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Energy Services BULLETIN

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

REC sale gets Wray school wind project off the ground

A truly great idea will stand the test of time and adversity to become reality, as the Wray School District wind project demonstrates.

In spite of setbacks and obstacles, the small northeastern Colorado town cut the ribbon on a 335-ft. wind turbine in February at a ceremony attended by Gov. Bill Ritter. The 900-kW unit would have been Colorado's first school wind project had it been completed in 2005, on the original schedule. Superintendent Ron Howard will settle for having the largest single turbine owned by a school district in the United States—and the revenue stream for the K-12 school that serves 670 students.

Community supports project

Records come and go, after all, but the reason for building the turbine has plagued Wray for years. Like countless small, rural communities across the country, the school district has grappled with severe state budget cuts and declining attendance. When district staff was challenged to find new sources of income, high school teacher Jay Clapper proposed building a wind turbine in 2002. The renewable energy generator would also double as an educational tool for the entire school district.

The city rallied around the project with great enthusiasm, donations and in-kind support, said City Manager Stan Holmes. "There's the feeling that what's good for the school is good for Wray," he said. "It's a small community and we are used to working together to get things done."

Highline Utility, Y-W Electric and Yuma County Economic Development Corporation worked with the school district. Colorado politicians on both sides of the aisle voiced their support for the project.

Fundraising went well too, starting with a contribution of $3,000 seed money from the Rocky Mountain Farmers Union. A $10,000 Carl Perkins Grant was used to complete a feasibility study and purchase two weather stations and technical support for collecting wind data. The school district received a $350,000 Energy Impact Grant, large pledges from the Kitzmiller-Bales Trust, significant individual donations and an interest-free loan from the city.

Scale, funding problems

In late 2004, the district upgraded the project to a 1.5-MW turbine and looked forward to completing construction by spring 2005. Then things started to get complicated. The school district needed a big turbine to make the project economically worthwhile, but buying a single, utility-scale unit with a suitable service contract proved to be difficult.

Construction crews hoist the hub into place on the Wray School District wind turbine. NativeEnergy's purchase of the unit's projected lifetime REC output made the project possible. (Photo by Wray School District)

After what Howard described as "a lot of phone calls," he connected with the Canadian company Americas Wind Energy. Relatively new to the U.S. wind market, the Toronto-based manufacturer specializes in community wind projects. "Our turbines are utility-scale, like Vestas or GE, but we service the town or the farm that wants to install only a few units," said Frank Pickersgill of AWE. Smaller projects lack the economy of scale that appeals to large-turbine manufacturers, he explained, so AWE is focusing on that marketing opportunity.

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What's inside

Big lighting upgrade holds many benefits for Alameda County

Long used to represent a bright idea, the light bulb may soon replace the dollar sign as the symbol of cost savings in Alameda County, Calif.

The California Energy Commission recently approved the county's loan request to upgrade lighting systems at 50 county facilities. The $1.7 million retrofit project should save Alameda County $362,860 annually, reduce electricity consumption by 2,879,115 kilowatt-hours per year and prevent the release of approximately 1,670 metric tons of carbon dioxide. As a bonus, workers will benefit from improved lighting and significantly reduced mercury in their facilities, while long-life fixtures and standardized lamps will simplify maintenance and cut down waste.

Clean, efficient, standard

The project focuses primarily on fluorescent lighting, said Energy Program Manager Matt Muniz. High color-rendering index (CRI) T-8 lamps will replace T-12 and older T-8 fluorescent lamps. Efficient T-8 lamps and third-generation electronic ballasts will also replace high-pressure sodium fixtures and high-wattage metal halide lamps.

Other changes include installing LED exit signs in place of incandescent and fluorescent signs and replacing all incandescent bulbs with CFLs. "In all, some 25,000 fixtures are involved," said Muniz. "Because the bidding process takes so much time, we wanted one project to cover as many lighting systems as possible."

The 5,000 degrees-Kelvin lamps allow fixtures with four or three lamps to be de-lamped to two lamps, now the standard lamp throughout county facilities. The high-CRI lamps use fewer watts to light a space and though the lumen output is less, the human eye perceives more light at the desktop. Consistency of the same-color lamps also improves the lighting quality, Muniz explained."

Standardized long-life lamps and ballasts make lighting systems easier to maintain, too, added Muniz. Lamps won't have to be replaced as often, and the equipment will be the same from building to building.

Another reason Alameda County is upgrading lighting, in addition to using less electricity, is that these new fluorescent lamps contain as much as 80 percent less mercury than older models. A few years ago, the county's sustainability program received an Environmental Protection Agency grant to reduce mercury levels in county buildings. Replacing older lamps and removing all mercury vapor lamps will advance that effort.

Payback achieved

The CEC loan will fund 100 percent of the lighting project, with the county expecting to receive $250,000 through utility rebates. CEC's Energy Efficiency Financing program offers state schools, hospitals and local governments loans up to $3 million, with rates as low as 3.95 percent, for energy saving projects.

After rebates, the loan has a payback of four years, fitting within the terms requiring projects to have a five-year payback. Determining that the lighting project would meet the payback period was a lengthy process, ironically, because of past efficiency upgrades. "Back in the early 1990s, the county retrofitted most of its lighting systems with first-generation

The Alameda County Courthouse is one of 50 county facilities receiving a lighting upgrade. The project is expected to save the county hundreds of thousands of dollars annually in electricity consumption. (Photo courtesy of Alameda County)

T-8 technology," recalled Muniz. "We had to do energy audits on all of our buildings to make sure there would be enough savings to qualify."

Energy Watch, a partnership between local governments and Pacific Gas and Electric, performed the audits over a one-year period. The third-party program works with cities, counties and other California agencies to lower energy bills. PG&E provides service to all the county buildings included in the project scope. The only county facility that receives electricity from Western customer Alameda Power and Telecom was not part of the project. "The electricity rates are still too low to get a good payback," observed Muniz.

The audit indicated a broad range of paybacks for the proposed efficiency measures, from a few months to several years. "If a building has already been de-lamped, or we are only replacing two T-8 lamps with more efficient ones, the savings may only be 13 watts per fixture," explained Muniz. "Where we can

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Lighting upgrade

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replace four lamps with two and a white reflector or three lamps with two and no reflector, we get the much greater savings."

By aggregating 50 facilities into one project, Alameda County was able to reach an average payback period that qualified for the CEC loan. The approach also fit in with the goal of simplifying the bidding process.

Popular cost-cutting

Lighting retrofits are often referred to as the "low-hanging fruit" of energy-efficiency projects. Upgrading lighting systems can yield savings as high as 40 percent of current costs, and projects fit easily into routine building maintenance, which explains why municipalities are embracing efficient lighting technology.

Contra Costa County used a $180,000 CEC loan to retrofit eight county buildings last year to save about 297,092 kWh, or $41,593 in avoided energy costs, annually. A $900,000 CEC loan paid for new LED street and traffic lights for the city of Alhambra, last summer. The project is expected to save the city around $90,000 annually.

Of course, grants, low-interest loans and rebates make any energy-efficiency project more attractive. Check with your power provider, state energy office or the Database for State Renewables and Efficiency to see what is available in your area.

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2008/apr/apr082.htm

Wray wind project

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Even going through a specialized vendor, however, the 900-kW turbine the district settled on cost more than planned. "We were a little short on money, and then a large individual donor withdrew his pledge," Howard recalled.

Green tag sale

Faced with a choice of looking for more funding or dropping the project, Howard persevered. In doing so, Wray School District ran up against a number of issues. "As a non-taxed entity, we don't qualify for the production tax credit that might have made up the shortfall," he said. An attempt to form a separate corporation would have jeopardized the district's tax status, and there was even a question about whether a school district had the rights to green tag proceeds.

Renewable energy credits turned out to be the key to reviving the project. Through many more phone calls, Howard learned of NativeEnergy, a green tag and carbon offset marketer. The company helps to build new renewable energy projects by buying a share of a project's long-term REC output. That support has been instrumental to the success of several tribal projects.

NativeEnergy's purchase, combined with money from a successful bond project the city implemented in 2005, put the Wray School wind turbine back on track. "Once I had NativeEnergy's contract in hand, I called AWE and placed the order," said Howard. "It was a great day, seeing that tower going up finally after we thought the project was dead."

Coordination issues

The long wait was not without some fringe benefits, Howard noted. "We renegotiated our power purchase agreement with Y-W Electric and it was a better deal," he said. "Also, the city bought the ground for the site and gave us the land lease."

The site was different from the one the district originally chose, said Holmes. "The city's main distribution line was close to the land we donated, so it was a less expensive option than the site serviced by Y-W's line."

Transmission continues to be an issue in developing northeastern Colorado's wind resources, he added. "People think that it's as simple as putting up a turbine and hooking it up to the grid," Holmes said. "But the school had to figure out how much turbine it could afford versus how the power would get used. Whenever the size of the turbine changed, the whole equation changed."

In the end, all the calculating, fundraising, research and negotiating are worth the educational opportunities and financial rewards the project will provide for Wray students. And because renewable energy is a good investment for communities, the school district's experience can serve as a model for other community wind projects. In fact, Howard's advice to schools and towns interested in developing local wind resources is, "Call me. I'll be happy to answer your questions."

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2008/apr/apr081.htm

Many ways for cities, residents to go green

Western customers use their ingenuity—and technical assistance from Energy Services—to make the most of generation resources. It is hardly surprising that many communities Western serves are applying that know-how to protecting other critical resources.

Every day, local governments provide services that encompass energy and water use, waste management and transportation, to name only a few. The upside of this daunting task is that it presents opportunities to "green" city operations, and to encourage residents to do the same.

Saving resources

Like an old-fashioned barn-raising, local energy- and water-conservation initiatives bring neighbors together to accomplish a common goal. These programs can be effective in a way that no national campaign can match. And they provide a template that other publicly-owned utilities can duplicate.

The sense of community helped Loveland [Colo.] Water and Power launch a voluntary load-management program. Customers allow their air conditioners to be cycled during summer peak-demand periods to reduce the need to purchase expensive supplemental power. Instead of a direct payment or credit, the incentive is the long-term goal of keeping electricity rates down.

Neighborly competition is another useful motivator in small towns and big cities alike. Brigham City, Utah, celebrated Energy Awareness Month in 2006 by giving away a mountain bike. Only customers who had made energy-efficiency improvements in their homes were eligible to enter the drawing. To gain coverage for its refrigerator turn-in and recycle program, the Los Angeles Department of Water and Power sponsored the "Coolest Loser" contest. Customers competed for the title of ugliest refrigerator, and to win an energy-efficient replacement.

Municipalities also create comprehensive conservation programs. Colorado Springs Utilities offers energy audits to commercial and residential customers, and rebates for efficient appliances and peak demand reduction. Wise water use is equally important in the semi-arid region. Rebates are available for high-efficiency toilets, clothes washers and water-saving irrigation equipment. The utility strongly promotes xeriscaping with classes, exhibits and Web resources. Residential customers can learn more about their water consumption, indoors and out, with a water efficiency profile.

Green power programs

Although renewable portfolio standards often don't cover publicly-owned utilities, municipalities have other reasons to develop renewable energy resources. Wind turbines, for example, have helped school districts in small rural towns like Spirit Lake, Iowa, and Wray, Colo., stabilize operating costs or create a revenue stream, and give the science curriculum a boost, too.

To keep renewable energy revenues in the community, a group of Minnesota landowners formed a partnership to build the Trimont Area Wind Farm. The project brought more than 100 construction workers to town, created six permanent jobs and continues to provide land

Extensive recycling programs are just one of many ways for cities to become more sustainable. (Photo by Logan City, Utah)

lease payments to 40 area farmers. Great River Energy buys the power from the facility to apply to its RPS requirements.

Moorhead, Minn., Public Service uses the power from its two wind turbines for its own green power offering. The National Renewable Energy Laboratory ranked Capture the Wind among the top green power programs in the nation from 2000 to 2005. Other Western customers with highly rated green power pricing programs include Lenox, Iowa; Palo Alto, Calif.; and Sacramento Municipal Utility District.

California isn't the only western state to show strong support for solar power and other renewables. In St. George, Utah, customers who install solar or wind-energy systems receive a rebate of $2,000 per kilowatt-AC. A pilot program in Murray City, Utah, offers net metering to customers who generate electricity using solar, wind or hydroelectric systems with a maximum capacity of 10 kW.

Managing solid waste

Every community produces waste, and every town or county has to figure out how to dispose of it. That gives municipalities plenty of incentive to come up with creative recycling programs.

The Logan, Utah, Environmental

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Go green *from page 4*

Department developed a comprehensive recycling program to extend the life of its landfill. The program provides residential curbside recycling, hazardous waste collection and drop-off sites for green waste, glass and bulky cardboard. The unique Landfill Mall gives residents a place to recycle usable household items that other customers can take away for a five-dollar fee. The Solid Waste Association of North America awarded the Logan program a silver Excellence Award in 2007.

Another award-winning program began with a landfill closure. Instead of trucking organic waste to a new facility 40 miles away, Brigham City launched a pilot program to process it into compost. The project was so successful, the city opened a full-fledged composting facility and implemented curb-side green waste collection. The Utah Recycling Coalition named the program Green Waste Recycling Program of the Year in 2004.

Mesa, Ariz., took the same approach to a similar problem with its Green Barrel Recycling program. To save space in the Salt River Landfill, the city began collecting green waste separately and processing it into mulch. In 2007 alone, the program diverted more than 17,000 tons of organic material from the landfill. The Solid Waste Trivia page on Mesa's Web site points out that residents still sent more than 121,000 tons of trash to the landfill.

Alternative-fuel vehicles

In an effort to contain traffic congestion and greenhouse gas emissions, most cities already offer some form of public transportation. Now, many municipalities have moved beyond that step to find more ways to reduce fossil fuel use by public vehicles.

One of Colorado's most environmentally friendly cities, Fort Collins, launched a multifaceted hydrogen energy system pilot project four years ago. The project included converting a Transfort mini-van from compressed natural gas to hythane, a compressed natural gas (CNG)-hydrogen blend. Recently, the city installed the only hydrogen and hythane fuel pump in the state at its south Transfort fueling station.

CNG-powered buses are a popular choice nationwide for cities concerned about air quality. According to Burbank, Calif., Mayor Todd Campbell, every natural-gas burning bus in circulation is the equivalent of removing the negative effects of approximately 300 cars on the road. Burbank recently expanded its bus routes, adding more CNG-vehicles and the fleet's first hydrogen-powered fuel-cell bus.

Converting the city fleet to alternative and/or renewable energy sources is another way to reduce the environmental impact of transportation. Pasadena, Calif., leased 21 electrical vehicles in 2001 for use by meter readers, parking enforcement, printing services, power troubleshooters, transportation engineers and utility customer service representatives.

Cities interested in promoting alternative vehicles can join DOE's Clean Cities program. The network of 90 volunteer coalitions works to develop public/private partnerships to promote clean transportation choices.

The long view

Local governments may be in a better position than any other public entity to recognize that all activities and functions of daily life are interrelated. Particularly in the West, where tourism, recreation and agriculture are central to many local economies, municipalities are taking a more proactive approach to city planning and environmental stewardship.

Communities as diverse as Sioux Falls, S.D., Sacramento, Calif., and San Juan Pueblo, N.M., are applying Smart Growth principles to development. Though the practices vary from town to town, smart growth generally calls for restoring and preserving existing infrastructure to strengthen community and use resources as efficiently as possible.

The Mayors Climate Protection Center, another organization that helps cities address environmental issues, boasts several Western customers as partners. The mayors of Aspen, Longmont and Montrose in Colorado; Lincoln and Omaha in Nebraska and Taos, N.M., are among the more than 800 city leaders who have signed the U.S. Mayors Conference Climate Protection Agreement. Participating cities commit to reducing their emissions to 7 percent below 1990 levels by 2012.

That ambitious goal may have found its match in the creativity and determination of local governments. Western applauds our customers, and all the cities, towns and counties in our territory, that are leading the way in creating more sustainable communities.

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2008/apr/apr083.htm

Technology Spotlight:

Heating and cooling with VRF systems

This column highlights innovative equipment, systems and applications that can help utilities save energy and improve service.

There's a new HVAC technology in town that's turning some heads. It's easy to retrofit to existing buildings—even historical buildings without existing ductwork. It can move heat from warmer parts of the building to cooler parts; it provides very good part-load performance; it can limit conditioning to only those rooms that are occupied; and it may cut energy costs. This new technology is most commonly known as variable refrigerant flow (VRF). It's an outgrowth of the "multi-split" systems used in residential applications.

VRF equipment manufacturers include Mitsubishi, Daikin, Toshiba, Fujitsu, Hitachi, LG and Samsung. VRF systems are most popular in Asia and are established in Europe, but are gaining a foothold in the United States. These systems combine one or more centralized, variable-speed, air-cooled compressors and condensers connected to dozens of terminal (fan coil) units throughout a building, each of which can act as an economizer or an evaporator, as needed, to provide heating and cooling. Electric resistance coils provide additional heating and defrost cycles during the coldest weather.

VRF vs. HVAC

Comparing VRF systems to conventional HVAC systems is difficult because of the variations in conventional systems and buildings. This challenge is compounded by the lack of standardized protocol for efficiency testing of VRF systems, lack of clear agreement among existing case studies and applicability of VRF systems in various regions in the country.

The current industry standard HVAC system for medium/large commercial buildings is the rooftop direct-expansion, variable air-volume (DX-VAV) air conditioner with an air-side economizer, series terminal boxes with electric reheat in perimeter zones and natural gas for building warm-up. These units are controlled to minimize fan horsepower and optimize supply-air temperatures, and use an economizer to minimize compressor power. Although they require reheat energy in cooler regions, for most of the year this reheat energy may come from air above the ceiling that has been heated by a recessed lighting system. Chillers may be used for larger buildings and split systems for smaller buildings, but rooftop VAV is a common alternative for VRF and therefore a good choice for a comparison.

Is VRF right for you?

Those interested in VRF systems should review the energy and non-energy benefits above, and obtain cost estimates for a VFR and one or more conventional systems. For a particular project, the impact on rentable area or the need for humidity control could be a key factor in system selection.

See the table on page 7 for a comparison of the two systems.

Web site of the month:

DOE Builders Challenge—www.eere.energy.gov/buildings/challenge

Utilities supply power and buildings consume it—70 percent of the U.S. electricity load, according to the U.S. Green Building Council—so power providers looking to control load growth may be interested in the U.S. Department of Energy Builders Challenge.

More energy-efficient houses

Based on lessons from DOE's Building America research program, Builders Challenge calls on the construction industry to build 220,000 high-performance homes by 2012. To qualify as a high-performance home, a building must use at least 30 percent less energy than a typical new home built to meet criteria of the 2006 International Energy Conservation Code.

DOE launched the program at the International Builders Show in Orlando, Fla., Feb. 14. Secretary of Energy Samuel Bodman was joined onstage by 22 of the 38 builders who are the first to take the challenge. The program's ultimate goal is to provide 1.3 million high-performance homes across the nation by 2030, and give consumers the opportunity to buy an affordable net-zero energy home (NZEH). Such super-efficient homes would save Americans $1.7 billion in energy costs, and equate with taking 606,000 cars off the road annually.

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Technology spotlight *from page 6*

VRF Systems	DX-VAV Systems
Ductless terminals eliminate heat and air gains and losses from ductwork, and eliminate most duct friction that increases fan energy use.	Long ductwork runs have relatively high static and dynamic pressure losses.
May require separate ventilation ductwork with fans, controls, etc. Ventilation may be provided through an energy recovery ventilator that transfers much of the heat and moisture from exhaust to incoming air.	Ventilation air supplied with conditioned air.
Can recover heat from core zones to offset ventilation and envelope heat losses by adding third refrigerant distribution pipe. Amount of useful heat recovered depends on building envelope design, climate and building operations.	Series VAV fan boxes recover heat from ceiling plenums to meet reheat requirements (less so on the top floor of a building); water-loop heat pump systems can also recover heat from building core.
Fans/motors efficiency about 30-40 percent. At least one per room rather than one per zone, and greater pressure drop, due to coil and filters.	Primary fan/motor efficiency nearly 75 percent at full load, and series box fan/motors 30-40 percent efficient.
Requires more installed capacity because designer must choose unit with capacity meeting or exceeding each zone's maximum.	Building load diversity allows cooling system to be downsized as much as 20 percent depending on building.
Variable speed compressors (less common in DX-VAV rooftop units) enhance part-load efficiency.	Multiple cooling stages provided by various means (none as effective as variable speed compressors) enhance part-load efficiency.
No "free" cooling, due to lack of economizer. Without the economizer, energy codes require higher minimum equipment efficiency (10-20 percent higher in the International Energy Conservation Code), increasing the cost of cooling equipment.	Outside air economizer (which requires only fan energy) can provide substantial portion of cooling load in more moderate climates.
Heat lost and gained from multiple long runs of refrigerant piping.	Uses minimal refrigerant piping.
Can respond to staged occupancies, only conditioning rooms as they become occupied.	More limited in ability to condition only occupied spaces.
Morning warm-up (and back-up electric resistance heat on coldest days) increases electrical demand charges and shortens energy-saving set-back periods. Also, electric heating generally costs more than gas heating.	Morning warm-up uses a central natural-gas furnace that can bring building up to operating temperature quicker with no additional demand charges. Series box strip heaters increase heating costs on coldest days.

Non-Energy Issues

VRF Systems	DX-VAV Systems
Easy retrofit to existing buildings, even older buildings that had steam heating and no cooling, so no ductwork.	Larger ductwork requires shafts, multiple fire/smoke dampers and adequate ceiling space, reducing usable/rental space.
Can phase installation to serve portions of the building as funding or program requirements allow.	Can break system into smaller sub-systems for phasing, but many benefits of VAV systems are lost.
Some ability to filter air and control humidity. Less cross-contamination among zones.	Ability to provide various levels of filtration and humidity control in a central location, minimizing maintenance and operation costs for this feature.
Provides only the required minimum quantity of outside air.	During economizer operation, improves indoor air quality with up to 100 percent outside air, benefiting occupant health and pre-cooling the space on cool summer nights.

Want to know more?
Visit www.wapa.gov/es/pubs/2008/apr/apr084.htm

Web site of the month

from page 6

At the program's core are five key elements:

1. Voluntary participation by American homebuilders
2. EnergySmart Home Scale (E-Scale) house-rating system
3. National outreach campaign to educate homebuyers about the benefits of high-performance homes
4. Design competition to increase the supply of high-performance home plans
5. Awards to recognize and reward Builders Challenge participants

Bringing players together

Grid-connected houses that annually produce as much energy as they use have obvious advantages for builders and homeowners, but what do utilities stand to gain from the program? Such quality homes can help utilities reduce peak demand, meet renewable portfolio standards and defer the need for new powerplants.

For homebuyers, the Builders Challenge Web site offers several resources to help reduce home energy consumption. Those in the market for a new home will find the database of participating builders valuable. The database is searchable by state and contains pertinent contact information. Related links offers more information to anyone simply looking to learn more about high-performance homes.

Construction professionals will find tools to help them create a more competitive product in the builders section. Visitors can download DOE's Building America performance criteria and learn about requirements for joining the challenge. Registering with Builders Challenge will connect builders with homebuyers seeking energy-efficient homes, and provide access to marketing and technical resources, as well as high performance home plans.

Utilities that want to promote energy-efficient housing in their service territory can join Builders Challenge as a partner. Businesses, associations and educational institutes will play an important part in educating homebuyers and encouraging the housing industry to adopt higher energy-efficiency standards.

Measuring progress

The E-Scale, the measurement tool of Builders Challenge, gives homebuyers an easy way to understand home energy performance. The system is based on the Home Energy Rating System (HERS) index, developed by the Residential Energy Services Network.

A house must rank 70 or lower on the E-Scale to qualify as a high-performance home. A brightly colored sticker the builder places on the house's energy panel will tell buyers what to expect in terms of home energy consumption. The rating includes estimates of carbon dioxide reductions associated with the energy savings. The Builders Challenge is currently developing a carbon footprint metric to add to the label.

In its 2006 Energy Pulse survey, the Shelton Group found that 86 percent of Americans would consider energy-efficiency in their decision to purchase one home over another. Yet

Ben Medina, Jr., (l.) planning and community development director of Brownsville Homeownership Corporation, is welcomed to the Builders Challenge by Secretary of Energy Samuel Bodman. (Photo by U.S. DOE)

78 percent of the homeowners polled reported that the topic of energy efficiency did not come up during the buying process. The E-Scale and Builders Challenge is a way for builders and partners like utilities to start the conversation we all need to have.

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