development a common-sense decision to many Native American tribes. "Utility-scale renewable energy generation is a 'no-regrets' sustainable homeland economic development strategy, with a positive impact on CO₂ emissions reduction," said Pat Spears, president of the Intertribal Council on Utility Policy.

COUP has a vision of Native-owned wind farms providing clean energy, creating jobs on reservations and generating revenues for its eight member tribes. Toward that goal, the council recently purchased majority interest in NativeEnergy, a national green tag marketer that has helped tribal and rural communities develop renewable energy projects.

Native-owned development

One of the founding COUP

members, the Rosebud Sioux Tribe, put that philosophy into action, launching the first Native-owned and operated wind turbine in 2003. NativeEnergy purchased renewable energy certificates from the 750-kW NEG Micon unit to provide the upfront funding needed for its construction.

The successful installation turned the tribe into a cutting-edge green power developer. The Tribal Utility Commission is currently putting together a financing package to build a 30-MW wind farm near St. Francis, S.D. Like the tribe's first wind turbine, "The facility will be the first Native-owned, utility-scale wind farm in the country," said Tribal Utility Commissioner Tony Rogers.

Building a wind farm presents more challenges than putting up a single turbine, the commission has found. Getting a purchase agreement for the large amount of power has been difficult, according to Tribal Energy Planner Kenny Haukaas. Also, as a non-profit entity, the tribe cannot take advantage of the production tax credit that would help fund the project.

Haukaas strongly recommends that tribes considering renewable



Tom Stoddard and Tom Boucher, NativeEnergy, present Rod Bordeaux, Rosebud Sioux Tribe Utility Commission president, with a certificate recognizing carbon dioxide reductions expected from the tribe's wind turbine. (Photo by NativeEnergy)

energy projects work with a management firm.

Interconnection so far is proving less complex than financing. The initial system impact study, funded by Nebraska Public Power District, indicated no constraints.

The construction phase of the project should employ 45 to 60 workers. Plant operation will create four to six full-time jobs that Haukaas would like to staff locally. "The single turbine has been too reliable to need a full-time employee," he added.

A training clause is likely to be included in the vendor contract for the wind farm. Three tribe members recently received turbine maintenance training from Vestas, which acquired NEG Micon in 2004. Rogers hopes to eventually have enough trained individuals to establish a reservation energy office.

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Cutting edge technology stras in Burbank Landfill Project

A city associated with entertainment has recently been performing like a superstar in the field of landfill-gas powerplants. Burbank, Calif., installed a 250-kW Ingersoll-Rand microturbine at its landfill in the Verdugo Mountains. The unit, serial no. 1, is the first in the world to run directly off landfill gas. “We went looking for state-of-the-art technology for this expansion,” explained Project Manager Rick Owen, BWP combustion turbine specialist.

Initial phase

The joint project of Burbank Water and Power and the city’s Public Works Department expands on the groundbreaking Burbank Landfill Project launched in 2001. At the height of the state’s energy crisis, Burbank flipped the switch on the world’s first commercial microturbine installation to run on landfill gas.

Public Works built the 300-kW system with funding from the California Energy Commission, and handed it over to BWP to operate. Although research indicated that the turbines would be well suited for the unique

application, problems soon arose. “You expect to learn from demonstration projects, and we did,” observed Owen.

The corrosive gases present in landfill gas ate away at the 10 compressors until they all failed. BWP found that the compressors were not well suited for the application and that the moisture removal system couldn’t handle the large amount of water in landfill gas. Also, the activated carbon filtration system placed before the compressors was not cleaning the gas as effectively as the system needed.

Latest technology

Several system refinements developed after the initial Burbank Landfill Project provided solutions. BWP learned of a sliding vane-type compressor that had operated very well for more than a year at the Los Angeles County Sanitation District’s Calabasas Landfill micro-turbine project. Filtering the gas both before and after compression and refrigerating it to remove moisture would correct the other problems.

Replacing the original 10 compressors with three new ones, restored the Capstone microturbines to operation. Adding the experimental Ingersoll-Rand unit boosted the plant’s capacity to 550 kW. New centralized controls allow BWP to run the plant from one location and system designer SCS Energy to monitor the unit’s performance from its central control room.

The IR microturbine operates continuously. “It was designed for 90 percent availability,” said Owen. “The first time we fired it up, there was one little puff of smoke and it went to full capacity.”



Combustion Turbine Specialist Rick Owen with Burbank Water and Power’s new 250-kW Ingersoll-Rand microturbine. (Photo by Burbank Water and Power)

The controls monitor the gas pressure from the landfill and turn on the Capstones as needed to burn the excess fuel. The flare that used to burn the landfill gas still runs three days each month to flare off the liquid condensate from the refrigerated gas. Eventually, enough Capstones should be operational to use virtually all the landfill gas and turn the flare into a backup system in case a microturbine goes down.

Experience and accolades

Expanding the powerplant to use more of the landfill gas qualified the project for another CEC grant. The city applied for and received \$450,000 toward the total \$1.1 million project cost. BWP was able to apply the balance of the funding to its Public Benefits spending obligation.

The Burbank Landfill Project puts the city 550 kW closer to its adopted

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Energy Services Bulletin

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Burbank Landfill

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renewable portfolio standard of 20 percent renewable power by 2017. That incremental step in renewable generation brings a greater leap in experience handling the issues related to integrating diverse resources.

For example, the project team had to write testing protocols for the first edition microturbine. Once the Southern California Air Quality Management Bureau provides written approval of the protocols, BWP will begin testing. In the meantime,

the experimental unit will continue to generate clean power under a construction permit.

The upgrade has burnished BWP's standing as a renewable energy innovator. Officials interested in developing similar projects have come from as far away as Dade County, Fla., to tour the site.

Of course, Burbank Water and Power isn't going to all this effort just for the stardom. "It's about environmental stewardship," said Marketing Manager Jeanette Meyer. "The plant disposes of a waste product—landfill gas—by converting it to environmentally friendly electricity."

Even in a town where the main industry is turning dreams into reality, turning that free source of energy into electricity seems like a dream come true. But Burbank Water and Power is clearly ready for the big time. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2005/dec/dec052.htm

Opportunity

from page 1

Tribes get DOE grants

Several of Western's Native American customers will join the Rosebud Sioux in developing their renewable resources with help from the U.S. Department of Energy. In June, DOE made more than \$2.5 million available to assist 18 Native American tribes with renewable energy and energy efficiency initiatives.

The Jicarilla Apache Utility Authority will invest almost \$200,000 in renewable energy and energy efficiency strategic planning. The Hopi tribe and the Navajo Tribal

Utility Authority are both receiving funding to study the feasibility of large-scale wind projects.

A DOE grant, along with a Bureau of Indian Affairs mineral assessment, will move the Hualapai Tribe closer to establishing a utility-scale wind farm. The proposed facility would provide power to the tribe's Grand Canyon West tourism center. Tribal Planning Director Jack Ehrhardt observed that the center is, "\$8 million and no easements away from the grid."

The northern Arizona tribe has been collecting wind data with anemometers from Western's Equipment Loan Program and the BIA for the last two years. "We've measured a steady 14-mph wind that would

work well with the new slow-speed turbines," said Tribal Chairman Charles Vaughn.

The wind farm would interconnect with an Arizona Public Service Company line. The Hualapai currently receive their Western allotment through a partnership with NTUA. A portion of the tribe's DOE funding will be used to investigate forming a tribal utility and training a workforce to staff it. "The community needs power and jobs," said Vaughn. "The renewable energy industry has the potential to provide both." ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2005/dec/dec051.htm

Exhaust power provides new resource for Basin Electric

A new source of “green” power with a potential of hundreds of megawatts is just waiting to be tapped, and Basin Electric Power Co-operative is getting in on the ground floor.

The North Dakota-based co-op has signed a power purchase agreement with Ormat Technologies, Inc. for 22 megawatts from four new plants “powered” by hot exhaust. Ormat is building three powerplants in South Dakota and one in North Dakota that will generate electricity using the hot exhaust from compressor plants along the Northern Border Pipeline.

“The plants actually reduce the environmental impact of existing operations,” explained Ron Rebenitsch, Basin Electric Member Services Manager. “That makes the power even greener than wind or biomass.”

New application

The power might be more accurately described as recovered energy generation rather than renewable energy. “The application is unique to Ormat,” said Tom Buchanan, the company’s heat recovery systems manager. “The Ormat Energy Converter is an air-cooled, heat-recovery system based on the Organic Rankine Cycle.”

Many powerplants use the Rankine Cycle, in which superheated steam drives turbines to generate electricity. Typically, water is the working fluid in the process. In the Ormat unit, the Organic Rankine Cycle uses pentane, a non-freezing, ozone-benign organic fluid.

The Northern Border Pipeline,

which carries natural gas from the U.S.-Canadian border to the upper Midwest, is particularly well-suited to this application. The gas-turbine-powered compressor stations exhaust 900-degree gas which will vaporize pentane. The pentane vapor, in turn, drives the turbines connected to electricity generators. The process is a closed system and produces virtually no emissions and uses no real fuel or water. The only energy input required is the waste heat in the exhaust gases.

The technology turns what is now a waste product into a steady, long-term revenue stream for pipelines and other locations where waste heat is available. Given the large number of pipelines and compressor stations in the United States, the potential for energy recovery is vast.

Co-ops, Western support project

Construction on the four powerplants is underway, and they are expected to be operational by summer 2006. “Part of the appeal of the project was that it could be up and running in one year to 18 months,” Rebenitsch acknowledged.

Basin Electric members East River Electric Power Cooperative and Mor-Gran-Sou Electric Cooperative agreed to build about 15 miles of transmission lines and substation interconnections to distribute the power. “Their cooperation was essential in making the project happen,” said Rebenitsch.



Construction is underway on four recovered energy powerplants along the Northern Border gas pipeline running through North and South Dakota. (Photo by Basin Electric Power Cooperative)

Western, too, worked with Basin Electric on the logistics of the purchase, he added. “The Upper Great Plains staff identified some of the issues that are specific to a behind-the-meter project like this,” Rebenitsch said.

Benefits create demand

The 20-year purchase agreement with Basin Electric represents Ormat’s first sale of power from a recovered energy plant. If the demonstration succeeds, other utilities may follow in Basin Electric’s footsteps. Buchanan estimates that hundreds of sites in the United States are suited to the application.

Rebenitsch believes that the demand for the resource will be there. “It’s long-term, base load power; it can be developed fairly quickly and the cost is competitive with coal generation,” he pointed out. “Best of all, it is environmentally benign.”

So far, no renewable portfolio standard recognizes recovered power as green energy, something Rebenitsch hopes will change. “We are exploring ways to get it accepted as a renewable resource,” he said. ⚡

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2005/dec/dec053.htm

ETS incentive still works for Colorado utility, customers

A good program can change with the times and remain popular, like the special rate package Mountain Parks Electric, Inc., offers to customers installing electric thermal storage heating. At 10 years, it is still going strong.

ETS systems store heat in high-density ceramic bricks during off-peak hours when electricity costs less to supply. The 100-percent efficient units provide homeowners with clean, safe electrical heat at economical time-of-use rates. Utilities benefit, too, by increasing their off-peak loads.

Program shapes load

That was the reason the north central Colorado utility launched its ETS program back in 1995. “We had some big valleys in our load in the middle of the day and overnight,” explained MPEI Member Services and Marketing Manager Gary Ashby. “ETS offered a solution that would also help our customers save money.”

The program started out with room units that MPEI bought from the manufacturer, Steffes Corp. in North Dakota and sold to customers. Two MPEI electricians were trained to install the systems initially. “Local licensed electricians can do installs, now,” said Ashby.

After a round of billing inserts to announce the ETS offer, word of mouth was all that was needed to keep the two electricians busy.

Interest stays up

Ten years and 350 ETS systems later, MPEI’s mission has been ac-

complished. “The program was so successful that it flattened our load curve,” said Ashby.

The utility was decided it was time to make a few changes. A new rate structure went into effect for customers installing ETS systems after Jan. 1, 2005. They receive off-peak rates between 10 p.m. and 7 a.m. Past participants were grandfathered in at the old off-peak times.

That hasn’t affected the popularity of the ETS systems, however, said Ashby. “With the increase in natural gas and electricity prices, we’ve been getting a lot of inquiries,” he noted.

Changes in ETS technology have helped to keep the system in demand. A centrally-ducted, forced-air furnace became available about five years ago. The Comfort Plus unit can be used as a stand-alone furnace or can be installed with a heat pump for greater efficiency and savings.

The latest version of ETS adds a hydronic boiler system for greater flexibility. Most of the hydronic systems MPEI installs deliver heat through a radiant floor, although baseboard radiation, free-standing radiators and forced air systems can also deliver the heat.



MPEI’s Master Electrician Guy Larson (left) and Member Services and Marketing Manager Gary Ashby inspect an installation of a Steffes ETS hydronic heating system. (Photo by Rob Taylor)

Payback may improve

Program participants are split about half and half between new installs and retrofits, Ashby reported. The hydronic systems have been very popular with customers building new, large and up-scale homes in MPEI’s territory, he added.

Depending on many factors, including the size of the home and the tightness of the building envelope, owners can expect a 5- to 15-year payback. “Compared to propane, it’s going to be sooner,” Ashby said. “Rising natural gas prices are going to improve the equation, too.”

ETS units may get some competition from other electric heating options. In addition to ETS rebates, MPEI also offers rebates on heat pumps and new installations of controlled resistive heat through power wholesaler TriState Generation and Transmission Association. Energy efficiency, after all, is not a one-size-fits-all proposition but electric thermal storage still ranks as a timeless classic. ⚡

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2005/dec/dec054.htm

Crested Butte, Colo., learns from school solar project

Solar Energy International teamed up with Crested Butte Office of Resource Efficiency and Gunnison County Electric Association to introduce students of the K-12 school to renewable energy. The result was, “One of the best projects I’ve ever been involved with,” said Soozie Lindbloom, coordinator of SEI’s Solar in the Schools program. “We came into the school and really created a huge spark.”

Inspiring outreach

During the Week of Sept. 19–23, SIS provided renewable energy education to the teachers and students of CB Community School. At the end of the week, students helped to install a 1.55-kW photovoltaic system and data monitoring equipment on the school roof.

Each grade received an hour-long, hands-on presentation covering the basics of renewable energy and preparing them for the installation project. “At one point we were able to step back and watch the older kids teaching the younger kids,” Lindbloom recalled. “The installation was a real highlight of the week.”

SEI presented its renewable energy curriculum to teachers at a three-hour workshop. The curriculum covers conservation and energy efficiency as well as renewable resources for elementary, middle school and high school students. It includes grade-appropriate textbooks and technology demonstration kits for classroom use. “They were surprised to find out how versatile the curriculum is and how easily renewable energy can be

integrated into other subjects,” said Lindbloom.

Learning about renewable energy and then building a working system inspired teachers and students to share what they learned. In October, the school hosted a Solar Energy Fair to demonstrate student-run renewable energy displays to parents, the mayor and town council members.

Different agencies, similar goals

Generating that kind community participation and enthusiasm was exactly what the three agencies had in mind when they undertook the joint effort.

SEI created SIS to develop renewable energy curriculum, conduct teacher workshops and demonstrate solar technology by installing it at schools using the curriculum. The Crested Butte project included all those aspects, and moved to the next level when the school sponsored the energy fair.

The Office of Resource Efficiency works on projects to improve energy and resource consumption and cost. One of ORE’s goals is to encourage renewable resource development in Crested Butte and the Gunnison Valley.

To GCEA, the school project was an opportunity to start a discussion about distributed generation. “This was a good way to get the truth out to our customers about solar’s capabilities,” said GCEA Consumer Services Manager Mark Daily.



SEI Instructor Carol Weis teaches 5th graders how to check the charge on each solar panel before installing them. (Photo by Solar Energy International)

Many contribute

That was the goal when the electrical co-op’s board of directors allocated \$10,000 for a solar education project a few years earlier. The formation of ORE in 2003 gave GCEA a way to launch the education program and to broaden its involvement in alternative energy issues. GCEA offered the money to the school as a challenge grant. “It was one of the first projects the office took on,” said Gesa Michel, ORE executive director.

It wasn’t hard to find a few organizations that wanted to support solar education. The school’s parent-teacher association, a private donor and the Community Office of Resource Efficiency all contributed funding. Many local businesses, including a hardware store, lumber yard, welder and electrician, donated materials and services to the project.

The in-kind donations along with volunteer labor helped to keep the cost of the installation down. “We

See SCHOOL SOLAR PROJECT, page 12

**Want to know more?
Visit www.wapa.gov/es/pubs/esb/2005/dec/dec055.htm**

Municipal utility spreads Christmas spirit with lighting contest

What started out as a plan to build a little electrical load has become a Christmas tradition in Graettinger, Iowa, population 900.

Like many municipal utilities serving rural Midwestern towns, Graettinger Municipal Light Plant struggled with a shrinking population base, especially in the '80s. "The board of directors was looking for a way to boost electricity sales and to remind people about the benefits of a local, public utility," said Scott Tonderum, GMLP general manager since 1994.

Free lighting

They came up with the idea of a Christmas lights contest in 1985. Businesses and homes decorated for the holidays and vied for prizes. GMLP drafted a panel of residents to judge the entries and awarded first, second and third prizes to the most lavishly decorated houses in town.

Starting in 1990, GMLP added a new promotion by giving away free lights. Each household could pick up its complementary string of lights at the GMLP office. "The lights really motivated people to get involved in the contest," recalled Receptionist Myrtle Erb, who coordinates the distribution.

Even though the goal of the promotion was to build load, GMLP wanted to do it wisely, so, "We provided the energy-efficient lights as soon as they were available locally," Tonderum said.

Funds for purchasing the lights and for the prizes came from the utility's general budget. "The board approved the promotion hoping to get a return in additional electricity sales," explained the general manager.

Simple logistics

The contest and light giveaway resulted in only a modest boost to sales, but significant return in public involvement. About 50 to 80 homes and businesses participate in the contest each year. Erb estimates that the utility has given out more than 500 light strings.

For the first few years, GMLP ran advertisements in the local newspaper to announce the contest to Graettinger residents. "We still run the ads," said Tonderum, "mainly as a reminder and to let people know when they can come in to pick up their lights."

The utility quickly learned to insist that customers pick up their own light string in person. With such a small population, it isn't hard to keep track of contest participants. "I just write down their names and whether they take colored or clear lights," Erb said.

The contest generates additional publicity each year when the Graettinger newspaper runs a story and pictures of the winning houses. The winners often take out newspapers ads to thank the community.

Adding year-around load

It takes more, however, to keep a city in economic health. GMLP has worked with the city and other utilities bring in more meters.

New home builders can apply to the utility for an incentive of \$1 per square foot up to 1,500 sq. ft. or \$.75 per sq. ft. up to the same cap for moving a pre-owned house into town. The housing incentive is matched by the City of Graettinger and Rivervalley Telecommunications. The program has brought about 40 to 50 new and relocated



Each year, Graettinger residents compete in the Christmas lighting contest. Graettinger Municipal Light Plant sponsors the contest and gives away strings of energy-efficient lights. (Photo by Graettinger Municipal Light Plant)

houses into town over the last 12 years.

In another joint venture, the Graettinger Development Group built a 20,000-sq. ft. spec building in partnership with Energy Panel Structures, Inc. Corn Belt Power Cooperative provided low interest financing for the construction, and GMLP provided power to the project.

Located in Graettinger since 1981, EPS manufactures the structural insulated panels that were used in the pre-engineered construction of the spec building. The market for SIPs has soared in recent years due to the high energy efficiency rating of this type of construction. The company has grown to the point of needing additional space for expansion and ended up purchasing the spec building.

Graettinger Municipal Light Plant doesn't expect the successful economic development project to replace its popular Christmas lighting contest, though. An innovative utility can increase electricity sales year around, but the chance to visit with customers, encourage a little friendly competition and brighten up the city comes but once a year. ⚡

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2005/dec/dec056.htm

Renewable energy powers hurricane recovery efforts

Solar power and two different types of biomass are playing roles in hurricane recovery efforts in Texas and Louisiana, while demonstrating to the rest of the nation the benefits of diversified fuel sources.

Emergency PV power

The National Renewable Energy Laboratory and Florida Solar Energy Center provided solar-powered charging stations to the town of Kilm, Miss. NREL sent a portable, 600-watt unit, while FSEC delivered another 500-watt portable PV system.

The generators consisted of solar panels and batteries mounted on trailers for easy towing. The FSEC's 500-watt, PV trailer replaced a failing diesel generator powering a commercial radio station that transmitted emergency communication every other hour. The 600-watt unit provided the power to charge mobile phones, laptop computers and hand-held radios.

"Solar energy is particularly suited to this kind of application where the grid goes down," said NREL Spokesperson George Douglas.

Several solar manufacturers donated panels and systems to light-critical locations, according to the Solar Energy Industry Association. Working with donated solar panels from Sharp Solar Systems, Solar Outdoor Lighting, Inc., installed 30 solar-powered lighting systems around camps housing state police from nine states.

Canada-based Carmanah Technologies, Inc. held back other shipments to rush more than 500 orders of solar-powered LED lights to areas

affected by Hurricane Katrina. Most of the orders were for solar-powered marine navigation lights for the U.S. Coast Guard.

Biodiesel delivers supplies

The biofuel industry has been a big contributor to relief efforts, as well. The Veggie Van Organization, a nonprofit group from Venice, Calif., teamed up with West Central biodiesel company of Iowa and the Naples, Fla., City Council to transport 13,000 gallons of biodiesel to help victims.

The National Biodiesel Board helped to coordinate biodiesel donations from West Central and other producers. "Food companies sent food, clothing companies sent clothes and individuals sent money. As a fuel industry organization, we tried to relieve fuel supply shortages in the region," said Chief Executive Officer Joe Jobe.

The donated fuel powered a former military ship, as well as make-shift medical facilities and emergency generators aboard the vessel. The 105-ton M/V Diamond left from south Florida Sep. 16 carrying 12 tons of food and running on biodiesel for the first time in its operation. Veggie Van Organization founder Josh Tickell went on the voyage and recorded the trip in his online blog.

The Veggie Van was in Lake Charles, La., when Hurricane Rita hit, forcing Tickell to leave the vehicle behind during evacuation. Fortunately, the damage was not too severe, and the van was back on the road by Thanksgiving. Tickell is making return trips to Louisiana to work with



Bill Young (left) of Florida Solar Energy Center, with WQRL Announcer Sara Allen, used solar power to get the radio station back on the air for emergency broadcasting. (Photo by Bill Young)

local groups.

The Veggie Van team received a personal commendation from former President Bill Clinton for its aid efforts. Clinton endorsed the use of biodiesel in hurricane recovery and other applications.

Debris into power

Green Energy Resources is looking beyond immediate relief to long-term recovery. The New York-based bio-energy company pledged to purchase up to one million tons of hurricane-damaged wood each from Louisiana and Mississippi. With a contract to supply the United Kingdom with more than five million tons of wood chips annually, there is no lack of market for the hurricane debris.

In a recent announcement, CEO Joseph Murray stated that the company may buy another million tons for power plants in the northeast. "Each hurricane provides an opportunity to strengthen the U.S. economy and energy security and develop new export markets," he commented.

See RECOVERY EFFORT, page 12

**Want to know more?
Visit www.wapa.gov/es/pubs/esb/2005/dec/dec057.htm**

Wal-Mart experiment showcases sustainability for retailers

A retail chain best known for its low prices has launched a project to make its name synonymous with sustainable operations. Wal-Mart opened an experimental SuperCenter in Aurora, Colo., Nov. 9, and it boasts 50 different tests of environmentally friendly building materials, energy-efficient systems and renewable energy.

The 206,000-sq. ft. department and grocery store is intended to evaluate the cost-effectiveness of those measures in a working setting. It is the second such facility the company has built. The first, located in McKinney, Texas, has 26 sustainable features and is 10 percent more efficient than a typical Wal-Mart SuperCenter. The Aurora store is designed to be 20 percent more efficient.

“The company’s goal is to make its operations to build a prototype that is 25 to 30 percent more efficient and reduces green house gas emissions by 30 percent within four years,” said Aurora Store Manager Charlie Harris. “The experiments at this store will help us figure out how to get there.”

Monitoring results

The National Renewable Energy Laboratory believes that other big box retailers can benefit from Wal-Mart’s experience, too.

NREL installed data acquisition systems in the Aurora store and a conventional SuperCenter nearby in Centennial, Colo. For the next three years, the laboratory will collect and compare information on energy and water use in each store to find out how much energy the measures are really saving. Oak Ridge National Laboratory is doing a similar study on

the McKinney store.

“It’s one thing to want to build a green facility, another thing to actually get it built and something else again to run the building,” said Senior Engineer Paul Torcellini, project leader for NREL. “Part of our involvement is to close that loop, to help others beyond Wal-Mart.”

Ron Judkoff, director of NREL’s Buildings and Thermal Systems Center, added, “What makes this project especially interesting to us is the potential for large-scale replicability of the energy-saving features.”

Wal-Mart hired a team of consultants to help the company take energy efficiency to a new level, and approached NREL afterward to monitor the results. The NREL team helped with researching some of the proposed measures, but was otherwise not involved in the building design. “That way, we could be totally objective in our evaluation,” explained Senior Engineer Michael Deru, project manager.

Lighting technology

The lighting experiments are probably the measures that shoppers—and other retailers—are the most likely to notice.

The saw-tooth roof design creates three rows of clerestory windows, bringing natural light into the shopping area. Several different types of tubular skylights such as Solatube and So-Luminaire on the roof redirect sunlight down a highly reflective tube, through a diffuser that spreads it around the interior space. A dimming system adjusts the lighting to supplement the natural light. At night, the system reduces artificial light levels at



A 50-kW wind turbine is one of 50 sustainable measures being tested at Wal-Mart’s SuperCenter in Aurora, Colo.

the entrances and in parts of the main floor to help customers’ eyes adjust to the change of light when going in and out of the store.

An existing facility would require extensive retrofits to duplicate the SuperCenter’s use of daylighting. However, some of the other lighting strategies could increase efficiency and improve marketing for a smaller investment. The main store lighting system uses smaller, more efficient T5HO lamps. One of the high-output, linear fluorescent lamp replaces two of Wal-Mart’s standard T8 lamps and uses about 15 percent less energy. Its light more closely resembles natural daylight, improving customers’ ability to see the merchandise.

The store’s lighting fixtures have been placed 12.5 feet above the produce, instead of the usual 18 feet, and use lower wattage lamps that illumi-

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Wal-Mart *from page 7*

nate the fruits and vegetables in truer colors. LED fixtures light the grocery and jewelry cases, saving electricity and maintenance and improving the product displays. The lighting energy savings for the Aurora SuperCenter are projected to be between 350,000 and 450,000 kWh annually.

Conventional, renewable energy

Wal-Mart is testing power supply technologies that may find wider use once other retailers start seeing the results. Although the systems focus mainly on efficiency, a 50-kW Bergey wind turbine will provide about 1.25 percent of a typical SuperCenter's annual electricity needs.

Additional electricity is generated by three types of photovoltaic panels—single crystalline, edge film growth and amorphous—mounted on the roof and on parking lot signs. Also, the building's south face is covered with perforated metal siding that warms outside air by 10 to 20 degrees. The air rises to the top of the passive solar wall to be drawn in by the ventilation system.

A grid-tied, natural gas-fired cogeneration plant generates electricity, provides backup power and recovers and re-uses waste heat. The highly efficient system includes six 60-kilowatt microturbines, an absorption chiller plant and a cooling tower. The designer chose indirect evaporative cooling instead of energy-intensive air conditioning to cool the store.

In cold weather, a radiant floor will keep customers and employees comfortable. Water from two waste

oil boilers and heat recovered from the cogeneration system heats the floor. The boiler uses cooking oil from the store's deli and motor oil from the automotive center for fuel. The efficiency of radiant floor heating made it a good choice for the auto center, the cash register aisles, and the refrigerated grocery section.

Comfort, air quality

Another reason shoppers won't catch a chill in the refrigerated foods aisle is that most of grocery cases have doors. First tested in the McKinney store, the measure keeps cold air in and reduces energy use. "One of our vendors was concerned that doors would make his product less accessible," said Harris. "It turned out that refrigerated food sales actually rose 22 percent at that store."

Also, the refrigeration system in medium temperature cases uses 35-percent propylene glycol. The use of this secondary low-pressure refrigerant cuts the amount of greenhouse gas-producing, high-pressure refrigerant in the system by half. The technology also reduces the chances of leaking high-pressure refrigerant into the atmosphere.

DuctSox are another innovation that adds to comfort and protects air quality. Perforated fabric tubes mounted 11 feet overhead disperse air all along their length, instead of through a single register. When the airflow is cut off, the tubes deflate and the dust that usually accumulates on hard ducts settles to the ground where it can be swept up. Designers chose white tubes to reflect the daylight cascading through the clerestory windows.

Consumer education

All this efficiency comes with a cost, but the company did not release the figures. "The SuperCenter is more of a lab where we can look at as many different measures as possible and see what offers the best return," explained Harris.

Wal-Mart plans on sharing the learning experience, too. Large green signs on the floor tell customers about the store's many experiments, while kiosks at the main entrances reports on how much electricity the systems are generating and saving.

Interested individuals in other parts of the country won't have to wait for the NREL report. Wal-Mart has posted an interactive Web site for the Aurora and the McKinney stores, where visitors can follow the progress of the experimental SuperCenter and monitor its systems.

Not all of those systems will make the cut—that's why it is called an experiment. However, Wal-Mart officials say that the technologies that prove to save energy and money and are good for the environment could start showing up in future stores and retrofits as early as next year.

Whatever the results, the SuperCenters have already taught Wal-Mart and other retailers one lesson: How building owners, scientists, engineers, architects, contractors and landscape designers can work together to create stores that appeal to shoppers and protect the environment. ⚡

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2005/dec/dec058.htm

2005 Energy Act encourages efficiency and renewables

The energy bill President Bush signed on Aug. 8 contained many provisions to promote the use of renewable energy and reward energy efficiency measures in business and residential sectors.

“This historic bill strengthens our nation’s electrical infrastructure, reduces our dependence on foreign oil, increases conservation and expands the use of clean renewable energy,” said Energy Secretary Samuel Bodman.

The comprehensive, 1,700-page Act supports programs and incentives that will help Western customers improve operations, and cut costs for themselves and their consumers. “Our goal in writing this legislation was, very simply, to ease demand, increase supply and save consumers and businesses money spent on energy,” said U.S. Rep. Joe Barton (R-Texas), chairman of the House Energy and Commerce Committee.

Federal agencies, utilities

Federal agencies will lead the way in adopting sustainable practices under the Energy Policy Act of 2005. The law requires federal buildings to cut energy consumption to 20 percent below their energy use in 2003, in energy use per square foot, by 2015. The act allows some exceptions for energy-intensive processes and matters of national security.

The act also allows Federal agencies to keep the funds resulting from energy savings, but requires agencies to reinvest the money in energy efficiency or renewable energy projects. To help agencies pay for energy improvements, the act extends the Energy Savings Performance Contract program. The program allows private companies to pay for the improve-

ments and to be paid back with a portion of the energy savings.

Purchasing is covered in the act, as well. Federal agencies are required to buy either Energy Star products or products designated as energy efficient by the Federal Energy Management Program.

Utilities will benefit from provisions modernizing domestic energy infrastructure to help reduce the risk of large-scale blackouts and minimize transmission bottlenecks. The new law repealed outdated rules that discourage investment in new infrastructure. Tax incentives in the bill encourage new transmission construction and development of new technologies to make the power grid more efficient.

To encourage small, self-generation projects, the energy act amends the Public Utilities Regulatory Policies Act to require every public utility to offer interconnection to the power grid and net metering upon request.

The Renewable Energy Production Incentive received new life in the act. REPI encourages public power providers to develop and purchase electricity from renewable technologies. Qualifying facilities are eligible for annual payments of 1.5 cents per kWh for the first 10 years of operation, subject to the availability of annual funding. Nonprofit electrical co-ops, public utilities and tribal governments or Native corporations selling the project’s electricity to someone else are among the agencies that can take advantage of REPI.

Incentives promote diversity

Increasing the use of renewable resources to generate electricity was a key component of the bill. The

Solar Energy Industry Association, American Wind Energy Association, National Hydropower Association, Renewable Fuels Association and National Biodiesel Board all issued statements supporting the act.

The new law extends the production tax credit through 2007 for wind power, geothermal power, biomass, landfill gas, small irrigation power and trash combustion facilities. The credit would have expired at the end of this year. The extension also applies to hydropower generated from new facilities added to existing dams or conduits and additional generation gained from efficiency improvements at existing hydro plants.

Biodiesel and ethanol also fared well in the Energy Act. The new renewable fuels standard in the bill requires that gasoline sold in the United States contain a total of 4 billion gallons of biofuels in 2006, increasing to 7.5 billion gallons in 2012. The standard provides greater flexibility for refiners by allowing renewable fuel credits and by eliminating the reformulated gasoline oxygenate standard.

The bill set the stage for the first Federal tax credits for solar energy systems on homes in 20 years. For the first time since 1985, homeowners who install solar energy systems will receive a tax credit worth 30 percent of the system cost, capped at \$2,000. Businesses that purchase solar equipment will also receive a credit worth 30 percent of the system cost.

The Database of State Incentives for Renewable Energy provides a comprehensive list of incentives and tax credits by state.

See ENERGY ACT, page 12

Energy Act *from page 11*

Measures benefit consumers

At the signing ceremony, President Bush observed that the bill takes the side of consumers who make the choice to conserve.

The energy-saving potential of the Energy Policy Act of 2005 is significant, according to the Alliance to Save Energy. The Alliance estimated that by the year 2020, the law's energy-efficiency measures could reduce the anticipated growth in U.S. energy use by nearly 10 percent. Those mea-

asures focus on promoting residential efficiency and increasing appliance and commercial product efficiency, and are the ones most likely to yield savings for consumers.

Research promoting energy-efficient residential buildings—"zero-energy" homes—received funding in the bill. Homeowners installing insulation, energy-efficient doors and cool reflective roofs will be eligible for credits of 10 percent of the cost. New energy-efficient commercial buildings will also earn a tax deduction. The credits will be available in 2006 and 2007.

New minimum energy efficiency standards for appliances and other products will help consumers save energy. The bill requires DOE to set standards for industrial products including dehumidifiers, distribution transformers, ceiling fans, traffic signals, illuminated exit signs and torchieres. New standards will also be developed for a variety of equipment for commercial use, including clothes washers, icemakers, refrigerators, freezers and packaged air conditioning and heating equipment. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2005/dec/dec059.htm

School solar project *from page 6*

had volunteers all over the place," Michel noted.

Lindbloom added that the project turned SEI staff into celebrities for a week. "Crested Butte is a small town, so kids would point me out to their parents and say, 'There goes solar girl!'"

More teamwork

In spite of the success of the Solar in the Schools project, its sponsors don't expect it to translate into solar arrays popping up on Crested Butte rooftops, at least in the near future. "Most of the buildings in town are protected as historical landmarks," Michel acknowledged.

Renewable energy education—and teamwork—will continue, however, thanks to the data monitoring system and the curriculum. Conservation and energy efficiency

are key components in SEI's curriculum. "You can't really teach people about renewable energy without telling them that the easiest way to create more power is to use less," said Lindbloom.

That ties in neatly with ORE's agenda, too. "You can make a building more efficient without significantly altering its appearance," said Michel.

Improving home energy efficiency will be the next cooperative venture for GCEA and ORE. The utility is developing a "Healthy Home Assessment" program and ORE will be borrowing or leasing GCEA's blower door to perform home energy audits. ⚡

Recovery effort

from page 8

The plan to divert the wood waste from landfills creates jobs, develops new export markets, and provides the states with badly needed revenue streams. Biomass can be processed into ethanol, gasified or mixed with coal to reduce greenhouse gases. According to the company, the abundance of biomass for renewable energy from each natural weather event could power up to 10 percent of America's total energy demand.

It will take time and hard work to restore the Gulf Coast's infrastructure, and nothing can ease the pain and loss the hurricanes caused. If residents find ways to build a more secure and sustainable future with renewable energy, however, the nation may yet be able to see the green lining in those storm clouds. ⚡

Workshop, group cater to growing interest in geothermal power

One of the greatest challenges to developing geothermal energy—or any renewable resource—is lack of understanding among utilities and the general public. Geopowering the West is chipping away at that obstacle with a series of workshops, most recently the Utah Geothermal Power Generation Workshop in Salt Lake City.

Lack of interest was not the problem, as 40 professionals from utilities, government agencies, municipalities and industry organizations gathered at the Utah Department of Natural Resources, August 17. Event sponsors included Western, American Public Power Association and National Rural Electric Cooperative Association, as well as several geothermal industry groups, research laboratories and resource developers.

The meeting featured an overview of geothermal power, including development, power purchases, comparison to other resources and interconnection and reliability issues. “Our goal was to bring utilities up to date on the technology status, how existing plants operate, power purchasing issues and development opportunities,” said Randy Manion, Western’s Renewable Resource Program Manager.

Manion serves as the utility outreach coordinator for GPW. The Utah workshop is the fourth such event he has planned with Renewable Energy Consultant Guy Nelson.

Many issues covered

The day-long workshop opened up with a panel to educate utilities

on “the pains and pleasures of adding geothermal energy to a portfolio,” said Nelson. “Like hydropower, it is a valuable resource as long as it is properly managed. Utilities that haven’t been involved with a geothermal plant need that background to get off on the right foot.”

Project development was covered in two sessions, one from the developer’s viewpoint and one from the utility’s. Bruce Levy, senior vice president of business development for energy developer Amp Resources, walked utilities through the development process. “It was Geothermal 101—what development means to the power provider and the six or seven main points of the process,” he said.

Those points are the same for developing any energy resource, he stressed, with geology issues being the only difference. “Any utility that has been involved in a development project, whether it was a coal plant or a wind farm, will be familiar with the procedures,” said Levy.

Buying geothermal energy from a project is another way for utilities to add the resource to their mix. “Power purchases are critical to development,” said Nelson. “Investors often require proof that there is a market for the power before they fund a project.”



Ernie Wessman, Resource Development vice president for Pacific-Corp, left, discusses geothermal development with UGWG Executive Director Guy Nelson and Western Energy Services Specialist Paula Fronk. (Photo by Patrick Laney, Idaho National Laboratory)

Randy Ewell, general manager of Mt. Wheeler Power Association, was interested in both developing and buying geothermal power. The eastern Nevada utility buys renewable energy certificates and also had been involved in the Rye Patch geothermal development. “I attended the workshop to catch up on what was happening in the industry and what investment incentives are out there,” he said.

Focus on utilities’ needs

The positive response to this workshop and earlier ones points to a growing interest in geothermal energy. To support utilities in integrating this resource, Western and GPW are creating a Utility Geothermal Working Group. Guy Nelson is executive director of the group, which is being modeled on the Utility Wind Interest Group. “The focus will be strictly on the utilities and the direct benefits of integrating geothermal energy to power providers and their customers,” he said.

See GEOTHERMAL POWER, page 16

**Want to know more?
Visit www.wapa.gov/es/pubs/esb/2005/dec/dec059.htm**



TOPICS from the POWER LINE

Editor's note: The Energy Services Bulletin features real answers to real questions posed to our staff at the Energy Services Power Line. We hope you find it useful.

Savings from tankless water heaters depend on application

Question: In terms of energy use and costs, how do on-demand (electric instantaneous) tankless water heaters compare with electric storage systems for whole-house water heating?

Answer: Contemporary electric storage water heaters are efficient. The fully submerged electric resistance heater provides 100-percent efficient conversion of electrical energy to heating water.

Heat loss from hot water in storage does decrease the overall efficiency of the equipment, however. This is reflected in the unit's Energy Factor. A system with an EF of .88 loses 12 percent of the heat energy from the storage tank. A better-insulated storage tank may have an EF of .96, losing only 4 percent of the heat energy from the storage tank.

Instant electric water heaters provide increased efficiency by eliminating the loss from water in storage. Typical loss from the storage tank ranges from 4 to 12 percent. This is the energy that would be saved if a 100-percent efficient instant water heater replaced an electric storage water heater.

However, many instant water heat-

ers do not perform at 100-percent efficiency. On some models, the heating coil is not submerged in the water it is heating. A closer look at electrical input versus hot water output shows that models are likely to deliver 94- to 96-percent efficiency.

Comparing energy costs

"Tankless vs. Tank Type Storage Water Heater Efficiency Comparison Testing," in the January 2005 PM Engineer is a recent and well-designed comparison study. Researchers found that a tankless heater has a surprisingly small energy and cost advantage over a storage heater in a typical home application for a family of four with two bathrooms. This actually makes sense, because the standby losses are not that great with four people using water every day.

A better application for a tankless heater would be for a single person or a couple, or better yet, a secondary residence where water would be sitting in a tank heated for long periods of time. Then the payback for a tankless heater would look much more attractive.

Impact on peak demand

Widespread use of instant electric water heaters for whole house water heating may have a significant impact on peak load for the utility. To provide a flow rate of one gallon of water with a temperature increase of 61 degrees F requires an input rating of 9 kW. More than one instant

water heater may be needed if larger volumes of hot water are required, and this could increase the peak kW even more. For that reason, a gas-fired instantaneous system might be a better option.

A 50-gallon storage water heater typically has a peak input rating of 4.5 kW. While they cannot instantly recover all of the heat lost from a large volume draw, the storage capacity generally provides adequate service. Drawing one gallon per minute for 20 minutes from 50-gallon tank will drop the water's delivery temperature by about 10 degrees. Short-term, large-volume draws do not require additional electrical input. The water heater will provide serviceable results with only 4.5 kW of input.

Articles, fact sheets:

- *Going Tankless*; Kelly Faloon, Plumbing and Mechanical, January 2004
- *Tankless Coil and Indirect Water Heaters*; U.S. Department of Energy
- *Energy Efficient Water Heating: Purchasing a New Electric Water Heater*; Western Area Power Administration, 2004
- *Home Energy Briefs — Water Heating*; Rocky Mountain Institute brief on home energy efficiency
- *Water Heating Residential Water Heater Energy Requirements*; P&M Magazine article that examines the energy use of instantaneous, tankless water heaters

See POWER LINE, page 16

**Want to know more?
Visit www.wapa.gov/es/pubs/esb/2005/dec/dec0511.htm**



Energy Shorts

More consumers want green power

A recent report from the National Renewable Energy Laboratory stated that more electricity customers are demanding energy generated from renewable resources, driving more U.S. utilities to offer green power marketing programs.

The number of residential customers in the country purchasing environmentally friendly power from suppliers has more than doubled in the past five years, according to Green Power Marketing in the U.S.: A Status Report, Eighth Edition. As of the end of 2004, more than 330,000 customers in the United States, including about 8,100 commercial and industrial customers, bought 1.8 billion kWh of green power. C&I customers drove the largest increase in market growth—30 percent in 2004—seeing renewables as a hedge against rising energy costs.

Several government agencies, universities and private companies such as Johnson & Johnson Corp. and FedEx Kinko's, are among the top green power users in terms of annual MWh purchased. Many companies participate in the EPA Green Power Partnership program, which encourages companies to buy power from renewable resources.

The report concluded that green power's strong market growth is providing an important stimulus for renewable energy development. More than 50 percent of the nation's electricity customers now have the option

of buying green power, either directly from their utility or through renewable energy certificates.

University of Colorado wins 2005 Solar Decathlon

The Department of Energy named the University of Colorado as the overall winner of the 2005 Solar Decathlon on October 14 in Washington, D.C.

The Colorado team earned 853 points of a possible 1,100, operating its house under cloudy skies throughout the week. The team took first place in the Documentation and Communication contests and drove the farthest in an electric car: 318.8 miles. Cornell University placed second with 826 points and won the Comfort Zone and Hot Water competitions.

California Polytechnic State University finished third with 809 points after winning in both Appliances and Lighting. Despite taking an early lead by winning the Architecture and Dwelling contests, the Virginia Polytechnic Institute and State University ended up in fourth place with 784 points.

The 2005 Solar Decathlon challenged 18 collegiate teams from 13 states, Puerto Rico, Canada and Spain to design, build and operate the most attractive and energy-efficient solar-powered home.

DOE energy-saving tips for consumers, businesses

The Department of Energy and the Alliance to Save Energy unveiled a series of radio public service announce-

ments to provide consumers with easy tips to save energy and gasoline.

English and Spanish versions of these PSAs are being distributed to nearly 4,500 radio stations across the country. The radio spots will complement DOE's ongoing Energy Hog campaign, carried out in partnership with ASE, the Ad Council, the Home Depot and the North American Insulation Manufacturers Association.

DOE is set to move the Energy Hog campaign into the next phase with ads in newspapers and magazines, as well as on billboards all over the country. Top DOE leaders are also traveling the country to discuss how U.S. families can save money and energy this winter. Manufacturers, retailers and utilities can assist the DOE's education effort by reprinting and distributing the Energy Savers Guide.

Industry and the Federal government are getting guidance as well. DOE is sending teams of energy efficiency experts to 200 of America's most energy-intensive factories and

See ENERGY SHORTS, page 16

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/dec/dec05coe.htm>

Energy Shorts

from page 15

Federal facilities to help improve their efficiency by 10 percent. Through this effort, DOE hopes to create momentum to significantly improve industrial energy practices.

Queen installs earth energy system

They're changing the HVAC system at Buckingham Palace. By installing a geothermal heat pump at her official residence, Queen Elizabeth is showing her green leadership and leading the trend among Brit-

ish celebrities to adopt sustainable technology.

Officials say that the £50,000 cost of drilling a vertical borehole under a four-acre lake on the palace grounds, plus additional funds to convert the palace's existing heating system, should be recouped in seven years. The system will save public funds, as tax money pays for all the Queen's utility bills at Buckingham Palace and Windsor Castle.

The queen ordered a small trial in 2002 to use heat pumps in a new art gallery built to mark her golden jubilee. Sources say the results were so impressive that she decided to ex-

pand the green heat system to replace conventional space conditioning for the formal area of the palace.

Others following the Queen's example include Sir Elton John, Sir Richard Branson of Virgin Airlines and Microsoft co-founder Paul Allen who is installing a borehole at a property he is renovating in Belgrave Square, close to Buckingham Palace.

Plans are underway to install small hydro generators on the Thames River for Windsor Castle. Another hydro facility at Balmoral Castle in Scotland is expected to generate enough power for the residence and surplus electricity for 1,000 local homes. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2005/dec/dec05es.htm

Power Line

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- *Update on Demand Water Heaters*; Product reviews from Environmental Building News
- *Water Heating: Energy-Efficient Strategies for Supplying Hot Water in the Home*; DOE fact sheet on selecting, installing, maintaining and safety of water heaters

Reports and documents:

- *Domestic Hot Water System Modeling for the Design of Energy Efficiency Systems*; A report prepared for the National Renewable Energy Laboratory by the National Association of Home Builders on modeling energy efficient residential water heating systems. ⚡

Geothermal power

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The group has established headquarters at the University of Nevada Redfield Campus, and members are drafting bylaws and a mission statement. Early efforts will focus on mainstreaming three applications UGWG has identified as most cost-effective: electricity generation, direct use for heating and ground source heat pumps.

Presenting workshops on each of those technologies will be one of the group's first projects. "We'd like to start with generation, in early spring 2006," said Nelson.

"Workshops have been a great way to draw attention to the benefits of the resource," Manion added. "Utilities that said they

weren't interested in geothermal energy went on to add it to their portfolios after attending workshops in California."

Creating a forum for dialogue between utilities and the geothermal industry is the central goal of the Utility Geothermal Working Group, Manion noted. "We can't tap the full potential of geothermal energy until we know utilities' needs and concerns," he said.

Understanding, in other words, is a two-way street.

Utilities interested in joining the Utility Geothermal Working Group should contact Guy Nelson at 541-994-4670. ⚡