



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

Advanced meters prepare Anaheim for smart grid future

In the energy future of educated consumers who know what peak demand is and how it affects their energy bills, advanced meters will be a common tool for reducing energy use and costs. For 1,700 customers of Anaheim Public Utilities, that future has arrived, and more will join them as the city's advanced metering initiative moves forward.

Currently, close to 1,000 residential customers have the "smart" meters, as do all of the city's large commercial and industrial (C&I) customers, about 700. Technology Development Manager Stephen Nees estimates that all of Anaheim's 160,000 meters will be advanced units within 15 to 20 years.

'Spare the Power'

The California energy crisis spurred the initiative, pushing Anaheim to seek demand-side management (DSM) tools that would give consumers more information about their energy use habits. DSM programs

were already in place for C&I customers, so the utility turned its attention to the residential sector. "We were already testing advanced meters, and knew that the technology could play a role in reducing customers' consumption," said Nees.

In 2004, the "Spare the Power" pilot program began to put advanced meters to the test in a real-world residential setting. The city invited 150 randomly chosen customers to participate and equipped their homes with meters that recorded energy consumption data in 15-minute intervals. Participants received a refrigerator magnet to remind them when their advanced meters would be installed. Brochures and newsletters were used to explain the program, and the department set up a phone line where participants could talk to a customer service representative trained to answer questions about the pilot project.

Based on weather forecasts, the department designated 'Spare the Power' days and contacted participants by phone the day before. On the selected days, between noon and 6:00 p.m., customers who lowered their electricity use received a credit of 35 cents per kWh below their baseline consumption for comparable days. The standard rate is \$0.11 per kWh. Those who did not use less electricity received no credit.

The customer response was very

positive, with about 70 percent of the participants reducing their energy use. In the first year of the two-year pilot, preliminary data indicated load reductions in the range of 20 percent during critical peak events. This program earned the Most Innovative Demand Response Initiative from the Energy Planning Network, a utility membership-based peer group.

Wider deployment

Even before "Spare the Power," the department was outfitting large customers with advanced meters. As Anaheim's biggest power consumers, they stand to benefit the most from scaling back their use. Nees noted that about 30 customers in this category already take advantage of Web access to interval data.

In addition to giving customers the data to control their own loads, advanced metering allows the city another tool for controlling loads during critical peaks. Selected commercial customers receive incentives for participating in an air conditioning control program. Anaheim may extend that incentive with a "Smart Thermostat" program for small and medium businesses this summer. Residential customers with high energy use may be able to participate in the program, too. "The plan is to install an advanced meter for any

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Advanced meters

from page 1

customer who gets a 'smart thermostat,'" said Nees.

There are other advantages to advanced meters besides load control. The technology cuts down on field trips by enabling utilities to read meters and connect and disconnect power remotely. Advanced meter systems speed up the response time for discovering outages and restoring power, and make it easier to set up specialized rate schedules, such as time-of-use. As deployment moves forward, Nees anticipates that the utility will offer more time-based rates to reward customers for keeping their consumption low, and to incentivize higher consumers to use less.

Right for today, future

Finding a system that delivers results now, and can adapt to future

requirements and capabilities makes choosing advanced metering equipment a big challenge.

Anaheim selected eMeter software for its meter data management system (MDMS), because it can be readily integrated with current and projected applications, said Nees. "What we like about their system architecture is that it is specifically designed to mitigate future integration costs by using 'adapters' that communicate with other applications such as billing and asset management," he explained.

The system architecture for eMeter's EnergyIP product also allows configuration, rather than customization, Nees added. "That gives us the flexibility to adapt to changing requirements and to switch to another product's application, if ever needed."

Sustainability push

Anaheim's advanced metering initiative is one of many investments

the municipal utility has made in sustainability. According to the city's recently released Top 10 Sustainability Accomplishments, energy efficiency has just as great a role to play in protecting the environment as renewable energy does.

And the results of the utility's commitment to conservation and efficiency are impressive. Through a combination of education, rebates and other incentives, Anaheim's customers have reduced energy use by 698 million kWh over the past 10 years.

The advanced metering initiative helped to achieve those savings, and will create more opportunities for the utility and its customers in the future. "We will continue to look for technologies that enlist our customers as partners in preserving our natural resources," Nees stated. ⚡

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Visit www.wapa.gov/es/pubs/esb/2009/apr/apr091.htm

Energy Services Bulletin

The Energy Services Bulletin is published by Western Area Power Administration for its power customers. The mailing address is Western Area Power Administration, P.O. Box 281213, Lakewood, CO 80228-8213; telephone (720) 962-7508.

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Geothermal Heat Pump Workshop

April 29-30, 2009

Salt Lake City Library

210 East 400 South, Salt Lake City, UT 84111 (801) 524-8200

Don't miss this opportunity to learn about geothermal heat pumps, compare them with other resource options and discover how to improve on existing programs.

Contact the Geothermal Resource Council at 530.758.2360, or e-mail to grc@geothermal.org.

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Catching up with energy-efficient cooling systems: Coolerado

Cooling season is fast approaching—in some parts of Western’s territory, it’s already here—so it is a good time to revisit two promising, energy-efficient, cooling technologies that could help utilities control this rapidly growing summer load. This month, Energy Services Bulletin looks at the Coolerado, which last appeared in the June 2005 issue.

Since its introduction five years ago, the Coolerado has evolved, gained wider acceptance and earned recognition. In late January, the Colorado Governor’s Energy Office presented the Denver-based Coolerado Corp. with the Governor’s Excellence in Renewable Energy Award. The award recognized Coolerado for developing a solar-powered mobile air conditioner, “The closest thing to free air conditioning,” as Coolerado Executive Vice President Rick Gillan described it.

Not typical cooler

Although the company refers to its equipment as an air conditioner, the system represents very different technologies. Utilities should take that into account when considering equipment for a rebate program, or recommending a particular technology to a customer.

The Coolerado, a type of indirect evaporative cooling system, can take the place of conventional air conditioners in most applications, especially in dry and semi-humid climates. Direct “swamp” coolers add moisture to cool an air stream, making it unsuitable for humid climates. In the indirect process, the air does not come in contact with water, but the temperature of the delivered air is typically warmer than a swamp cooler.

The Federal Energy Management Program described Coolerado as an ultra-cooler because its indirect evapora-

tive process cools to significantly lower temperatures than a swamp cooler can, without adding humidity. A heat and mass exchanger (HMX) cools the air instead of water, as in a swamp cooler, or refrigerant and compressors, as in an air conditioner. The result is air-conditioner temperatures for about 15 percent of the electricity an air conditioner would use.

Improving good product

Responding to growing concern about the environment and ever more volatile energy prices, Coolerado has made improvements in the first generation cooler and is working on new products.

In the new R600 unit, the original cellulose HMX has been replaced with an all-plastic component. The plastic HMX increases air flow to get lower temperatures, so the same size unit provides more cooling than the previous generation. “It delivers 5 tons of cooling for just 600 watts, and it lasts 10 to 15 years,” Gillan said.

Sacramento Municipal Utility District, in its fifth year of field-testing the technology, installed the new HMX in one of its seven Coolerados, and has since ordered the plastic components for the other units. “There was a big pressure drop in fan energy across the cellulose HMX, so the plastic one is definitely an improvement,” said Dave Bisbee, project manager for SMUD’s Customer Advanced Technologies program.

Bisbee also likes the redesigned water controls that regulate the Coolerado’s water use based on outside temperature. “Water use is a big concern,” admitted Bisbee. “Before SMUD offers rebates for these types of systems, we want to be sure that the products use water efficiently, too.”



A solar array provides power for the Coolerado air conditioner, and the cool exhaust stream from the Coolerado improves the performance of the solar panels. (Photo by Coolerado)

Reaching new audiences

Last year, a grant from GEO to build a solar-powered mobile demonstration cooler brought Coolerado to the attention of a broader audience. The unit is outfitted with four PV panels to power the cooler, and the cooler “returns the favor” to the solar array. A duct from the cooler directs the cool, saturated exhaust air behind two of the solar panels. The ducted and un-ducted panels are separately metered to show how the Coolerado exhaust air can actually improve the performance of its own distributed power source by more than 15 percent. The company demonstrated the mobile unit first at the Mile Hi Music Fest, and then at the Democratic National Convention.

Although Coolerado is expanding its manufacturing capacity, Gillan said the company does not plan to build PV-powered coolers. “Air conditioning installation and solar construction are two different skill sets,” he explained. “We would rather work with AC and PV contractors, and encourage them to work together. That will get more units out to consumers.”

To reach contractors, consumers and anyone else who wants to learn more

See COOLERADO page 5

Get your motor running at 2009 DSM Technology workshop

If you were one of the many participants who benefitted from the Demand-Side Management Technology lighting workshops, you may want to meet us in Bismarck, N.D., April 6 for DSM Technology, the Sequel: Motors and Variable-Frequency Drives (VFD).

The success of the first series made it clear that utilities want more information about equipment and systems that can reduce their loads, and they want it in the context of their own territories. So Western's Upper Great Plains Region (UGP) and Basin Electric Power Cooperative are teaming up to take down the single largest electric end use in the country.

Strategic systems

"We choose the topics for the DSM Technology workshops to help utilities take the strategic approach to setting up DSM programs," said workshop speaker Katherine Johnson of Johnson Consulting Group. "The first series covered lighting technology because that's the easiest, most cost-effective efficiency measure. Motors are the logical next step because, like lights, motors are everywhere, and they can be changed in a targeted way, unlike heating and cooling systems for example."

Motors represent enough of the load in Basin's territory that member co-ops suggested that the power wholesaler put on a workshop. "Our members serve a lot of customers who are doing irrigation and grain drying," said Chad Reisenauer, Basin key accounts and energy conservation coordinator. "We also have some large industrial accounts and more than a few ethanol plants in our territory, too. Which is to say, there is a lot of room to improve motor efficiency."

The target audience for the motors

workshop is electric utility managers, energy program planners and facility designers who have made the decision to implement DSM programs. Like the previous series, this agenda focuses on specific technologies to help utilities and their customers meet energy savings goals.

Reisenauer hopes that the workshop will provide participants with the background they need to guide their customers in choosing motors based on the application. "Too often, customers ask their power providers for help after they have purchased a motor," he noted. "The greatest savings are realized from the proactive approach."

Same format

Except for the technology, the workshop format is similar to the lighting series. It begins with a "technology roadmap," a brief primer on motors and VFDs that will be especially useful for attendees who have little technical background.

A panel discussion on regional case studies follows featuring Cory Fuehrer, energy efficiency program manager for Nebraska Public Power District (NPPD). Fuehrer will talk about NPPD's successful statewide irrigation efficiency program.

In 2008, NPPD recognized a curtailment of 515 megawatts from irrigation load control at its system peak through billable demand and energy curtailment programs. The power wholesaler also promotes cost-effective improvements to electric irrigation systems with incentives to help defray costs associated with irrigation system tests and equipment upgrades.

In the Motor Program Strategies session, Fuehrer and Johnson will lay out the costs, benefits, challenges



For agriculture and industry, the written pole motor offers a cleaner, more efficient alternative to fossil fuel-powered pumps. Precise Power will be demonstrating its written pole model at the DSM Motors and VFD workshop. (Photo by NPPD)

and considerations of implementing a motor program. They will also provide resources where attendees can find more ideas for program strategies. "There is no need for utilities to reinvent the wheel," said Johnson. "The participants will find plenty of successful strategies and program models documented in software, case studies and established agencies."

Motors for lunch

The lunch break will also be a break from past workshop agendas—instead of a speaker, participants will be treated to an equipment demonstration. Dan Slotke of Precise Power Corporation is bringing a 30-horsepower, written-pole motor mounted on a trailer. "It can run on a 100-amp breaker," said Slotke. "The 100-hp model only needs a 200-amp breaker."

Unlike most high-horsepower motors, the written-pole motor can run on a single-phase line. "Most powerful motors require a three-phase line, which can be very expensive to build out to a high-motor load like irrigation," explained Slotke.

There are many benefits the written-

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WORKSHOP page 5*

DSM Technology workshop *from page 4*

pole motor has to offer agricultural and industrial customers. When the motor replaces non-electric equipment, utilities can increase their sales, while customers can save 65 to 70 percent on motor operation. “The written-pole motor is appropriate for irrigation, gas and oil fields and factories,” said Slotke. “The more the motor runs, the quicker the payback.”

Marketing, reference

The best-laid motor program will go nowhere if customers don't hear about it, so the workshop includes a session on marketing the program. Johnson will go over the materials available to utilities to help them communicate the

benefits of motor DSM to different customer segments. The session ends with a discussion of the best ways to track and evaluate and monitor progress and identify areas for improvement.

The day promises to be filled with a lot of valuable information, but we don't expect participants to absorb it all at once. Attendees will receive a list of links to all of the resources discussed throughout the day. That amounts to a veritable arsenal of Adobe presentation slides, program materials, Excel spreadsheet calculators and practice worksheets to estimate savings costs and track program participation rates.

Only motors workshop

Western has scheduled only one Motors and Variable Frequency Drive workshop so far this year, but more

could be planned if customers express an interest. “We hope that Western customers recognize the tremendous opportunity for savings from motor DSM programs—between 62 to 104 billion kilowatt hours (kWh) annually, according to the Department of Energy,” said UGP Energy Services Representative Mike Radecki. “It's hard to imagine any utility with a significant industrial customer base wanting to pass that up.”

It's not too late for your utility to claim a share of those savings. Register today for the Motors and Variable Frequency Drive workshop in Bismarck, N.D., April 6. Or contact Mike Radecki at 406-247-7442 to find out how to sponsor a DSM Technology workshop in your area. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2009/apr/apr093.htm

Coolerado *from page 3*

about this proprietary technology, Coolerado produced a series of videos and posted them on YouTube. An introduction video and Coolerado Air Conditioning Basics II have received about 600 hits each. The solar demonstration video has been viewed more than 4,000 times, thanks in part to the mobile unit's high profile.

Cooling the West

SMUD continues to test its Coolerados, while Public Service Company of New Mexico already offers an incentive for the unit and Xcel in Denver may follow soon. Since the beginning of the year, Coolerado has signed agreements

with new distributors and salespeople to pitch the cooling unit to builders and commercial property owners across the western United States.

In anticipation of those orders, and to handle the interest generated by the solar demonstration, Coolerado recently relocated to a larger manufacturing facility and is adding employees. And improvements keep coming: the company is working on an M50 modular system that can be stacked to build a larger airflow for cooling bigger facilities.

Coolerado also has built a commercial roof top air conditioner as an entry in the Western Cooling Challenge, held by the Western Cooling Efficiency Center at University of California-Davis. The

competition judges commercial rooftop units designed to reduce cooling system electrical demand and energy consumption in the Western United States, “Where we don't need to dehumidify our air,” noted Gillan.

Most air conditioning standards, he added, are based on one type of equipment for all climates. With cooling systems, as with all energy-efficient equipment, there is not “one size fits all” answer. Consumers—and utilities—need to look at all the options, as well as the big picture, to make the right decision.

Next month, Energy Services Bulletin highlights new developments with the Ice Bear. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2009/apr/apr092.htm

Technology Spotlight: Industrial Heat Pumps

Industrial heat pumps can significantly reduce fossil fuel consumption, energy costs and greenhouse gas emissions in a variety of drying, washing, evaporating and distilling processes. Industrial heat pumps can also be used to produce steam and provide process-water heating and cooling. Industries that can benefit from this technology include food and beverage processing, pulp and paper, forest products, textiles and chemicals.

The two main types of heat pumps are closed-cycle mechanical heat pumps and absorption heat pumps. Absorption heat pumps compress the working fluid thermally, rather than mechanically, and use the ability of liquids or salts to absorb the vapor of the working fluid to achieve a temperature lift. Closed-cycle mechanical heat pumps, the focus of this column, mechanically compress a working fluid, typically a refrigerant, to achieve a temperature lift.

Industrial heat pumps are most commonly used to recover heat from a waste stream, such as exhaust from process equipment (e.g., a dryer). The waste stream is often both warm and humid. The heat pump can recover both the heat associated with the waste stream's temperature ("sensible heat") and the heat associated with its humidity ("latent heat"). The recovered heat is then used to heat the supply air to the process, for example, or to provide heat to another process.

In a retrofit of fossil-fuel fired equipment, an industrial heat pump will increase electricity consumption due to the heat pump's compressors and fans, while reducing or eliminat-

ing fossil fuel use. Heat recovery results in the overall improvement of energy efficiency. Industrial heat pumps are most cost effective in regions with low electrical costs compared to fossil fuel costs. In industrial applications, simple paybacks of two to five years are typical.

Re-emerging technology

Many industrial heat pumps were installed in the 1980s. However, the Federally mandated phase-out of ozone-damaging chlorofluorocarbons in the 1990s necessitated the development of new refrigerants capable of operating at the higher temperatures needed for typical applications. Today, new environmentally-sound refrigerants have allowed industrial heat pumps to reemerge in a range of applications. Some older units continue in operation today and are being retrofitted from R22 refrigerant to the ozone-safe R134a.

Heat pump examples

Closed-cycle mechanical heat pumps range in size from relatively small—on the order of 25 hp (20 kW)—to as much as 13,500 hp. One project uses a 25-hp unit to dry flour so it can be pneumatically conveyed. In another, an apple drying facility will use a 1,300-hp system to dry apples from 80 percent moisture content to 20 percent. A 3,000-hp heat pump provides process cooling for a yeast factory. Perhaps the largest closed-cycle mechanical heat pumps in the world are the six 13,500-hp units that use sea

water as the heat source for district heating in Stockholm, Sweden.

In the United States, the size of an industrial heat pump is conventionally expressed in terms of electrical power requirements in horsepower. In Europe, the measurement is kilowatts or megawatts of output (heating or cooling capacity) One horsepower is equivalent to 2500 Btu/h of electrical input, which corresponds to 15,000 Btu/h of cooling or heating capacity with a coefficient of performance (COP) of 6 One kW of capacity is equivalent to 3,412 Btu/h of cooling or heating capacity and about 0.22 hp of electrical input with a COP of 6.

Temperature and COP

Closed-cycle mechanical heat pumps can achieve maximum temperatures of 220° F with temperature rises of as much as 100° F. To achieve greater temperature rises, two-stage systems can be used. The COP of the heat pump improves as

Temperature Lift* (degrees F)	Coefficient of Performance**	
	High Efficiency Commercial	Large, Advanced Industrial
20	15	19
50	6	8
80	4	5

Table 1. Coefficient of performance and temperature lift for closed-cycle mechanical heat pump.

* Temperature difference between evaporator (heat source) and condenser (heat sink). ** Assumed efficiency of heat pump cycle is 65 percent theoretical maximum for large advanced unit and 50 percent for high efficiency commercial unit; assumed evaporator temperature is 120 degrees F.

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Web site of the month:

Renewable energy tracking systems

As more states adopt voluntary renewable portfolio standards (RPS), utilities need to be able to have confidence that the renewable energy certificates (RECs) they purchase count toward meeting their goals. Renewable energy tracking systems provide a way to collect meter readings from renewable plants, verify the output and issue the RECs into a generator's account.

Such systems are usually regional, and in Western's territory, there are two. Midwest Renewable Energy Tracking System (M-RETS) tracks renewable generation located within the boundaries of Illinois, Iowa, Manitoba, Minnesota, Montana, North Dakota, South Dakota and Wisconsin. Western Renewable Energy Information System (WREGIS) serves the region of 14 states, 2 Canadian provinces and Baja California covered by the Western Interconnection. Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Oregon, South Dakota, Texas, Utah, Washington and Wyoming are part of WREGIS, as are the Canadian provinces of Alberta and British Columbia.

Both organizations are members of the Environmental Tracking Network of North America (ETNNA). Funded by the Department of Energy, ETNNA is a national organization that seeks to increase compatibility between systems. Members, including tracking systems, stakeholders and government agencies, come together

to discuss common issues, identify best practices and design solutions to common problems.

Similar mission, services

M-RETS and WREGIS share a similar mission: to track renewable energy generation and verify compliance with mandatory or voluntary state and provincial RPSs and objectives. Both organizations issue certificates for each MW of renewable energy registered facilities generate. This information is entered into Web-based databases that members can use to research potential vendors.

The databases offer a variety of functions to help utilities verify compliance and manage their portfolios. Capabilities include creating unique certificates, tracking serial numbers and certificates in company accounts, enabling transfers and transactions, tracking certificate retirement and creating a full audit trail. Utilities can use the databases to manage their individual REC portfolios within their accounts.

In addition to member services, both Web sites make reports available to the public. M-RETS consolidates its reports under "Documents and resources," where visitors will also find the organization's statutes and operating procedures, helpful links and registration. WREGIS has separate pages for documents, links and member registration.

To help members get the most from their services, the tracking systems offer frequent trainings. The "Events" page on M-RETS lists trainings, webcasts and meetings and



The Midwest Renewable Energy Tracking System and the Western Renewable Energy Information System are regional organizations that can help Western customers verify REC purchases. Both are members of the Environmental Tracking Network of North America, a national forum for industry stakeholders. (Artwork by M-RETS, WREGIS, ETNNA)

seminars. WREGIS has an Events page, along with separate pages for training and a calendar. Non-members, as well as members, are able to download presentations from past events on the M-RETS "Webcast" page, and from "Past Events" on the WREGIS site.

National perspective

ETNNA's site focuses largely on educating the power industry on the issues surrounding REC tracking and promoting discussion. The Learn page offers an overview of renewable energy certificates, covering tracking systems, renewable energy, renewable energy certificates, carbon offsets and renewable portfolio standards. For those interested in more specific topics, the extensive library of publications and downloads

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Technology spotlight

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the temperature difference between the heat source and the heat sink decreases. Very high COPs can be achieved with small temperature differences, as shown in Table 1. For best efficiency, heat from the waste stream can first be recovered passively with a heat exchanger followed by heat recovery with a heat pump.

Avoid corrosion, fouling

When drying acidic products,

such as apples and oak, or if using caustic cleaning products, the heat pump's exhaust heat exchanger may require stainless steel tubes with aluminum fins coated with a protective material such as ElectroFin's "e-coat." Sticky exhausts can be handled by incorporating a wash cycle to periodically clean heat exchanger surfaces. During the wash-down cycle, which might last a few minutes once a day or so, auxiliary heat can be used to maintain temperature.

Other considerations

Warm water that is condensed out of the exhaust can be recovered for other uses. If condensed water is not reused, its addition to the waste water stream must be accounted for. When installing a large unit on a roof, structural issues must be considered. The increased electrical demand of the compressor may increase electric demand charges and may require upgrade of the electrical service. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/2009/apr/apr094.htm

Web site of the month

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includes best practices papers and background and meeting documents, most of which are available to the public.

Users who might wish to join can download the meeting notes to learn more about ETNNA's activities. Membership is divided into two categories: council members and affiliate members. The first comprises representatives of existing and emerging certificate issuing or tracking systems in North America, such as M-RETS and WREGIS, and North American emissions registries. Affiliate members are stakeholders—

companies or individuals—with an interest in certificate issuing systems, tracking systems or emissions registries, and regulatory and governmental representatives.

Members are encouraged to participate in frequent meeting and teleconferences to discuss common issues and resolve common problems. The Events calendar lists currently-scheduled meetings, along with links to notes from past meetings.

ETNNA also maintains a renewable energy "Generator Registry" for North America to ensure that electric generation or conservation certificates are not double-counted. However, this database is not

accessible from the Web site.

While ETNNA works to increase compatibility between systems, the organization recognizes that each regional tracking system has its own unique needs. As a forum where stakeholders across regions can meet and exchange ideas, ETNNA helps tracking systems implement changes required to meet new and emerging regional requirements as well as the existing ones. This forum could provide a framework for a national network should a Federal renewable portfolio standard be put into place. ⚡

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Visit www.wapa.gov/es/pubs/esb/2009/apr/apr095.htm