

BULLETIN

Western's monthly energy efficiency and planning newsletter dedicated to customer activities and sharing information.

RETROFIT PROJECT TURNS PVREA HEADQUARTERS INTO MODEL OF EFFICIENCY

Poudre Valley Rural Electric Association (PRVEA) is practicing what it preaches by upgrading the building envelope and heating system at its Fort Collins, Colo., headquarters.

Utilities often occupy buildings that are not as efficient as they could be, but PVREA has been steadily and methodically correcting that problem over the past four years. The long-term retrofit of the 18-year-old, 46,000 sq. ft. building will be complete in July with the installation of 13 new geo-exchange heat pumps. The high-efficiency units, two of which are already in service, will replace the 13 air-to-air heat pumps that previously heated and cooled the facility.

FIRST THINGS FIRST

The project began with a professional energy audit, as all energy upgrades should. PVREA offers a three-tiered home energy audit program for its members and employs its own energy auditor, Gary Myers—Gary the Energy Guy. "I started auditing our building when I noticed that our HVAC [heating, ventilation and air conditioning]



This well-designed HVAC control system at Poudre Valley's headquarters provides energy use information that helps facility managers identify anomalies before they become issues. (Photo by Poudre Valley Rural Electric Association)

equipment was running an awful lot," he recalled.

Myers and coworkers hooked up five blower doors to establish the infiltration rate and then fired up their infrared cameras to find air leaks. It quickly became clear that a leaky building shell was putting a strain on the HVAC system. The building was losing 9,000 cubic feet per minute (cfm) of conditioned air to the outside. Thermal Concepts, a local insulation company, helped with air-sealing the main portion of the building, which reduced energy loss from air filtration.

Next up, since the headquarters roof was in need of replacement anyway, PVREA replaced it with a light-colored roof. Energy Star-qualified roofing materials that reflect the sun can reduce peak cooling demands by 10 to 15 percent.

Tightening up a building shell before installing new HVAC equipment allows for sizing the system appropriately. But before choosing the new heat pumps, the facilities team had one more system to evaluate. An HVAC system that delivers too much outside

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SMALL UTILITY GETS BIG RESULTS FROM FULL-SERVICE EFFICIENCY PROGRAM

An energy-efficiency program that is easy for the utility to manage, easy for the customers to implement and pays for itself might sound like a dream, but for San Miguel Power Association (SMPA), it's a dream come true.

Launched in 2011, San Miguel Power Partners achieved energy conservation measures in 136 residential and 5 commercial facilities in its first year, saving the western Colorado utility nearly \$20 thousand. "Our goal was to make it as easy as possible for members to make energy-efficiency improvements in their homes and businesses," explained Brad Zaporski, SMPA's member services and marketing manager.

Members had been asking for help on reducing their energy bills, Zaporski recalled, "So our board went looking for a program that could deliver the benefits of a 'big city' energy-efficiency program."

Those benefits go beyond energy savings to encompass increased comfort and health in homes and buildings, business opportunities for local contractors, improved property values and the environmental benefits of reduced emissions. And, best of all, Power Partners accomplishes these things by getting the customers who sign up to pay for it.

SEEKING PARTNERS

That's a pretty good trick for a utility with only 13,000 meters and no large staff or budget to design and administer programs. The secret is that SMPA didn't go it alone.

An SMPA board member had heard about iCAST and invited a representative to make a presentation. The Colorado-based nonprofit's unique "ResourceSmart" program is set up like an energy services company. The board was impressed with the company's turnkey approach that provides a one-stop shop for consumers to make energy-efficiency upgrades.

iCAST President Ravi Malhotra explained the simple strategy underlying Power Partners. "We design our energy-efficiency improvements so that the loans needed to make them are paid for with the savings on the utility bills—there's no monthly 'out-of-pocket' expense," he said. "After the loans are repaid, the recipients enjoy all the savings. And because utility bills aren't going down anytime soon, recipients continue to save even more over the 20-year lifetime of the improvements."

The company manages every stage of the program, from community outreach to managing the energy audits, arranging project financing, recruiting and training local contractors and performing final inspections and reporting. Choosing iCAST as the program provider was not a hard decision.

Before rolling out the program to its members, SMPA decided to enlist one more partner. "We invited SourceGas, the local gas utility, to join the program to expand its scope," said Zaporski. "The auditors would be evaluating not just electricity, but gas use, too. It gives our members access to more rebates for measures that will improve health and safety, as well as energy consumption."

START 'EM UP

Another partner, the philanthropic Telluride Foundation, put up \$5,000 to get the program off the ground.



San Miguel Power Partners is turn-key energy-efficiency program that walks consumers through the entire process of making improvements to their homes and businesses. (Artwork by iCAST)

The foundation provides cash grants for regional community improvement projects, and had worked with iCAST on an efficiency upgrade at its offices.

iCAST set contractor qualifications and reached out to the local contractor pool. Alpine Bank, an established West Slope bank, joined the team to finance improvement projects. "By using local businesses wherever possible, the program has the added benefit of boosting the local economy," said Zaporski.

SMPA and SourceGas began to promote Power Partners on their websites, Facebook pages, bill stuffers and at member meetings. The utilities also share their marketing resources with iCAST to reach the widest audience possible.

PROGRAM IN ACTION

To participate in Power Partners, members sign up online or call to schedule an energy audit. Rebates may be available for audits, depending on the number of measures the member completes. After qualifying interested members, iCAST guides them through the process, helping to interpret the audit and choose appropriate measures, estimating the payback and working with funders such as Alpine Bank to set up financing for the projects.

Insulation, large lighting projects, appliance upgrades and caulking and sealing are popular choices. The

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ENERGY SERVICES BULLETIN

The Energy Services Bulletin is published by Western Area Power Administration for its power customers. The mailing address is Western Area Power Administration, P.O. Box 281213, Lakewood, CO 80228-8213; telephone (720) 962-7508.

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Retrofit project *from page 1*

air causes needlessly high energy bills, and PVREA's office space turned out to be over-ventilated. This discovery prompted a search for a new HVAC control system that would provide the proper amount of ventilation air. "After considering options, we decided to go with the I-View system, a Carrier product for commercial applications," Myers said.

ON TO HVAC

Two aging air-source heat pumps due for routine replacement were the first systems targeted for retrofit. Twin Rivers Engineering and Colorado Geothermal Drilling designed the loop field to supply water at a consistent 40 degrees Fahrenheit, even through most of the winter. "That takes lots of planning and experience," Myers explained. "Experienced geothermal designers are critical to the success of installations—and to utility programs

promoting ground-source systems."

PVREA chose Northern Colorado Energy Solutions to install the units. The installation contractor participates in the utility's Select HVAC program, and the heat pumps were factory commissioned to "guarantee performance," a program requirement.

Once operating, the new heat pumps required 30 to 50 percent less power, compared to the remaining air-to-air units, a satisfying, if not surprising result. Properly installed air-source heat pumps are 150 to 300 percent efficient, while geothermal systems offer 300 to 600 percent efficiency ratings. PVREA's demand charges are down, and Myers reports that employees have not been using space heating this season. "Efficiency isn't the only reason for an HVAC upgrade," stated the Energy Guy. "A project is not a success unless it improves comfort, too."

FINISHING UP

Myers is now working with contractors to change out the building's

remaining 11 air-source heat pumps. Once the all-ground-source system is operational, he looks forward to seeing further reductions in PVREA's demand charges, and sharing the results.

When the project wraps up this summer, PVREA will have drilled 84 300-foot vertical wells and installed 108 tons of geo-exchange heat pumps. The loop field uses smart pumps that adjust the water flow to the building's energy demand. The computer-controlled pumps will reduce the energy needed for pumping. "The smart pumps are not standard equipment on geothermal installations," Myers said. "We want to create a showpiece to demonstrate what can be achieved with available technology."

Poudre Valley Rural Electric Association's investment will help to keep operating costs down—always a good thing—and set a good example for members, too. The utility used its own resources and followed its own guidelines to make improvements that deliver real results. ⚡

For links to more resources, visit <http://ww2.wapa.gov/sites/western/es/pubs/esb/Pages/esb1.aspx>

Small utility *from page 2*

measures must result in substantial savings, based on the Energy Department's deemed savings formulas. "We don't take anything off the table, but evaluate projects on a case-by-case basis," noted Zaporski.

He added that auditors may make minor upgrades while they are in the home, such as replacing incandescent lights with compact fluorescent bulbs or installing low-flow shower heads.

For big impact, though, it is hard to beat the project that targeted the largest low-income housing complex in SMPA's service territory. The mix of measures included lighting retrofits; insulation; and replacing water heaters, appliances or space heating

systems. Contractors installed some type of upgrade in every unit—more than 100 private residences in all.

PROGRAM MODEL SPREADS

Moving into its second year, Power Partners has provided energy-efficiency services to almost 1 percent of SMPA households. "It takes years to have an impact of that magnitude in an urban setting," observed Malhotra.

Other small utilities with limited budgets have duly noted those results and want to see if their communities can duplicate them. iCAST is now managing similar programs in six Southeast Colorado counties and two small urban towns.

Zaporski doesn't see any reason, though, why the Power Partners

model wouldn't work for a larger utility or municipality. "The key is to make sure they have the necessary quality assurance in place and do the groundwork with local contractors," he said.

Most utilities would be willing to do little outreach and collaboration for a self-sustaining energy-efficiency program that takes the burden for making upgrades off the consumer. Many power providers would put in a lot more effort for a program that could stimulate the local economy and help them reach their energy management goals. But San Miguel Power Association knows that utilities don't always have to work hard for success—they just have to work with the right people. ⚡

For links to more resources, visit <http://ww2.wapa.gov/sites/western/es/pubs/esb/Pages/esb2.aspx>

EAST RIVER, GOLDEN VALLEY ELECTRIC NAMED 2012 WIND CO-OP OF THE YEAR

The 12th annual Wind Cooperative of the Year Awards honored Western customer East River Electric Power Cooperative, along with Golden Valley Electric Association on Feb. 21 at the National Rural Electric Cooperative Association (NRECA) TechAdvantage Conference in New Orleans, La.

The Department of Energy's Wind Program sponsors the award with NRECA to recognize innovation and leadership in wind development among NRECA members. The award went to East River for achievement in the generation and transmission cooperative category, and to Golden Valley for wind development by a distribution cooperative. A panel of wind industry, utility, government, national laboratory and cooperative experts selected the cooperatives from a group of 15 nominees nationwide.

COMMUNITY-OWNED WIND

A wholesale electric power supply cooperative serving eastern South Dakota and western Minnesota, East River Electric Power Cooperative is one of wind power's earliest champions. In 2009, the co-op created South Dakota Wind Partners LLC (SDWP) to advance and promote the state's wind industry. Historically, wind projects have relied on Federal production tax credits, which favor large investors. SDWP provides a model for community-based, locally owned wind development that enables individuals to invest in projects.

SDWP proposed a 10.5-megawatt (MW) addition to the 151-MW Prairie Winds SD1 project as its first opportunity. Prairie Winds is a for-profit subsidiary of Basin Electric Power Corporation, interconnected with Western's transmission system. To launch the offer, the SDWP board

of directors contracted with Val-Add Service Corporation, a company specializing in developing projects for individual investors.

East River worked with the partnership to promote investor meetings across the state where individuals could learn about the project and different investment options. The concept met with overwhelming acceptance, reaching the aggressive offering goal of \$16 million in just 60 days with investments from more than 600 South Dakota citizens.

"South Dakota Wind Partners demonstrated a new model for developing renewable energy projects by enabling widespread local ownership," said East River General Manager Jeff Nelson. "East River and its members are very pleased that the South Dakota Wind Partners created new local wealth and proved a new model for accomplishing that goal."



Through South Dakota Wind Partners, more than 600 South Dakota Citizens invested in the expansion of the Prairie Winds SD1 wind farm, making it a true community venture. (Photo by East River Electric Power Cooperative)

MEETING RENEWABLE GOALS

Fairbanks, Alaska-based Golden Valley Electric Association relied on fuel oil for more than a third of its power. Facing rising oil prices, the board of directors set a goal in 2007 to get 20 percent of its peak load from renewable energy by 2014. Remote Eva Creek had been on the utility's radar for years as a potential wind farm site, but the board was determined not to let its renewables goal negatively affect ratepayers. When the American Recovery and Reinvestment Act brought down interest rates on Clean Renewable Energy Bonds, the project finally became feasible.

Developing a 25-MW wind farm on ridge tops at the end of a 10-mile, dirt, mining road accessible only by railroad bridge presented many challenges. All materials arrived by railroad, before being transported by truck along a road that had to be widened and straightened to accommodate the 147-foot blades. Michels Wind Energy of Wisconsin oversaw all the engineering and construction work.

Choice of equipment increased the project's complexity—Golden Valley selected innovative, cold-climate wind turbines produced by the German manufacturer REpower. At the time, no other commercial wind farms were using the technology. Also, managing the risk of fluctuating currency exchange rates required extra planning and cooperation. Those efforts are paying off, however, as the equipment's generating capacity of nearly 25 MW is on track to help the co-op meet its renewable goals ahead of schedule. Eva Creek may also save Golden Valley members as much as \$4 million by the end of 2013.

"We're proud to have the northernmost wind farm in North America of this size. That truly makes us unique.



The remote location of the Eva Creek Wind Farm created many challenges for the Golden Valley project, but the views of Mt. McKinley from the site were spectacular. (Photo by Golden Valley Electric Association)

We appreciate the efforts of REpower and Michels in completing the project," said Greg Wyman, manager of construction services and Eva Creek Wind project manager.

PAST WINNERS

Since NRECA and the Energy Department's Wind Powering America created the award as part of its outreach and education initiative, several Western customers have been named Wind Cooperative of the Year. Iowa Lakes Electric Cooperative, Minnkota Power Cooperative, Holy Cross Energy,

Basin Electric and Great River Energy are among the past winners.

Western congratulates East River and Golden Valley for their creativity and determination to add clean energy to their power portfolios. The Wind Cooperatives of the Year have overcome significant challenges to show that wind power can be good for ratepayers, the community and the environment. For more information on DOE's Wind Powering America outreach and stakeholder engagement initiative, visit Wind Powering America. ⚡

For links to more resources, visit <http://ww2.wapa.gov/sites/western/es/pubs/esb/Pages/esb3.aspx>



QUESTION:

Are the paint products being marketed as energy efficient (sometimes called “low emissive” or “radiant” or “reflective coatings”) effective as insulators? Our summertime peak temperatures can reach 120°F or more.

ANSWER:

There are many misconceptions when it comes to how insulation actually works and the interpretation of results. It is important to first understand what causes the transfer of heat.

TYPES OF HEAT TRANSFER

Heat is transferred by three different methods:

- Conduction transfers heat throughout a stationary material by molecular agitations. Heat causes the molecules within an object to vibrate at a faster rate. As these molecules bump into each other the energy is passed on and migrates on a path from warm to cool. Insulation’s “R” value—its ability to impede heat flow—measures only conduction. Some materials translate this energy more quickly (conductors), and others more slowly (insulators). Metals tend to be good conductors and ceramics are good insulators. When you grab a hot pan, heat is transferred by conduction.
- Convection transfers heat by means of a fluid (usually air or water) that moves away from a heat source. This can be done by mechanical means (fans or pumps) or naturally. A blow dryer is an excellent example of forced convection. Natural convection occurs when the heat causes the fluid to become less dense and it expands, displacing other fluid.



Solano County Government Center

“Cool roofs” have been shown to use up to 40 percent less cooling energy than similar buildings with dark roofs. (Photo by Solano County, Calif.)

- Radiation transfers heat by means of electromagnetic waves emitted from a heated object. Though we cannot see these electromagnetic waves, they are a form of light energy. The ability of an object to radiate this light energy is called its emissivity. The higher the emissivity of an object (the closer to 1.0), the more like a perfect “black body” it is. A “black body” is considered to be a “perfect emitter;” that is, it emits (and absorbs) radiant energy at the maximum theoretical rate. Heat felt from a campfire is radiation heat.

ABOUT RADIANT HEAT

Reflective coatings and paints affect radiant heat transfer. Unfortunately, both consumers and retailers often have only a dim understanding of radiation as it relates to these products. Reducing radiant heating does not increase R-value.

To get a better idea of the nature of radiation as it applies to paints and coatings, consider that visible light is one expression of radiation. The electromagnetic spectrum of radiation emitted by the sun runs from short-waved ultra-violet to long-waved infrared. In between these extremes is visible light—only a small portion of the overall spectrum. A building roof is constantly bombarded by radiation, some visible and some not. Regardless of where on the spectrum radiation falls, it travels in a line-of-sight fashion. When you stand in front of a fire you feel the heat, but if something comes between the fire and you, the heat goes away.

Here’s an excellent example of how emissivity changes things: When you boil water on the stove in a black cast iron pot, you can feel the heat as your hand moves closer to the pot. However, with a non-coated shiny

See *ENERGY EXPERTS*, page 8



WEBSITE OF THE MONTH: ON-DEMAND WEBINARS

The beauty of the Internet is that it frees us to set our own schedules, whether you like to pay bills or shop in the wee hours, catch up on favorite TV shows on a lazy afternoon, or learn about the latest program or technology over lunch hour. Webinars are a popular and cost-effective way to deliver training, and recorded and archived sessions make online learning even more convenient.

NOT ALL THE SAME

Because we are talking about the Internet, you can expect on-demand webinars to run the gamut in cost, technical quality, formatting and content. If you are paying for training, do a little homework to make sure not only that the material suits your needs, but that your computer has the necessary hardware, software and bandwidth to deliver the webinar.

Although this column focuses on free resources, on-demand training has become big business, and an incentive to membership. Professional organizations may offer archived webinars for free, but to members only. Several nonprofits require users to register—for free, of course—to get access to past webinars. You can expect to wind up on the organization's email list, which may be news you can use anyway. Even if it isn't, the webinar might be worth deleting a few extra messages—decide on a case-by-case basis.

Formatting and bandwidth can also be a challenge to online learners, especially those using older home computers. Audio and video files can be huge, and may frequently buffer (stop streaming to load.) Some webinar companies

require users to download a special code to access recordings. Many libraries include presentations in PDF or PowerPoint formats for users who have problems with giant recording files. It is not the same as hearing or seeing the speakers, but it still provides the gist of the material. If you are planning on taking an online course for credit, however, be sure you can access all the necessary class materials before signing up.

FEDERAL FREEBIES

There is nothing like on-demand webinars for providing low-cost technical assistance to remote clients and regional employees, so it is no surprise that the Energy Department offers so many free resources.

Most of the topic home pages under the Office of Energy Efficiency and Renewable Energy (EERE) have a "webinar" link on the right side of the page. You may also find webinars under "Information Resources" in the top navigation bar, or on the publications page.

The Advanced Manufacturing Office presents webcasts on energy-saving strategies from leading manufacturing companies and energy experts. Most are in PDF format, and some require free registration. In the archives of the Buildings Technology Office, users will find recordings on residential research and solid state lighting.

The Sunshot Initiative's Solar Resource Center has a searchable database with webinars and podcasts that can be further sorted by topic, audience and state. Wind webinars and podcasts are archived on the Wind Powering America website.

CLEANER THAN TRAVEL

For the Environmental Protection Agency, webinars have the added benefit of reducing travel miles and the accompanying emissions. You can learn about EPA initiatives without leaving your office—or home!

Energy Star offers free online training covering such topics as energy management, project financing, benchmarking and building rating to name only a few. Most webinars are recorded, and some require passwords.

EPA's Green Power Partnership regularly hosts webinars that explore green power technologies and products, procuring green power and other related issues. Users can download presentations, recordings and other supplemental materials dating back to 2008. Audio recordings of more recent events are available upon request.

DON'T FORGET WESTERN

While you are on Western's website, check out the Renewable Energy Program's webinar library. We partner with other Federal agencies, like the Energy Department's Tribal Energy Program, and private nonprofits, like the Interstate Renewable Energy Council, to educate customers about clean energy opportunities and issues. Whenever possible, those webinars are recorded and placed in the library for free access. Some of the webinars require users to install the GoToMeeting codec for access.

Energy Services also works with outside organizations to make online training easy. Clean Energy Ambassadors presents a Lunchtime Webinar series that Western

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Website of the month *from page 7*

cosponsors. Check out their past webinars and then register for *How Performance Contracting Can Help Your Utility* March 26.

Energy-efficiency Emerging Technologies (E3T), another program Western cosponsors with Bonneville Power Administration, presents an

Emerging Technologies Showcase series users can download for free. The question-and-answer sessions are included separately.

Many power providers have started to use webinars to educate ratepayers, contractors and program allies. If your utility archives online training and

makes it available to the public, let Energy Services know about your experience with the format. Also, if you have a favorite on-demand webinar resource, we'd like to share it with other Western customers. ⚡

For links to more resources, visit <http://ww2.wapa.gov/sites/western/es/pubs/esb/Pages/esb5.aspx>

Energy Experts *from page 6*

aluminum pot, you will not feel much heat until you actually touch the object. Both pots conduct heat, but the aluminum one is a poor emitter, while black cast iron has higher emissivity. If you paint the shiny aluminum pot black, it will start radiating heat that you will feel before you touch it.

Not all shiny or light-colored objects radiate the same way. A shiny galvanized metal roof will get very hot. Painting it white will significantly decrease the heat.

WHAT REFLECTIVE COATINGS DO

Reflective coatings work by reducing the radiant heat the coated surface both absorbs and emits. Reducing absorption improves the energy-efficiency of the building shell since the radiant heat never gets into the building. However, if it is cloudy and 100°F outside, or raining, the reflective coating accomplishes little.

As with most energy-efficiency measures, effectiveness depends on where you use it and how you install—or, in this case, apply—the

product. Black or galvanized roofing material absorbs radiant heat very easily, especially in a climate with lots of sunny, clear weather (the western United States, for example). A reflective coating, coupled with good insulation, can lower the roof temperature and keep the building cooler. However, these paints and coatings don't give off much radiant heat, so snow on the roof will melt more slowly.

HELPFUL TIPS

Here are a few things to keep in mind when considering reflective coating products:

- Reflective coatings are effective for reducing radiant heat transfer, but have little effect on R-Value, which relates to heat conduction.
- Cold climates benefit less than warm climates.
- The coating must be exposed in order to work. Anything touching the reflective surface or blocking its "view" of the radiation source negates its effectiveness.

- You can't save more energy than you lose from the roof through radiation.
- Building energy lost from the roof from all heat transfers (conduction, convection and radiation) typically ranges between 20 and 40 percent. Be wary of any product that makes large energy savings claims.

MORE READING

- *Principles of Heat Transfer* EnergyIdeas Clearinghouse, 2007
- *Radiant Barriers: A Question and Answer Primer* Florida Solar Energy Center
- *Laboratory Testing of the Reflectance Properties of Roofing Materials* Florida Solar Energy Center
- *Cool Roofs* E3T Energy Efficiency Emerging Technologies ⚡

For links to more resources, visit <http://ww2.wapa.gov/sites/western/es/pubs/esb/Pages/esb4.aspx>