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Energy Services BULLETIN

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

Building tune-ups yield big energy savings for Platte River

A utility program in northern Colorado is doing for commercial buildings what a good tune-up does for a car: saving the owner money by making sure all the systems work properly together.

To date, Platte River Power Authority's Building Tune-up Program has saved 11 commercial and industrial (C&I) customers a total of 1,150,000 kilowatt-hours.

The power wholesaler's cost to achieve these savings was $158,000, with a simple payback of just over one year. Participating customers spent more than $86,000 in 2011 with a simple payback of three months. "Customers are understandably nervous in this economy about making big capital investments, so we developed a program that captures the savings from no- and low-cost measures," explained Platte River Energy Services Specialist Adam Perry. "It turns out that those are pretty significant."

A significant portion of the energy savings from Agilent's Building Tuneup came from retrofitting the existing chiller with a variable speed drive, optimizing the facility's two-stage evaporative cooler and integrating the operation of the two systems. (Photo by PCD Engineering)

How it works

Platte River pays the entire cost of the retrocommissioning study that identifies the low- or no-cost energy-saving measures and ways to improve the building's comfort, operation and efficiency. Building owners agree to invest a minimum of $4,000 in the recommended measures that have a simple payback of less than two years based on energy savings.

To be eligible for a tune-up, a building must be at least two years old and have 50,000 sq. ft. of conditioned space. Unique circumstances, such as unusually high utility bills, may qualify a facility for a tune-up. In addition to paying for the projects, building owners and their facility managers must be actively involved in the retrocommissioning. "They know their building and energy management history better than an outside contractor could," Perry observed. "They can tell us what measures they've tried and what the results were, so we know where to focus our efforts."

Platte River does not provide additional incentives for electricity

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savings from the Building Tune-up, but customers may apply for equipment upgrade rebates through the utility's Electric Efficiency Program. Many of those rebates target end-of-life replacements for large systems and equipment, while the Building Tune Up program goes for the quick savings. However, the retrocommissioning study alerts customers to capital improvements that can lead to greater energy savings when the time comes to replace a system.

Case study

The Loveland, Colo., company Agilent Technologies is a "poster child" for what retrocommissioning can do for a C&I customer.

Before Agilent signed on for a building tune-up, demand levels in the 137,000 sq. ft. building reached nearly 1,000 kW per month, with annual energy use of 5.3 megawatt-hours in 2009. The facility's calibration labs, power center, shop areas, data center, commercial kitchen and office space represent a large, 24/7 industrial cooling load. Weather, time of day and building envelope had little effect on the building's demand. The corporate goal for the building was to reduce its energy consumption by 3 percent. "Agilent Technologies takes energy savings and sustainability seriously, and annually sets aggressive stretch goals for energy reduction," explained Rick Walston, the workplace site manager for Agilent's Boulder/Loveland facilities.

Of course, a policy dedicated to reducing energy use raises the bar—over time, the Loveland facilities team had systematically picked the "low-hanging fruit" of efficiency.

"The retrocommissioning effort let us explore more in-depth opportunities to reach and exceed our annual goal, and to identify additional future projects," Walston said.

Platte River and Agilent put the bid out to three vendors from its list of approved retrocommissioning service providers (RSPs), and awarded the project to PCD Engineering. Customers can hire their own contractors or use in-house staff to implement the measures, but the retrocommissioning plan must be performed by an approved RSP. "Retrocommissioning is a specific discipline," Perry acknowledged. "With our list, we know that the study and project oversight is being done by a contractor who's had hands-on experience with the process."

The three-part process includes the retrocommissioning plan, implementation support services and verification. "After PCD identifies the energy-saving measures, we are there to answer the customer's questions about implementation," said PCD President Peter D'Antonio. "Once the project is completed, we come back to monitor and verify post-installation results."

The audit found no- and low-cost opportunities to reduce energy use and demand in:

- 400 tons of chiller cooling
- 600 tons of cross flow cooling towers
- Flat plate free-cooling heat exchangers
- Direct and indirect evaporative cooling air handlers with variable air volume zoning
- Data center cooling
- Process closed loop cooling towers
- Central compressed air
- Central vacuum
- Exhaust
- Lighting systems

Agilent implemented nine energy-saving projects ranging from simple to complex. One measure involved turning off equipment that had been left to run after working hours. On the challenging side, a chiller was cooling the building when a more-efficient indirect-direct evaporative cooler (IDEC) was available, but the cooler wasn't engaged with the building's energy management controls. "Getting the IDEC to work with the energy management system was really difficult, but that's where we got the lion's share of the savings, so it was worth the effort," said D'Antonio.

The building tune-up has saved Agilent more than 6 percent of its energy use, or more than double its corporate goal. The annual cost savings of more than $25,000 will pay back the company's investment in less than two years. "Having our application selected by Platte River was a great opportunity," Walston said. "And then working closely with PCD Engineering, the implementation exceeded all our expectations."

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Energy Services Bulletin

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Editor: Kevon Storie
Designer: Grant Kuhn

Army initiative enlists private partners to reach energy goal

Military installations have long been among Western's most proactive and innovative customers when it comes to energy management. Now, a new army program aims to take those efforts to a higher level, while creating opportunities for utilities and private renewable energy developers.

The U.S. Army Energy Initiatives Task Force (EITF) establishes a central managing office to build a portfolio of cost-effective, large-scale renewable energy projects greater than 10 megawatts on U.S. Army installations. The office will serve as the entry point for private companies seeking to develop the projects the army needs to meet its goal of getting 25 percent of its energy from renewable resources by 2025.

The army hopes to attract private sector investments over ten years to reach 2.1 million megawatt-hours annually of renewable generation. The use of third-party financing authorities such as power purchase agreements, enhanced-use leasing and energy-savings performance contracts will maximize the return on investment for private partners. "The army's relationship with the industry will be that of business partners," said EITF Outreach Director Jonathan Powers.

This 2-MW ground-mounted solar array built on a former landfill at Ft. Carson, Colo., will help the installation reach its goal on producing as much energy as it uses by 2020. Western helped the army by writing contracts that allow Fort Carson to buy power from the system as supplemental energy for a low fixed cost for 20 years.

Industry flocks to summit

EITF began its outreach to the renewable energy industry with a summit at U.S. Navy Yard's Admiral Gooding Center in Washington, D.C., on Nov. 3. The industry's response was very encouraging: initial registration for the event closed in only four hours. The summit was moved to a bigger venue, and a subsequent registration closed in six hours.

More than 350 individuals from renewable energy developers, storage technology companies and other stakeholders showed up to find out about the initiative and how they could participate. Speakers included Nancy Sutley, Chair of the White House Council on Environmental Quality; Katherine Hammack, Assistant Secretary of the Army for Installation, Energy and Environment; and Richard Kidd, Deputy Assistant Secretary of the Army for Energy and Sustainability.

Why partnerships

Attendees learned that operating military installations consumes 67 percent of the army's annual energy use of more than 200 trillion Btu—most of that from oil. Reducing the army's dependence on fossil fuels would not only increase the military's energy security, explained Hammack, it would also make installations more resilient and self-sufficient. "Many of our installations are at the end of the line, in fairly remote locations," she told the Army News Service. "If anything happens upstream, our fallback is diesel generators. We'd like to increase our resiliency by having generation on the installations."

Programs like Net-Zero Army are already improving the efficiency of water use and waste disposal on installations, as well as energy consumption. In each of the three areas, six installations are implementing pilot programs to bring down their resource consumption to the effective rate of zero. Fort Bliss in Texas and Fort Carson in Colorado are Net Zero Overall pilot sites. The army wants 25 such sites by 2030, but Powers acknowledged that reaching such ambitious energy and efficiency goals won't happen without help. "Military installations simply aren't equipped to undertake projects of this scope—we need outside expertise," he said.

Utilities are natural partners for Army energy projects, noted Powers. More than 200 utilities count army installations as customers, and some, like Colorado Springs Utilities and

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Fort Carson, have already teamed up to develop renewables.

Next step: register!

If the summit is any indication, businesses across the renewable energy industry are ready to collaborate. According to Powers, 100 companies have already registered on the EITF website to meet with the office. "Each company will get the chance to tell us about their capabilities and ideas," he said.

Announcements will also appear on FedBizOpps, but the EITF website will be the main source of information about development opportunities. "Registration is also the best way for interested companies to learn about future events," Powers pointed out.

EITF is planning a renewable energy conference this spring, along with several "industry" days, including one targeting utilities. There will also be project-specific days once the army issues requests for proposals.

Good decisions take time

The first request for proposals will likely be announced this spring after EITF finalizes its process for identifying opportunities "For something this big, it is important to do due diligence," Powers said. "The office is currently working with the National Renewable Energy Laboratory to evaluate 20 potential projects and move existing projects forward."

As for the type of project that most interests EITF, Powers said that the office looks at proposals very much on a case-by-case basis. "Broad initiatives offer a great opportunity to maximize private sector innovation, but you still want to work with proven technologies for large-scale generators," he observed. "Also, if the army is committing to a 30-year power purchase agreement, we want to make sure we get the right partners."

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

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Expanding the program

Platte River launched the Building Tune-up program in 2009 with money from its energy-efficiency budget, and recruited seven customers to participate. So far, four tune-ups have been completed and the other three are still in various stages of planning. "It actually takes nine to 12 months from the study to verification to complete a tune-up," Perry said.

More customers came on board the following year, and Platte River received Recovery Act funding to expand the program to small to medium sized businesses. Partnering with Brendle Group http://www.brendlegroup.com/default.aspx, Platte River launched the pilot program for small- and medium-sized buildings in their owner municipalities of Estes Park, Fort Collins, Longmont and Loveland.

The small building program focuses on even simpler measures such as installing programmable thermostats and low-flow faucet aerators; fixing outside air economizers; adjusting water heater temperatures, pump timers and lighting controls and PC power management. So far, 30 customers have tuned up facilities that include schools, retailers, offices, city buildings, a health club and a light industrial warehouse.

Going forward, Perry envisions combining the large and small building programs into one program with two options, overseen by a trade ally network. Growing the program will require more and better trained contractors, and more analysis about what measures are most cost-effective under which circumstances. But Platte River Power Authority believes in the value of a tuned-up building. "There is still a lot of 'low-hanging fruit' customers can capture with a little guidance from their power providers," noted Perry.

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

Western awarded for efforts to reduce SF_6 emissions

By Guest Editor Liana Reilly, Western Environmental Protection Specialist

Recipients of a 2011 Secretary of Energy's Achievement Award pose with Secretary Chu after accepting their awards. Western received an award for its work on the Fugitive Emissions Working Group to reduce sulfur hexafluoride emissions. (Photo by the U.S. Department of Energy)

The Department of Energy recognized Western's participation and leadership in the Fugitive Emissions Working Group (FEWG) at an Oct. 27 ceremony in Washington, D.C., honoring Energy Department employees for their outstanding contribution to DOE's mission.

Rocky Mountain Region Environmental Manager Gene Iley accepted the Secretary's Achievement Award on behalf of Western. Awards were bestowed upon groups or teams from more than 20 DOE laboratories, power administrations and National Nuclear Security Administration facilities. Recipients shook Chu's hand and received a crystal statue and leather-encased certificate signed by the Secretary. "It was a very cosmopolitan crowd. It demonstrated how diverse DOE is in terms of the scope of what the department accomplishes," Iley said, referring to the wide range of work that was recognized at the ceremony.

Some recipients were assisting Japan with assessing the consequences of radiation release from nuclear power plants, while others were decommissioning nuclear weapons. One team was cleaning up waste from uranium mill tailings, and those involved in the FEWG have been working to decrease greenhouse gas emissions.

Western's recognition

The FEWG launched its successful campaign to eliminate emissions of the most highly potent greenhouse gas (GHG), sulfur hexafluoride (SF_6) in 2010. When asked what prompted the recognition of the group, Iley remarked, "We just recently showed this [Western's SF_6 reduction efforts] to DOE and we seem to have opened their eyes to the work that we have been doing."

Iley, along with Larry Romero, Ken Mathias and Merlin Thompson gave a presentation to the entire working group on Western's SF_6 reduction program last January. The presentation focused on Western's successes in the face of unique challenges. "In many instances, DOE sites have one location with one very large piece of equipment containing tons of SF_6, whereas Western has thousands of smaller pieces of equipment to be managed," Iley noted.

Prior to the presentation, FEWG Chair Josh Silverman toured Western's facilities in Loveland, Colo., a visit he called eye opening. Silverman commented on the role Western played for the working group: "When we began assessing fugitive emissions within DOE, I was immediately impressed by Western's successes in controlling these gases," he commented. "Western has become a frontrunner among DOE facilities in preventing SF_6 releases."

Silverman added that Western employees' willingness to share their experience and knowledge within the FEWG helped to steer DOE in a successful direction. "Their efforts have helped the department and the planet," he said.

Iley modestly credited his success on the FEWG to those who have contributed to Western's SF_6 Emissions Reduction Program. He explained that Western's SF_6 Emissions Reduction Program has been around for more than 10 years and involves numerous employees. It started with Western electricians monitoring SF_6 leaks and then learning how to fix them and establishing their own procedures. From that experience, Western developed a program for leak detection and repair following best management practices.

SF_6—why worry about it?

Atmospheric concentration of non-toxic, nonflammable, colorless and odorless SF_6 is less than that of other GHG. However, concern about its emission is high, partly because it is the most potent GHG. Its warming impact is more than 22,800 times that of carbon dioxide, with one pound of SF_6 being equal to 11 tons of CO2. Also, the gas's life span of 3,200 years means it remains in the environment for a longer time, making even a small amount harmful to the climate.

The gas has many uses, and global industry manufactures around 8,000

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ask the energy experts

HVAC controls for energy savings in commercial buildings

Question:

Would it be cost-effective to add programmable thermostats in our existing retail facilities located all over the United States?

Answer:

You are definitely on the right track targeting programmable thermostats as a cost- effective energy-efficiency measure for existing retail facilities. In a 1995 study by the Oak Ridge National Laboratory titled Energy Conservation Opportunities in Small Commercial Buildings control systems were identified as the most cost-effective energy conservation measures in nearly all small commercial building types.

Commercial buildings are usually occupied less than 24/7. Since ventilation and temperature control are only required when the building is occupied, and since these off-hours account for 30 to 60 percent of the energy used by the system, a great deal of energy can be saved by shutting down the HVAC system during the unoccupied hours.

In a simple single-zone commercial building with rooftop HVAC units (RTU), a seven-day programmable thermostat with outdoor temperature compensation can be programmed to bring the temperature in the store to the occupied set point when employees arrive. This saves both heating and cooling energy and electrical fan energy in proportion to the number of unoccupied hours and the severity of the climate. A commercial control system also requires a seven-day time clock to activate the ventilation system. If the building has an RTU, the time clock is usually set to open the outdoor air damper and activate the bathroom exhaust fan(s). If the time clock is combined with the programmable thermostat, it's called a commercial thermostat.

Caveats

One common problem in commercial HVAC systems is use of a residential thermostat without a time clock. In this case the outside air damper is wired to open whenever the thermostat calls for heat or cooling. The problem with this arrangement is that, if the temperature in the building drops to the nighttime set point and the RTU calls for heat, unnecessary ventilation air is heated too—resulting in wasted energy.

Another issue with programmable thermostats is that users often change settings and schedules. Also, owners may forget to reset the unit for daylight savings time, putting the HVAC system out of sync with the season for half the year or more. To preclude tampering, you may want to invest in a password-protected commercial thermostat that automatically adjusts both its outside air and temperature schedules for time changes.

Once you lock local users out of the control system, make sure you have an effective way to deal with comfort complaints from employees and customers. Some manufacturers offer an "internet" or IP thermostat that can be controlled by a remote internet browser. Internet thermostats offer the opportunity to remotely control the temperatures in all your facilities from a single point. An online search on the term "internet thermostat" results in a list of several models of internet thermostats from various manufacturers.

Wireless thermostats like this unit can be a very cost-effective way for building owners to gain greater control over energy use for heating and cooling. (Photo by Cypress Envirosystems)

Add an economizer

In much of the United States, economizers can reduce the cooling energy requirements by 50 percent or more. They do this by sensing the condition of the outside air (temperature or enthalpy) and when it is low enough, using it to cool the building—here's a link to a Purchasing Advisor document with more information on the topic (E Source Companies LLC, 2006).

In areas with large daily temperature swings, an economizer can precool the building using cool night air. This can save 20 to 30 percent of the building's cooling energy requirement, and delay the start of refrigerated air conditioning until afternoon. The effectiveness of night cooling depends on the availability of air 10 to 20 degrees cooler than the inside temperature of the building, the rate at which outside air can be introduced into the building and the building envelope's thermal storage capabilities. For more information on evaluating the potential for night cooling, check out the paper "Parameter Study on Performance

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Website of the month:

HUD Energy efficient Mortgages

The old saying, you have to spend money to make money, is also true of saving money, at least where energy efficiency is concerned. The hard part, of course, is coming up with the money in the first place, so Congress mandated a pilot program in 1992 to help homeowners finance energy-saving improvements. Three years later, the U.S. Department of Housing and Urban Development (HUD) made Energy Efficient Mortgages (EEMs) available nationwide.

How it works

EEMs, which are insured by the Federal Housing Administration (FHA), allow homeowners to finance energy-efficiency projects on new or existing housing as part of their home purchase or refinancing mortgage. The idea is that implementing energy improvements reduces utility expenses, giving homeowners the extra cash to cover the cost of the features.

FHA EEMs provide mortgage insurance for a person to purchase or refinance a principal residence and roll the cost of energy-efficiency improvements into the mortgage. The borrower does not have to qualify for the additional money and does not make a down payment on it. A lending institution—mortgage company, bank or savings and loan association—funds the mortgage loan, and HUD insures the mortgage through FHA, which does not provide loans.

Finding a way in

Reaching the EEM pages within the HUD site is not as easy as it should be for such an important program. Anyone who wants to have EEM information handy should bookmark the link.

Otherwise, users must work their way through Program Offices to Housing, which oversees the FHA, to Single-family Housing. The final link on this page is labeled only EEM—not exactly instinctive.

The FHA page makes the program a little easier to find by spelling out the name instead of using the acronym. Still, if users don't know that EEMs fall under Single-family Housing on the Program menu they will have to take the time to scan the page.

Nuts and bolts

Once you reach HUD's page for Energy Efficient Mortgages, the short list of self-explanatory links makes the excellent resources very easy to access.

Start with Energy Efficient Mortgages Description to get an overview of the program. Here, users can learn about the type of mortgages available to improve energy efficiency, how to apply, who is eligible and more. This page contains the only link on the EEM site to the FHA-approved Lender List—essential for applicants.

Another valuable link at the bottom of the page takes users to the FHA Resource Center, where they can search FAQs, ask questions or send an email. This link is also on the main EEM page, but it was broken at press time.

Several of the links on the EEM main page are to documents that will be needed in the application process. These include Excel spreadsheets showing the median EEM prices being approved by lenders in different parts of the country in 2010 and 2011. Users will also find Mortgagee Letters covering program requirements, a sample worksheet to determine eligibility and a tip sheet for EEM rules and compatibility across different mortgage programs.

Need convincing?

But all that application assistance may be jumping the gun. Some visitors may simply be curious about how energy-efficiency relates to the value of their home. For them, the Energy Efficient Mortgage Home Owner Guide does an excellent job of explaining the benefits of energy efficiency to homeowners, buyers and sellers.

The Home Energy Rating System is covered here, and a comparison of costs for an older existing home and the same home with energy-efficiency improvements shows why EEMs work. Users will also find case studies and more information about applying for an EEM. Pacific Gas and Electric; DOE's Office of Energy Efficiency and Renewable Energy, Alliance to Save Energy and the Federal Citizen Information Center all contributed to the guide.

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Help for utility customers

Utilities looking to boost participation in their own energy-efficiency programs should become familiar with HUD's Energy Efficient Mortgages program. Customers who are ready to make improvements but don't have the necessary cash flow may be eligible for an EEM. Member services managers who are trying to communicate the value of energy-efficiency improvements to hesitant customers can reference the EEM Home Owner Guide.

Also, through HUD's Title I program, homeowners can apply for loans for home improvements that are not attached to mortgages. Either way, HUD offers a potential source of energy-efficiency financing that utilities cannot afford to not overlook when they want to help their customers save money.

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

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of Building Cooling by Night-time Ventilation" at Science Direct.

The problem with economizers is, if they malfunction, they can increase energy use and decrease comfort—and nearly 50 percent of all new economizers malfunction. Malfunctions can be caused by mechanical problems such as a broken linkage, or electronic problems such as a bad damper actuator, sensor or controller. At the 2005 Consortium for Energy Efficiency, the Western Premium Economizer Program presented some strategies for improving economizer performance.

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

Western awarded

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metric tons of SF_6 emissions annually. Military and electronics equipment use SF_6; it is used in double-paned windows for soundproofing, and was once used to manufacture tennis balls and sneakers. The biggest SF_6 user is the electric power industry, which uses about 80 percent of all SF_6 produced worldwide. The electric power industry uses SF_6 for insulation and current interruption in electric transmission and distribution equipment.

SF_6 was first used by the electric power industry to replace oil breakers. Because SF6 is non-toxic and has a greater dielectric strength than air, it made it possible to significantly reduce the size of electrical equipment. It is now used widely in circuit breakers and other switch gear to manage the high voltages carried between generating stations and customer load centers.

Recognizing that such a useful substance is hard to replace, the FEWG focuses on reducing its emission. This does not always mean replacing SF_6 but rather improving management of its possible releases. Several factors affect the release of SF_6. The type and age of SF_6-containing equipment and handling and maintenance procedures all impact the amount of gas that is emitted. Iley cited four old gas breakers at Western, each containing 1,800 pounds of SF_6. The normal leakage rate for these old breakers is 115 pounds of the gas annually. The gas can also be lost during equipment servicing.

It is important to not only upgrade equipment to the newer versions that have lower SF6 leakage rates but also to observe best management practices in handling the equipment. Western has been successful in making these changes, but it can only happen when individuals are committed to the group effort.

If you would like to know more about Western's practices for reducing SF_6 emissions, contact Gene Iley at 970-461-7294. Also, we would like to hear about innovative strategies your utility uses to prevent SF_6 leakage. Share your story with the Energy Services Bulletin.

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