

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

School district learns lesson in energy conservation

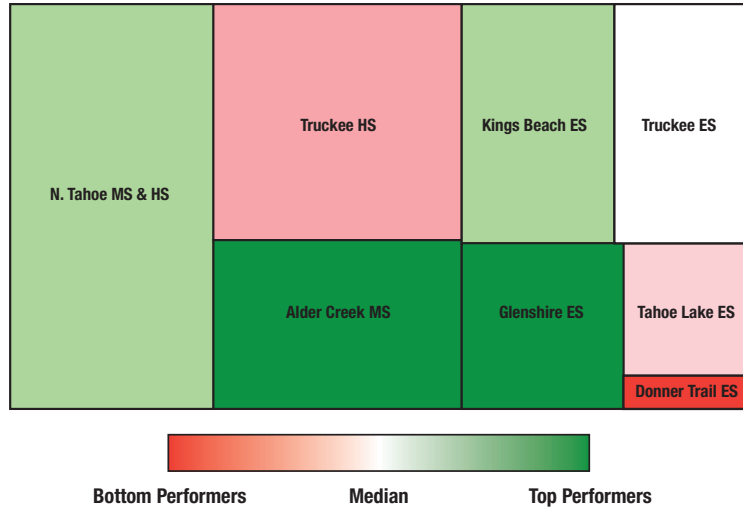
Anyone who questions whether energy efficiency improvements are worth implementing need only ask the Tahoe Truckee Unified School District (TTUSD), where an aggressive energy conservation program has saved more than \$1 million since it began.

To make the argument even stronger, energy-efficiency rebates from both Liberty Energy (formerly NV Energy) and the Truckee Donner Public Utilities District (TDPUD) contributed an additional \$220,000 to the bottom line. Local organizations have contributed about \$60,000 more in donations and grants, added Anna Klovstad, C.E.M./Project Manager for TTUSD.

Driven by budget

This conceptual chart showed the energy performance of each school in the Tahoe-Truckee Unified School District before the conservation plan was implemented. Administrators whose schools were in the red were eager to turn their performance around. (Artwork by CLEAResult)

The TTUSD Energy Conservation program began in 2008 as a result of budget reduction, that all-too-familiar



This conceptual chart showed the energy performance of each school in the Tahoe-Truckee Unified School District before the conservation plan was implemented. Administrators whose schools were in the red were eager to turn their performance around. (Artwork by CLEAResult)

process in school districts across the country. With a shortfall in the millions, the district was open to any and all ideas to save general fund money. Klovstad saw the opportunity to demonstrate the business value of energy efficiency. In a presentation to the school board, she explained how implementing energy-efficiency measures funded with rebates from TDPUD, NV Energy and some remaining bond money could significantly reduce the district's energy bills.

Once the facilities department began benchmarking energy use throughout the district, it became clear just how significant those savings could be. Performed by CLEAResult, an energy management company that works with NV Energy and Liberty Energy, the benchmarking revealed that TTUSD was spending \$270 per student on building heating and lighting. The

median energy costs for schools in the Tahoe-Truckee area at \$180 per student. "The process helped us understand where we should be," said Klovstad.

It also showed which schools were the most inefficient. A simple but powerful graphic in the report showed the energy savings opportunity for each school in colored blocks, sized to represent the building's square footage. Each block was colored from green (low) to red (high) to indicate its energy consumption. "When I presented it to the administrators, those with schools in the red were texting me during the presentation, asking 'What can I do?'" Klovstad recalled.

Controlling the controls

There was so much that could be done to improve the schools' energy

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Energy conservation

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performance that TTUSD set a goal of reducing its energy costs by 15 percent the first year. The plan was to make the buildings as efficient as possible, and Klovstad knew where to start. “We were just not managing our schedules,” she admitted. “The heating systems in several buildings were running as much as 20 hours per day. Obviously, there was a lot of room for improvement.”

Although each school has automated building controls to lower the temperature at the end of the day, the skeletal facilities staff had taken the “set and forget” approach. The problem with that strategy was made clear by a spike in gas use at five schools. The control systems had an “optimum start feature” that was turning on the heat at midnight. Resetting the systems to start at 7 a.m. produced major savings.

Monitoring building control systems and heating buildings only when people are in them were the first critical steps toward the 15-percent reduction. Klovstad acknowledged that staying on top of systems that range from brand new to 30 years old means more work for her. It doesn't help that some schools have thermostats in every classroom while others have only one unit for the entire building. Metering each facility has helped her drill down through usage

data to identify elusive energy wasters.

“The bottom line is the more you watch your systems, the more waste you find,” she said. “Suppose a damper is stuck open, feeding all outside air to an air handler for six months. If I can figure that out with two hours of navigating my building controls system, it's totally worth it.”

Gooooaaaa!

With building scheduling under control and all classrooms retrofitted with more efficiency T8 light fixtures and occupancy sensors, TTUSD was able to meet its cost savings goal within six months. In the 2008-2009 school year, electricity consumption went down by 8 percent, and gas use was 16 percent lower.

The following year saw another 11-percent reduction in energy costs through a 14-percent drop in kilowatt-hour (kWh) use and a 4-percent decrease in gas use. A harsh winter in 2010-2011 caused a 1-percent overall increase in energy costs, due to a 7-percent rise in gas use for heating. The mild winter of 2011-2012 put savings back on track, cutting gas consumption by \$45,000 and electricity by \$20,000 compared to the previous year.

As the TTUSD energy conservation program moves into its fifth year, the goal is shifting to cost avoidance. One of the district's power providers, Liberty Energy, is proposing a 10 percent rate hike (TDPUD and Southwest Gas are not projecting an increase). To avoid paying that increase, TTUSD must reduce electricity use in its facilities by 10 percent.

Not done yet

There are plenty of places left to squeeze more savings from TTUSD operations—upgrading outdated, inefficient heating systems, for one. In one school, the huge old boiler

that ran 24/7 has been replaced with a series of smaller boilers that can be staged to meet the heating load more efficiently. Klovstad is monitoring the system's performance to see if it should be installed in other schools with old boilers.

Improving the insulation in the modular classrooms would save on heating during the school day and when teachers have to work after hours. “All of our buildings have a setback of 55 degrees when they aren't occupied,” Klovstad explained. “That's not a problem for the permanent buildings, but the temperature in the modulares drops to 55 pretty quickly when the heat shuts off. We had to install programmable thermostats with a two-hour override for teachers working on evenings and weekends.”

Next summer, the conservation program is targeting pumps and motors to retrofit with variable-frequency drives. Also, Klovstad is getting ready to submit a request for retro-commissioning rebates to TDPUD, too. “We found a lot of opportunities for tuning up our facilities, and more projects mean more rebates,” she said. “At this point, our program runs on rebates and donations.”

Conservation isn't only for energy, either. TTUSD has begun benchmarking its water use and installing low-flow water fixtures in some of its schools. A 10-percent reduction in water and sewer costs could save the district \$22,000 annually. Measures to reduce waste disposal costs are already saving an average of \$4,000 per month.

All of the savings the conservation program achieves go into the district's general fund. To a school system facing budget shortfalls and cuts—as so many are—the value of such a program cannot be emphasized enough. Or, as Klovstad put it, “Saving money is saving jobs. That's a big part of what this is all about.” ⚡

Energy Services Bulletin

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visit <http://ww2.wapa.gov/sites/western/es/pubs/esb/Pages/esb1.aspx>

Regional utilities gather at Aspen to talk energy efficiency

The Rocky Mountain Utility Efficiency (RMUE) Exchange enters its sixth year with the earned reputation as the premier networking event for utility professionals and industry allies throughout the region, and increasingly, beyond. Those of us who have been trekking to Aspen from the beginning have shared many ideas (and beers), seen bears, made friends and partners and endured difficult economic cycles. The RMUE Exchange has changed its name but not its laser-like focus, hit some walls and leaped over them—or blasted through them.

Energy Services representatives will be there Oct. 10-12 at Aspen Meadows Resort, both as sponsors and participants. We have supported the RMUE Exchange from the beginning because we believe that the people delivering the power, programs and services are the best teachers. “Each year, we’ve seen customers leave the conference inspired, and then return the next year to give presentations on the programs they created,” said Energy Services Manager Ron Horstman.

Building bridges

No one is a bigger booster or better walking advertisement for the event than Utilities Energy Efficiency Manager Jeff Rice of co-host City of Aspen Utilities. “It brings so many industry professionals together in an environment that makes it easy to talk,” he said. “Say you have a program that isn’t working, you’ll be able to find someone who’s had a similar experience and figure it out.”

Rice added that the RMUE Exchange has introduced him to people and organizations at that he might not have encountered, or become involved in, otherwise. “Joining the executive council for ReCharge Colorado and getting to

know people at Western and DOE has given us access to the state and Federal perspective on energy efficiency,” he pointed out. “All of these resources have played a role in improving Aspen’s programs.”

Even utilities that set a high bar for sustainability can learn a variety of things at the RMUE Exchange. Stephen Casey, Manager Member Services at co-host Holy Cross Energy, and his department members enjoy the opportunity to meet vendors, consultants and other utility professionals.

“This event helps bring to light emerging technologies; boots-on-the-ground experiences; creative and innovative solutions; lessons learned; and other valuable programmatic thoughts and ideas,” Casey explained. “If we discover a good idea that’s proven to reduce Holy Cross’s environmental impact or help our members manage their energy use, there’s a strong likelihood we may use it. That helps us to avoid re-inventing the wheel.”

The chance to connect with innovators in the utility industry is bringing Piper Foster of metering technology company Amatis Controls to Aspen. The company manufactures performance meters used for power purchase agreements, and specifically for solar water heating systems. Amatis Controls is a member of DOE’s Utility Solar Water Heating Initiative (USH2O), and is working with Aspen’s Community Office for Resource Efficiency on policy to encourage solar thermal deployment. Foster, who will be a panelist on the Utility



During a break between RMUE Exchange sessions, Energy Services Representative Bob Langenberger (right) chats with Michael Whitaker of Symbiotic Engineering. The company worked with ReCharge Colorado to move the program from the Governor’s Energy Office to a stand alone non-profit organization. (Photo by Randy Martin)

Snapshots portion of the program, hopes to interest local utilities in solar thermal projects. “The fastest uptake of the technology is at the utility level,” she explained. “Learning from utilities about their experiences with solar thermal is an important part of USH2O outreach, and the RMUE Exchange is a great place to do it.”

Cooking up efficiency

“Utility Snapshots” offer bite-sized nuggets of information that whet your appetite for more, while the sessions provide the meat of the RMUE Exchange agenda. Wednesday afternoon is the smorgasbord, when speakers from investor-owned and public utilities and gas and electric providers offer overviews of their program portfolios.

Thursday is more like a cooking class as breakout sessions delve into all the ingredients that go into an energy-efficiency program. Attendees choose between two different flavors of session tracks—residential or commercial

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More than one way to evaluate energy resource options

Editor's note: This is the second of a three-part series on integrated resource planning that asks readers to think about how to use the process to prepare their organizations to deal with new expectations and demands.

We've all been there—cut corners by choosing the cheapest item on the market, only to find that it costs us far more than the original price tag in ways we didn't expect. Energy can be like that too, which is why integrated resource planning (IRP) is an important part of utility operations. Planning can help uncover the real cost of each resource—traditional, renewable or avoided—and decide if it is the right option in the right place at the right time.

Planners can no longer protect their customers—or their operations—by choosing the least-cost resource and being done with it. Resource choices have consequences that extend well past first costs to affect the environment, public health, the economy and national security. Tempting as it may be to dismiss these concerns as outside your organization's scope, they will come back to haunt you and your ratepayers if you ignore them.

Resource testing

The key to seeing the big picture, now that the picture is so much bigger, is to look at it through a lens with a wider angle, says Energy Services Director Ron Horstman. "Just as there are many options for supplying a load, there are many ways to pick your option," he pointed out. "Planners should evaluate a potential resource from several different angles."

He suggests applying different tests to each resource option. One

place to start is with the tests developed by the California Energy Commission and the California Public Utilities Commission in the 1980s. The tests described by the California Standard Practice Manual are designed specifically to determine whether the benefits of a demand-side management (DSM) program outweigh its cost. However, the tests can offer a useful framework for looking at the issues surrounding purchased and generated power as well.

Depending on a utility's unique situation, one issue may carry more weight than another, Horstman added, but planners should not rely only on any single testing method. "The soundest decision is made with the most information," he said.

Weighing all issues

To understand how testing aids decision making, imagine that you are the energy planner for a summer-peaking utility with a growing population. Over the next five years, you estimate you will have so many more customers, all cooling their homes with some type of air conditioning, increasing demand by a certain number of kilowatts (kW). Three (of many possible) ways to meet this load are:

- (a.) Purchase the power,
- (b.) Build a small, gas-fired peaking plant, or
- (c.) Launch a DSM program to save that much power.

Total resource cost, traditionally applied to DSM programs, compares the benefits to the power provider (savings over purchased or generated energy) to all costs, including those of running the program and participants' contribution. These are reasonable questions that should be asked of all options

under consideration. Otherwise, this test can put DSM at a disadvantage since participants' cost, especially for a program requiring expensive retrofits, drives up the total price tag.

Consider stakeholders

The program administrator's test evaluates programs based on the costs only to the provider, including incentives. Again, this test focuses on DSM programs, but all options cost something. You must pay for member services staff to design, promote and administer the program. But executing a power purchase agreement (PPA) or bidding out power plant construction also requires staff time—or hiring an outside consultant if you don't have employees who can do these jobs.

Determining the cost of a resource to your organization in staff time, incentives, permitting, fuel and other tangibles provides valuable budgeting information, but it doesn't tell you how much the choice will cost your customers. What will they have to spend to participate in the DSM program? Will you need a rate increase to pay for building a power plant? Could a time-of-use rate offset the cost of expensive purchased power? These questions will have a significant impact on your customer relations, and, in the case of the DSM program, on how much power it is likely to save.

Participant cost fills in some of the crucial details for DSM programs by comparing how much money and energy participants will save, versus their investment in the program. The better you know

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page 5

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your customers, the easier it will be to figure out how much of the program cost you can ask them to share and still get the participation level needed to meet your goal.

Since cost is rarely the whole story, it helps to have an idea of what intangibles drive your customers' decision making. Comfort may be as big a selling point as energy savings in a territory with older housing stock. In areas where the economy relies on agriculture or outdoor recreation, customers may be willing to pay more for DSM, or to absorb the cost of peak power purchases to prevent a new plant.

Nevertheless, customers do pay attention to utility bills, and their provider had better be ready to explain how a chosen option may affect rates. Planners need some sort of rate payer impact test to anticipate the direction and magnitude of rate changes, so they can prepare their customers.

For example, buying peaking power on the open market may have the same total cost on paper as building the power plant. In practice, however, power prices are volatile, and customers will pay the price if your estimates fall short.

Keeping the cost of participating in a DSM program low enough to attract customers might cost the utility nearly as much as the PPA or the power plant. But if it lowers demand charges, your customers enjoy the savings. This type of testing can also help you figure out what participation

levels a program needs to meet demand reduction goals.

The really big picture

Societal cost should be evaluated for all resources, but planners often skip this one because they are not sure how to calculate these costs. The power plant, for example, gives the utility local control and creates jobs, but many citizens don't want to live or work near them. You might be able to mitigate some concerns by building a state-of-the-art facility, but that will likely increase your costs without completely changing the perception.

The societal costs—or benefits—of PPAs are less clear. If your customers are calling for more renewable energy, this might be an opportunity to show them you are listening. Supporting a local renewable project would be even better. If the power comes from the same or similar resource as the rest of your portfolio, you may end up questioning the societal costs of all your resources. That's not necessarily a bad thing, as there is no "away" for waste products to go, and public health is everyone's health.

The implications of a DSM program depend somewhat on your relationship with your customers (again). They may see the program as a way to take control of their energy use and work with their utility to keep rates down, or they may view it as an intrusion. Just make sure they understand how it is likely to affect their bills, because misunderstanding breeds mistrust.

Nothing's perfect

Going forward, resource providers will need to seek out a wider variety of testing methods, given the growing number of factors that traditional evaluation was not designed to take into account.

Some planners are concerned that the California tests don't fully reflect the value of energy-efficiency programs. Measure it Right, a white paper by the National Home Performance Council (NHPC) recommends best practices planners can adopt to address some of the tests' more serious flaws. Best Practices in Energy Efficiency Program Screening, also commissioned by NHPC, focuses on ensuring that the tests take non-energy benefits into account.

Any test, no matter how meticulously applied, will have blind spots—don't expect easy answers, but don't let that stop you from including resource testing in your IRP process. It will create a stronger, more flexible plan, not to mention giving you a better understanding of your portfolio, your customers and your community, and that's good for business.

Editor's note: *The final story in the IRP series will highlight the results of planning. If planning helped your utility reduce costs, control your load or improve customer relations, contact us.* ⚡

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

Perform retrocommissioning before retrofitting

Before encouraging your utility customers to explore the option of adding new energy-saving features to a building, it is important to make sure the building's existing systems are performing well. Building performance will likely benefit from retrocommissioning, which often involves recalibrating sensors; adding valve and damper actuators; and adjusting the variable speed drive, setpoints, schedules and setbacks.

Benefits

Retrocommissioning can reduce energy use by 15 to 30 percent and improve occupant comfort at the same time. Benefits of retrocommissioning include:

- Cutting energy bills
- Offsetting rising energy rates and extending equipment life
- Identifying low-cost/no-cost improvements in operation and maintenance
- Improving staff productivity through improved lighting, comfort and indoor air quality
- Reducing the carbon footprint
- Taking advantage of generous utility and government incentives

Primary actions

Typically, a sequence of operation is included in the contract construction documents. These provide a good starting point for a retrocommissioning effort. The basic categories include:

1. Equipment scheduling
2. Temperature setpoints
3. Outdoor air control
4. Chiller optimization

5. Airflow and ventilation, occupancy sensors
6. Boiler optimization
7. Control system trending

Facility managers should avoid the common mistake of tuning building systems to the manuals—it is more important that the operation of the building fit the needs of its current occupants.

Proper scheduling of heating, ventilating and air conditioning system (HVAC) is the most basic energy-saving strategy. Make sure:

- All schedules are current
- No manual overrides are left on
- Schedules are checked frequently

Energy codes currently require that building operators provide for an optimal start for the primary air handling units. This strategy averages the last 10 days of indoor and outdoor temperatures to determine the best time to bring the building up to temperature, and typically takes a few weeks to fine tune.

Occupied setpoints can be adjusted to fit certain schedules; however, the best starting point is 68°F in winter and 76°F in summer. For each degree these two temperatures are separated—the deadband—building owners can save 1 percent of heating and cooling costs.

Demand-controlled ventilation (DCV) can save about 20 percent of heating and cooling costs. It is recommended that the ventilation system be set to provide at least 5 percent outside air during occupied hours to flush out excess carbon dioxide (CO₂); however, the systems in most buildings are set to bring in about 25 percent outside air. This

excess outside air makes the HVAC equipment heat and cool unnecessary volumes of outside air, which provides no value to the occupants and wastes energy and money. By adding a CO₂ sensor in the return of each primary air handler, the volume of outside air that is brought in can be regulated based on the number of occupants in the building.

The water chiller can be optimized using hydronic setpoint adjustments. Typically, the chiller is set to supply 45°F water all the time, but it is significantly more efficient to run the chiller to maintain a 12°F difference between the supply and return water temperatures.

The variable-speed drive (VSD) on the blower in the primary air handlers should be adjusted to a duct pressure sensor. This sensor may be set lower, saving fan energy without compromising air flow to the farthest zone. Operating the duct at lower pressures can also reduce duct leakage, which saves on heating and cooling.

Another method to control the VSD is to reduce the speed when terminal units detect that the desired air flow and pressure have been reached (or “satisfied”). When a certain number of zones (typically two) are not satisfied, the duct pressure setpoint rises until all zones are satisfied. Be sure to note if the same terminal units are driving this setpoint because it may indicate that the terminal unit is out of calibration or needs to be redesigned.

For areas that are occupied only intermittently; such as restrooms, conference rooms and exercise rooms; occupancy sensors can

See TECHNOLOGY SPOTLIGHT, page 8

Website of the month:

Western's Renewable Energy Program

ww2t.wapa.gov/sites/western/renewables/Pages/default.aspx

There is more than one form of low-impact, renewable energy in the West—there are several, in fact—and Western's Renewable Energy Program encourages customers to explore them all.

Until recently, the program worked with Federal and other agencies under the banner of the Public Renewables Partnership to help utilities integrate renewable energy into their power portfolios and business strategies. The PRP provided tools and resources that our customers will now find on Western's website. "The move will make it easier for Western customers to find what they need and connect with the experts who can answer their questions," explained Renewables Program Manager Randy Manion.

The resources start with the home page of the new Renewables site, where users can quickly scan for announcements about educational opportunities, solicitations and policy developments. The menu on the left of the page lists links to more information about specific topics related to renewable resources.

Educate yourself

Users who are just beginning to investigate renewables can browse publications and webinars. This page provides links to research organizations, databases, guidebooks and case studies covering the range of resources. Check out the webinar library for slide presentations and

recordings by expert speakers on topics including marketing, transmission, policy, law and more.

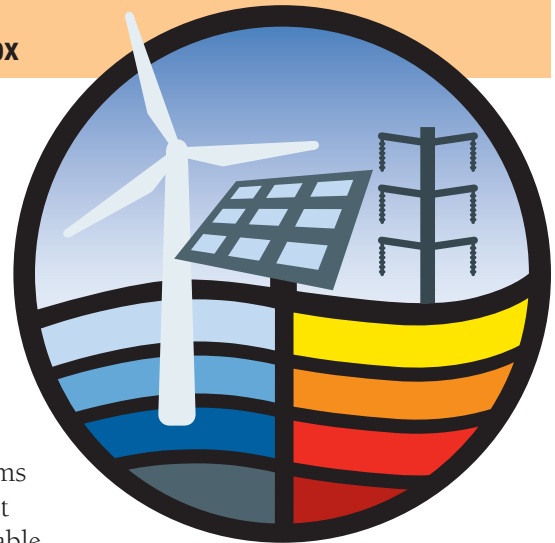
Once you've studied up on the general issues surrounding renewables, find out what's happening now across the country and in your area. Federal programs provide links to agencies that are at the forefront of renewable adoption. State activities connects users to policies, decision makers and marketing information that will drive local and regional development.

Round out your education with a visit to renewable calendar events to find upcoming webinars, conferences and symposiums. The calendars listed on this page are maintained by Federal and nonprofit organizations supporting renewable energy in general or a specific resource.

Take action

The site features plenty of resources for those who are interested in acquiring renewables, too. Transmission and interconnection and integration help users address two of the biggest issues facing renewable developments. On both pages, users will find agencies that can answer questions about the challenges and opportunities unique to their regions.

Funding is another concern common to all renewable projects, and this page will connect users to several websites that list upcoming grants and solicitations.



To simplify renewable acquisition for our customers, Western launched Renewable Resources for Federal Agencies in partnership with the Federal Energy Management Program. Initially, this program helped Federal facilities meet their clean energy goals, but Western now extends the services to all its firm power customers. Check out these pages for resources and tools to help you participate in Western's annual solicitation for renewable energy certificates and other solicitations.

The goal of Western's Renewable Energy Program is to give our customers the technical and marketing support they need to evaluate clean energy options. If you have a suggestion for the website, or would like more information about adding renewable energy to your portfolio, contact Randy Manion at 720-962-7423. ⚡

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

Technology spotlight

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greatly reduce lighting and HVAC demands, allowing the building operator to set back the temperature setpoints and minimize outside air settings. Of course, occupancy sensors must be properly selected and placed to control both systems.

Most control systems can track operational characteristics, called trending. Encourage facilities managers to review trending data daily to spot issues so they can proactively adjust the building's systems. The retrocommissioning process could include helping the facility manager to set up trending

logs that are useful for monitoring operations.

Cost to implement

Retrocommissioning can occur in stages. Many facilities managers start with re-tuning the primary air handlers, terminal units, boiler and chiller to reflect the actual use of the building. A complete recommissioning of an existing building costs about \$0.25/square foot. Typical payback is around six months. An article from Energy Design Resources provides details about the costs of retrocommissioning.

Some utilities offer incentives to support this effort. For information about utility rebates, refer to the

Database of State Incentives for Renewables and Efficiency (DSIRE).

Choosing an agent

Building controls have become quite sophisticated, so it is important that your utility customers hire a commissioning agent who has:

- A solid engineering background to understand the ramifications of changing the system
- Training in building systems commissioning from the National Environmental Balancing Bureau

The Federal Energy Management Program identifies excellent resources for planning retro-commissioning projects. ⚡

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

Regional utilities

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efficiency in the morning and technology or collaboration in the afternoon.

Keynote speakers, like celebrity chefs, will be on hand to tell how their programs made it big—and yours can, too. Irene M. Stillings, California Center for Sustainable Energy executive director emeritus, will open the conference with a presentation on the importance of collaboration. Closing keynote speaker Josh Radoff of sustainability consulting firm YR&G will focus on the big picture, and how utilities can play a role in the transition to a more sustainable society.

It's all about you

A great agenda is only half the story of the RMUE Exchange—it's your participation that makes it different from

so many other conferences. It's you, overcoming your fear of public speaking to share your program success during Utility Snapshots (imagine us in our underwear). It's you, getting so absorbed in discussing a poster at the opening networking reception that you forget the hors d'oeuvres table (which would be a shame). It's you, buttonholing a veteran presenter to get game-changing advice on a program your utility just started.

It's also you, 'fessing up about your less-than-stellar moments in program management (c'mon, we all have them). The agent provocateurs of Energy Services will be asking attendees to write down lessons learned and unintended consequences from programs and strategies that didn't turn out quite as planned (anonymously if you want). Your collected thoughts will be part of the discussion,

“Blessings and Other Blunders.” Yes, blessings, because mistakes are good not only for teaching us what doesn't work, but for sometimes showing us a new path to success.

So come prepared to be a part of a professional development event that will give you (at least) a year's worth of ideas to consider and resources to leverage. Whether you are a newcomer to energy efficiency, or an old friend returning to update us on an evolving program, you have something to say. Whether your utility serves the mountains, the plains or the desert, your experience is valuable. Participants have made the RMUE Exchange the hardest working energy-efficiency conference in the Rocky Mountain region, and we need you to keep making it better. ⚡

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