



Long road leads to solar success for Southern Ute tribe

The Southern Ute Tribe built their solar array on the mostly unusable Oxford Tract near a substation and just three miles from the tribal building campus. (Photo by the Southern Ute Indian Tribe)

Tenacity paid off for the Southern Ute Indian Tribe on July 24, when they dedicated their newly commissioned and fully operational Oxford Solar Project on the Southern Ute Indian Reservation in Ignacio, Colorado.

The years it took to develop the 1.3-megawatt (MW), ground-mounted solar photovoltaic (PV) system ultimately ensured that the project was a winner for all involved. The array will reduce operating costs for the tribe by offsetting about 15 percent of the energy used by 10 tribal buildings. The siting of the project repurposes more than 10 acres of tribal land that was mostly unusable due to naturally occurring selenium contamination. The Oxford Tract, as the land parcel is called, has strong solar resources, is

located near two substations and does not have any endangered or threatened species on it. La Plata Electric Association, which is purchasing the power and providing the grid connection, counts the electricity toward its goal of 20 percent local generation by 2020.

Slow start gathers steam

The Southern Ute Tribe first began to explore the idea of building a PV

continued on Page 2

inside

- 3 Proven storage technology
- 4 Rocky Mountain Utility Efficiency Exchange
- 6 Energy efficiency investments
- 7 Evolution of demand response
- 8 Commercial irrigation efficiency

Subscribe to *Energy Services Bulletin* at esnews.wapa.gov/wordpress/subscribe

system in 2006 as a way of diversifying its business interests, and launched the Southern Ute Alternative Energy LLC (SUAE) in 2008. As a for-profit business, the SUAE evaluated solar PV development opportunities on tribal lands from a business perspective. For several years, alternative energy projects remained stubbornly out of reach, too costly for SUAE to pursue.

The turning point came in 2011 when the tribe performed a new feasibility study to look at potential sites and business models. James Jensen, who had recently joined the SUAE staff, recalled that the study was very thorough. "We were open to projects either on or off of tribal land," he said. "If it was on tribal land, what was the best location? We evaluated environmental factors like whether the land was arable or disturbed or in a floodplain."

The study also considered the proximity of transmission and substations to potential sites and did economic modeling on hypothetical projects. "We came out of the process with a comprehensive understanding of what would make a successful solar project," said Jensen.

The findings determined that the Oxford Tract was the most suitable location for a utility-scale solar development, and that a grant was needed to make the project economical.

JumpSTARTing project

Southern Ute Grant Specialist Jody Rosier began working with Jensen on the grant application to submit to the Department of Energy (DOE). Financial help wasn't the only thing DOE had to offer the tribe, however.

Just as important, Rosier recalled, was the tribe's participation in the Strategic Technical Assistance Response Team (START) Program. START, a program of the DOE Office of Indian Energy, provides technical assistance to help Native American tribes complete renewable energy and energy efficiency projects. "START

analyzed and validated the findings of the feasibility study," Rosier recalled, "and helped the tribe to establish a relationship with DOE."

The program also helped the tribe determine the siting of the project near substations belonging to LPEA. "Initially, the project was planned as a 'virtual metering' situation, where any kilowatt-hours being generated would offset kilowatt-hours the tribe was using," explained LPEA Engineering Manager Ron Meier. "Siting the array near a substation was key to making physics work. It really simplified the development process for them."

Beyond that, Meier added, the purchase power agreement was pretty straightforward. With a budget of \$3 million co-funded by the tribe and a \$1.5 million grant from the DOE, it was time to start building.

Ready, set, install!

SUAE issued a request for proposals at the end of 2014 for an 800-kW system. It was around that time that the solar industry saw a significant drop in the price of panels. "We were pleasantly surprised when the bids came back to find that we could afford to build a somewhat larger project," said Jensen.

The tribe chose Boulder, Colorado-based Namaste Solar to design the project for the tribe and install the tracking panels. Jody Rosier noted that tracking technology is becoming more common in new solar installations. "Panels that follow the sun across the sky generate more electricity and that improves a project's economics," she said.

The long process that culminated in the July 24 celebration provided the Southern Ute tribe with a thorough education in solar development. Jensen observed that the most important lesson they learned might be to keep the first project simple. He pointed to the selection of a site that did not require an environmental impact study as one factor that kept the project from getting too financially and legally complicated.

Although grants that require matching funds may put projects beyond a tribe's reach, Rosier encourages tribes that are interested in developing renewable energy systems to investigate available grants. "Grants that require matching funds may not work for tribes," she warned. "But once the renewable system is up and running, it provides years of sustainable electricity and needs little maintenance." ■



UNL embraces proven storage technology to control costs

As in life, so it is in energy storage: maturity is often not considered very sexy. With all the attention lately being showered on lithium-ion battery energy storage systems, we might forget to consider an effective storage technology that has been around awhile. However, the facilities systems team at the University of Nebraska–Lincoln (UNL) is showing its appreciation for maturity by planning a new chilled-water thermal energy storage (TES) cooling system at its City Campus.

Shaving the peak

Like many satisfied TES cooling system owners, including the California State University system with 19 TES installations on 14 campuses, UNL is a repeat customer. The university's first experience with the technology was a 2.4 million-gallon system installed at its East Campus location in 2009.

As the largest load served by Lincoln Electric System, UNL was looking for a way to lower its high demand charges. TES uses off-peak electricity to chill water for cooling a building or a group of buildings during the hottest time of day when electricity is most expensive. "Electricity rates are not usually the driver for installing TES, especially in a state like Nebraska where electricity is very inexpensive," explained Lalit Agarwal, interim director of utility and energy management for UNL's facilities systems.

The City Campus TES will save UNL between \$800,000 and \$900,000 annually in demand savings by shifting chilled water production from peak to off-peak hours. Agarwal suspects that there are

additional savings because chillers run more efficiently at night when it is cooler. "But we are not hanging our hat on those figures," he added.

Right technology for right place

Before finalizing the decision to build a second TES cooling system on the City Campus, the facilities team weighed other options. Cool Solutions, a thermal energy storage consulting company, performed a scoping study for UNL.

In addition to being extremely cost effective, TES leads the other technologies in such areas as safety, ease of permitting and life expectancy. Siting flexibility is another advantage

continued on Page 5



Architect rendering of the new \$11.9 million thermal energy storage tank being built near landscape services buildings north of 17th and Y streets. (Artwork courtesy of University of Nebraska-Lincoln)

Conference highlights initiatives worth imitating

**Rocky Mountain Utility Efficiency Exchange
Aspen Meadows Resort
Sept. 27-29**

Rolling into its second decade, the Rocky Mountain Utility Efficiency Exchange has now been around long enough for its many participants to see the fruits of meeting annually to swap program ideas and stories of successes and failures with colleagues from across the region.

Forward-looking agenda

This year's theme, "Initiatives worth Imitating," focuses on using lessons learned from past programs to address the new issues and opportunities utilities are facing. Programs incorporating time-of-use rates, community solar, the internet of things and big data will be in the spotlight. Sessions will also cover new spins on demand response, customer outreach, behavior change and incentive programs.

"Technology often integrates tools and strategies that were part of successful energy-efficiency and load management programs in the past," explained Energy Services Manager Ron Horstman. "Load management today and going forward requires updates and changes in approach that will maximize the new resources and technology that are constantly being introduced to the industry. This year's agenda encourages that kind of thinking."

The future is on the minds of keynote speakers, too. Mark Martinez, the senior portfolio manager for emerging markets and technologies with Southern California Edison will deliver the opening keynote, Preparing Today for an Integrated Demand Side Management Future. He will draw on his more than 25 years of experience in

the design, management and evaluation of electric demand side management (DSM) programs to present a vision of how DSM needs to change.

The closing keynote by Ellen Steiner, the vice president of Opinion Dynamics, will explore how utility customer programs can adapt to meet the needs of changing demographics. A master methodologist, Steiner has strong energy-efficiency industry experience encompassing workforce education and training, marketing, community outreach and HVAC program design and evaluation.

Hear from your peers

New and familiar faces host the regular sessions, including the dual

track residential and commercial sessions on Thursday. Sponsors the City of Aspen and Holy Cross Energy will join Fort Collins Utilities, Colorado Springs Utilities, Nebraska Municipal Power Pool and many more regional utilities to talk about the state of customer programs in 2017. Research agencies and nonprofits like Rocky Mountain Institute and National Renewable Energy Laboratory team up with program vendors such as CLEARResult, Franklin Energy and Nexant to discuss the latest services and solutions available to help utilities manage their loads.

Friday offers a special treat with a focus on electric vehicles and storage. These topics were overwhelmingly popular at the 2017 Utility Energy Forum in California, and Rocky Mountain area utilities will be facing the same issues sooner than we expect.

Network toward your goals

If the sessions are a great way to explore the nuts and bolts of program

continued on Page 5



Utility program managers will be gathering at the Gold LEED-certified Doerr-Hosier Center at Aspen Meadows Resort Sept. 27-29 to share their ideas for taking customer efficiency programs to the next level. (Photo by Randy L. Martin)

Conference highlights *from Page 4*

design and delivery, the networking opportunities let you take the pulse of the regional industry.

In addition to breaks and meals (pack your “comfortable” business casual wear), attendees will have plenty of time to mingle with their colleagues and swap ideas. On Wednesday, Sept. 27, grab a snack and a beverage and check out the poster session reception. These mini-presentations allow attendees to talk one-on-one with presenters about topics as diverse as community solar, connected home devices and infrastructure planning.

Relaxed networking continues Thursday night at the Limelight Hotel

in downtown Aspen. This venue provides a low-key atmosphere where it is easy to carry on a conversation. If you hatch dinner plans at the end of the evening, the city’s world-class dining options are close by, or, you can catch an airport shuttle from the hotel lobby if need to depart early.

Enjoy Aspen

Of course, it would be a shame to cut your conference experience short, between the intriguing Friday sessions and the pleasures of September in the Rockies. We can’t promise good weather, but, most years, the days have sparkled with sunshine and fall colors

and the nights have been crisp and clear.

Aspen Meadows Resort is now sold out, but you can still stroll the grounds. The city is close enough that you could park your car at your hotel and walk off the delicious meals—included in your registration fee—on your way to and from the conference.

If you need one more reason to attend the Rocky Mountain Utility Efficiency Exchange, the Building Performance Institute awards continuing education units (CEUs) for many of the sessions. Download the instructions to find out how to verify your attendance. ■

Proven storage technology *from Page 3*

TES offers that was particularly important for UNL, as the City Campus is “landlocked,” observed Agarwal. “There is a certain amount of NIMBY-ism [not in my backyard] involved with other types of systems and only so many places we can build,” he acknowledged.

Related to the siting issue is the ease with which TES can be expanded. The system will be located on the edge of the campus and have oversized piping so it can be expanded in the future. Stefan Newbold, director of UNL Engineering Services, pointed out that the ideal time to look at installing TES is when a chilled water plant is already close to reaching its capacity. “It grows chilled water capacity significantly,” he explained. “TES is economical anyway, but it becomes more so when you throw in not having to expand a chilled water plant.”

Findings from the Cool Solutions study made up the basis of an article in District Energy’s quarterly newsletter. The story also included a comparison of TES with a hypothetical battery system.

Tried and true pays off

The new TES system, which has four times the capacity of the East Campus

plant, will be commissioned over the winter and spring, and be ready for the 2018 cooling season. The system controls will be centralized to eliminate the need for additional staff and to minimize new demands on existing staff. Using existing infrastructure and operators who already have chiller experience is another way the technology keeps costs down.

As the grid and the power supply continue to evolve, large facilities and municipalities will have to look at new solutions for managing their energy use. And while every end-user faces different circumstances, UNL’s story is a reminder that sometimes the best answer to a new challenge is an “old” idea. ■



The new thermal energy storage tank is located on the north side of City Campus, immediately south of the Devaney Sports Center (left) and Nebraska Innovation Campus (right). Photo by Craig Chandler / University of Nebraska-Lincoln Communication

ACEEE blog series explores energy-efficiency investments in US

Energy efficiency is a big and growing business with \$231 billion invested globally in 2016, according to an estimate by the International Energy Agency (IEA). The American Council for an Energy-Efficient Economy (ACEEE) used the release of the IEA Worldwide Investment report in July as a springboard to examine how much the United States invests in energy efficiency, what is driving that investment and how it could be increased.

We spend how much?

The first blog post, *How Many Billions do US Businesses and Individuals Invest in Energy Efficiency Each Year?*, gave \$41 billion as the estimated figure for efficiency spending in our country. This was the first year that the IEA report gave a separate estimate for the U.S., but spending was not broken out by sector. Based on the worldwide estimate, about 58 percent of that spending is for buildings, 26 percent for transportation and 16 percent for industry.

Drawing on other spending reports to get a clearer picture, ACEEE concludes that our energy-efficiency investments may actually range from \$60 billion to \$115 billion annually. This wide-ranging estimate results from different studies employing different measurement methods and parameters. However, additional research by ACEEE and by the U.S. Green Building Council suggest this range is reasonable.

Policy appears to be the primary driver in energy-efficiency investments, with building codes and appliance and vehicle standards responsible for about \$20 billion worth. “Spillover” occurs when policies and programs, such as utility incentives and customer programs, indirectly influence consumer decisions.

Reasons why

Other factors driving the decision to invest in energy efficiency include income and education levels among residential consumers and type of industry for business customers.

Who Invests in Energy Efficiency and Why?, the second blog post, cites a survey by the U.S. Energy Information Administration (EIA) showing that large firms are more likely to engage in energy management activities than small companies. Businesses participating in the Shelton Group’s 2016 B2B Pulse study rated how important sustainability and conservation were to their company’s operating and capital expenditure decisions. Commercial real estate development and property management were the industry groups that gave energy issues the most consideration.

The EIA’s 2015 Residential Energy Consumption Survey found that consumers with higher incomes are more likely to make energy-efficiency investments large enough to be eligible for federal energy-efficiency tax credits. Smaller investments, such as new lightbulbs, do not appear to be affected by consumer income. Another study found an education effect along with the income effect, but income and education are usually closely related. Households that have moved

within the last three years spend more on efficiency improvements, as do younger families.

The reasons commercial customers offer for making efficiency upgrades, while not unexpected, show a subtle shift in priorities. From the Shelton Group study, business customers cited “energy savings or other cost reductions” as the leading motivation for investing in efficiency. Although concern about climate change ranked toward the bottom of the list, the percentage of respondents that mentioned it has nearly doubled in the last year.

Saving on electric bills also topped the reasons residential customers gave for undertaking energy-efficiency improvements at 61 percent. Making the home more comfortable followed with 35 percent and making the home healthier was mentioned by 27 percent of respondents. Taken together, comfort and safety are an equal consideration to financial concerns. The study recommends focusing homeowners on both the financial and non-financial benefits of energy efficiency to explain the value of their investment.

Let’s do more

The final post addresses the question on every utility program manager’s mind—How Can we Increase Energy Efficiency Investments?—and offers 10 suggestions to make it happen. According to ACEEE, only about one-quarter of households and businesses implement efficiency upgrades, in spite of the benefits.

The suggestions focus on expanding what is already working, while remaining open to new approaches. More measurement and benchmarking could help program providers identify successful programs and help custom-

continued on Page 7

White paper, training explore evolution of demand response

Utilities have long used demand response to deal with high wholesale electricity prices or generation shortfall. What was once accomplished with phone calls to large industrial customers or one-way controls on aggregated residential loads is now done in near-real time with sophisticated two-way communication. Yet, despite the fact that this strategy has become an integral part of grid operations in the U.S., there has been no agreement on a definition of demand response.

The Peak Load Management Association (PLMA) set out last year to develop a consistent definition for demand response to use across its three training courses on the topic. A demand response dialogue that included several experts in the field took place in September 2016 and was recorded and archived on the PLMA website. At the 2016 PLMA conference later that year, the discussion continued with a panel presentation, *Defining the Evolution of Demand Response: From 1.0 to 3.0 and Beyond*.

Three epochs

The white paper from these discussions breaks down demand response into three periods beginning with the first interruptible tariffs for large commercial and industrial customers. Demand response was primarily used to provide energy (MWh) and capacity (MW) during periods of high wholesale prices, shortfall of generation or transmission capacity or unexpected emergency grid-operating situations. Utility staff contacted a commercial customer, usually a day or hours ahead of a forecasted event, to manually change power consumption onsite. Also, residential customers voluntarily allowed utilities to install load-control

devices to cycle their water heaters and air conditioners. Verification usually came from the utility meter which was read on its regular cycle.

Current demand response strategies provide more precise energy and capacity to support the wholesale marketplace, along with sophisticated, near-instantaneous ancillary services such as non-spinning and spinning reserves and frequency and voltage support. Measurement and verification occur in almost real-time measurements (either utility or non-utility) and often serve as confirmation of customer performance during demand response events. Two-way communication also allows for greater customer feedback and engagement.

Demand response is evolving to be a component of broader distributed

ACEEE blog from Page 6

ers see the value of energy-efficiency improvements. The article also recommends seeking partnerships with real estate, financial and construction industries to reach consumers through different channels.

Energy-efficiency investments were 8-9 percent higher in 2016 than in 2015.

energy resources both behind and in front of the meter. The service benefits demand response offers in this capacity, both to the grid operator and to the customer, include volt/var control, renewable energy integration and localized distribution system congestion management. The future of demand response may move away from traditional utility control to automatic, pre-programmed triggers based on price thresholds.

Learn more

Two upcoming courses expand on PLMA's demand response white paper to provide utility and regulatory staff and industry trade allies with a greater understanding of the evolution of demand response. Join subject matter experts from PLMA member organizations in Portland, Oregon, Sept. 26 or in San Francisco, California, Oct. 25.

Presentations will cover current technology and market conditions, utility case studies and more. Demand response will be compared to other load management strategies, and participants will discuss how to design a load management portfolio that serves your utility's needs.

The training is open to all industry stakeholders, with significantly discounted rates to PLMA member organization staff. ■

The ACEEE blog series offers some starting points to help utilities keep the momentum going. Energy Services looks forward to hearing about your ideas for getting more results from your existing programs and for creative new service offerings. ■

Take steps to improve commercial customer irrigation efficiency

According to an article in Buildings, a facility management trade publication, inefficient irrigation methods and systems can waste up to 50 percent of the water they consume. That quickly adds up to a painful water bill for your commercial customers and puts pressure on local water supplies and treatment systems. Share these tips to help facility managers at office parks, golf courses and other public green spaces get control of their irrigation practices.

Take care of your system

Failing to maintain irrigation systems may be the biggest factor leading to massive water waste.

One of the reasons for this neglect is that maintenance staffs often lack experience with irrigations systems. For example, when systems break down, they may attempt to make repairs with whatever equipment they can find, not understanding that every sprinkler waters differently. A replacement sprinkler head that does not work properly with the remaining original heads could affect the efficiency of the entire system.

Even working systems need a tuneup from time to time by someone who knows about irrigation. Something as simple as routine landscaping tasks can accidentally redirect a sprinkler head. Watering areas that don't need it—like sidewalks and pavements near landscaping—can waste enormous amounts of water.

Choose your method

The critical question of which type of sprinkler technology to install—drip or overhead—is best answered in the system design phase. The two main types of

irrigation systems each have their own set of pros and cons, many depending on the specific area to be watered.

The drip method of irrigation provides a steadier flow of water that goes directly into the soil, and can reduce water use by as much as 20 percent compared to an overhead sprinkler system. The down side of drip irrigation is that it is susceptible to breaking, and requires a higher quality of water. If you don't have an in-house irrigation specialist, this may not be a good choice for your facility.

Overhead systems—more traditional sprinklers that spray water above the targeted plants—are likely to be less efficient with water use, but they require less maintenance. This method is suitable for larger lawn spaces, whereas a drip system might be more appropriate for localized shrubs and flowers.

Control, schedule watering

Setting a schedule for your system's operation over time is vital to reducing water use and will have a big impact on conservation efforts.

The article states that a common mistake is turning on the irrigation

system in the spring and keeping the same watering schedule until it is shut off for the winter. Plants generally need less water in May or October than they do in the middle of summer. Adjusting the schedule throughout watering season can not only reduce water waste, it can improve the look and health of the plants.

Big water savings can come from replacing a simple timer with a smart controller that determines watering schedules based on climate or soil moisture. However, educating staff members is critical to getting optimum results from a smart controller. Otherwise, your crew is likely to revert to a time-based schedule because it is easier to understand and gives them more control.

Try xeriscaping

Landscaping with native and drought-resistant plants is another proactive strategy for reducing water consumption. But unlike switching to a new type of sprinkler system, this change is relatively cheap and easy and offers a lot of flexibility.

The Environmental Protection Agency did a case study on a Texas shopping mall that coupled xeriscaping with changes to its irrigation system to reduce its water use by 60 percent. The Village at Stone Oak in San Antonio saved nearly 14 million gallons of water annually by converting around 50,000 square feet of turf grass to xeriscape and modifying almost 85,000 square feet of its irrigation system. ■