

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

NPPD plans for future with efficiency and renewables funding

Things have changed for Nebraska Public Power District since it submitted its last integrated resource plan to Western—supply and demand, the economy, technology and public opinion, to name only a few. The next IRP, due in March 2008, will show how one utility is helping to lead the change, rather than fighting it.

As NPPD develops its IRP, the utility is also looking at expanding energy efficiency's role in meeting future demand. NPPD President and CEO Ron Asche said, "Many variables are included in this complex study; however, we are confident that from this study will come a continued and increased commitment to energy efficiency."

That commitment was clear when the NPPD board of directors approved \$482,000 for domestic energy research and application initiative projects at its August meeting. "These projects are just the beginning of NPPD's efforts to improve efficient use of energy and develop renewable energy in Nebraska," Asche stated in a press release on the decision. "The cleanest and least expensive kilowatt

is one we do not have to generate."

"This is a great example of how a utility's budget and its IRP can interact to meet long-term goals," noted Western Energy Services Manager Ron Horstman. "This is exactly how power providers can benefit from IRPs."

Ready for the future

Change, however, and not the required plan, is the main driver behind NPPD's investment, said NPPD Corporate Communication Supervisor Brenda Sanne. One of the biggest changes since the last IRP is growing concern about global climate change and how it might effect future electric generation. "The board of directors recognizes that coal-fired plants will be coming under more pollution control regulations," she said.

NPPD is also preparing for growth, as the utility estimates that its load will grow at more than twice the historical rate over the next six years. "It is mainly from the rapid expansion of the number of ethanol plants in Nebraska," said Sanne.

An overall thriving economy, industry and business expansion, residential development and an increase in electric-powered irrigation are also contributing to that growth. Clearly, even positive change requires planning and preparation.

Invest in awareness

Stepping up its focus on energy conservation, renewable energy and



NPPD is providing partial funding through a grant to Ponca State Park, Neb., to build a guest cabin like this one with energy-efficient construction, lighting, heating and cooling controls and complete on-site waste disposal and treatment. (Photo by Nebraska Game and Parks Commission)

new energy technologies is part of NPPD's plan. The board allocated \$256,000 from the \$482,000 investment to promote a new compact fluorescent light program. "CFL programs are a great way to get residential customers thinking about energy efficiency," said Sanne.

NPPD's CFL program consists of providing in-store coupons for \$2 off a package of Energy Star CFLs, or \$1 for a single light. The program will be offered through many chain retailers in the service territory, and to smaller stores by request, as well. Promotion for this event, scheduled for November and December, will be through newspaper advertisements, on the radio and posters. "After looking at all the options, the coupon promotion seemed like the most simple and cost-effective way to cover our service territory," said Sanne.

Another environmental education

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NPPD plans *from page 1*

project, the Ponca State Park “Green Cabin,” will receive nearly \$33,000 to develop the first of several cabins planned. The “Green Cabin” project will use recycled and renewable building materials. Guests staying in the cabins will get first-hand experience with energy-efficient construction, lighting, heating and cooling controls and complete on-site waste disposal and treatment. Ponca State Park gets about 600,000 visitors annually.

The Nebraska Energy Assistance Network program, a cooperative effort among utilities to promote low-cost, but under-used energy-efficiency measures, will receive \$18,000 from NPPD. NEAN provides targeted households with “Energy Efficiency Starter Kits” containing two CFLs, a light-emitting diode nightlight, low-flow shower head, temperature cards and an energy efficiency booklet. This allocation will fund kits for low-income families.

Adding renewables

As important as energy efficiency is to NPPD, diversifying fuel sources must also be part of the plan, Asche continued. “Adding more wind-powered generation will help NPPD achieve our goals for supplying a

greater portion of our customers’ energy needs from renewable generation resources,” he said.

NPPD has earmarked \$75,000 to buy a new portable, towerless wind monitor to collect data on potential sites for wind farms. A separately-funded initiative will give NPPD 10 more non-portable anemometers. “We learned several years ago through deliberative polling that some of our customers support NPPD developing wind,” said Sanne. “NPPD’s board and management are taking proactive steps today that will help put us in a better position from a generation resource standpoint should federal or state renewable energy portfolio standards be adopted for Nebraska in the future.”

The deliberative polling results were a consideration in NPPD’s investment in the Ainsworth Wind Energy Facility, which supplies 60 MW of power. NPPD has submitted a Clean Renewable Energy Bonds request for \$32,960,000 to fund additional wind turbines at Ainsworth. The proposed, 15-MW expansion would boost the facility’s output to its nameplate capacity of 75 MW.

Two more CREB applications would add more than 5 MW of renewable energy to NPPD’s portfolio. One for \$3,387,000 would build two new, advanced-design wind turbines at Springview, Neb., replacing two older turbines recently retired at that location. The other application is requesting \$9,200,000 for a hydroelectric facility in the coal-fired Gerald Gentleman Station water discharge canal.

Water efficiency, more

The proposed hydroelectric facility is in addition to two water-efficiency research projects NPPD is funding

through the Nebraska Center for Energy Sciences Research at the University of Nebraska-Lincoln. The projects focus on cooling water used by power facilities and water used in corn production. The investment in the CFL program notwithstanding, NPPD expects irrigation control to continue to be a big source of demand reduction. “NPPD still has a large agricultural customer base,” said Sanne, “and the NCECSR partnership and NPPD’s technical solution experts are great resources for providing technical assistance to these customers.”

In addition to the research partnership with UNL, a lengthy list of smaller projects shows that NPPD has an eye on the big energy picture. NPPD has earmarked \$30,000 to conduct an engineering analysis and develop a conceptual design for a modular, scalable photovoltaic demonstration project. An Electric Power Research Institute gas turbine bio-diesel demonstration will receive \$30,000 to determine the feasibility of using bio-diesel from domestically grown oil crops like soybeans to power gas turbines.

As Asche pointed out, NPPD’s commitment to renewables and energy efficiency is nothing new, and the utility is not waiting to complete its IRP to move forward. The final plan and several of the projects will take time to develop, but, “Stepping up our commitment to energy efficiency with initiatives like the CFL campaign... is something we are starting now.”

The beauty of planning is that you don’t have to wait for the future to happen—you can get ready for it today. ⚡

Energy Services Bulletin

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Visit www.wapa.gov/es/pubs/esb/2007/oct/oct071.htm

Western customers make strong competition for annual wind award

The judges for the 2007 Wind Power Pioneer Award recognizing public power utilities for innovative wind projects are facing a tough decision, choosing from an impressive field of nominees that happens to include several Western customers.

DOE's Wind Powering America Program and the American Public Power Association sponsor the annual award, now in its fifth year. The Wind Power Pioneer of 2007 will be announced during the APPA Customer Connections Conference in Seattle, Oct. 28 through 31. Fort Collins Utilities is the only Western customer so far to receive the award, in 2004. The other Wind Power Pioneers were Waverley Light and Power, Austin Energy and last year's winner, the town of Hull, Mass..

This year's nominees include Aspen Municipal Electric Utility, Modesto Irrigation District, Municipal Energy Agency of Nebraska, City of Palo Alto Utilities, Sacramento Municipal Utility District and Silicon Valley Power. "It's gratifying that Western customers are so strongly represented among this year's nominees," said Western Renewable Energy Program Manager Randy Manion. "Our service territory is rich in renewable resources, and the West is known for its spirit of innovation and opportunity."

Aspen's green history

In nominating the city of Aspen, Colo., for the Wind Power Pioneer Award, Randy Udall, director of the Community Office for Resource Efficiency, pointed out that the city's power supply was 100 percent renewable hydropower until 1955.

So the municipal utility's embrace of wind power seems only natural—Aspen supplies a full 25 percent of its load from wind energy.

It started with the purchase of one turbine's worth of generation from Medicine Bow, Wyo., in 1998, and increased five years later with 4 million kilowatt-hours from the wind farm at Kimball, Neb. Concerned about climate change, the Aspen City Council voted unanimously to quadruple its Kimball wind energy purchase to 20,000 kWh, or about four turbines worth of power. The purchase increased the city's avoided greenhouse gas emissions to 40 million pounds annually.

Aspen's 2,600 customers supported wind power from the beginning, accepting a rate-based mix instead of a voluntary green program. Additional funding comes from the city's innovative Renewable Energy Mitigation Program, which taxes very high energy consumption.

Modesto takes initiative

Even though California's renewable portfolio standard did not apply to public power utilities when it took effect in 2002, Modesto Irrigation District wasted no time in voluntarily adopting its own RPS.

To reach its goal of increasing retail sales from renewable resources to 20 percent by 2017, MID set out to acquire wind power from California-based providers. Wind farms in Solano County, Calif., now supply 75 MW of power, meeting MID's incremental goals until 2008. The purchase agreements also promote and benefit the local economy.



The city of Hull, Mass., received the 2006 Wind Power Pioneer Award for engaging the entire community to understand and move forward together on its wind power project.

As specified in its RPS, MID compares each product's purchase price with the levelized cost of a non-renewable resource of equal term. Public Benefits funds help to offset the cost difference—the above-market price.

MEAN tailors purchases

Providing wind power to fit the unique needs of its different member systems requires the Municipal Energy Agency of Nebraska to be flexible, to say the least. MEAN has bought green tags, owned and operated the Kimball Wind Project and entered into life-of-unit participation agreements totaling almost 18 MW of wind capacity.

Wind comprises almost 3 percent of MEAN's energy portfolio. About 30 MEAN members purchase this wind from the wholesaler's renewable resource pool in amounts of

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Wind award

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one to about 10 percent of their power needs. MEAN approaches each renewable energy sale to its members with a specific goal, depending on the circumstances of the community.

Energy imbalance and scheduling issues associated with wind projects are particularly challenging to small, transmission-dependent utilities—many MEAN members. To help its members address these challenges, MEAN has developed an advanced wind project scheduling module with funding from APPA's Demonstration of Energy Efficient Developments.

Successful Palo Alto program

Since 2005, the National Renewable Energy Laboratory's Top 10 list ranked CPAU's PaloAltoGreen program as the nation's highest in customer participation—16.9 percent last year. In 2006, Palo Alto became California's first "Green Power Community" as designated by the U.S. Environmental Protection Agency. As of September 2007, CPAU has achieved nearly 20 percent enrollment in its Green-e Certified Program.

CPAU specifically uses California wind turbines, thanks to a contract negotiated with PPM Energy. PaloAltoGreen subscribers now receive wind power directly from the new Shiloh I Wind Project in Solano County.

Wind from Shiloh and the High Winds Energy Center are also providing power for CPAU's

renewable portfolio standard goals. Palo Alto set a goal to obtain 33 percent of its electric supply from renewable resources in addition to the PaloAltoGreen program. CPAU's share of electricity from renewable resources has grown from 5 percent in 2004 to 13 percent in 2007, plus 4 percent for PaloAltoGreen.

SMUD pioneers turbines, O&M

Achieving a 20-percent renewable energy portfolio by 2011 is an ambitious goal that Sacramento Municipal Utility District is taking bold steps to meet.

In 1993, long before SMUD's board of directors made that commitment, the municipal utility launched the Solano Wind Project, installing 5 MW of wind power in the Collinsville-Montezuma Hills Wind Resource Area. The project continues to be central to meeting SMUD's goals.

Garnering data from the first turbines, SMUD replaced the older units with the first "modern" 660-kW generators in 1999. By May 2006, the project was generating 39 MW, much of which came from eight of North America's largest wind turbines, the Vestas V-90 3-MW model. An additional 63 MW is planned for 2008, putting SMUD on track to install more than 200 MW by 2011. The utility developed the first five-year, full-service operation and maintenance agreement in the United States, guaranteed by Vestas.

SVP wind leadership

Silicon Valley Power prides itself on leading in wind development for more than 20 years. Starting

in 1985, Santa Clara, Calif.'s municipal electric utility entered into innovative leases that spurred the construction of a 20-MW wind farm in the Altamont Pass area. The original agreement allowed a third-party developer to receive tax credits and PURPA-related benefits while shouldering the technology and development risks.

A recent 20-year, fixed-price contract through the M-S-R Public Power Agency will provide SVP with 105 MW from the Big Horn Wind Energy Project. The facility has a 34.5-percent capacity factor, and a price that is competitive with natural gas. A firming contract guarantees the energy can be scheduled into SVP's retail system in peak and off-peak blocks without regard for intermittency.

On the heels of the Big Horn contract, SVP signed a new power purchase agreement for 20 MW with San Diego-based Seawest LLC, a privately-owned wind farm developer and operator. The two contracts boosts SVP's qualified renewable resource portfolio from 22 to more than 34 percent of its resources.

While there can be only one Wind Power Pioneer for 2007, each nominee is a winner. These utilities recognized the need for a more sustainable power supply and saw the opportunity beyond the hurdles. Western congratulates its customers for their pioneering spirit and wishes them good luck. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2007/oct/oct072.htm

Western sets example with pollution prevention program

Just about everything we do consumes resources and produces waste, and if we thought about each activity in those terms, we could undoubtedly find plenty of ways to use and waste less.

Several executive orders require Federal agencies, including Western, to do exactly that. Federal pollution prevention programs have their genesis in the Resource Conservation and Recovery Act. However, any private facility that manages hazardous waste must meet RCRA requirements as well.

Western bases its Pollution Prevention Program on goals set by the Department of Energy. While Western is mandated to comply with Federal goals and regulations, “Protecting the environment is simply sound business practice,” added Western Environmental Protection Specialist Gene Iley.

The Western-wide Pollution Prevention program, or P2 for short, focuses on five strategies:

1. Waste prevention
2. Recycling
3. Reduction of environmental releases
4. Environmentally preferable purchasing
5. Sustainability in design and operation

“You really can’t say one aspect is any more important than another,” observed Iley. “Each contributes to the whole of the pollution prevention effort.”

Successful strategies

The waste prevention component of Western’s P2 program has been a great success. Following the three steps of waste prevention—source reduction, reuse and recycling—West-

ern cut sanitary waste by 83 percent over several years. “Sanitary waste is anything you can legally throw in the dumpster,” Iley explained.

In 2006, Western recycled many types of waste that utilities and transmission providers typically generate:

- 1,243 metric tons of wood poles and cross arms
- 287 metric tons of dielectric fluid
- 175 metric tons of concrete and asphalt
- 55 metric tons of batteries
- 41 metric tons of transformers

Reducing the source of pollution starts with a Pollution Prevention Opportunity Assessment, said Iley. The PPOA evaluates each facility for opportunities to reduce or eliminate waste generation. For example, one PPOA found that cardboard represented about half of Western’s sanitary waste. “We found a recycler for it and were able to reduce the number and size of dumpsters we needed,” said Iley. “Savings are a nice fringe benefit of protecting the environment.”

Iley noted that regulated substances like transformer oil have to be recycled, but the infrastructure is in place to handle such materials. For non-regulated waste, “It differs from area to area, so it pays to do some checking,” he said. “For example, the Montrose area doesn’t have a cardboard recycling facility, but there is one in Loveland.” He suggested checking with state offices of environmental quality, public health or natural resources to find out more about area recycling centers.

Finding a business or individual with a use for waste is an alternative



Western recycles the carcasses of equipment that is typical of utility waste.

to recycling. Landowners often take Western’s discarded wood poles and cross arms to use for fences and posts. Since the wood is often treated to inhibit growth of molds and pests, Western requires the recipients to sign a product information sheet before accepting the material.

Processes, products

Not all waste can be eliminated, but cutting down on the use of regulated substances or changing processes that use them can reduce environmental hazards and liability.

Here again, Iley recommended performing a PPOA of activities using regulated materials like oil, PCBs and refrigerants. The PPOA can help a utility identify actions to reduce environmental releases. In the electric power industry, releases from spills and other mishaps are an unfortunate fact of life. Other utilities and customers can be valuable partners in developing plans for spill containment. Also, the Electric Power Research Institute offers many resources to help manage releases.

Purchasing products that substitute recycled material and biodegradable ingredients for harsh chemicals is another way to reduce environmental releases. Western’s procurement

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Technology Spotlight:

Consider absorption technology for waste heat recovery

This column features helpful information, innovative equipment, systems and applications utilities around the nation can use to save energy and improve service.

Absorption technology operates on the “heat pump” principle and has been used in various forms for well over 100 years. The technology uses thermal energy rather than mechanical shaft energy for its operation. In the past, it has been used predominately for creating chilled water (with steam or fossil fuel combustion as the primary energy source) and for cooling in specialized industrial processes.

Complex technology

In the United States, absorption technology for chilling has been substantially replaced by electric motor-driven mechanical vapor compression technology. Many factors are responsible for the decline, including complexity of absorption systems and lack of understanding of absorption principles and applications, even by technically-trained individuals. But the primary factor is economic, due to the technology’s comparatively poor energy conversion efficiency and today’s high fuel costs.

For sake of simplicity, the operating principles of absorption technology will not be explained in this brief article. However, the technology has some very interest-

ing characteristics that make it an option if the absorption system can be operated with recovered low-level waste heat energy. Many energy policymakers and conservationists have stated the largest opportunity for reducing industrial energy consumption in the U.S. is thermal energy recovery.

Cost-effective heat recovery

The most promising and economically viable potential applications of absorption technology are situations where a source of inexpensive thermal energy (or “free” energy in the case of heated waste streams) is available at temperatures ranging from approximately 200 degrees F to 400 degrees F, and the need for cooling or heating exists. Examples of these types of streams are hot exhaust gas discharges, hot water discharges and waste low-pressure steam.

The following example illustrates waste heat energy recovery resulting in reduced electrical energy consumption. A large food processing operation often has large heating loads handled by steam boilers, and cooling loads handled by mechanical cooling/freezing systems. One energy reduction scenario is to recover a significant amount of the heat energy in the boiler flue gases to provide the operating thermal energy for an absorption technology chilled water system. This could probably not be

done directly, but would require an intermediate system installed between the boiler flue gas stream and the absorption chiller.

Substantial energy recovery is possible with this strategy, especially if the water vapor component of the boiler flue gas is condensed. Significant cooling loads could be displaced from existing mechanical-vapor compression systems, resulting in reduced overall electricity consumption.

Adopting absorption technology for energy recovery has been difficult to implement due to a lack of pre-packaged, pre-engineered systems. Typically, specialists in heat recovery with knowledge of the specific situation must design a customized system, adding cost, time and complexity. Even with these factors, the economics of potential energy recovery in many situations make exploring absorption technology a good idea.

For more information about absorption technology or technical assistance on this topic, please call the Power Line at 1-800-769-3756. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2007/oct/oct074.htm

Web site of the month:

National Renewable Energy Laboratory

Note: If there is an energy- or utility-related Web site that you find especially useful, let us know. Contact the editor with your suggestion for Web site of the Month.

There was a time when it was enough for power providers keep the lights on and, hopefully, keep the rates down. Increasingly, however, customers want to know what their utilities are doing about energy independence and the environment. Instead of snapping, “Darn it, I’m a customer service rep, not a scientist!” find out what the scientists are doing at the National Renewable Energy Laboratory.

NREL is the nation’s primary laboratory for renewable energy and energy efficiency research and development. Transferring technologies developed at the laboratory is also an important part of NREL’s mission. Western and many utilities have partnered with NREL on demonstration projects that produced widely-used technologies.

Scientific education

But back to the utility that is taking its first steps toward sustainability. Learning about Renewables is a good place to start. This section covers the basics on biomass, solar, geothermal and wind. Using Renewable Energy addresses issues specific to residential, agricultural, small business customers—and electricity providers. A community-minded utility can do its local school district a good turn by pointing science teachers to the wealth of student resources for all grade levels.

Under Science and Technology, visitors can learn more about NREL’s research projects on renewable resources and in other related areas like building performance, computational science and electric infrastructure. While many of these projects are highly technical in nature, Energy Analysis offers practical resources for utilities. Models and Tools links to software programs, calculators and reports to assist with analyzing benefits, policies, markets and programs.

Energy Analysis Publications is a searchable database of NREL analysis reports, articles and papers relating to renewable energy and energy efficiency. The resources found in a search of all documents in the “Federal Energy Management Program” category are particularly relevant to utilities.

Getting involved

To take the next step toward becoming a partner with NREL, visit Applying Technologies. This section helps to connect organizations with the right clean energy technologies, programs and strategies for their unique needs. Options include “Developing International Applications,” “Developing Environmental Applications,” “Saving Energy and Water in Federal Buildings,” “Assisting State and Local Governments” and “Assisting Tribes to Develop Renewables.” Interested investors will find links to business opportunities on this page, as well.

The renewable energy novice



who is not quite ready to commit to partnerships or investment can still become more involved in the industry. NREL’s event calendar posts conferences, meetings and training opportunities for energy-related organizations around the world. For those in the Denver area, NREL frequently hosts educational workshops, lectures and discussion forums, for the scientific and business communities as well as the general public.

The Event Calendar is part of NREL’s newsroom, a good place to simply browse for more about the latest developments in renewable energy and energy technology. Discover NREL is a monthly newsletter that highlights research activities and partnerships, and announces events, publications and funding opportunities. Visitors can register to receive the newsletter by e-mail. For more details about specific projects, check news releases and Science and Technology News.

Lab open to visitors

For a world-class research and development laboratory, the National Renewable Energy Laboratory Web site is surprisingly accessible, like the facility itself. Through self-guided tours of the NREL Visitors Center in Golden, Colo., visitors of all ages can

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Want to know more?
Visit www.wapa.gov/es/pubs/esb/2007/oct/oct075.htm

Pollution prevention

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policy calls for purchasing products with a lesser or reduced effect on human health and the environment than comparable products, wherever possible. Environmentally-preferable purchasing can help a business meet environmental goals, improve worker safety and health, reduce liabilities and cut down on disposal costs.

A successful “green” purchasing program requires research, since regional distributors may not advertise that they carry a preferred product, Iley said. “The products may not be available in every area, but at least ask for it. That tips off distributors that there is a demand for the product,” he said.

Resources like the Department of Agriculture’s list of Biopreferred Products can help purchasing agents identify those products. Green counterparts are available for such industrial products as mobile equipment hydraulic fluids, urethane roof coatings, water tank coatings, diesel fuel additives and penetrating lubricants.

Another way to green your procurement is to look for products made of recovered material. This measure not only reduces the use of new resources, “It creates a market for the materials we recycle, like used paper and oil,” said Iley.

The EPA publishes Comprehensive Procurement Guidelines for recovered material content products. The EPA’s Environmentally Preferred Purchasing program is an excellent resource for more information on all types of sustainable products and services.

Vehicles, buildings

The Energy Policy Act of 2005 requires government vehicles to run on alternative fuels whenever possible, and Western parking lots show it. Western has 67 fuel-flexible cars that run on E-85 ethanol blend and 363 service trucks that can use B20 biodiesel blend.

Fuel availability continues to be a challenge for operators of alternative-fuel vehicle fleets, Iley acknowledged. “Ethanol fueling stations are more common in some parts of Western’s territory than others,” he said. “And biodiesel stations can be hard to find.”

The Desert Southwest and Sierra Nevada regional offices solve this problem by buying biodiesel in bulk, as New Mexico utility PNM does for its service fleet. The market will adapt if consumers, businesses and municipalities continue to purchase fuel-flexible vehicles to meet their own environmental goals. Until then, any business considering this strategy should research fuel availability in its area.

Perhaps the greatest opportunity for reducing environmental impact, not to mention saving on energy costs, comes from sustainably-designed facilities. “With ‘green’ buildings, you don’t have to play catch-up,” said Iley. “They are designed from the ground up to consume fewer resources and produce less waste.”

The catch is that those decisions have to be made when a facility is being built, or at least renovated. A new facility or major upgrade may not be in your business plan this year, but you can still improve your building’s energy and water use. Putting lights on motion sensors, replacing old

lighting ballasts with more efficient models, fixing plumbing leaks and landscaping with native plants are just a few ways to make operations more sustainable. Also, providing energy management training for facilities managers is as good for the bottom line as it is for the environment.

There are many ways to reduce a business’s environmental footprint and just as many good reasons to do it. In meeting its Federal goals, Western continues to discover better ways to do business and improve our performance. That’s good for the environment and good for our customers.. ⚡

Website of the month

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discover technologies that can save energy, improve the environment and lower energy bills.

NREL also offers free education programs for children, teens and adults. These programs present renewable energy and energy efficiency concepts and applications in a fun and engaging way.

The most surprising thing to be learned from NREL’s Web site may be how advanced renewable energy and energy efficiency technologies are. A little time spent browsing the site is bound to turn up some measure that can help utilities and their customers save energy today. NREL may not be able to turn a customer service representative into a scientist, but it can make science seem like a utility’s friend. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2007/oct/oct073.htm