

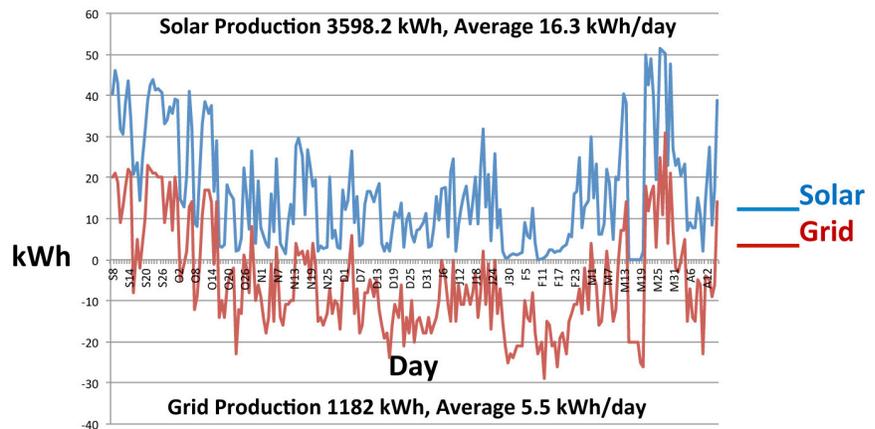
BULLETIN

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

FIRST YEAR OF SOLAR POWER CHALLENGES CASS COUNTY ELECTRIC CUSTOMER

Our pioneer ancestors knew that being the first arrival on a new frontier is fraught with hazards as well as rewards, and John and Robyn Bagu of Fargo, N.D., have experienced both during the first winter of their journey to total energy independence.

Energy Services Bulletin introduced the Bagus in the December 2012 issue (link to Breaking News reprint Cass County Electric supports customer solar project), shortly after the Cass County Electric customers installed their 7.4-kilowatt (kW) solar array with storage batteries. The renewable energy system is stage one in the couple's six-stage plan for leading a zero-carbon lifestyle. After making changes to bring their monthly home energy use down to 700 kWh, the North Dakota State University (NDSU) scientist estimated that his solar array could generate 100 percent of their current energy needs over the entire year.



This chart shows the Bagus' daily solar energy production versus home energy use from September 2012 to April 2013. The array covered 75 percent of their energy needs during the coldest months of the North Dakota winter. (Artwork by John Bagu)

It will do that, and then some, although not exactly in the way Bagu expected. From September 2012 to April 2013, the solar array generated 75 percent of their home energy. Moving into the summer months, generation is ramping up, and Bagu anticipates it to be at 100 percent sometime in July and producing surplus electricity in August.

COLD, HARD REALITY

Bagu admitted that he hoped for a hard winter to put his system through its paces. "Be careful what you wish for," he added.

From September, when it went online, through well into December, the system generally produced more electricity than the household needed. Cass County pays customers with renewable energy systems 5.25

cents per kilowatt-hour for surplus generation.

Then in February, when winter usually starts to loosen its grip on North Dakota, the weather got worse and winter continued into March and April. The generation dropped and the Bagus found themselves unplugging vampire loads, like a virtual picture frame and the microwave and TV in the basement. "It doesn't seem like much, but 25 watts over a month can really add up," observed Bagu.

Putting off laundry was another energy-saving strategy. "A dryer uses 5.5 kW for an hour or two, so we would wait for a sunny day so we could hang our wash outside," he recalled. "Our laundry piles got pretty high sometimes"

The Bagus also use an electric

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lawn mower and electric trimmer. With the upcoming purchase of an electric barbecue, the sun will handle all their “outdoor” energy needs.

EXPERIENCING TECHNICAL DIFFICULTIES

System malfunctions added to the pioneer experience. A chilly spring brought plenty of the cold, clear weather that is optimum for photovoltaic production. But the conditions were a little too good, causing the system to exceed its maximum production by 1,100 watts. “The excess energy caused surges that switched the system off,” Bagu recalled. “I need to put in a new 100-amp switch that should be able to handle the surges.”

The technical difficulties continued in March, when the charge controller blew, taking the system down for two weeks. The inverter failed, too, stopping electricity production for yet another week. Both components were under warranty, but Bagu had to pay for labor. “Repairs added \$700 to our investment,” he noted. “Knowing that cost up front wouldn’t have stopped us from installing the system, but homeowners should be prepared for

it when they put in solar.”

Part of the problem, Bagu noted, was that local electricians don’t yet have a lot of experience with complicated photovoltaic systems. Also, he would like to see solar companies offer better warranties for their product. Consumers might have better options in states with stronger solar industries, like California and Colorado, he observed. “Solar power could really be helped by more consistent national standards,” Bagu said, echoing a common concern among renewable energy advocates.

ON THE BRIGHT SIDE

The first winter hasn’t been all struggle and hardship, however. The Bagus were among the first Cass County customers to get set up with Smarthub. The product from National Information Solutions Cooperative provides an interface for the Bagus to view the usage information their meter collects. “We knew the Bagus were very interested in keeping track of their usage,” said Cass County Distributed Generation Engineer Troy Knutson. “They seem very pleased with the new information they are able to get from the meter.”

The smart meter interface made data collection much easier for Bagu. With its Internet portal, he can log on to computer to monitor his energy use by the hour, without going outside—a plus in the winter. “The graphs are fantastic,” he said. “I will definitely be using them in my next presentation.”

SPREADING THE WORD

Concordia College, in Moorhead, Minn., invited Bagu to talk about his zero-carbon project as part of the college’s Earth Day festivities. Some Concordia employees who live in Fargo were interested in learning more about going solar in North Dakota. At a time when the Keystone XL pipeline is stirring contentious debate in the Midwest, Bagu also enjoyed the chance to show another way to be an environmental activist.

Taking personal responsibility for

the environment is one of the themes of a class Bagu started teaching in January at NDSU. Chemistry of Renewable Energy and Electric Vehicles invites students to explore how we generate and use energy and look at how that affects society, from the individual to planetary level. The introductory-level class is open to all majors and is the first at the university dedicated to renewable energy technology. Bagu included electric vehicles in the curriculum because transportation is such a huge part of our energy use. “We can’t make a dent in the energy problem unless we become more efficient in that area,” he said.

The class project, which comprises 50 percent of the grade, requires the students to come up with a renewable energy project the university or the city could implement. Proposals included a solar education center, a 5-kW solar system, a 1- to 4-kW wind turbine and an electric vehicle charge station at NDSU. Students collected data, developed business plans and made presentations to the student government—great real-life experience for renewable energy advocates.

And like real life, the student government passed over the proposals to fund other more expensive, higher-profile projects. The proposals were well-received even though they weren’t adopted, and it was an excellent lesson in tenacity and resilience—traits you need in the renewable energy industry. Bagu admits to being disappointed. “It’s a microcosm of what’s going on in our society,” he said. “If we don’t treat sustainability as a priority, our children won’t either.”

FOLLOWING THE PLAN

Even if their renewable projects are on hold (for now), the students can still find an example of environmental responsibility in their instructor. With one winter under their belt and the bugs worked out of their solar system,

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ENERGY SERVICES BULLETIN

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LADWP SHEDS COAL, EMBRACES CLEAN ENERGY FUTURE

The Los Angeles City Council voted unanimously April 23 to approve a plan eliminating coal from the Los Angeles Department of Water and Power's (LADWP) resource mix.

The utility plans to sell its 477-megawatt (MW) stake in the Navajo Generating Station to the Salt River Project by the end of 2015—four years before the contract expires. The vote puts LADWP in compliance with California law (SB 1368), which bans state electric utilities from importing power that exceeds a fossil-fuel emissions cap after current utility contracts end. The emissions cap is set at the level of an efficient, combined-cycle natural gas power plant.

The Intermountain Power Project (IPP), LADWP's other coal-fired power source, is slated for conversion to natural gas by 2025 at the latest, two years before the end of LA's contract to purchase IPP power.

As former Vice President Al Gore said at a press conference announcing the city's plan, "This is a really big deal." The decision will slash LA's emissions to 60 percent below 1990 levels by 2025, an achievement unmatched by any other metropolis. Currently, the municipal utility's base-load power supply is 39 percent coal. Going coal-free requires nothing less than a complete transformation of LADWP's 100-year-old power supply.

GETTING THERE FROM HERE

Replacing coal doesn't happen overnight—it takes lots of planning and, in the case of California, a push from state law.

In 2002, the California State Legislature passed a renewable portfolio standard (RPS) for investor-owned utilities (IOU) and required municipally owned utilities to develop their own RPS. The City Council approved a resolution in 2004 supporting a "roadmap" to achieve 20 percent renewables by 2017, the same as the IOU standard. LADWP presented the City Council with an RPS plan the following year.



To meet its aggressive renewable energy goal of to 35 percent by 2020, LADWP is building 120 megawatts of solar in the Los Angeles basin on properties owned by the utility and the city. (Photo by Los Angeles Department of Water and Power)

By December, however, the Board of Water and Power Commissioners adopted an accelerated RPS goal to reach the 20 percent target by 2010—which LADWP achieved.

The key elements of the LADWP RPS "roadmap" include:

- Issuing a Request for Proposal (RFP) to develop or purchase renewable energy resources. Proposals are evaluated based on "least cost, best fit" technologies.
- Soliciting feedback from key stakeholders, including elected officials, labor unions, the environmental and business communities and neighborhood councils.
- Completing an independent review of the RPS plan and auditing it for compliance annually.
- Establishing a renewable surcharge to recover anticipated additional costs of renewable energy.

LADWP's aggressive development of renewable resources already helped

the city reduce its CO₂ emissions by 7 percent between 1990 and 2007 (Environment LA city inventories). Utility-built solar and wind projects combine with long-term purchase power agreements to comprise more than 2,100 MW of renewable generation projects either existing or at various stages of development. The ongoing RFP process has brought in proposals for wind, solar and solar thermal, small hydro, geothermal and waste-to-energy plants.

The RPS roadmap will continue to be central to reaching the plan's ambitious goal to increase the city's renewable energy supply to 35 percent by 2020, and reduce greenhouse gas emissions by 35 percent below 1990 levels by 2030.

THE WATT YOU DON'T USE

Modernizing LA's power supply calls for an unprecedented investment, not only in new sources of megawatts, but in "negawatts," too. LADWP has teamed up with Southern California

See CLEAN ENERGY FUTURE, page 4

Clean energy future from page 3

Gas Company to invest \$440 million in energy efficiency funding into the community. By doubling spending on energy-efficiency programs this year, LADWP aims to reduce power use by at least 10 percent by 2020.

Residential incentive programs through Energy Upgrade California include air and duct sealing, new insulation, low-flow showerheads and more for existing homes. Working with California Advanced Homes, the utility offers incentives for building more efficient new homes. Other rebates for homeowners cover appliances, building materials, toilets, pool pumps, landscaping systems and electric vehicle chargers. Business customers can take advantage of rebates for lighting, refrigeration, chillers and custom measures.

If these programs are successful, energy efficiency will jump from 1 percent of LADWP's portfolio to 10 percent—a loss of revenue that

might make any utility cringe. To remove this significant barrier to pursuing cheap, clean efficiency, LADWP has taken the unprecedented step of decoupling sales from revenue.

The strategy common to IOUs will enable the municipal utility to meet its financial obligations while expanding efficiency and renewables to meet 43 percent of its load. Ratepayers, rather than stockholders, will be seeing the benefit of decoupling, as LADWP Energy-efficiency Director David Jacot pointed out. "Energy-efficiency programs provide an avenue for us to make investments that improve the environment and help create jobs in our community," he said.

A FEW HURDLES LEFT

The balance of LADWP's post-coal portfolio will come from converting IPP to natural gas, but that switch is not a foregone conclusion. As is one of six Southern California municipal utilities and 30 Utah utilities buying power from IPP, LADWP can't

unilaterally change its purchase power agreement. All 36 purchasers must unanimously agree to IPP's conversion and the 2025 deadline.

The price tag for shedding coal is still a matter of debate, too. One estimate puts the cost to consumers of converting IPP at more than \$500 million, and encourages a bigger emphasis on large-scale wind and solar projects. Other opinions assert that an early transition away from coal gives the utility the time and flexibility to find ways to minimize the impact on ratepayers.

As one councilman accurately observed, there is no cost-free option, and ignoring climate change and an aging grid comes with its own high cost. The city of Los Angeles is choosing the path of a clean, diversified energy supply and a modern grid, in the conviction that planning can manage the costs and the benefits will outweigh the investment. ⚡

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

Solar power challenges from page 2

the Bagus have completed stage one in their six-stage plan. Next year, they plan to buy a pair of electric bicycles, followed by a wind turbine in 2015. "Wind power will supplement the solar panels on overcast days and give us the extra generation we need to charge electric vehicles," Bagu said.

Stage four and five will be the purchase of the battery-

powered cars—Bagu has his eye on the Ford Focus electric with temperature-controlled battery. "Our electrical use for the house and two electric cars combined will be 2,440 kilowatt-hours per month," he said. "That's down from our starting monthly average of 4,660 kWh [based on 36.6 kWh per gallon of gas conversion]."

As the final step, Bagu wants to switch out his natural gas furnace for some form of electric heating. Georexchange heating is an attrac-

tive whole-house option, but a portable electric heater to move from room to room could be an interim solution.

Whatever technology they choose, you can be sure the Bagus will do their homework and make the decision with a sustainable future in mind. And that they will be blazing a trail for others to follow. ⚡

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

NATIONAL GEOTHERMAL SUMMIT HIGHLIGHTS CRITICAL ISSUES

Geothermal energy, the underground and underutilized renewable, will be energized when the National Geothermal Summit brings together a Who's Who of the geothermal industry in Reno, Nev., June 26-27.

Join industry leaders, government officials, and national and international power sector representatives at the Grand Sierra Resort and Casino for critical discussions on ways to move geothermal energy forward. "We started the Summit three years ago, because most industry events focused heavily on science and technology," explained Geothermal Energy Association Executive Director Karl Gawell. "By bringing policy makers and power providers into the conversation, we can create a more favorable environment for geothermal expansion."

The Geothermal Energy Association (GEA) and Ormat Technologies are presenting the event. Western is among the cosponsors, which include the Geothermal Resources Council, California Geothermal Energy Collaborative, City of Reno, Great Basin Center for Geothermal Energy and Nevada Geothermal Council.

Applauding the choice to hold the Summit in Reno, Nev., Senator Harry Reid urged collaboration between the geothermal industry and utilities. "I hope leaders in the geothermal and utility sectors will work together to find new and innovative ways to bring these resources to market," he said in a statement to the GEA. "Nevada's economy and our future are strengthened when we take advantage of our abundant clean energy resources. I will continue to work to help ensure that Nevada remains the geothermal capital of the nation," added Senator Reid.

WHAT'S IN IT FOR YOU

The agenda covers the state of geothermal energy, new technologies, valuing geothermal for purchase

power agreements and the future outlook for the geothermal industry. The format has been designed to encourage interaction and discussion about government policies, projects in development, market potential and opportunities for U.S. companies.

The Summit offers utility resource planners and renewable program managers the opportunity to learn about the progress geothermal energy has made, examine the issues challenging development and deployment, discuss relevant policies and hear different viewpoints. "For many utilities in the west, geothermal energy is a new renewable," said Gawell, "and thanks to advancing technology, there are new ways to fit it into the power mix."

"How to value geothermal energy for PPAs and more" is a session that utility attendees will find particularly interesting. Paul Thomsen, Ormat's Policy and Business Development director, is chairing a panel that includes Carl Stills, interim energy manager for Imperial Irrigation District. "We know renewables are going to drive costs in the future," Stills observed. "However, I believe we can be prudent and still get the renewable portfolio we need without sharp cost increases to our customers."

With that goal in mind, IID is looking at geothermal development through multiple lenses and from different angles. "Public-public and public-private partnerships are avenues IID is exploring as ways to reduce risk and increase financing options to the utility and its customers," said Stills.

ESTABLISHED, WITH GREAT POTENTIAL

Geothermal power presently supplies the world with approximately 11,800 megawatts (MW) of firm yet flexible electricity in 27 countries, on six continents, but the potential to use geothermal resources is even



Interim Energy Manager Carl Stills of Western customer Imperial Irrigation District will talk about how public-private partnerships helped IID add geothermal power to its resource mix while controlling cost increases to the customer. (Photo by Conveyor Group)

greater. With the technology available today and under development for the future, geothermal resources could supply more than 300,000 MW of power.

Gawell pointed to a recent study by The Aspen Institute that showed geothermal generation could be used for firming power as well as base-load. Enhanced geothermal system (EGS) technology offers the chance to extend use of geothermal resources to larger areas of the western United States, he added. "Many of the companies working on EGS are exhibiting and presenting sessions, so this will be the place for utilities to get answers to their questions," Gawell said.

Geothermal energy has an important role to play in reducing carbon emissions, too. GEA recently released an updated study, Air Emissions Comparison and Externality Analysis,

See GEOTHERMAL SUMMIT, page 8



TECHNOLOGY SPOTLIGHT:

EVAPORATOR FAN CONTROLLERS REDUCE ENERGY USE

The small and inconspicuous evaporator fans in walk-in coolers and freezers don't usually get much attention, but they can have a surprising effect on energy bills because they typically run 24/7 and generate heat that adds to the cooling load. Controlling evaporator fans so they run at full speed only when necessary can reduce refrigeration bills by 25 to 35 percent.

FANS WASTE ENERGY

For a small piece of equipment, evaporator fan motors in refrigeration units are big energy wasters because:

- They are very inefficient. Evaporator fan motors are usually single-phase motors of the shaded-pole type (10 to 40 percent efficient) or permanent-split-capacitor motors (30 to 60 percent efficient).
- They run 24/7. Evaporator fans provide air circulation when the compressor is on and the evaporator is cooling the walk-in unit. Even when the compressor is off, some air circulation is desirable so the cool air is distributed evenly. The fan can operate at a slower speed and still provide adequate circulation.
- They generate excess heat. Any heat generated by the motors adds to the cooling load so the compressor has to work harder. Energy savings from reducing fan use is essentially doubled because the compressor will also run less.

MONITOR COMPRESSOR, TURN FAN DOWN

When the compressor is not running, the controller turns the fan down to a lower speed to save energy. Two companies currently manufacture these

controllers: Energy Control Equipment Inc., and Functional Devices, Inc.

Energy Control Equipment offers the Frigitek ECM I and ECM III controllers for electronically commutated permanent magnet (ECPM motors)—also referred to as ECMs or EC motors—because this technology saves energy and has few service issues. Because most coolers do not have ECPM motors, Energy Control Equipment also sells ECPM motors and the controllers to go with them.

This strategy addresses all three modes of energy waste:

- ECPM motors are much more efficient than typical single-phase motors. ECPM motors are generally 75 to 85 percent efficient, providing significant energy savings just with the motor change.
- Reduce the full-speed run time of the fans. The fans still operate 24/7, but they run at low speed most of the time. When the compressor is on—usually less than 40 percent of the time—the fans run at full speed. At low speed, the motors use only about 10 percent of the energy as at full speed. This also reduces product shrinkage due to excessive evaporation.
- Reduce the cooling load. With more efficient, variable-speed motors, the fans add significantly less to the cooling load so the compressor does not have to work so hard, which also saves energy and maintenance.

Functional Devices Inc. manufactures the EFC4045T controller, which can also control shaded-pole or permanent-split-capacitor motors. Although average savings are between 25 and 35 percent of the cooler's total energy use, the actual savings may vary



By operating fans at low speed when cooling isn't needed, and at high speed only when the system is actively cooling the refrigerator, the EC motor controller introduces much less heat into the refrigerator. (Photo by Energy Control Equipment, Inc.)

as much as 10 to 60 percent. Simple paybacks generally range from one to three years.

MOTOR TYPE, RUN-TIME KEY TO ENERGY SAVINGS

The amount of energy saved by installing a controller depends on:

- The kind of motor being replaced
- The current run-time of the compressor. The less the compressor runs (the more oversized it is for the load), the more energy your customer can save. The evaporator fan can run at low speed more often when the controller is installed. Making other efficiency improvements, such as improving the walk-in doors, seals and shell, will actually increase the effectiveness of the controller, since they will make the compressor run less.

See TECHNOLOGY SPOTLIGHT, page 8



WEBSITE OF THE MONTH: DAILY INFOGRAPHIC

Explaining rates, generation, transmission or energy programs to people outside the utility industry is a tough job. If you are the person who has to do it, a visit to Daily Infographic may help you find new ways to communicate with customers.

This website is not specifically about utilities or energy, although it has some excellent resources covering related issues. Rather, it showcases the best in information design and data visualization from around the Internet. These data-filled illustrations don't just tell a story, they show it with colorful, easy-to-understand graphs, pie charts and comparisons.

STYLE, SUBSTANCE

Infographics are as much about how you communicate as what you communicate. Take *How to Save on Your Energy Bill*, for example. This infographic from a British renewable energy company illustrates 10 easy tips for reducing energy use with a simple icon and one or two sentences of instruction. *Eco-Housing 101* shows how to reduce energy use room by room with a diagram of a home and brief factoids explaining how and why.

To reinforce the importance of simple measures, show skeptics *Small Things, Big Environmental Impact*. This infographic from Wellhome uses the strength of numbers—watts, pounds of carbon dioxide, dollars—to build a strong case for going after the low-hanging fruit. *How Much Do We Really Recycle?* can do the same for people who wonder if recycling is really worth the trouble.



Daily Infographic

RELEVANT TO POWER PROVIDERS

Daily Infographic offers statistics on everything from Snakebites in Family Pets to The Facts About Poop (just try and stop yourself from clicking on that link). However, the categories that are most likely to interest utilities are business, environmental, Internet and tech.

Some infographics are perfect for turning into bill stuffers or linking to your website; however, you will need to get permission from the company that created it. Before each infographic is an introductory paragraph; at the end of the paragraph you'll find a tiny and not-exactly-self-explanatory link labeled "via." This link takes you to the infographic's owner, where you can request permission to use it. The good news is, many of the companies encourage linking with their websites.

You can also mine infographics for statistics for presentations and reports—a good one will cite the source of its data. Whether you need to explain to your board how Internet use has changed your load profile, or talk to customers about wind or solar power, Daily Infographic makes your research easier.

MESSAGE, MEDIA

Utility-related infographics make up only a small portion of the posts on Daily Infographic, but information—especially in concise, digestible nuggets—is power. Program managers can comb social

media and marketing for insights into how consumers form allegiances to brands or respond to different types of messaging. Lifestyle can alert resource planners to trends like urban growth or telecommuting that could have a long-term effect on load.

The real value of the site, however, is in how it gets users to think about information—how to break it down and package it to make your point quickly and directly. Of course, creating effective infographics is a specific skill, but signing up for a daily dose of visual information can help sharpen your marketing and presentations. Just don't get distracted by *The Cost of Being Iron Man*. ⚡

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

Technology Spotlight
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WHEN TO USE A CONTROLLER

Controllers offer a quick, easy, inexpensive and usually cost-effective way to save energy. After achieving success with this measure, your customers may be willing to look at lighting, HVAC or other efficiency measures. Keep incentive programs simple and straightforward to encourage your customers to participate. For help calculating potential savings for different applications, or advice on how to structure an incentive program, call Western’s Energy Experts hotline at 800-769-3756. ⚡

DO use a controller if...	Do NOT use a controller if...	Comments
The compressor does not run constantly.	The compressor runs constantly.	Single-speed compressors are unlikely to be sized exactly right (or too small) so that it must stay on constantly to keep up with the load. Especially if the condenser is located outside the unit, fluctuations in ambient temperatures require that the compressor be sized so it is often off.
The evaporator fan constantly runs at constant speed.	The evaporator fan is variable speed, multi-speed or is sometimes off.	In some systems, the evaporator fan turn off when the compressor is not running.

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

Geothermal summit
from page 5

which shows that geothermal energy provides significant benefits to public health and the environment as a low-pollution, environmentally friendly form of energy. The analysis found that binary geothermal plants produce virtually no greenhouse gases and dry steam and flash geothermal plants put out only trace amounts of emissions. GEA estimates geothermal provides approximately \$88 million in externality benefits per year to Californians and \$29 million to Nevadans by avoiding fossil fuel emissions.

SEE YOU THERE!

Registration for the National Geothermal Summit offers special and group rates. Sponsorship opportunities are still available too; contact Kathy Kent at 202-454-5263 to learn more. To request press credentials, contact Shawna Seldon at 917-971-7852.

To keep up with news about the geothermal energy industry, subscribe to the Geothermal Energy Weekly. Check out GEA’s YouTube Channel, follow GEA on Twitter or become a fan on Facebook. ⚡

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