

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

SEPA Germany trip highlights solar potential for U.S. utilities

Hoping that a close encounter with success might inspire imitation, the Solar Electric Power Association (SEPA) hosted 31 utilities on a five-day tour of the country with the most integrated renewable energy in the world.

Utility executives and managers, including some Western customers, traveled to Germany June 8 to 13 to meet with German utilities representatives. The fact-finding mission included visits to solar companies, multi-megawatt photovoltaic (PV) installations, a research institute and a solar module manufacturing plant.

Mainstream solar

Inviting German solar experts to speak to the same group in the United States wouldn't have had as much impact, asserted SEPA Executive Director Julia Hamm. "Spending a full week talking about solar power with their U.S. colleagues—sometimes the only English-speakers around—forced the delegates to really focus on

the issues," she said.

The specific goal in hosting a trip to a country with so much integrated solar in the power supply was twofold. German utilities get about 3 percent of their electricity from solar power, Hamm explained. "We wanted the representatives to talk to their counterparts in Germany to learn what kind of impact that much solar power has on the grid."

The association also wanted utilities to see that solar is a mainstream resource now, not something in the future. "Outside of California, a lot of utilities simply aren't aware that solar is a realistic option for their power supply and their customers," she stated.

Technical, policy surprises

What the delegation saw surprised even representatives from California utilities. Fred Fletcher, assistant general manager of power supply for Burbank Water and Power, admitted to learning that, "Some technologies we thought were still on the drawing board are ready to be developed as a business case. The trip changed the way we look at risk."

That from the utility that SEPA's 2007 U.S. Utility Solar Electricity Market Survey ranked eighth in the nation for solar electric capacity per customer on the customer side of the meter. The delegate from Salt River Project (SRP), another utility



The SEPA delegation visited a landfill powerplant site in Germany where this solar array and wind turbine are co-located. (Photo by Mike Taylor, Solar Electric Power Association)

that ranked in the survey, agreed that solar technology is at a different stage in Germany. "Thin-film solar is the next hot technology there," said Lori Singleton, SRP manager for sustainability initiatives and technologies. "We would like to incorporate more of that into our mix."

Singleton was most interested in the policy aspects of developing so much solar power. "I wanted to learn more about Germany's feed-in tariff (FIT) and the associated costs to the customer," she said.

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SEPA Germany trip

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Under a FIT system, renewable electricity producers are paid a fixed, above-market rate for the electricity they feed into the grid. That cost is spread across all electricity consumers. In Germany, the estimated additional cost to the average family of three is about 2 per month—not as significant as Singleton expected.

Different approach

As an engineer, Fletcher hoped to learn more about mass deployment of PV, he said. “We don’t have much exposure to solar power on that scale here.”

The amount of capacity Germany had installed and the quality of engineering impressed him. “The level of professionalism in the solar industry is very high—on par with electrical engineering in the United States,” Fletcher said.

The trip gave him an appreciation for the limitations of mass deployment, he added. German policy has succeeded in bringing down the cost of panels, but Fletcher thought more could be done to reduce integration costs, too. “Also, we saw a lot of hand-wiring of the panels into the

grid,” he said. “It would be better if the wiring was integrated into the frame or paneling.”

Grid issues don’t seem to stand in the way of Germany’s solar development, however, Singleton noted. “German utilities just don’t perceive that as the big barrier American utilities consider it to be.”

The cost of solar technology was another area where there is a difference of opinion, she said. “The Germans believe that the cost will decrease significantly in the near future. In the U.S., even solar advocates expect it to take a long time for prices to drop,” Singleton observed.

Mixed group networks

Fletcher’s and Singleton’s views represented the different perspectives SEPA aimed for when selecting delegates for the mission. Participants came from investor-owned and public utilities, from urban, rural, large and small power providers. Most important, said Hamm, “Everyone was at a different level in their solar experience.”

A surprising number of applicants came from outside the solar industry when SEPA announced the trip through Western, American Public Power Association and regional utility groups, Hamm recalled. Narrowing eligibility down to just utilities, there were still twice as many applications as the association could fund. “We planned to pay for 20 delegates,” she said. “In the end, another 10 utility professionals paid their own way.”

Mixing up the demographics led the delegates to learn from each other as well as from the Germans. Singleton called the trip a valuable opportunity to discuss renewables policies and customer issues with other U.S. utilities. Also, the one-on-one time she spent with German solar

manufacturers offered the potential for creating partnerships with SRP.

What will, won’t work

To gauge the mission’s success, SEPA gave delegates pre-trip and post-trip evaluations to fill out. Two significant changes were how delegates ranked the general importance of solar power in a portfolio, before and after; and how soon they thought their utility might add solar generation. “Everyone moved up the scale after the trip,” said Hamm. “They took solar more seriously and saw a place for it in their mix after seeing what was happening in Germany.”

Still, there are cultural differences that would prevent American utilities from exactly duplicating the German solar experience. For example, Singleton points to Germany’s FIT, noting, “Some municipalities and utilities have experimented with a tariff, but it probably wouldn’t happen here without Federal legislation.”

The FIT has helped to build Germany’s solar industry in a way that net-metering in the United States has not matched. Germany has no net-metering rules—customers buy their power from the grid and sell electricity from their own arrays back to it. As the FIT decreases over time, PV owners will be paying more for power than they will make from selling it. “Customers in the U.S. would definitely have a problem with that,” Fletcher said.

He also felt that German utilities are more accepting of government regulation. “Delegates would ask about the reason behind a regulation, and often as not, the utility representative couldn’t tell us—it was just the way things are done,” Fletcher said.

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Energy Services Bulletin

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School's new bio-heat boiler funded by Colorado Governor's Energy Office

Proving that there is more than one way to efficiently heat and cool a facility, South Routt School District in northern Colorado is replacing its old coal-fired boiler with geothermal heat pumps, a woody biomass boiler and a back-up propane furnace.

The new heating systems are part of a \$4.1 million energy makeover of the district's schools and buildings. The need to get rid of the 35-year-old, failing boiler drove the project, but it expanded to include lighting upgrades, installing system controls and Vending Misers and replacing pump valves.

The school district looks forward to reduced operating expenses, thanks to the package of energy-efficiency measures. Just using wood pellets from nearby plants for fuel instead of propane will save county taxpayers about \$10,000 annually. "For almost any building with 15,000 to 20,000 square feet, woody biomass is an economical alternative to propane," said Stacey Simms of the Colorado (GEO) Governor's Energy Office. Simms manages GEO's Community Woody Biomass for Thermal Usage program, which funded the installation of the new boiler. "The system can yield a return on investment in as little as three years."

Community support

The GEO established the woody biomass program in 2007 to support communities in choosing bio-heating systems for municipal facilities. The initial capital costs of the system can be a barrier, even when a local supply of biomass is available. The program is intended to provide the final push

of financial support the project may need to get off the ground. "The GEO doesn't go it alone," Simms explained. "We like projects that benefit more than one facility and that leverage other funding in the community."

The South Routt School District project fits that description. Voters approved a \$1.57 million bond issue in November 2007 to improve energy efficiency in the high school, middle school and elementary school and administration buildings. The bond matched funding from the state departments of Education and Local Affairs. "The South Routt school board was very proactive in gaining community support," recalled Leslie LaRocque, business development manager for the McKinstry Company. "And the community was very supportive of a clean energy solution."

The Seattle-based engineering firm, a pre-approved GEO contractor, became involved in the South Routt project while working on a performance contract for the nearby Hayden, Colo., school district. "The Hayden school superintendent knew that South Routt was going to have to replace its boiler, and suggested we call them," LaRocque said.

An energy audit that the GEO



This old coal boiler was one of the last in operation in a Colorado school district. The new heating system includes a wood chip boiler and geothermal heat pumps. (Photo by McKinstry)

had already done at South Routt determined that replacing the coal boiler would not generate enough savings to qualify for a performance contract, even with the other efficiency upgrades. "Coal is such a cheap fuel that any other system is probably going to cost more to heat," LaRocque observed. "Fortunately, the school district raised enough funding that we could approach the project as a standard construction contract."

The audit also indicated that bio-heating would not be cost-effective for the entire complex, and it wouldn't provide cooling. McKinstry analyzed the school district's needs and recommended installing geothermal heat pumps. But even the most efficient heating and cooling system won't work in every building. The middle school's turn-of-the-century steam-pipe system could not be converted to ground-source heat pump (GHP). "McKinstry frequently installs GHP systems, but we'll look at any current

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Bio-heat boiler

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technology to find the best system for the application,” LaRocque said.

Beating other fuels

The biomass boiler was back on the table, along with several other options—including a new coal boiler. But coal technology—and safety regulations—have changed since the 1970s. Coal boilers are now manufactured primarily for much larger facilities than the middle school building, LaRocque discovered. “A small boiler would be a specialty system, which would add to the cost,” she said.

Air quality issues added more complications. Even if the installation received a permit—not guaranteed, in LaRocque’s view—a separate building would have been required to house the boiler. “When all those things were factored in, the overall cost of a coal system became comparable to other, cleaner technologies,” she said.

The wood pellet boiler was certainly cleaner than coal, and it could use the school’s existing infrastructure for storing and delivering fuel. Initially scrapped for district-wide use, bio-heating turned out to be the best alternative for South Routt’s middle school.

Simms noted that it is not uncommon for communities to apply for one GEO program and then find a solution from a different GEO program. “If one specific technology isn’t an option, we’ll

keep talking—maybe weatherization or demand-side management is what they need,” she said. “Once we have that contact, we like to turn it into a success story.”

McKinstry sized the biomass boiler to heat the entire school, but also installed a propane back-up system. Propane is the most common heating fuel in parts of Colorado not served by natural gas, and it is the system McKinstry used for cost comparisons. Although a propane boiler would have cost less initially, long-term fuel costs made the wood boiler a better investment.

The biomass boiler, the last piece of the school district’s energy makeover, will be delivered in September. The lighting upgrade was completed last spring, and the ground loops for the heat pump were laid during the summer. Yampa Valley Electric Association, which serves the South Routt administration buildings, worked with McKinstry to upgrade the buildings’ single-phase line to a three-phase line to accommodate the GHPs. The new electric heating system will boost the cooperative’s electricity sales to the school district.

State energy programs

Simms would like to see more Colorado utilities use the GEO as a resource for incorporating biomass systems. The woody biomass program focuses on commercial bio-heating projects, rather than power production, but helping customers reduce operating costs is

always a good relationship builder. “I meet with many communities to discuss the woody biomass program, and the interest in the New Energy Economy is definitely there,” she stated.

The GEO resources to help commercial buildings and schools improve energy efficiency include performance contracting, high-performance building design and renewable energy opportunities like the woody biomass program. Residential customers can find information about home efficiency, incentives and rebates, utility bill assistance and free energy services.

The GEO’s programs are not for end users only, though—the utility program provides a resource to help power providers implement the Governor’s Climate Action Plan and the New Energy Economy goals at the utility scale. The program focuses on increasing utilities’ use of demand-side management and renewable generation, and on building new transmission to meet Colorado’s growing demand for electricity.

Colorado utilities and their customers can visit the GEO Web site to learn more about partnership opportunities, and to download program applications. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2008/sep/sep082.htm

Equipment Loan Program introduces user-friendly diagnostic kit

Thanks to the computer revolution, technology often becomes smaller, less expensive and easier to use as it advances. This progression applies to the set of affordable and highly useable tools in the Equipment Loan Program's new diagnostic kit.

The eight pieces in the kit cost about \$4,000 total, compared to \$26,000 for a single, high-end infrared camera, for example. Better yet, you don't have to be an engineer to use the tools—a minimal amount of training is all that is needed. "These are tools that any utility could afford to own," said Energy Services Manager Ron Horstman. "We hope our customers will use the kits to take diagnostic testing and energy audits to the next level."

Tools for small jobs

Applications range from monitoring a single appliance's power consumption to performing a basic energy audit on a home or small business, said Equipment Loan Manager Gary Hoffmann. "It doesn't make sense to tie up one \$6,000 piece of equipment, and an electrical engineer's time, if the member services manager can solve the problem with a simple power meter," he explained.

The idea for the kit occurred to Hoffmann at a Western customer meeting in New Mexico when a customer asked about borrowing load-monitoring equipment to test a remote well for leaking. "That's the perfect application for the Watts Up?," Hoffman said.

Watts Up? is a simple power meter that can calculate the amount of electricity a small system or appliance is consuming to determine monthly energy costs. The Equipment Loan



With the inexpensive, easy-to-use tools in the new diagnostic kit, utilities won't need to assign electrical engineers to solve minor energy problems.

Program stocks a range of power meters, from the consumer-friendly Watts Up? and Kill-a-Watt to complex units designed to monitor incidents on industrial and utility systems.

Easy use, versatility

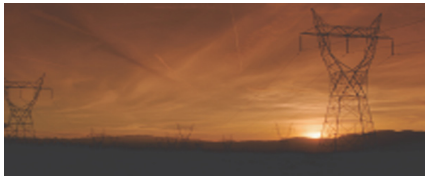
Power meters aren't the only diagnostic tools that come in a wide range of capabilities and complexity. Infrared cameras run the gamut, too, from the highly sensitive FLIR P-45 to the Extech i-5 compact camera in the diagnostic kit. This low-resolution camera can be used to detect a variety of problems including building envelope deficiencies; faults in heating and cooling systems; problems in motors, fans and bearings or overheating electrical panel components. The photos can be downloaded to a personal computer to include in reports to customers.

"The Extech is not difficult to operate—it only has a few buttons, and the instructions are in the kit," Hoffmann stated. "It's lightweight, handheld and easy-to-use, and takes accurate images of building-level

systems." In addition to the IR camera and the Watts Up? and Kill-a-Watt power meters, the kit includes:

- Lighting usage monitor – determines if lights are being left on, or if timers or sensors are turning lights on when a room is not in use.
- Magnetic field monitor – indicates if motors (such as irrigation pumps) are cycling on when they are not needed. The monitor does not require an electrical connection.
- Current meter – measures running time and energy use on air conditioners, water heaters and other systems that cannot be unplugged.
- Circuit breaker finder – tests outlets for proper wiring and functioning, and locates the outlet's circuit breaker.
- HVAC combo kit – contains a voltage meter, IR thermometer and thermocouples to troubleshoot problems on space-conditioning systems.

See *USER-FRIENDLY KIT* page 8



TOPICS from the POWER LINE

Question:

Our community wants to upgrade several public facilities, including school district buildings. We're considering performance contracting to finance the projects, but should we first have an independent audit?

Answer:

It is a good idea to do research before choosing an independent energy audit. Fortunately, there are many resources to help with your decision-making and to make you a savvy customer if you hire an auditor.

Auditing resources

Start with *How to Hire An Energy Auditor to Identify Energy Efficiency Projects* (359 kb pdf), by the California Energy Commission, January 2000. Washington State University Energy Program also offers many publications on energy audits. Another resource that may be useful is the publication *Energy Resources for Schools* (92 kb pdf).

It would be a good idea to consider energy-efficiency training for someone within your public works department. Check out the EnergyIdeas Clearinghouse database of training events or look into these Northwest Energy Efficiency Alliance ventures that provide such training:

- Building Operator Certification program
- Northwest Energy Education Institute

Hiring an auditor

If you decide to hire an independent auditor, the first step is to ask your local utility about its own auditing services. Also, your power provider may contract for auditing services, so ask about consulting firms as well. For additional consulting firms, the Bonneville Power Administration (BPA) hosts the Northwest Energy Efficiency Business Listing on its Web site. This site allows you to select a type of service in a specific geographic area.

The Northwest Energy Efficiency Council (NEEC) represents businesses involved in energy-efficiency products and services. From the NEEC Web site, you can search its member directory, which includes categories of services such as “consulting” and “engineering firms”—two categories with substantial overlap.

You could also look in the local phonebook under “Energy Management and Conservation Consultants,” possibly under “Consultants-Energy,” “Engineers-Air-Conditioning, Heating and Ventilating” or “Engineers-Consulting.”

Before hiring an auditor, make sure to check references and talk to their clients to determine their satisfaction.

Financing projects

To find funding for an energy-efficiency upgrade, again the first place to start is your local utility. It may have some programs to help you out with

energy-efficiency projects and may consider some custom projects. Some states and power marketing administrations, like BPA, require utilities to offer customers such programs. If yours does not mention it, ask.

State-sponsored performance contracting programs, such as the one the Colorado Governor's Energy Office offers, usually require you to hire one of their approved energy services companies (ESCO). The ESCO identifies energy-savings opportunities, which may involve an audit performed by the company or an independent contractor. How charges for the audit are handled will vary from program to program. Some waive the charge if you decide against doing the project.

If you choose to install any of the recommended measures, the program or the contractor provides a capital loan to be paid back with energy savings over a specified time period. On most such contracts, the ESCO agrees to make up the difference if the project does not deliver the guaranteed savings. In other words, you get energy savings with no out-of-pocket expenses.

You should also take a look at the Internet presentations sponsored by the Energy Star program of the U.S. Environmental Protection Agency. One that might be useful in your case is “Money for Your Energy Upgrades,” which discusses traditional and non-traditional financing methods, including performance contracting. ⚡

Want to know more?
Visit www.wapa.gov/es/pubs/2008/sep/sep084.htm

Web site of the month:

National Energy Education Development Project www.need.org

It's back to school time, and for schools that are looking for ways to put a little more energy into the curriculum, the National Energy Education Development (NEED) Project is a goldmine.

The NEED Project began as National Energy Education Day in 1980, with a proclamation from President Jimmy Carter. The goal of the one-day celebration was to create a foundation to reduce the nation's dependence on fossil fuels through comprehensive energy education. Today, the NEED program provides engaging curriculum materials, exciting professional development, turnkey assessment and evaluation tools and high-quality teacher support.

Teachers and schools that join NEED for a small membership fee receive a curriculum packet containing a variety of classroom materials. Membership also includes access to NEED conferences and subscriptions to NEED's newsletters, the quarterly Energy Exchange and the bimonthly Career Currents. Members have the opportunity to personalize programs and order supplemental materials. However, many of the resources can be downloaded from the Web site.

Education for all grades

Curriculum materials cover grades K-12 and encompass language arts, geography and economics, as well as science. NEED has correlated curriculums to National Science Education standards, and for most state standards.

NEED's energy infobooks lay the groundwork for an energy unit, with resource information on the sources of



The NEED Project promotes an energy consciousness by creating partnerships to design and deliver energy education programs. (Artwork by National Energy Education Development Project)

energy, electricity and consumption, as well as general energy information. The booklets are available in primary (grades K-4), elementary (grades 4-5) intermediate (grades 4-8), and secondary (grades 7-12) versions. All four reading levels are provided in the NEED Membership/Energy Curriculum Kit. NEED revises the classroom resources each year to provide the most complete, up-to-date information.

Wind and solar curricula for all class levels are available, and can be supplemented with purchased kits. Upper level teachers will find materials for lessons on transportation issues and thermodynamics.

NEED also has a large portfolio of lessons to teach students about energy efficiency and conservation. The project has teamed with private companies and state and Federal agencies, including Energy Star, to develop home energy efficiency kits and programming for teachers and students. Materials are updated annually through NEED's partnership with the U.S. Energy Information Administration.

Those who would like to design an independent course of study can start with NEED's Energy Bibliography. Book title, author, topic, reading

level, ISBN number, copyright date, publisher, whether it is fiction or non-fiction, and a short summary can be found here. The information is also available in Excel format.

Getting the most

While good classroom materials are an important part of teaching, the NEED project recognizes that teachers need support, too.

On the curriculum page, visitors can download the Blueprint for Success, a guide to help teachers develop an effective energy education program. The booklet contains basic units and sample lesson plans for all grade levels and instructions to implement an energy unit in the classroom. There are also brief descriptions of all NEED materials with grade levels, pre- and post-energy polls to assess students' energy knowledge and an energy unit exam as evaluation tools.

The new Question Bank allows teachers to customize evaluation tools for their energy units. There are questions at four grade levels: Primary, Elementary, Intermediate and Secondary. At each grade level, the questions are divided into the following topics: Science of Energy & Forms of Energy, Sources of

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SEPA Germany trip

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Room to improve

That doesn't mean U.S. utilities can't find their own way to incorporate more solar power into the mix, Singleton is quick to say. "With all of the solar resources here, we should be able to do more," she insisted.

And utilities need to be open to all opportunities, she believes, recalling a sight that summed up Germany's attitude toward renewable resources, not just with solar, but with all renewable resources. The group was visiting a landfill power-plant that was capturing methane to generate power. A wind turbine on a hill overlooked the landfill, and

solar panels were mounted on one side of the site. "And sheep were grazing under the panels," she said. "I've never seen that much renewable energy in one place."

Read the summary report, *Solar Fact Finding Mission to Germany for Utility Decision Makers*. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2008/sep/sep081.htm

User-friendly kit

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Customers weigh in

But that is only the beginning of what the diagnostic kit might eventually contain, and of how Western customers might use it. When Horstman previewed the kit at the Four Corners Utility Efficiency Exchange in August, customers suggested that a light meter be added to it. "That was a good idea we overlooked," Horstman admitted.

Utilities showed plenty of interest in the kit, but concern, too, about how much training would be necessary to operate the equipment, Horstman

recalled. Also, several utilities acknowledged that they were contracting their audits to outside vendors. "I pointed out that the kit gives utilities the opportunity to take control of the quality and detail their audits provide," he said. "An audit, after all, is a roadmap that gives customers information to help them make better energy use decisions in the future."

The Home Energy Makeover workshop on the last day of the exchange made it clear that consumers want that type of information. The consumers who attended were even more enthusiastic about the kit than their power providers. "I told them that they would have to contact their

utilities about energy audits, and warned the utilities that they would be getting calls," said Horstman.

Hoffmann is assembling two kits to offer to customers later this year. The Equipment Loan Program will continue to accept suggestions about tools that might be useful additions, and we welcome stories about creative uses for the kit. Use the online request form to reserve the diagnostic kit. Contact Hoffmann, 720-962-7420, with tool suggestions and success stories. Or send your success stories to the Energy Services Bulletin editor if you would like to share your ideas with other Western customers. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2008/sep/sep083.htm

Web site of the month

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Energy, Electricity, Transportation, and Conservation and Efficiency. Under each topic, Knowledge, Comprehension and Application questions are included.

Administrators and school boards

may be interested in NEED's Energy Education Report Card. During the 2002-03 school year, the project conducted an evaluation of the effectiveness of its education programs. The report and findings are posted on this page, along with the polls so members can continue to assess the program.

The future will demand that we learn how to use energy more efficiently, to lessen or eliminate environmental impacts of energy use, and to find new ways to use our energy sources more wisely. The NEED project gives teachers the tools to start preparing their students to meet that challenge today. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2008/sep/sep085.htm