

# Energy Services **BULLETIN**

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

## Escalating summer peaks turn United Power into load warrior

Colorado's Front Range has become a land of summer peaks where air conditioners are the nemesis, and United Power has chosen the heat pump as its weapon.

The Brighton-based cooperative went from serving 20,000 meters in 1990 to almost 65,000 meters in 2008. As the new houses went up, air conditioners went into them—45 percent of the region's homes are now air-conditioned, compared to only 13 percent 15 years ago.

The problem is that most of those air conditioners operate only from 2 to 9 p.m. from June to September, when residential demand is at its highest and peaking natural gas power at its most expensive. "That makes air conditioning in Colorado a lousy load no matter how efficient the unit is," explained United Power Member Services Specialist Ed Maycumber.

### Rebate program

To combat the spiky load curve,

United Power offers customers generous rebates on energy-efficient electric appliances and systems. Chief among those systems are heat pumps, both air-source (ASHP) and geothermal (GHP).

Maycumber gave a presentation (1 MB PPT) on United Power's rebate program at the Geothermal Technologies workshop in June. "These systems save our customers money on their electric bills, but we don't give out rebates because we are nice guys," said Maycumber. "We're doing it to shave the peaks and fill the valleys."

The co-op pays \$400 for the installation of ASHPs, and \$2,500 for GHPs. Tri-State Generation and Transmission Association, United Power's wholesaler, offers an additional \$150 per ton. Energy-efficient, electric water heaters, the second highest energy consumer in the home, qualify for multiple rebates.

### Heat pumps to cool

The ASHPs are United Power's



United Power's headquarters in Brighton, Colo., enjoys year-round comfort and energy savings because it is heated and cooled with 35 all-electric geothermal heat pumps. (Photo by United Power)

most popular rebate because they are less expensive and easier to install than GHPs. The systems are coupled with forced-air gas furnaces and can also be used for both heating and cooling, unlike an air conditioner. The SEER efficiency of an Energy Star-rated air conditioner and ASHP is the same, so why does United Power offer a rebate? "If customers use the heat pump the way it is meant to be used, it helps us fill valleys in the winter," Maycumber explained.

On the Front Range of Colorado, 55 percent of all heating demand occurs when temperatures are 42° or warmer. Over 40°, ASHPs heat more efficiently than gas furnaces, relieving the demand for natural gas generation during peak hours. In spring and fall,

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# United Power

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the all-electric units allow homeowners to take advantage of United Power's off-peak rates, even as they increase the utility's electricity sales. "Running an air source heat pump instead of a natural gas furnace at 40 degrees and warmer can save from \$25 to \$50 per month—and more compared to propane—on overall heating costs," said Maycumber.

Pushed by rising natural gas prices, customers who installed ASHPs are increasingly relying on them for heating. "Before 2003, maybe 1 percent of the ASHPs were being used to heat homes. As natural gas prices rose regionally, customers started calling, wanting to know how to switch the heat pumps to be their primary heat source," Maycumber recalled. "Now, about one third of the units are running most of the year."

## Geothermal best load

No air-source heat pump can match the performance of its geothermal counterpart, however; Maycumber is quick to point out. "Depending on the model, a ground-

coupled heat pump will cool for one third the cost of an ASHP or AC unit," he said. "And it will heat for half the cost of a natural gas furnace, and even less on off-peak rates."

While "cycling" ASHPs and air conditioners can only shave peaks, cycled GHPs can both shave peaks and fill valleys. A GHP-conditioned home uses twice as much electricity (mostly off-peak) as a home with a natural gas furnace. "Overall, it is just a better load factor," Maycumber declared.

The units are a good load match for renewable energy, too, he observed. "Peak summer solar generation occurs between 10 a.m. and 4 p.m. The wind primarily blows at night during winter, spring and fall in Colorado—diminished periods or no peak demand," Maycumber said. "GHPs can run 24/7/365, so the units give us a place to use renewable generation."

## Partnerships, marketing

United Power has offered a GHP incentive program since 1985, and the experience has taught a few lessons. Acting early on as the installer/contractor, for example, proved not to be the best model for this utility. "Local contractors saw the co-op as competition," said Maycumber, "especially the propane and natural gas furnace vendors."

Working with contractors is a better way to promote a rebate program and to increase industry awareness about the technology. Building trade allies ultimately improves the customer's satisfaction with the system.

Keeping the customer's perspective in mind is critical to effectively marketing a system. "You have to communicate that a GHP doesn't cost the homeowner money—it saves it,"

said Maycumber.

Increasingly, customers are concerned about the environment, he added, and GHPs address 58 percent of a household's carbon footprint: heating, cooling and hot water. The system is available any time of day in any weather, and it is 300 to 500 percent efficient. Compare that to a home photovoltaic system, which generates only 6 hours per day and is 13 to 17 percent efficient. The cost of a 5-kW PV system is about \$37,000, versus \$20,000 to \$30,000 for the equivalent kilowatts in a GHP. "That makes the heat pump a better investment from both the environmental and economic standpoint," Maycumber insisted.

## Energy savings, safety

United Power is such an advocate of geothermal heat pumps that it installed 35 of them in its new headquarters, opened in 2006. Combined with measures such as energy-efficient lighting and daylight harvesting, the system reduces the facility's energy use by about 14 percent over the old building, which was a little more than half the square footage.

As a bonus, the co-op has one of the coolest, quietest boiler rooms around, since there is no boiler. "It's much safer for maintenance crews," Maycumber noted.

Municipal facilities and buildings that house public agencies are ideal candidates for geothermal heat pumps, in Maycumber's opinion. Such organizations will stay in the building long enough to recover installation costs. "They also have a responsibility to keep operating costs low for taxpayers, which justifies the initial investment," he said.

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## Energy Services Bulletin

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# SMUD green mower program saves customers green

**S**acramento Municipal Utility District (SMUD), in cooperation with several area agencies, is encouraging customers to switch to cordless electric mowers with a trade-in program that cuts the price of a new mower by more than half.

Now in its twelfth year, the “Mow Down Air Pollution” program has replaced nearly 10,000 gas-powered mowers with non-polluting, rechargeable electric mowers. With the trade-in of their gasoline-powered mowers, 1,200 Sacramento-area residents purchased a 24-volt Neuton EM 5.1 for \$189 at “MowDown 2008.” The rechargeable electric mower retails for about \$400.

Customers pre-register online or by phone on a scheduled sign-up day. On the day of the trade-in, they bring their old mowers, drained of gas, to the trade-in site where event staff unload and load mowers from customers’ cars. “They can drive right through the event,” said SMUD Spokesperson Chris Capra.

## Working out logistics

Some trial and error was involved in getting the MowDown to run as smoothly as one of the electric mowers. At the first event, mowers were available on a first-come, first-served basis. “People got there very early, and we had cars lined up back to the freeway on-ramp,” Capra recalled.

Pre-registration within a limited timeframe solved the problem, he said. “Now, the customers show up between specific hours at the specified trade-in site. We also pick a big site to avoid traffic congestion,” Capra added. “We’ve held the trade-in at McClellan Air Force Base, and this

year, it was at Sacramento State University.”

SMUD promotes the MowDown with news releases and a media demonstration before pre-registration. The demonstration compares the performance of the quiet, electric mower with a smoky, noisy gas mower. The comparison is compelling enough that even with the small promotion budget, the program keeps growing.

The brand of mower being sold varies, often based on availability, noted Capra. “We’ve distributed Toros, Lawn Boys and Black & Deckers,” he said. “They’re all good models, but sometimes, a manufacturer just isn’t able to deliver enough mowers.”

Neuton, a New England-based company, meets SMUD’s demand with an exceptional product. The EM 5.1 can cut two or three California (“small,” said Capra) lawns on one 12-hour charge, weighs only 69 lbs. and can handle some tougher growth. “Electric mowers aren’t made for heavy landscaping work, but they are great for your average suburban lawn,” Capra acknowledged.

## Pros and cons

Even without SMUD’s generous trade-in plan, electric mowers have many advantages that make them attractive to homeowners. Mowing a 10,000-square-foot lawn 20 times a year with an electric mower uses less than \$5 of electricity. The cost for a gas mower is \$50 to \$75, plus the required oil changes or, in some cases, the two-stroke oil required to be mixed with the gas.



**With the trade-in of their gas-powered mower, SMUD customers can purchase an emissions-free Neuton EM 5.1 mower for \$189. The rechargeable electric mower retails for about \$400. (Photo by Neuton)**

There is no fuel to mix, spill or store for electric mowers—a big selling point in Sacramento, where summer temperatures can top 100 degrees. “You don’t want to be storing gasoline in your garage in that kind of heat,” said Capra.

On the average, electric mowers are about 50 percent quieter than their gasoline counterparts. Neighbors who like to sleep in on the weekend will appreciate the noise level of usually less than 85 decibels. Another benefit is that electric mowers always start as long as the battery is charged—no need to pull a starter cord.

There are minor drawbacks, including higher initial cost. That is offset somewhat in California, where the catalytic converters the state requires on all new gas mowers can add as much as \$179 to the price. Most electric mowers must be pushed, because a self-propelled function would eat up too much battery life. However, the mowers are generally lighter, so they are usually easy to maneuver.

*See GREEN MOWER PROGRAM, page 5*

# Webinar introduces utilities to industrial energy-efficiency tools

Utilities know that large industrial facilities are not only important loads, but also valuable assets to the entire community, and that keeping those customers economically healthy is a top priority. What many power providers may not know is that no- and low-cost resources are available through DOE's Industrial Technologies Program (ITP) to help them reduce their industrial customers' costly energy bills.

A series of energy management webinars sponsored by ITP, Western and the American Public Power Association (APPA) is about to change that. The first event, Exploring Options for Keeping Industrial Customers Competitive, will take place Aug. 20 from noon to 1:30 p.m., MDT. Participants will learn about the Save Energy Now initiative (SEN) to drive a 25-percent reduction in industrial energy consumption in 10 years, and how utilities can leverage SEN resources to benefit their industrial customers.

## Benefits for utilities

Those resources include Energy Assessments, software tools, training and recognition programs. "To utilities that don't have the funding to start industrial energy-efficiency programs, our message is, 'Don't panic—you don't have to start from scratch,'" explained Sandy Glatt of DOE's Office of Energy Efficiency and Renewable Energy. "ITP is a ready-made resource utilities can give to customers to help them understand how they use energy, and how to use it better."

In addition to an overview of ITP tools, the webinar will cover the reasons why utilities should consider partnering with DOE. Utilities once

worried about losing sales if large customers improved their energy efficiency. "Now the choice is often between helping customers control operating costs and losing industrial loads entirely," Glatt said.

There is plenty of positive motivation for utilities to offer their industrial customers ITP services, added Mary Medeiros McEnroe of Silicon Valley Power. Medeiros McEnroe, SVP acting Public Benefits Program coordinator, will give a presentation on her utility's experience working with the ITP program.

Helping facilities to compete keeps valuable manufacturing jobs in the area, noted Medeiros McEnroe, and it attracts more businesses to the community. "The assessment provides contact with the customer, and that opens the door to communication on many issues," she said.

Also, faced with load growth, SVP has found that energy efficiency and conservation are a lot cheaper than building a power plant. "It frees up the utility's resources to serve more customers, and reduces the carbon footprint of both the business and the power provider," Medeiros McEnroe concluded.

## SVP learns from customer

ITP tools are helping SVP to realize those benefits, and Medeiros McEnroe wants to get the word out to other utilities. "We had to learn about the SEN program from one of our customers," she admitted.

Owens-Corning approached SVP in 2007 about upgrading several systems in its Santa Clara plant. The utility pays rebates to customers for energy-efficiency improvements through California's Public Benefits



**An ITP energy expert take measurements during a Save Energy Now energy assessment. The assessments have helped manufacturing facilities save an average of \$2 million on their total energy costs. (Photo by U.S. Department of Energy)**

Charge, and offers a program targeting compressed air equipment. "But the other systems Owens-Corning were looking at were outside the scope of our program," Medeiros McEnroe recalled.

Fortunately, Owens-Corning had participated in SEN on the corporate level and went through ITP to get assessments on its pump and fan systems. "It turned out that the consultant that provides our compressed air assessments also performs Energy Assessments for DOE in our area," said Medeiros McEnroe.

The fan assessments resulted in projects that will potentially save Owens-Corning more than one million kWh each year. The savings from the pump project are estimated to be more than 200,000 kWh, and

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## Webinar *from page 4*

the compressed air project, when completed this fall, will save another three million kWh annually. SVP paid the manufacturer \$400,000 in rebates for the projects. “One of the advantages of the utility being involved in the assessments is the ability to ensure the projects meet all the qualifications for receiving the rebates,” Medeiros McEnroe said.

### Utilities central to plan

Working with DOE on the energy assessments led SVP to participate in a meeting ITP held last winter for utility stakeholders. Representatives from utilities, utility associations, state

energy offices and power administrations gathered to discuss what ITP and utilities needed to do to meet ITP’s 25-in-10 goal. From the meeting came Utilities Working with Industry: Action Plan, outlining the highest priority activities.

Those activities include establishing a partnership between the utility sector and ITP, the ultimate purpose of the webinar series. “Utilities provide a powerful means of expanding the program’s outreach,” said Glatt. “Their relationship with their industrial customers will help impact greater energy reductions across the U.S. manufacturing sector.”

As Silicon Valley Power learned, that relationship strengthens when

utilities are able to help their customers Save Energy Now. “The Owens-Corning project gave us a whole new set of tools we can offer other key accounts,” Medeiros McEnroe stated. “And it was a great opportunity to learn about a customer’s operations from the inside out. The Industrial Technologies Program has a lot to offer utilities.”

Learn more about ITP tools by registering today for Exploring Options for Keeping Industrial Customers Competitive. ITP is offering the webinar free of charge on a first-come, first-served basis. Register online or contact Jamey Evans at 303-275-4813 for more information.



Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2008/aug/aug083.htm](http://www.wapa.gov/es/pubs/esb/2008/aug/aug083.htm)

## Green mower program *from page 3*

### Polluting mowers


For people who are concerned about air-quality, however, the extra cost is a small price to pay for a cleaner, greener mower. Anyone who has ever pushed a gas-powered mower agrees—breathing the fumes is one of the most unpleasant parts of the job. More than unpleasant, one gas mower spews 87 lbs. of carbon dioxide and 54 lbs. of other pollutants into the air every year.

Another disturbing fact, more than 17 million gallons of gas are spilled each year refueling

landscaping equipment, according to Safelawns.org. Studies by the organization, which promotes natural lawn care, indicate that gas mowers are major polluters of the environment, up to 30 times worse than automobiles.

Statistics like those are why SMUD has teamed up with other area agencies to replace Sacramento’s gas mowers with an earth-friendly alternative. Other MowDown sponsors include the Sacramento Air Quality Management District, Yolo-Solano Air Quality Management District, Placer County Air Pollution Control District, El Dorado County Air Quality Management District and the Sacramento County

Department of Waste Management and Recycling. The partners all contribute funding to the program, and the waste management department recycles the trade-ins. Some of the agencies also host their own mower trade-in events.

Capra estimates that over the years, the electric mowers distributed through the program have reduced emissions by 99.5 tons—and made a lot of SMUD customers happy in the process. Those are impressive results from simply replacing one common household appliance, or, as SafeLawn.org puts it, getting your grass off gas. 

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2008/aug/aug082.htm](http://www.wapa.gov/es/pubs/esb/2008/aug/aug082.htm)

## Residential heat-pump water heaters

**H**eat-pump water heaters (HPWH) use about half as much electricity as conventional electric water heaters. Since water heating accounts for 12 percent of all of the energy used in buildings and buildings account for one-third of all energy used in the nation, the potential for total savings is large. HPWHs use the air of whatever space you install it in (house, garage, or basement) as a heat source and the water as a heat sink, transferring energy from the air to the water. This is very similar to the operating principle of a refrigerator, which transfers energy from inside the refrigerator to outside.

### Types of HPWHs

■ **Add-on HPWHs:** An add-on HPWH is installed in conjunction with an existing storage water heater and may be a good option as a retrofit. It converts the conventional water heater into a HPWH by replacing the function of the tank's lower element. The add-on unit is intended to provide most or all of the water heating needs, while the standard water heater provides storage and can also serve as a back up heater to provide additional capacity as needed during periods of high use. When the tank needs to be heated, a small pump circulates water through piping installed between the existing storage water heater and the HPWH. Manufacturers and models of add-on HPWHs include Nyle International's Nyletherm, Applied Energy Recovery Systems E-Tech, Trevor Martin's Hot Water

Generator, and Beyond Pollution's Air Tap.

■ **Drop-in HPWHs:** In a "drop-in" or "integrated" HPWH, the heat pump portion is integral to the tank, which has the same footprint and connections as a conventional water heater. Installation procedures are essentially the same, except for the requirement to provide for drainage of condensate. General Electric has developed a drop-in HPWH that is expected to be available by late 2009. The drop-in Water\$aver, manufactured by ECR, was introduced in 2002. However, production has been suspended, according to a 2006 market research study by the Northwest Energy Efficiency Alliance, "while they review their marketing approach."

■ **Desuperheaters:** Heat-pump water heating is also available as the desuperheater feature on some central air conditioners and heat pumps. A desuperheater is a small, auxiliary heat exchanger that uses superheated gases from the heat pump's compressor to heat water. As a caution to avoid confusion, the term "add-on HPWH" may also be used to describe desuperheater water heaters.

### Performance

Two measures of efficiency often used with HPWHs are the Coefficient of Performance (COP) and Energy Factor (EF). The COP of a HPWH typically does not include the standby loss of the tank, while the EF does.

EFs that are certified by the Gas Appliance Manufacturers Association (GAMA), are useful in comparing different models. COPs are most useful for examining how the performance of a water heater changes with operating conditions.

Average COPs have been found to vary widely, from 1.0 (i.e. no savings compared with a conventional electric water heater) to 2.44, with an average of 2.0 in one field study. Actual performance depends on many site-specific conditions, including the temperature of the space in which it is installed, the water heater's set point, water use, manufacturing quality and whether the heat pump is installed properly. The most common reason for low COPs is the resistive heating elements operating frequently because of heavy household water use. This can generally be avoided by ensuring the HPWH is properly sized. Another factor that can reduce performance of add-on units over time is the build up of hard water scale on their tube-in-tube condensers.

### Energy Star criteria

In April 2008, the U.S. Department of Energy announced new Energy Star criteria for water heaters, effective Jan. 1, 2009. Residential drop-in HPWHs require a minimum EF of 2.0 and a minimum First-Hour Rating of 50 gallons-per-hour. Add-on HPWHs will not qualify.

### Cooling, dehumidify

A HPWH will provide air conditioning and dehumidification for either the space in which it is located

*See SPOTLIGHT page 8*

## Web site of the month:

# DOE EERE Industrial Technologies Program [www.eere.energy.gov/industry](http://www.eere.energy.gov/industry)

In the utility industry, as in manufacturing, the right tools make the job easier, and that is what the Industrial Technologies Program (ITP) offers power providers: tools to help large industrial customers improve their energy efficiency.

Part of DOE's Office of Energy Efficiency and Renewable Energy, ITP aims to reduce energy consumption in the U.S. industrial sector by 30 percent between 2002 and 2020. The program does this through research and development, validation and dissemination of energy-efficiency technologies and operating practices. Commercializing industrial energy-efficiency technologies is another critical piece of ITP's Strategic Plan.

## National outreach

Save Energy Now (SEN) is ITP's national initiative to introduce industrial companies to the tools that can help to reduce energy use while increasing a business's profits. Utilities can participate in SEN, too, and learn how to leverage SEN resources to help their large key accounts.

Energy assessments are a key element in the initiative, helping manufacturing facilities to identify immediate opportunities to save energy and money. On average, large plant assessments yield potential savings of \$2.5 million. Implementing recommended measures could help the plants save 10 percent or more per year on energy bills, improve productivity and avoid carbon emissions. The assessments are performed by regionally-contracted experts on

compressed air, fans, process heating, pumping and steam systems.

Utilities can direct their customers to a description of the assessment process, and an online application. Information on getting the most out of the assessment, implementing recommendations and sharing the experience with other branches and with customers can be found in this section, too.

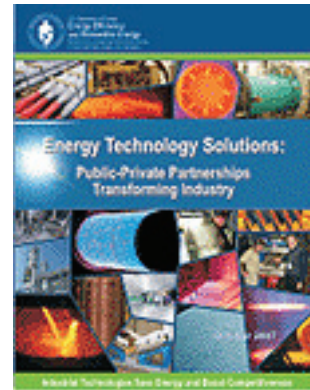
Case studies of manufacturers that have participated in energy assessments are posted on the Web site. The reports include a summary of key findings, detailed information on manufacturing processes, energy-saving recommendations and results and lessons learned. Visitors can also browse through assessments of participating plants to find businesses similar to their own.

Partnerships expand the reach of Save Energy Now by involving stakeholder organizations in promoting the initiative to industrial companies. In this section, utilities can subscribe to ITP's award-winning online news sources, E-Bulletin and Energy Matters, and learn how to enhance customer service by supporting customers' energy management goals.

In addition to the newsletters and case studies, ITP also publishes sourcebooks, tip sheets, fact sheets, handbooks and market assessments on industrial systems and components. Most can be downloaded from the Web site.

## Software, training

It is not necessary to be a



***Energy Technology Solutions: Public-Private Partnerships Transforming Industry offers a look at ITP-funded technologies and others expected to break into the market over the next three years. (Photo by DOE EERE Industrial Technologies Program)***

partner to use ITP's publication library or the BestPractices software tools. Many of the programs can be accessed directly from the Web site, although a few must be ordered from the EERE Information Center. The Quick Plant Energy Profiler is an overall diagnostic tool. Other software packages identify energy-saving opportunities in specific equipment and systems.

Since identifying the problem is only half the battle, BestPractices offers training courses, both system-wide and component-specific. Energy services representatives at utilities may find these courses useful for increasing their own expertise, or they may recommend courses to facility managers. The courses are offered all over the country, and many are webcasts, so anyone can participate. The training calendar lists all the upcoming events, locations and contact information.

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Visit [www.wapa.gov/es/pubs/esb/2008/aug/aug085.htm](http://www.wapa.gov/es/pubs/esb/2008/aug/aug085.htm)**

## Technology spotlight

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or a space to which it is ducted.

This will result in additional energy savings, to the extent that it avoids the use of central air conditioning and/or dehumidification. In the heating season, the cool air can be ducted outdoors to avoid simultaneous heating and cooling. The air conditioning benefit and the potential for increased space heating use, if the unit is not vented, should be included in an energy analysis. Other non-energy

benefits should be considered, as well. For example, damp basements will benefit from a HPWH's dehumidification.

### Location

Since heat-pump efficiency drops significantly at cold temperatures, HPWHs are best installed only in spaces where the temperature does not fall below about 40 degrees F, such as indoor utility rooms, enclosed garages and basements. Warm spaces, such as a furnace room, can be used to take advantage of increased efficien-

cy at higher temperatures, although the temperature typically should not rise above 90 degrees F. Be sure to check minimum and maximum temperatures recommended by the manufacturer.

HPWHs should not be installed in isolated, tight spaces due to the need for air flow across their evaporator coil. Ducts and dampers may be installed to improve air flow. The compressor motor on an HPWH system produces some noise, as with refrigerators, so pick a location where it won't be bothersome. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/2008/jul/jul084.htm](http://www.wapa.gov/es/pubs/2008/jul/jul084.htm)

## United Power

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Maycumber has worked with county and city governments in United Power's service territory to persuade them to install heat pumps in new buildings. Some officials have toured United Power headquarters, but it is an uphill battle, he admits. "Some mechanical

engineers and contractors are stuck in their old ways and argue against the technology. And it's still hard to get people to look beyond the first cost," Maycumber said.

That won't stop United Power from continuing the fight. "It's all about load control," Maycumber stated, "and heat pumps represent our best opportunity, and the customers' best investment." ⚡

## Web site of the month

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Speaking of training, Western is co-sponsoring Exploring Options for Keeping Industrial Customers Competitive, Aug. 20. The webinar will provide an overview of ITP tools and feature examples of how utilities can use them to benefit their customers. Contact Jamey Evans at 303-275-4813 for more information about this free event. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2008/aug/aug081.htm](http://www.wapa.gov/es/pubs/esb/2008/aug/aug081.htm)

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**Free webinar Aug. 20, noon to 1:30 p.m. MDT**

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