

A clean shave by Dave Wortman -
 9.28.07

Imagine a business meeting where a coworker receives a text message on her cell phone from her home energy system notifying her it's raised the refrigerator's temperature to cut back energy use in response to a spike in utility energy prices. Meanwhile, back at her desk, the office window, guided by the building's energy-management system, grows a shade darker, while external awnings automatically rotate to screen heat from the summer sun, cutting back on air conditioning needs. Her home and office are both responding to save energy — and money — without needing her input.



Such ideas aren't science fiction, but rather a glimpse into the real future of energy technology in homes, businesses, government buildings and schools thanks to innovations in systems that monitor, manage and respond to daily energy demands. They not only conserve energy but cut energy bills and delay costly investments in new power plants, creating a win-win situation for the companies that make them, the customers and public utilities that use them and, most recently, the investors who fund them.

If there's any doubt about the rapid advancement of energy-management and demand-response systems, one need only look to the enthusiastic response from investors. As global power grids face straining capacity, a new bull market is emerging across the energy industry.

"Demand response and energy management are a very hot area," says Rob Day, principal of venture capital group @Ventures. "People have finally figured out that the best, cleanest and cheapest way to make a kilowatt-hour is not to have used one elsewhere in the first place."

According to research and publishing firm Clean Edge, U.S.-based venture capital investments in energy technologies nearly tripled from \$917 million in 2005 to \$2.4 billion in 2006, while research consulting firm Energy Insights projects the demand-response sector alone may reach \$5.5 billion in annual revenue by 2011. Venture Capital funds focused on cleantech or energy technologies are driving investment, aggressively funding energy-management and demand-response companies. Active funds include DFJ Element, Chrysalix, Braemar Energy Ventures, Siemens Venture Capital, **SJF Ventures**, Foundation Capital and Expansion Capital, among others.

According to Day, until recently most funders were drawn to companies helping public utilities consolidate, respond to and reduce consumer demands on system capacity. The trend is now changing as investors turn to new companies that develop software, controls and services for making both demand response and day-to-day energy management more effective and efficient. **David Kirkpatrick, founder and managing partner of SJF Ventures, notes similar trends. "The potential for demand response tied to demand side and strategic energy management has captured investor interest," he says.**

Providing benefits to large companies



Energy-management and demand-response systems help companies track and manage energy use by type of machine, process or department — all from the control of a central point such as a desktop computer. They typically consist of data-gathering hardware and desktop software, which help monitor, analyze and optimize energy consumption from the collected data.

Such systems help companies profile energy use, allocate costs and reduce

McDonald's uses an Echelon Corp. designed energy-management system to eliminate excess energy use in its restaurants worldwide.

energy use at times in the day when electricity is most expensive. Systems that monitor, manage and respond to

energy demands have been used by large companies for the past 40 years. Big, energy intensive businesses, which utilities have subjected to demand-sensitive electricity pricing for years, understand the ability to monitor and manage where, when and how they use energy is critical to controlling costs.

Retail grocery stores — highly energy-intensive businesses operating on narrow profit margins — were early adopters of energy-management systems. Massachusetts-based Shaw's Supermarkets in the mid-90s began tracking energy used by its stores to help pinpoint energysaving opportunities in lighting, refrigeration and freezer cases, as well as heating, ventilation and air conditioning (HVAC) systems.

In doing so, the company saved 23 million kilowatt-hours per year across 110 stores, while avoiding 17,500 tons of carbon dioxide emissions and other greenhouse gases. And with an upfront investment of less than \$2 million and a payback of slightly more than two years with incentives from local utilities, such technologies made sound business sense for the company. For energy services companies, the rapid payback promises profits based on energy savings. West Coast grocer Albertsons entered into an agreement with energy services company EnerNOC (Nasdaq: ENOC) that allowed the retailer to defer up-front capital costs in exchange for sharing revenue from energy savings.

The Albertsons network, covering 300 California stores, can reduce its lighting load by 35 percent in response to energy shortages, track energy use, enhance store processes and save energy. "The tracking allowed by these systems is key," says Glenn Barrett, Albertsons' senior energy manager. "We can sustain our energy savings as we do our part in curtailing demand."

EnerNOC, which is positioning itself as the largest national provider of demand-response solutions focused on the commercial, institutional and industrial market, aggregates savings from other companies and offers utilities demand reductions to head off need for new power plants. So far, the company's services have garnered favor with customers on both sides of the deal, as well as with Wall Street. The company's May 2007 initial public offering (IPO) netted \$97.5 million. EnerNOC's successful public launch followed the \$95-million April 2007 IPO of electric power conservation firm, Comverge (Nasdaq: COMV).

Looking toward new technologies

Building on lessons from long-standing systems, companies are implementing increasingly larger and more sophisticated demand-response systems. McDonald's (NYSE: MCD) has teamed up with Echelon Corp. (Nasdaq: ELON) to control cooking equipment, lighting, refrigeration and HVAC in new restaurants. The partnership aims to reduce kitchen energy use by 10 percent and cut back on McDonald's \$1 billion annual global energy bill.

Large retailer Wal-Mart (NYSE: WMT) has networked more than 3,000 stores nationwide to its Arkansas headquarters, where the company can centrally control all HVAC systems from one location. Staples (NYSE: SPLS), which controls its 119 California stores from its Massachusetts headquarters, can shed up to 2.8 megawatts (MW) of energy on demand by using wireless control technology to dim lights and reduce cooling while customers browse store aisles.

As such systems grow in size, their ability to intelligently respond to climate conditions, peak loading or other factors increase. "Fault detection and diagnostics is a huge growth area and where the industry needs to go," says Greg Stiles, senior business sector manager for Energy Trust of Oregon. Stiles notes advanced systems can detect and diagnose problems with components such as HVAC equipment and identify minor issues before they become major problems.

Other advances could include abilities to dynamically manage building envelopes using shaded glass coatings, automated awnings and photovoltaic panels that respond to the sun's angle and intensity. "Exteriors of buildings are being transformed into living, breathing systems," says Jeff Harris, senior manager of planning for the Northwest Energy Efficiency Alliance.

However, increasingly sophisticated systems are not without challenges. Up-front capital costs, training needs and technical complexity can overwhelm many potential users, particularly smaller companies without a dedicated energy systems manager. "These systems can be like a police station getting flooded with calls from security systems," says Harris. "The data coming back from them can be immense — some buildings can have up to 5,000 data points."

Such complexity — along with utility pricing structures that don't vary prices in response to demand, encouraging conservation — adds to the difficulty of bringing energy-management technologies to homes and smaller companies. Some customers have little understanding of energy management and a less well-defined profit incentive than large companies such as

Wal-Mart or Staples. Yet as a whole, residential energy use accounted for 21 percent of national energy demand in 2004, and with surging use of energy-intensive home electronics and increasing home size, the time is right to bring energy technology home.

A handful of companies and developers are hoping to fill this gap, providing systems that help homeowners and small companies better understand their energy use.



LivingHomes has integrated an energy-management system into its U.S. Green Building Council-certified model home.

LivingHomes, a residential developer that makes and sells prefab green homes, has integrated an energy-management system designed by Lucid Design Group into its Santa Monica, Calif., model home, recently certified Platinum in Leadership in Energy and Environmental Design (LEED) by the U.S. Green Building Council [see "LivingHomes takes prefab to the next level," *SI*, Oct. 2006]. The system allows owners to track how much they're consuming, and how much energy is produced by onsite renewable energy. An eye-catching software interface displays graphs showing hourly energy use, money saved and carbon output [see "A kilowatt saved is a kilowatt earned," *SI*, May 2007]. "One of our six goals in addition to zero energy is zero ignorance," says Steve Glenn, Living Homes founder and CEO.

GridPoint, a company targeting homeowners and small businesses, produces a software and hardware system that integrates energy storage technologies, energy-use measurement and control devices, and renewable energy sources. With the promise of wireless technology, future home energy-saving devices may be as simple as a magnet that attaches to refrigerators to track energy use, or products such as Ambient Device's stylish glass "Energy Orb," a wireless technology that signals minute-by-minute electricity price changes [see "5 for the Future," *SI*, Oct. 2005]. Other advances include an increased ability to zone home HVAC systems to heat and cool rooms only when occupied.

But some energy experts question how far homeowners will go to manage energy, particularly when the intricacies of utility rate structures are largely foreign to them. "You really need to think about what the end consumer is willing to do, or it will come back to bite you," says Harris. He notes both Puget Sound Energy in Washington and Portland Gas and Electric have had mixed results with past customer-controlled demand-response programs. "People just don't want to manage their energy that closely."

While residential demand-response systems, particularly those integrated with renewable energy, are widely available in Europe, their adoption in the United State has been hampered by high costs and lack of customer incentives from utilities — but such factors are changing. "These systems have tremendous potential to attract millions of customers," notes Lew Pratsch of the U.S. Department of Energy's Office of Building Technologies. Pratsch says such systems will be an integral part of future zero-energy homes.

Utilities reap benefits



Wary of relying on unpredictable consumer behavior to manage energy, utilities are increasingly realizing the benefits of centrally controlled demand-response systems, which allow utilities to directly shift consumer loads and reduce peak demands, preventing the need for new power plants or transmission lines.

Ambient's stylish glass Energy Orb uses wireless technology to signal minute-by-minute electricity price changes using colored LED lights.

control devices operate nationwide, with utilities in Florida and California leading the way.

Along with smart meters, which allow two-way communication and monitoring of home energy use, 10 million load-

GridPoint has been shipping products since 2005, selling not only to consumers, but also directly to utilities. The company's system allows utilities to remotely adjust home thermostats, or other energy uses, among willing participants from a central location to shed peak load. Golden, whose company is working with most California utilities, says utilities have seen positive returns in as few as 18 months.

The success of such systems depends on greater recognition of how widely electricity prices vary over a 24-hour period. Deregulation has allowed utilities to use pricing as a tool for shedding peak loads. Utilities such as Florida's Southern Co.-owned (NYSE: SO) Gulf Power have succeeded by implementing critical peak pricing structures, spiking prices from 7 cents per kilowatt-hour to nearly 34 cents per kilowatt-hour. The price spike helped encourage consumers to shave peak energy use by 40 percent in the summer and 60 percent in the winter.

Eyes to the future

Energy Trust of Oregon's Greg Stiles says demand-response programs have the potential to reduce peak electricity demands nationwide by about 5 percent, saving \$3 billion in energy costs. Concerns over climate change and spiraling energy costs are finally creating the "perfect storm" to transform the energy industry. "Companies are working feverishly to modernize the electric grid, appliances and equipment. The federal government and state regulators are pushing it, and the utility companies want it," says Stiles. "It's a bonanza, an electric gold rush."

Like this article? [Subscribe to Sustainable Industries magazine.](#)

© [Celilo Group Media](#). All rights reserved. Permission is required for reproduction in whole or in part. For high-quality reprints of articles, contact FosteReprints at 866-879-9144 or via email: sales@FosteReprints.com

RELATED LINKS:

Wells Fargo banks electricity [Read More](#)

Honda brings efficiency home [Read More](#)

Solar hits the cul-de-sac [Read More](#)

Find this article at:

<http://www.sustainableindustries.com/energy/10094471.html>

Check the box to include the list of links referenced in the article.

©2006 Northwest Energy Efficiency Alliance and Celilo Group Media. All rights reserved. Most written content may be reproduced for informational and educational purposes provided it is appropriately credited. Contact ncurrent editor Brian J. Back at 503-226-7798 or brian@celilo.net prior to republishing.