

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

## Western customers gear up for electric vehicles

Consumer interest—and options—in plug-in vehicles (PEV) and plug-in hybrid electric vehicles (PHEV) is growing, and power providers are exploring what the technology means to their customers and to their own operations. The level of experience differs widely from utility to utility, as programs being implemented by two Western customers illustrate.

### Test fleet for Tri-State

Tri-State Generation and Transmission Association is testing a growing electrified fleet that includes six PHEV Chrysler pick-up trucks, a new Chevrolet Volt sedan and four other hybrid vehicles.

The heavy-duty Ram 1500 pickups are part of the Advancing Transportation through Vehicle Electrification program sponsored by Chrysler and the U.S. Department of Energy. Chrysler built 140 of the vehicles strictly for demonstration, and has no plans for a production model.



**With Colorado Governor John Hickenlooper's assistance, Tri-State and Chrysler held a news conference on the West Steps of the Colorado State Capitol in November to introduce the Chrysler PHEV Ram 1500 pick-up trucks Tri-State is testing in its fleet. (Photo courtesy of Tri-State Generation and Transmission Association)**

The trucks have been deployed across the country, primarily as fleet vehicles for universities, municipalities and electric utilities. Tri-State is the only organization in the Rocky Mountain West and the only electric cooperative in the nation to be included in the program.

Chrysler approached Tri-State through the Electric Power Research Institute to put the trucks through their paces in rugged day-to-day conditions. The G&T's service territory covers 200,000 square miles of mountains, desert and high plains. Maintenance and member services personnel at Tri-State's Northern Colorado Maintenance Center in Frederick, Colo., will be field-testing

the trucks through March 2014.

Chrysler provided a plug-in 120-volt Level I charger and a 240-volt Level II charging station for each truck. At the end of the field test, Tri-State will get to keep the permanently wired Level II unit, which charges an electric vehicle in about two hours. The 120-volt Level I charger can be plugged into an ordinary outlet and charges a car in about eight or nine hours—perfect for overnight, said Art Mander, Tri-State's delivery resource strategy manager. The portable chargers go back to Chrysler along with the trucks at the end of the demonstration.

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# Electric vehicles

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The PHEVs are equipped with data collection and remote diagnostics instrumentation and capabilities for fleet demonstration. Chrysler will use the collected data to evaluate customer use, drive cycles, charging, thermal management, fuel economy, emissions and impact on the region's electric grid.

Mander said that the information will also help Tri-State get its membership ready for PEV and PHEV electric charging stations. The association's member services personnel will be taking the trucks and the Volt to member co-op annual meetings throughout 2012. "We're looking forward to seeing what kind of interest that stirs up among our member systems," he stated.

## SMUD readies for new load

Sacramento Municipal Utility District has racked up a lot of experience with electric vehicles, starting with testing early PHEVs back in the 1990s. Today, SMUD customers can go online to get answers to many questions about buying, driving and

charging their own electric vehicles. SMUD has also offered customers a special discount rate for off-peak charging since the late '90s, and has updated it to keep pace with changing technology.

Electric Transportation Supervisor Bill Boyce estimates that there are as many as 300 PEVs in the Greater Sacramento area. They are not all in SMUD's territory, but the utility has laid the groundwork to support electric vehicles, and is working with the California Municipal Utility Association to help other utilities prepare. "What we bring to the party is pretty significant at this point in our history," said Boyce.

SMUD has supported charging station installation, coordinated regional efforts to build electric vehicle (EV) infrastructure, and analyzed customer charging behavior and grid impacts. Grid impacts are of particular concern, given that a Level II charger may draw up to 6.6 kilowatts. "That's about the average electricity use of a house in Sacramento in the summer with air conditioning," he explained. "So obviously, when the car charges, it becomes very important."

A nighttime charging load, when SMUD has the most capacity, is the most efficient scenario. The utility experimented with solar charging stations 20 years ago, but Boyce said, "It makes more sense for photovoltaic generation to go to the building load. Solar charging stations make a nice showpiece, but 80 percent of EV charging occurs at home, and that's usually at night," he added.

Recently, the utility purchased several Chevy Volt sedans for use in daily operations and to gain more experience with consumer-type use. Boyce, a Volt owner himself, speaks enthusiastically about the PEVs

performance and handling. "Several of the vehicles we use just for city driving haven't gone through 10 gallons of gas since August," he noted.

## Federal efforts, too

Programs like Tri-State's and SMUD's are being supported by DOE's investment in research and development to improve and integrate EV charging technology. Late last year, DOE awarded nearly \$7 million to fund projects designed to reduce the current costs of electric vehicle chargers by 50 percent over the next three years. Manufacturers in California, New Jersey, New York and Pennsylvania are working on improving charging equipment development and design. This research will promote "smart" charging capabilities to ensure that electric vehicles enhance, rather than strain, existing electrical grid capacity.

Two of the four selected projects will focus on improving home electric vehicle chargers for individual vehicles. The other two projects will target chargers in commercial and public locations that charge large numbers of vehicles, including commercial fleets of delivery vehicles.

As the cost of the technology comes down and the supporting infrastructure spreads, motorists will be more tempted by the PEV's potential annual cost savings of more than \$1,500 a year compared to a gasoline car. SMUD anticipates that the number of plug-in vehicles in its territory could reach into the thousands over the next 10 to 15 years. Soon, utilities everywhere will be dealing with a new—and significant—load.

What is your utility doing to get ready? ⚡

## 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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**Editor:** Kevon Storie  
**Designer:** Grant Kuhn

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# On-bill financing moves to the mainstream

*Editor's note: This story is the first in a series on overcoming barriers to energy-efficiency improvements.*

**O**f all the factors preventing consumers from upgrading the inefficient systems and equipment that run up their utility bills each month, financing may rank as Number 1. It's certainly hard to argue with a lack of money—if you don't have it, you don't have it. Moreover, the people who could benefit most from energy-efficiency improvements often have the least available cash to pay for them. One solution that many utilities around the country are exploring is on-bill financing.

## How it works

This financing mechanism rolls the loan payment for the energy-efficiency measures into the customer's monthly utility bill. Utilities may service the loan themselves or partner with state energy offices, financial institutions or other third-party providers. The sources of capital, program design, target market and implementation strategy vary widely, depending on the utility's specific situation and goals.

The American Council for an Energy Efficient Economy (ACEEE) recently published a report listing many advantages to on-bill financing:

- The loan is secured through an existing relationship with the utility, instead of a (potentially unfamiliar) financial institution.
- Monthly utility bills decline, even though the loan payments are included.
- The customer's payment history can be used to establish creditworthiness.
- Utility bills showing reduced energy use create a clear link for participants between their energy-efficiency investment and the resulting savings.

- Rebates and incentives available through the utility can be bundled with the financing to improve the terms of the loan.
- Capital investors see on-bill programs as a more secure investment since they are based on an established payment relationship.
- Loans can be tied to a rental property's meter, so the renter benefit from lower utility bills and greater comfort while occupying the unit, and landlords benefit from increased property values.

Of course, when a program has so many moving parts, it is difficult to pin down the precise elements that are most likely to ensure success. Utilities launching a first-time program will also have to deal with administrative challenges such as:

- Identifying or setting aside capital to use for loan funds
- Up-front costs if billing systems need to be modified
- Diverse utility and regulatory structures
- Specific needs of different communities
- Differing state and regional legal regulatory landscapes

## What's in it for utilities

In spite of the challenges and drawbacks, the number of utilities exploring on-bill financing programs is growing. Just as no two programs are alike, the reasons utilities offer them are just as diverse.

Case studies from the ACEEE report show an early on-bill program in Wisconsin saving 1.8 GWh and 93,000 therms over the life of the investments. According to KW Savings, a South Carolina nonprofit, its significant investment in an on-bill pilot offset the cost of building additional generation to meet current demand. Clean Energy Works Oregon uses on-bill repayment not only to reduce energy waste, but

also to create green jobs and make efficient technologies more affordable.

As far back as 1997, Delta Montrose Electric Association (DMEA) was using on-bill financing to move its customers from expensive propane heat to geoexchange heat pumps. First with the Co-Z Energy Plan and now with its Geothermal Loop Tariff, DMEA has been building its electrical load while improving its customers' comfort and saving them money.

Midwest Energy created How\$mart in 2006 to convert energy audits into actual energy-efficiency improvements and to reach the underserved tenant market. To date, 650 customers have taken advantage of the program to fund measures in the program's free energy audits. The utility estimates that measures implemented under How\$mart have saved 2,000 kilowatt hours annually for electric projects and 260 therms per year for natural gas.

## Want to know more?

Obviously there is much for a utility to investigate before undertaking an on-bill financing program: capital sources, administrative logistics, local regulations and legislation, technical support, consumer protection, and program design. But for all of the complexity and potential risk, on-bill financing offers utilities a way through one big barrier to energy efficiency improvements.

Western would like to help our customers explore this tool. If you would be interested in participating in a workshop or webinar on on-bill financing, contact Energy Services Manager Ron Horstman <mailto:horstman@wapa.gov> at 720-962-7419. Also, if your utility has explored or implemented a program, share your experiences with Energy Services Bulletin. ⚡

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

# Annual Interconnection Workshop focuses on wind, solar integration

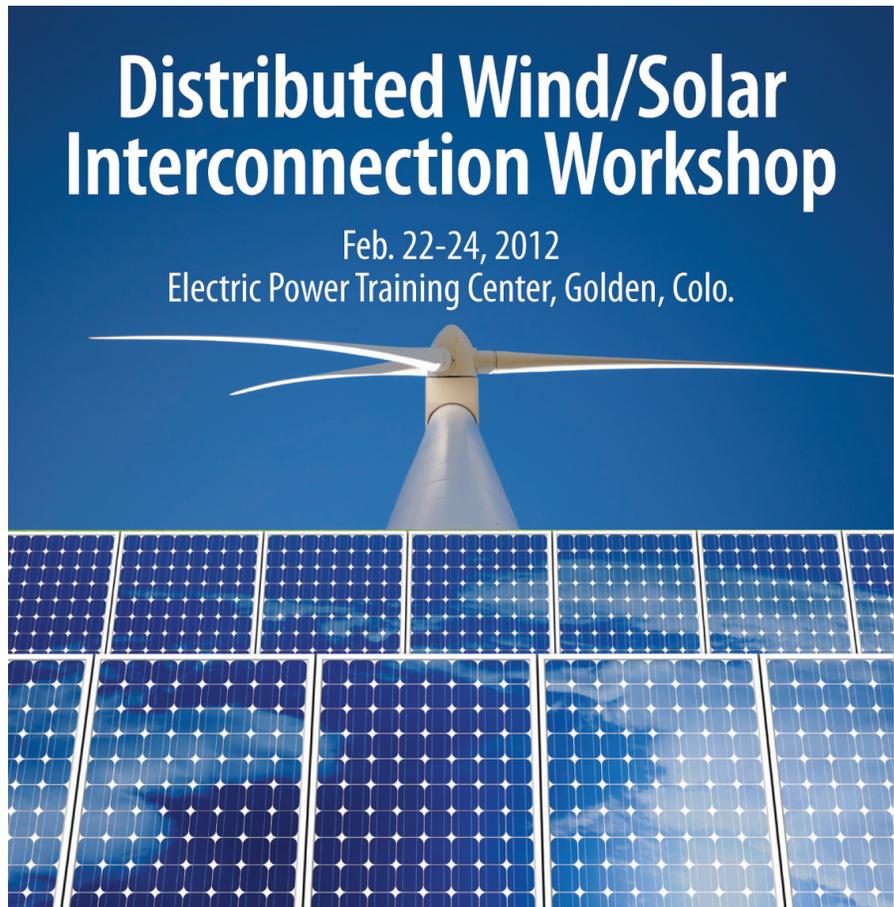
For the sixth year, Western is teaming up with the Utility Wind Integration Group (UWIG), American Public Power Association (APPA) and the Department of Energy's (DOE) Wind and Water Power, Solar Energy Technologies and Tribal Energy programs to present the Distributed Wind/Solar Interconnection Workshop.

Scheduled for Feb. 22 to 24 at Western's Electric Power Training Center (EPTC) in Golden, Colo., the workshop will offer a comprehensive overview of wind and solar integration issues. The agenda has expanded to include solar power, said UWIG Communications Coordinator Sandy Smith, because of significant growth in the market. "We've seen solar generation on utility distribution systems—particularly residential photovoltaics—outpace wind generation on these networks in the last few years," he said.

The growing body of research and real-world experience with the impact of different generation sources on grid reliability is also reflected in this year's agenda. "The first Interconnection Workshop focused almost exclusively on the challenges of interconnecting wind generation," Smith noted. "Since then, the curriculum has evolved to include more distribution system issues and, as of last year, solar generation."

## Different take-aways

The workshop is designed to address the many questions utilities must answer before they can integrate wind into their mix. What each participant learns from the event depends on their unique situation.



Some may return home ready to draft a renewable energy proposal for their board or city council. That was the experience of Austin Battin, distribution superintendent for the city of Larned, Kan.

Others may conclude that large-scale wind integration is not practical for their utility at this time. "Coming from a very small system, the workshop was an eye-opener," explained Line Superintendent Jeff Stocklin of Bighorn Rural Electric Association. "The UWIG modeling tool showed all the factors that have to be considered when you put wind power onto the distribution system. This information can help utilities make the decision about whether or not wind is right for

their system."

For Norman Sendler, whose company was researching applications for power storage technology, the workshop was an opportunity to learn the "rules of the road" from experts in the field. "I wanted to get a better idea of what transmission operators look for in terms of power quality coming onto a line," he explained. "The workshop was very useful for that."

Sendler added, "In this industry, you either spend money learning the issues or correcting the mistakes you make because you didn't learn first. You might as well spend the money on your education."

*See INTERCONNECTION WORKSHOP, page 5*

## Interconnection Workshop *from page 4*

### The basics and more

The agenda features expert speakers from Tri-State Generation and Transmission Association, National Renewable Energy Laboratory, Western and DOE. In addition to covering the basics of the integration, speakers will discuss transmission, energy imbalance markets, power operations training and renewable integration studies. Case studies will be used to answer questions about interconnecting wind and solar plants and other distributed power plants to electric distribution systems.

As with past workshops, participants will receive training on UWIG's Internet-based tools for assessing a distributed generation project's impact on the local distribution system. Smith noted that UWIG has enhanced the distributed generation toolbox to analyze solar as well as wind generation. A demonstration of these capabilities will be part of the training.

A tour of the EPTC is also on the agenda, giving participants a chance to observe the center's hands-on miniature power system, complete with its own wind farm simulator. There will also be a virtual tour of NREL's Energy Systems Integration Facility (ESIF), scheduled to open in fall 2012. This state-of-the-art laboratory and office space will house research aimed at overcoming the challenges of interconnecting distributed energy systems and integrating renewable energy into the electrical grid.

### Also new in 2012

The tour of the ESIF is not the only virtual event on the workshop agenda. For the first time this year,

**“We know that time and budgets are tighter than ever, so we found a way to open up the workshop to people who might not be able to attend otherwise.”**

those who can't travel to the EPTC will be able to participate through the Internet. Four sessions will be offered as live webcasts:

- Distributed Wind and Solar Integration Experience
  - Standards and Interconnection Requirements
  - Application of the UWIG Feeder Simulator
  - Eastern Renewable Grid Interconnection Study Update
- “We know that time and budgets are tighter than ever, so we found a way to open up the workshop to people who might not be able to attend otherwise,” said Western Renewables Program Manager Randy Manion.

Smith concurred, noting that the new generation of utility engineers is coming up at a time when training budgets and staff hours are limited. “But they need to understand these technologies and issues,” he said. “The webinars are a very cost- and time-effective way to meet their needs.”

### The logistics

The cost of the on-site workshop is \$300, or \$99 to participate in the four online sessions. The workshop fee includes workshop materials, as well as three continental breakfasts and two lunches. On-site attendance is limited to the first 35 registrants, so don't wait to register online. Continuing education credit will be available for the Interconnection workshop.

Attendees must make their own lodging arrangements, but there are several hotels close to the EPTC.

### Scholarships available

With an eye on training the workforce of tomorrow, UWIG is holding a limited number of spaces in this workshop for university and college students to attend at no charge. Contact Sandy Smith at 865-218-4600, ext. 6141 to learn more about UWIG's scholarship program.

Employees of electric cooperatives or public power utilities may also be eligible for scholarships to this event and other UWIG meetings. The Public Renewables Partnership, funded through the DOE Wind and Water Power Program, is offering thirty \$300 scholarships on a first-come, first-served basis. The scholarships may be used to help defray travel expenses or registration fees. Applicants may be either tribal representatives or employees of a member of National Rural Electric Cooperative Association or APPA. There is no limit on the number of scholarships per utility. To apply for the scholarship, contact Randy Manion at 720-962-7423. ⚡

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

## Technology Spotlight:

# Energy-efficiency standards for fans still evolving

Standards for commercial and industrial fans are beginning to emerge in an effort to develop energy-saving standards for appliances and equipment. Product-specific minimum efficiency requirements are spelled out in FEGs (Fan Efficiency Grades) and FMEGs (Fan-Motor Efficiency Grades). The FEG is a standard of total fan efficiency and the FMEG rates the efficiency of the fan motors and drives only. FEGs allow consumers, designers and procurement professionals to compare products by performance value or efficiency score. FMEGs help simplify programs that provide rebates or incentives for consumers who select highly efficient equipment.

A fan is a rotary machine that creates an air stream using one or more impellers or blades to maintain airflow at a pressure that normally does not exceed 120 inches of water column (as an indicator of pressure). Blowers and air compressors provide flows at higher pressures.

### Fan efficiency grades

FEG indicates the ability of the fan impeller to convert mechanical shaft power into air power. A value is assigned according to the fan's optimum efficiency calculated from total fan pressure, rather than static pressure. The FEG is a relative value that allows for simple efficiency comparisons among fan types and models. More efficient fans have higher FEG ratings.

The methodology for classifying fans according to their energy efficiency is outlined in the Air Movement and Control Association (AMCA) Standard 205-10 (Rev. 2011). The standard includes all fans with an impeller diameter of five

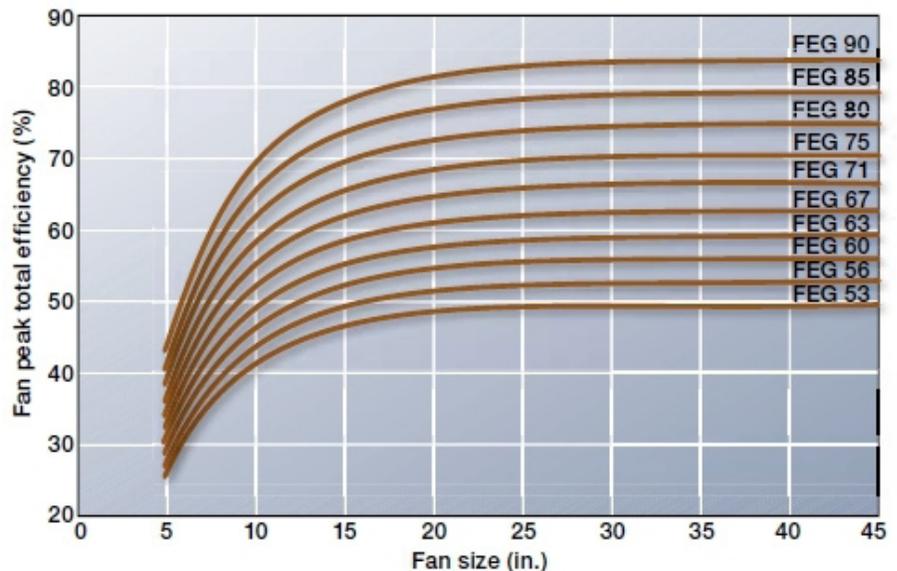


Figure 1. Fan efficiency grades for fans without drives

inches or greater and shaft power of 1 horsepower and above. FEG efficiency bands are a function of fan diameter and peak total efficiency (see Figure 1). The relative difference between the lower and upper limits for any fan efficiency grade is about six points of fan efficiency improvement. This methodology recognizes that smaller fans are typically less efficient than larger fans.

AMCA Standard 205 provides regulatory agencies with a tool for specifying minimum fan energy-efficiency levels for specific applications. To ensure that a fan operates at close to peak efficiency, AMCA states that codes or regulations requiring FEGs should also require that the total fan efficiency is not more than 15 points below the peak efficiency for all operational settings. Eventually, fans will display an AMCA-certified FEG rating seal and FEG ratings will be included in manufacturer's software and data sheets.

### Fan-motor efficiency grades

The International Organization for Standardization (ISO) recently developed standards that define FMEGs by fan type, as well as motor and drive losses (ISO Standard 12759-2010, Efficiency Classification for Fans). The standard applies to ventilation (supply, return and exhaust) fans used in the commercial sector, industrial buildings, and agricultural applications.

Because FEG rates total fan efficiency and FMEG ratings apply only to the motors and drives, the two standards should not be compared against each other when selecting fans or evaluating fan performance.

### European Union standards

EU fan efficiency regulations cover fans with an electric power input between 125 watts and 500 kilowatts (kW). Those who are importing European equipment or specifying fans for overseas facilities must

*See TECHNOLOGY SPOTLIGHT, page 8*

## Website of the month: Efficiency First

**R**esidential energy-efficiency improvements can reduce energy waste in most homes by 20 to 40 percent. At the individual level, that represents a great opportunity for utilities to build strong customer relationships. Widely deployed, efficiency retrofits could have a big impact on a utility's load profile, not to mention on the local economy. Power providers interested in tapping these benefits will find resources and allies at Efficiency First, a national nonprofit trade association.

With a membership made up of home performance workforce, building product manufacturers and related businesses and organizations, Efficiency First works to create a sustainable, scalable home retrofit market. To accomplish this, it advocates for public policy initiatives, supports state and local chapters and analyzes and shares industry best practices.

Although the resources here target the building industry, there is much that will be useful to utilities that have or want to develop home retrofit programs. Many of the organization's initiatives address familiar barriers to residential energy-efficiency projects: advocating for incentives, financing mechanisms and supportive public policy, building a skilled and knowledgeable contractor pool and developing standards and best practices.

### Public policy

Efficiency First focuses its lobbying and advocacy efforts on three key factors to stimulate rapid growth and local job creation in the home performance industry:

- National incentives to drive consumer demand for cost-effective retrofits
- Financing programs to make it easier for consumers to invest in cost-effective home energy improvements
- Industry standards and certification based on Building Performance Institute <http://www.bpi.org> contractor accreditation

Some of the issues the organization has worked for include HB 25E, the Cut Energy Bills at Home Act; home energy labeling and utility data access. The Policy Initiative page is a good source of news about the latest legislative developments affecting the home performance industry.

### State and local organizing

Of course, many of these policies are determined by state, county and city governments, so Efficiency First is building a network of local chapters, as well. These chapters work directly with member companies to promote favorable legislation, launch workforce development programs and build local partnerships.

A list of states that have active chapters can be found on the right side of the Local Chapters page. Selecting those links takes the visitor to a page that describes Efficiency First activities in that state. The right navigation on each page gives the local contact and has a calendar of upcoming events.



### Best practices

Energy First's best practices committee is made up of nine work groups that study existing markets and programs, and produce reports for contractors, policy makers and program managers. The committee has examined municipal incentive programs and produced case studies that can be downloaded from the Home Performance Resource Center.

Municipal utility professionals who would like to contribute to any of the working groups can learn more from the downloadable fact sheets at the bottom of the page. Visitors will also find a video orientation for potential working group members here.

### Education opportunities

The most useful page on the website, from a utility perspective, may be Contractor and Career Resources. The page begins with a list of upcoming and past webinars for both visitors and Efficiency First members.

Non-members can download recorded webinars on topics ranging from legislative briefings to business opportunities. The webinars for members go into more depth on contractor training and selection, program marketing and financing to name just a few subjects. Following the recorded webinars is a short list of home performance marketing resources for members.

Scrolling down the page, visitors

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*See WEBSITE OF THE MONTH, page 8*

## Website of the month from page 7

will find more resources to help with developing residential efficiency programs. There are links to trade associations, industry standards, research reports and perhaps most importantly, work-

force development. On the right side of the page are links to more references, publications and articles about the many aspects of home performance. These resources can come in very handy for a utility that must educate both contractors and consumers about residential efficiency measures.

As is often noted at workshops

and webinars, contractors can make or break a retrofit program. Utilities can use Efficiency First to get the home performance industry perspective on energy-efficiency upgrades and even better, open a new line of communication with contractor partners. ⚡

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

## Technology spotlight from page 6

understand this efficiency labeling approach.

The EU approach establishes minimum Tier 1 and Tier 2 efficiency grades for each fan type and input kW rating. Efficiency grades reference fan static and total pressure. Fans are required to meet Tier 1 efficiency grades by January 2013 and Tier 2 grades by January 2015. An efficiency grade is also set for Best Available Technology. By establishing progressively stronger efficiency standards, poorer performing units can be removed from the market while manufacturers sell existing inventory and redesign products.

### Other codes and standards

In the United States, American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) may incorporate FEG ratings into Energy Standards

for Buildings Except Low-Rise Residential Buildings. Draft language calls for a FEG rating of 67 or higher based on manufacturer's certified data, as defined by AMCA 205-10. AMCA International was also successful in getting fan efficiency standards incorporated into the 2012 International Green Construction Code. In proposed language for the new version of the code, to be published in spring 2012, stand-alone supply, return and exhaust fans operating with motors over 1 horsepower shall have an energy efficiency classification of not less than FEG 71 as defined in AMCA 205-10.

In June 2011, the Department of Energy issued a proposed rule to include commercial and industrial fans, blowers and fume hoods as "covered equipment" under Title III of the Energy Policy and Conservation Act. This inclusion could result in Federal rules for equipment test procedures and fan efficiency standards.

### More resources

- *Fan Efficiency Standards for Commercial and Industrial Buildings: What you need to know about AMCA International's Standard 205: Energy Efficiency Classification for Fans.* Contains three technical articles.
- Urs Steinemann. *Energy Consumption of Fans: European Fan Efficiency Regulations.* Motor Summit 2010.
- Mohn Cermak, et al. *Select Fans Using Fan Total Pressure to Save Energy.* ASHRAE Journal, July 2011, p1.
- Ronald Wroblewski. *A Method for Evaluating Fan System Efficiency (.pptx).* Energy Efficiency for Motor Driven Systems 2011.
- Dr. Peter Radgen, et al. *EuP Lot 11: Fans for Ventilation in Non-Residential Buildings, Final Report.* Fraunhofer Institute, February 2008. ⚡

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