

Energy Services **BULLETIN**

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

Largest cooperative wind project operational

By **Mary Klecker-Green**,
Basin Electric Power Cooperative

Editor's note: This story first appeared in the January/February issue of Basin Today, the bi-monthly corporate magazine of Basin Electric Power Cooperative.

Basin Electric Power Cooperative ended last year by making history. The nation's largest wind project owned solely by a cooperative, located near Minot, N.D., went into operation in the remaining hours of 2009. The 115.5-megawatt project, PrairieWinds 1, is owned by Basin Electric subsidiary PrairieWinds ND 1, Inc.

Dedication vs. deadline

The last 10 turbines of the 77-turbine project went into operation at 8:25 p.m. on Dec. 30, meeting the cooperative's aggressive timeline to complete the project in 2009. For the past five months, crews from contractors RMT and General Electric have been working day and night, seven days a week to complete this project.

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"They worked in snow, rain, wind and in the dark, but they got it done—and safely," says Ron Rebenitsch, Basin Electric manager of alternative technologies. "The employees from RMT and GE have worked tirelessly on this project and demonstrated true commitment to completing this project in a timely manner.

"I'd also like to thank our team for its dedication to seeing this project to completion safely and efficiently. The weather certainly didn't make it easy some days," Rebenitsch says.

Exceeding requirement

"This project represents a significant contribution to Basin Electric's—and North Dakota's—energy picture," says Wayne Backman, Basin Electric senior vice president of Generation. "With the completion of the wind project in Minot and other projects currently in development, we will be on track to have renewable energy generation with an installed capacity equal to more than 20 percent of current member load by the end of 2010."

This greatly exceeds the resolution Basin Electric's membership passed in 2005 requiring that 10 percent of their electricity demand be provided from renewable forms of energy. Through direct investments and annual pay-



With the completion of the PrairieWinds 1 project, Basin Electric moves closer to its goal of installed wind capacity equal to more than 20 percent of current load by the end of this year. (Photo by Basin Electric Power Cooperative)

ments under power purchase agreements from other renewable resources, these projects represent a capital investment of more than \$1 billion in renewable energy, with more than 700 megawatts of wind generation expected by the end of 2010. To assist in the economics of the renewable generation, Basin uses the renewable energy credits ("green tags") to meet member purchases or regulatory needs, or sells them to third parties.

This is enough capacity to power the average annual energy needs of 235,000 homes, according to Backman. The Minot wind project alone represents a \$250-million investment, according to Rebenitsch.

Members pull together

Rebenitsch says many additional parties assisted in the development

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Western practices efficiency we preach

By **Tiffani DeFore**, Western Enterprise Content Manager

Editor's note: This story originally appeared on Western's Tip-line, written by Western's Corporate Communications staff (and occasional guests) about what's happening at Western.

Just as American households are tightening their budgets, conserving resources and re-evaluating needs versus wants, Western, too, is examining its building energy use to separate the necessary from the merely convenient.

Like all Federal facilities, Western strives to reduce energy use and add renewable energy to our power mix as mandated in the Energy Policy Act of 2005 and other executive orders. With 22 sites and more than 400 buildings across our territory, conservation throughout our administrative buildings is the focal point of our efforts.

Low-hanging fruit

One recently completed efficiency measure involved evaluating lighting in Western's Corporate Services Office (CSO) building (both ceiling and workstations) to determine where LED bulbs

could replace compact fluorescent bulbs. The more efficient T8 lamps are already in use.

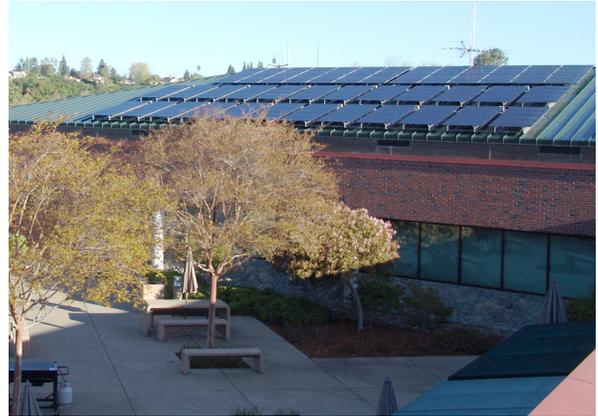
The building's HVAC system used to operate around the clock, seven days a week, with different temperature settings throughout the building. To save energy—and keep our own heating bills down—the system is now programmed to come on at 6 a.m., Monday through Friday, and turn off at 5 p.m. each night. The temperature is set at a consistent 72 degrees.

Regions tighten up

At Western's Rocky Mountain Region (RMR), we have installed variable frequency drives (VFDs) on several cooling tower fans and on a large air handler. The drives allow fans to run at slower speeds, based on demand.

We also installed LED bulbs in stairways that require lighting 24 hours a day, seven days a week. Finally, installing insulated fabric window shades has reduced solar gain in summer, optimized window insulation in winter and made RMR offices more comfortable.

In our Sierra Nevada Regional (SNR) office, skylights provide natural day lighting in hallways and office space. Photo-sensor cells turn out electric lights in areas where the skylights provide enough light to save more energy—and dollars. Dimmer switches retrofitted on overhead lights near windows reduce the indoor lighting level when outside natural light is enough.



After making its office facilities much more energy-efficient, Western's Sierra Nevada office installed a solar array to generate clean electricity. (Photo by Steve Richardson, Western Public Utilities specialist, Sierra Nevada Region)

Programmed lighting controls help to increase overall lighting efficiency. Most interior offices and conference rooms at SNR now have occupancy sensors that turn off the lights when the rooms are unoccupied.

Last year, SNR upgraded its chillers to high-efficiency scroll chillers with on-board controls to optimize the equipments' performance. Western also upgraded the building energy management system (EMS) with new controls and new operation sequences that optimize the performance of central heating and cooling units. The EMS has an astronomical clock that controls the external light according to seasonal daylight hours.

Heat exchangers on the building capture waste heat from our computer room cooling unit condensers and put it into our building heating loop. When the conditions are right, this system essentially heats the building for free.

Next, renewables

After we maximized lighting efficiency, regulated building temperature and recycled heat, Western's facilities

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Energy Services Bulletin

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Editor: Kevon Storie
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Western efficiency

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were ready to use renewable energy. What is good for many participants in our Renewable Resources for Federal Agencies program also turned out to be a good solution for Western. We purchased more than 10,000 MWh worth of renewable energy credits (RECs) in 2009, and expect to buy RECs totalling 8,982 MWh this year.

We haven't overlooked our territory's abundant solar resources, either. Repairs are being made to

RMR's 20-plus-year-old, ground-mounted photovoltaic (PV) system to extend the life of this clean energy generator. SNR topped off its conservation efforts with a rooftop solar array to provide electricity to the building.

Better metrics needed

Now we are asking ourselves, "Is that enough?"

In re-evaluating the way we calculate electricity use, we found some holes in our current method. To get a more accurate picture, Western is collaborating with our

sister agency, Bonneville Power Administration on a new calculation process that will take into account our facilities that don't have metering in place. This new process will allow us to determine if the current amount of renewable energy we are purchasing is sufficient. Results are expected in July.

So now we ask you, what is your company doing to conserve and to use our natural resources? Share your activities and ideas, and we will post them on our new interactive Breaking News page. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2010/jun/jun102.htm

Wind project

from page 1

of the project. "Verendrye Electric Cooperative (Velva, N.D.) provided a tremendous local force throughout the development of this project," Rebenitsch says. "Bruce Carlson (Verendrye Electric general manager) has been one of the biggest supporters of this project."

"This is a dream come true for me and for Verendrye Electric," Carlson says. "This goes back to the late '70s and early '80s when Verendrye Electric partnered with the Department of Energy on a wind data collection project at the former radar base site south of Minot. We knew we had good data then, and it took Basin Electric and great support from Verendrye member landowners to finally pull this together, and I'm extremely proud."

Gov. Agencies pitch in

State and Federal agencies also played a key role in the project.

"I'd like to thank the North Dakota Public Service Commission, along with other state and Federal regulators, for their assistance and commitment to seeing this project through and their commitment to wind development in North Dakota," Rebenitsch says.

The three turbines of the Minot Wind 2 project interconnect with a substation owned by Central Power Electric Cooperative, a Basin Electric member cooperative in Minot, N.D. The PrairieWinds 1 project interconnects with a new substation that was built to connect to a Western Area Power Administration (Western) 115-kV transmission line.

"This also highlights the value of the long-standing partnership with Western on the Integrated System. Interconnecting to Western's line, which crosses the project site, avoided the need for constructing about two miles of interconnection

line and a 230-kilovolt interconnection substation," Rebenitsch says. "Western's engineering support was critical to the success of this project."

The Minot wind projects are expected to need about eight full-time operations and maintenance employees.

More wind in pipeline

PrairieWinds SD 1, another Basin Electric subsidiary, continues planning and permitting for a 151.5-megawatt wind project in central South Dakota. "We're currently in the environmental permitting process. We're also working on engineering for the roads, substation and collector system, and micro-siting the turbines," Rebenitsch says. He said construction of the 101 wind turbines is scheduled to begin in mid 2010 and have it online by early 2011. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2010/jun/jun101.htm

Basin, Western offer home energy audit training

With the Home Star Energy Retrofit Act (“Cash for Caulkers”) working through Congress, utilities should ask themselves if they are ready to help customers who will need home energy audits to qualify for some of the program’s incentives.

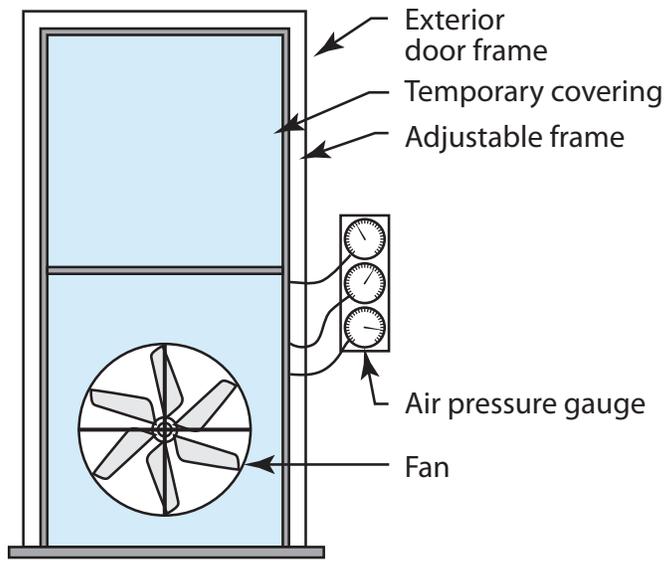
If the answer is “no,” or even “we aren’t sure,” Western would like to help you prepare your staff to provide comprehensive energy audits. Our Upper Great Plains office is working with Basin Electric Power Cooperative to plan a Home Energy Rater training course.

Lots to learn

More than a workshop on basic walk-through auditing, this weeklong training is the first step toward becoming a professional home energy rater accredited by the Residential Energy Services Network (RESNET). Energy raters are able to produce energy rating reports that can help homebuyers and homeowners qualify for financing incentives through a variety of private and government loan programs.

This workshop will teach participants how to evaluate the energy performance, comfort and safety of a house through a comprehensive, whole-house diagnostic procedure. Trainees will learn how to:

- Identify hidden flaws often found in standard construction that can cause discomfort, high utility bills, moisture problems and indoor air quality problems
- Use powerful new tools to find and correct flaws in a building’s thermal envelope
- Evaluate and sell the economic benefits of solutions to these



This diagram shows the components of a blower door, one of the diagnostic tools training participants will learn to use in home energy audits.

problems by using cutting edge energy analysis software—software that also provides precise sizing of heating and air conditioning equipment

- Apply building science principles and residential energy use
- Use of state-of-the-art diagnostic tools, including the blower door
- Conduct a comprehensive diagnostic analysis of a home
- Produce a complete home energy analysis using REM/Rate™ and International Energy Conservation Code (IECC) compliance report
- Create or expand their business selling home comfort and diagnostics
- Size heating and air conditioning systems for new or existing homes

Plan ahead

With so much material to cover, the registration is limited to only 12 participants, so early registration is

highly advised. The small class size will allow for individual attention and plenty of opportunity to work with the modeling and auditing tools.

The class is scheduled for the week of Sept. 20, 2010. A venue has not been chosen yet, but it will take place in Sioux Falls, S.D., so attendees need to factor time off and possible travel into their decision to take the class.

Due to the comprehensive curriculum and the accreditation, the cost for taking the home energy rater training is \$1,200 per student excluding travel, lodging and meals. Basin and Western have committed to offset a portion of the fee, but the final cost to attendees has not yet been determined.

Worth the investment

Spending \$2,000 for a week of training to prepare for certification may seem like a lot of money, unless you look at it as a long-term

*See HOME ENERGY
AUDIT TRAINING page 8*

Technology Spotlight:

Energy-efficiency opportunities in dairy milking centers

On a typical dairy farm, 70 percent of the electricity consumed is used to cool milk, heat water and run the vacuum pump used in the milking process. But dairy milking centers have many opportunities to save energy because of their combined need for refrigeration and hot water. New technologies such as variable speed drives for vacuum and milk pumps, and energy-efficient scroll compressors for refrigeration also reduce energy use. Other energy savings opportunities include energy-efficient mechanical ventilation, lighting, motors and, in some cases, compressed air systems.

Heat exchange

Well-water pre-coolers and refrigeration heat recovery, or RHR, are two measures that take advantage of the simultaneous need for hot water and cooling. Now widely in use, well-water pre-coolers simultaneously pre-heat water and pre-cool the milk by passing well-water and milk through a heat exchanger, to achieve refrigeration savings of 15 to 30 percent.

Refrigeration heat recovery is accomplished by a “desuperheater,” which recovers heat from the hot refrigerant leaving the compressor to preheat water, typically to 95 degrees Fahrenheit to 105 F. RHR units can be inexpensively added to existing refrigeration equipment. On small farms of 100 cows or less, the best, most cost-effective option tends to be using an RHR unit only. However, installing both can be cost effective on larger farms.

Variable speed drives

Variable speed drives can often achieve good savings on the energy use of vacuum pumps, milk pumps, well-water pumps and ventilation fan motors. In particular, the vacuum pump used for milking dairy cows typically consumes about 20 percent of the electricity used on the farm. A variable speed drive can reduce the vacuum pump electrical use from 30 to 80 percent (470 kb pdf), 60 percent being the typical savings. Larger farms, where the milking machine operates for at least five hours per day, generally achieve the most savings.

Scroll compressors

Scroll compressors are 15 to 20 percent more efficient than standard reciprocating compressors and should be specified on all new refrigeration systems. Early replacement of an existing reciprocating compressor may be cost effective on large farms where milk production is greater than about 15,000 pounds of milk per year per compressor.

Water-heating

In general, hot water measures such as RHR and high-efficiency water heaters are more cost effective than refrigeration measures and should be implemented first, especially for small farms. Many low-cost measures



The unique energy demands of dairy milking operations offer many opportunities for energy savings. (Photo by U.S. Dept. of Agriculture)

(40 kb pdf) reduce the need for (or improve efficiency of) water heating. For example, reducing wash and rinse water temperatures, flushing the water heater regularly, tuning up wash cycles to use only the water that is necessary and using a cold acid rinse cycle for the final rinse of the milk lines.

Keeping up equipment

Regular maintenance is important in maintaining the energy efficiency of many dairy farm systems. For example, regularly cleaning the refrigeration condenser unit can achieve 3- to 5-percent savings in refrigeration energy. Dirty shutters and obstructed air inlets and outlets of ventilation fans can reduce fan efficiency up to 40 percent.

Measures summary

The cost-effectiveness of the following conservation measures generally depends on such factors as the size of the farm, pounds of milk produced, milking system type and number of

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Technology spotlight *from page 5*

milking hours per day. Here's a break-down by equipment of how to optimize efficiency:

Water heating

- Reduce hot water temperature. Typically 165 F suffices for washing dairy equipment and ensuring a temperature of at least 120 F at the end of the wash cycle.
- Replace a hot water heater with a high-efficiency heater.
- Flush out the hot water heater at least once a year.
- Conserve hot water.

Refrigeration, water heating

- Install refrigeration heat recovery. But, unless there is inadequate space for a water heater, avoid the less efficient “all-in-one” heat recovery units, which have an electric heating element to perform the function of both a water heater and an RHR unit.
- Install a well-water pre-cooler or modify an existing pre-cooler to reduce milk temperature to within three or four degrees of the well-water temperature.
- Consider a variable speed milk pump to improve the efficiency of both refrigeration and the well-water pre-cooler.

Refrigeration

- Replace reciprocating compressors with scroll compressors.
- Install an evaporative condenser or evaporative condenser pre-cooler.
- Clean the condenser unit at least twice a year, and service annually.

Vacuum system

- Install a variable speed vacuum pump.
- Reduce vacuum pump speed if the milking machine has an excess of effective reserve (i.e., vacuum available for milking).
- Replace vane type or water ring vacuum pumps with correctly sized, blower type (lobe) vacuum pumps.
- Size vacuum pumps properly—keep in mind that high vacuum levels are not necessary for washing.

Mechanical ventilation

- Install a thermostat so fans run only as necessary.
- When replacing or adding high-speed fans, use 48-inch or larger high-efficiency fans.
- In free-stall barns or loafing barns/bedded pack barns, replace conventional high speed “box” fans with high-volume, low-speed fans.
- Retrofit existing fans with self-tightening devices for belts.
- Use variable speed fans to maintain a temperature set point rather than cycling the fan on and off.

Lighting

- Replace all fixture types with T-8 fluorescent lights (other than incandescent fixtures that use compact fluorescent lamps).
- Install lighting controls.
- If using high intensity discharge, or HID, fixtures such as high-pressure sodium and metal halide, choose full cut-off reflectors to direct light where it is needed.

Motors

- Use properly sized, high efficiency TEFC motors.
- Replace V-belt motor drives with cogged belts and pulleys.
- Maintain motors monthly.

More information

- *Dairy Farm Energy Management Guide: California*, Southern California Edison.
- Sanford, Scott, “Energy Conservation in Agriculture,” University of Wisconsin Extension, Publication No. A3784, Chapters 1 to 11.
- *Dairy Farm Energy Management Handbook* (665 kb pdf), Wisconsin Department of Agriculture, Trade and Consumer Protection.
- Maine Rural Partners’ “Farm Energy Field Guide” includes several great references from many sources.” ⚡

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2010/jun/jun104.htm

Web site of the month:

Energy Star

So many incentives, so many appliances, so little time. Fortunately, utilities and their consumers have a well-established, go-to resource where they can research qualifying equipment, and find local retailers who sell the products—Energy Star.

A little history

You are probably familiar with this joint program of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE), and if not, it is time to get acquainted. Since 1992, Energy Star has helped consumers save money and energy by identifying and promoting energy-efficient products through voluntary labeling. Computers and monitors were the first labeled products, followed by more office equipment and residential heating and cooling equipment in 1995. Today, consumers can find the Energy Star label on more than 60 types of products. EPA has also extended the program to cover new homes and commercial and industrial buildings.

The program has been a huge success, preventing 45 million metric tons of greenhouse gas emissions and saving consumers nearly \$17 billion on their utility bills in 2009 alone. Last year, Americans bought more than 300 million Energy Star qualified products for a cumulative total of about 3 billion products since 2000. It is no wonder Energy Star can claim more than 17,000 partners including nearly 3,000 manufacturers, more than 1,500 retail partners and 8,500 builder partners. These public

and private sector organizations have discovered that energy efficiency is good for business.

Products

Unlike many programs that target one type of customer over another, Energy Star has something for everyone who wants to use energy wisely. Visitors will find qualified products organized by category: Appliances, building products, computers and electronics, heating and cooling, lighting and fans and plumbing. Links under each category go to product pages that provide an overview, specifications, buying guides and frequently asked questions about specific products. There are also links to store locators, special offers and similar products on these pages.

In case you are curious, the product section has an explanation of how products earn the Energy Star label. Products must by meet efficiency requirements set forth in Energy Star product specifications established by the EPA. Look for related FAQs on the right side of each product page to learn more about that aspect of the Energy Star program.

Energy Star recognizes that installing efficient appliances and equipment is only half the battle when it comes to saving energy. Save Energy at Home provides visitors with more information about heating and cooling systems, the top energy consumer in the home. Tips on maximizing the efficiency of HVAC systems, installing and operating programmable thermostats and sealing and insulating ducts can be found here.



Efficient buildings

The building offers as many opportunities to save energy as the products that go inside it. Three Energy Star programs focus on capturing savings at the building envelope level: Home Improvement, New Homes and Buildings and Plants.

While it is easier to build an energy-efficient home from scratch, there is still hope for the millions of existing homes that were built when energy was “too cheap to meter.” Home Improvement with Energy Star guides visitors through green remodeling starting with a list of common home problems which will sound familiar to any homeowner. After comparing their home’s energy use to other houses across the country with the interactive Home Energy Yardstick tool, visitors can look into the different types of home energy audits.

Consumers who are in the market for a new home should look for Energy Star-qualified builders in their area. Energy Star homes are at least 15 percent more energy efficient than 2004 International Residential Code (IRC) requirements, and include

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energy-saving features that boost their efficiency by 20 to 30 percent over standard homes. Utilities in growing communities might even consider partnering with local Energy Star builders to encourage customers to buy more energy-efficient housing.

The section on commercial buildings and plants is particularly comprehensive, covering facilities from churches to hospitals to utilities and more. Facility managers can find a step-by-step guide for energy management, a tool and resource library and a network of expert help who can help them lower operating costs and increase the bottom line.

Partner resources

Consumers and businesses can leverage Energy Star's wealth of

programs and tools by becoming a partner. Your utility may be familiar with, or actively involved in, the Change the World campaign to save energy and money, and help fight climate change in your community. But that is only the beginning of the resources Energy Star offers utility partners.

Utility and Regional Energy Efficiency Program Sponsors (EEPS) resources provide utilities, state agencies and other organizations with tools and strategies that can reduce program costs and implementation timelines while increasing the program's efficacy. Use the database for incentives and joint marketing opportunities (DIME) to seek out partners for local promotions. The Advanced Search further customizes your search by

state, timeframe, campaign and opportunity.

The Utilities/EEPS Training Center gives partners a unique forum to share tools and best practices for sales associate training. It showcases the most effective training materials from Utilities/EEPS partners around the nation to help sales associates in retail environments convey the benefits of Energy Star products to consumers. Partners will also find product-specific training materials and a partner activity search. There is contact information for partners who would like to add their own programs to the database. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2010/jun/jun105.htm

Home energy audit training *from page 4*

investment in customer relationships. The advantages of utilities offering energy audits are significant: A utility-based energy auditor can provide a more accurate calculation of payback for energy-efficiency programs. Even better, the auditor can explain to consumers how the programs benefit them, making them more likely to participate. It is difficult to put a dollar value on building trust with your customers.

The proposed "Cash for Caulkers" program will provide utilities with the motivation to make energy audits a standard customer service. There are two tiers in the Home Star Act, the second of which is built around audits conducted by certified rating specialist. While the exact qualifications for certified auditors under "Cash for Caulkers" are still developing, the majority of commenters are recommend-

ing HERs/RESNET as minimum standards.

The home energy rater training will provide Western customers with high-quality training in a skill that will continue to pay off in any economy. Contact Mike Radecki, Upper Great Plains Energy Services representative, to learn more about the training, and to pre-register. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2010/jun/jun103.htm