Six Technologies and Trends That Challenged Energy Professionals in 2016

The year 2016 was tumultuous for energy efficiency. Our new report for members of the E Source Technology Assessment Service, “Top 20 Technologies and Trends of 2016,” highlights the major developments that challenged energy professionals in 2016 and will likely lead to an equally chaotic 2017. We’ve hand-picked 6 of our favorites just for you!

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New Low-Capacity Furnaces for Air-Tight Homes

Zach Hamber

As building envelopes improve, heating loads get smaller, increasing the need for smaller, less-energy-intensive furnaces to heat the same amount of space. These advances in envelope technology, highlighted in the International Energy Agency's Technology Roadmap (PDF), mean that the current average gas furnace is much larger than needed. According to AHRI, until recently the smallest commercially available furnace was sized at an output of 26,000 Btu per hour. Smaller alternatives are now available with outputs from 6,000 to 15,000 Btu per hour and annual fuel utilization efficiencies (AFUE) of more than 95 percent.

A great example is the Chinook (PDF) by Dettson Industries. According to the Gas Technology Institute, an independent nonprofit based in Illinois, the Chinook is the lowest-load unit on the market. Made in Canada, this furnace is a prime candidate for incentive programs. In addition to being smaller and more adequately sized for newer homes, it's fully modulating, which gives it further efficiency advantages over single- or multiphase furnaces with equal AFUE scores. The Chinook is quiet and has an incredibly small footprint—it can be placed on top of a stackable washer/dryer. This furnace can be paired with a small-diameter duct system and can be used with Dettson's Alize electric heat pump to provide cooling and moderate heating.

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EIA Finds Decline in Lighting and Space Heating Energy Consumption

Monali Mujumdar

The 2012 Commercial Buildings Energy Consumption Survey data from the US Energy Information Administration (EIA) became publicly available in March 2016. According to the EIA's Energy Usage Summary, consumption in US commercial buildings increased by only 7 percent from 2003 to 2012 although total building floorspace for this category increased by 22 percent. Of the 10 end uses monitored by the EIA, only lighting and space heating showed a reduction in energy consumption over the nine-year period; all other end uses exhibited an increase in consumption.

EIA analysts determined that the variation in energy consumption stems mainly from technological advances and changes in consumer habits over the years. Lighting technology vastly improved and inefficient incandescent lamps were replaced by more-efficient fluorescent and LED lamps. Researchers found a 46 percent reduction in lighting energy use, which can be chalked up to technology improvements and higher efficiency standards as well as (we suspect) utility efforts and incentives to promote efficient lighting. Similarly, changes in standards for space heating equipment and warmer-than-average winter months in 2012 decreased space heating energy use by 26 percent.

Analysts also provided hypotheses for the increase in energy consumption among other end uses. They attributed the three-fold jump in energy consumption by office equipment and computers to increased use of electronics such as printers, copiers, computers, and servers. And an increase in electronics use leads to an increased need for cooling, humidity control, and ventilation, further boosting energy consumption. More research is required to nail down the reasons for the increases and to devise strategies to minimize consumption.

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Free Solution for Declining Cost-Effectiveness in Energy Design Assistance Programs

Mary Horsey

Help has arrived for utility new construction programs that promote whole-building energy efficiency by supporting energy modeling for large commercial building new construction and renovation projects. The cost-effectiveness of these offerings, known as energy design assistance (EDA) programs, is being assaulted on two fronts:

- Savings per project is declining by about 18 percent as local governments adopt the more stringent 2012 International Energy Conservation Code (IECC 2012), which raises the baseline.
- Growing industry interest in energy modeling has increased the number of energy modeling firms (with new modeling platforms) seeking to participate in EDA programs, making quality control burdensome.

Add these issues to an inherently labor-intensive management process that requires ongoing communication among stakeholders and coordination of the submission, review, and documentation of the energy-modeling results.

Xcel Energy and the National Renewable Energy Laboratory's (NREL's) Commercial Buildings Group developed the Energy Design Assistance Program Tracker (EDAPT) software solution to streamline the EDA process by moving the majority of application, reporting, and review processes to a web-based program management tool and using a single energy-modeling platform to rein in the cost of analysis. Xcel chose the US Department of Energy's (DOE's) EnergyPlus engine and its OpenStudio front end for its ability to simplify energy simulation through a user-friendly interface and a suite of helpful plug-in modules.

Since EDAPT's launch in June 2013, Xcel has seen several measureable benefits, including:

- A 6 percent increase in administrative cost savings
- A boost of 33 percent over the program's expected energy savings that can be counted toward the utility's overall savings goal
- A 28 percent increase in new projects
- A 300 percent increase in the number of participating energy consultant firms

In an effort to help other utilities replicate the success of EDAPT in their own EDA programs, the DOE reimbursed Xcel's development costs and is making the EDAPT software solution available to interested utilities at no cost.

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New Efforts to Measure, Reduce Grid Impacts from Cannabis Cultivation

Bryan Jungers

In 2016, eight more states voted in favor of legalized cannabis: four voted to legalize medical marijuana and four voted for broader, recreational cannabis use. In all, 29 US states now permit the legal use of cannabis for medical reasons, and 8 states plus the District of Columbia allow individuals 21 and older to use pot recreationally. Because the vast majority of regulated commercial cannabis is grown indoors, impacts to the electricity grid have been significant where states are moving toward broader legalization, and the greatest impacts are in states where recreational pot use has been made legal.

Though the exact quantity of energy consumed for indoor cannabis cultivation remains unknown, estimates range from about 1 to 3 percent of total electricity generation in states where recreational cannabis use is legal. Two efforts are now under way to establish more-accurate baseline estimates of industry resource consumption and guide improvements in facility operational efficiency. One initiative, led by nonprofit Resource Innovation Institute based in Portland, Oregon, is tapping industry experts via a Technical Advisory Committee to develop best practices for the efficient use and management of energy, water, and nutrients. A similar effort by the Cannabis Conservancy out of Denver, Colorado, seeks to deliver sustainability certification and standards (PDF) for cannabis growers. The Cannabis Conservancy is also working with the Colorado Energy Office to better understand existing practices and resource consumption in the state.

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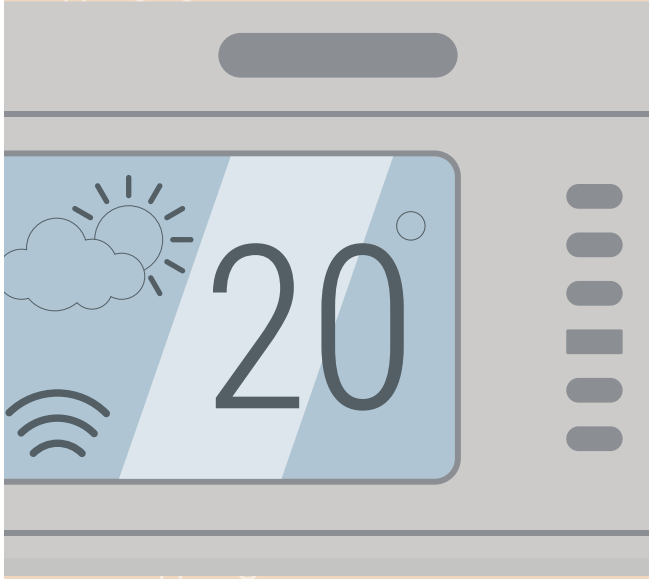
Some Smart Thermostats Increase Energy Consumption

Logan Jacobson

Smart thermostats have been growing in popularity for several years, but research released in 2016 demonstrates that some smart thermostats could be contributing to an increase in energy consumption. In the Energy Trust of Oregon Smart Thermostat Pilot Evaluation (PDF), owners of 383 participating homes installed Nest and Honeywell Lyric thermostats. Researchers collected data on energy consumption before and after the treatment and found that the Lyric contributed to an average increase in natural gas consumption in the participating homes. Participants with Nest thermostats saved an average of 34 therms per year, whereas Lyric users increased their annual average usage by 29 therms. The Energy Trust research didn't explore the reason for the energy increase, but it could be the result of differing energy-saving strategies used by each product manufacturer. Despite the study's negative findings for overall average energy savings, in homes with low initial gas usage (less than 618 therms per year) the Lyric saved 27 therms annually.



1

The Rise of Residential Voice Control

Essie Snell

When Amazon released its Echo device to a limited number of customers in late 2014, it would have been difficult to predict just how popular the device would become. The device—essentially a continually evolving voice-controlled speaker that can play music, answer questions, and control an expanding range of smart devices—has seen rapid and substantial sales. For example, 2016 research by Consumer Intelligence Research Partners estimated that Amazon sold just over 5 million Echo speakers in a little over a year since its launch (for comparison, Strategy Analytics estimates that Nest sold slightly more than 1 million smart thermostats in a similar time frame). It's been so successful, in fact, that Google scrambled to create its own version, called Google Home, which it released in November.

Why should utilities care? Smart homes offer a wide range of potential benefits—from energy and demand reductions to improved residential data collection, revenue-generation opportunities, new marketing and branding channels, and increased customer engagement. Unfortunately for would-be smart home promoters, the lack of interconnectivity between different manufacturers' devices has proved to be a major stumbling block. Voice-controlled products like the Amazon Echo and Google Home are helping to solve that problem—for example, the Echo already works with a range of prominent smart thermostat, smart plug, and smart lighting offerings, and the Google Home is likely to follow suit. Additionally, the E Source Residential Utility Customer Survey: 2016 found that roughly 60 percent of millennial customers are now aware of the Echo, which, in combination with its impressive sales, may indicate that these kinds of devices could continue to flourish in the market and have the potential to improve smart home interconnectivity on a large scale.

Beyond creating an effective control hub for the smart home, voice-controlled devices may also prove to be a useful channel for marketing and implementing utility demand-side management programs. For example, a utility with a residential trade ally program might create an app to help customers quickly find trustworthy contractors to do home improvements and simultaneously streamline the rebate process for efficiency measures. As these devices continue to grow and mature, we expect that canny utilities will find even more opportunities to leverage this emerging channel.

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