

# Energy Management— SIMPLE STEPS for SMART SAVINGS

Quick, easy strategies can open up avenues for new budget and revenue opportunities.

BY BEN WALLACE

*Images courtesy of 75F.*

The U.S. Green Building Council (USGBC) cites that buildings consume 70% of U.S. electricity and the U.S. Department of Energy (DOE) indicates that commercial buildings waste 30% of the energy they consume.

This is a major opportunity for facility management, contractors and technicians to look at smart building efficiency measures to save significant energy expenses and redirect those savings as new budget and revenue opportunities. Lighting and HVAC are good places to start, as they are historically dominant energy consumers in most commercial buildings.

## Lighting beyond LED switchover

While LED lighting installations have become a common route to reduce energy expenses, additional lighting savings can be realized with smart controls, such as enabling daylight harvesting.

In daylight harvesting, a light sensor determines the existing ambient lighting and adjusts the lighting to reach desired luminosity levels, which are delivered through lighting control systems dimming functions. Combined with smart scheduling, occupancy sensing and weather data feeds, lighting systems can get even smarter and more energy efficient. In comparison, HVAC actually represents much greater energy consumption and offers much larger energy savings potential compared with lighting in most buildings.

## HVAC efficiency

Following on the heels of LED lighting initiatives, companies are recognizing an even larger savings opportunity in their

HVAC systems, which can account for 40%–60% of utility costs. Utility incentives have created turnkey HVAC rebate and incentive programs, following the success of the LED programs. So, what can you do to take advantage of this opportune market?

## Simple Steps with current equipment

While purchasing new high-efficiency HVAC equipment offers savings in many forms, you don't need to buy new equipment to start saving energy. The long-term capital expenditure for HVAC equipment has a lifecycle to consider and live out. So, what can you do with existing HVAC equipment to save energy today?

Some of the easiest initial steps are proper maintenance to assure top performance, including filter and belt replacement and other maintenance services you likely provide today. Offering your customers a health check is a great start.

Selective upgrades can take efficiency farther. Programmable thermostats, for example, help assure the system is conditioning only when scheduled instead of 100% of the time, which is a mode still found in a surprising number of buildings. Going even further, Smart HVAC automation systems can have multiple times the savings of a basic programmable thermostat.

Existing equipment often has the capability to be more efficient, though it lacks the sensing and smart controls to orchestrate optimized air quality and energy consumption.

Without an understanding of the changing loads of a building, through seasons and weather patterns, occupancy and other environmental factors, a basic thermostatic control can't optimize for energy efficiency.

## Simple Steps with sophisticated controls

Yes, I said “simple” and “controls” together. The world of building controls is changing, and the complex controls systems of the past are being replaced with new, born-in-the-cloud solutions that are easy to install and to manage without experts who specialize in this technology. The real beauty of these advances is that sophisticated building automation capabilities are now affordable and easy to deploy, making them a good fit for even small- and mid-sized facilities less than 100,000 sq. ft.

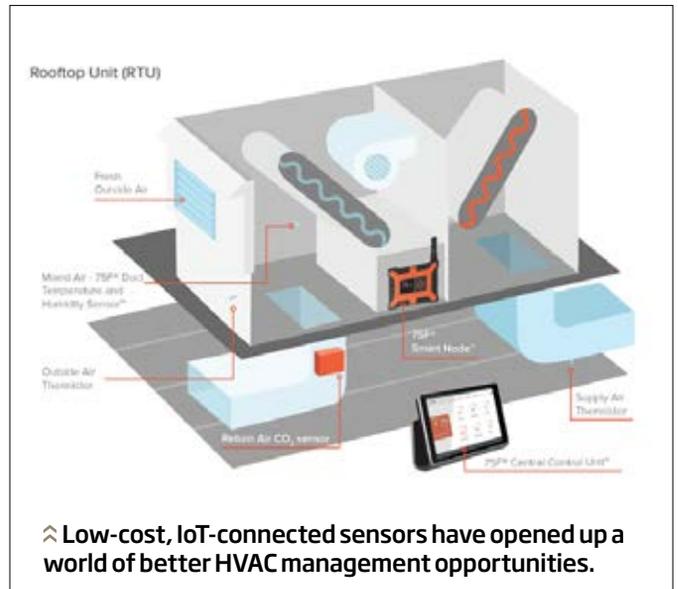
These newer systems’ cost of acquisition is a fraction of the cost of traditional complex controls systems, which were cost prohibitive for all but the top 15% of commercial buildings. No need to fear the “controls” challenges of the past, such as requiring years of specialized training and custom programming capabilities. Some newer controls solutions are so easy, eight-year-olds can install and commission them after watching a short tutorial video.



⤴ **New controls systems offer sophistication with ease; here, students install after brief video training.**

## Sensing (and data)

There's an adage that you can't manage what you don't measure. So, the proliferation of low-cost, IoT-connected sensors have opened up a world of better HVAC management opportunities. Consider temperature sensing alone—a smart system can measure and report in real time the zone temperature, supply-air temperature pre- and post-reheat element temperatures, return air temperature, mixed air temperature and outside air temperature. How does this relate to energy efficiency? Well, the more you measure, the better you understand the building loads and the HVAC system's ability to condition the air.



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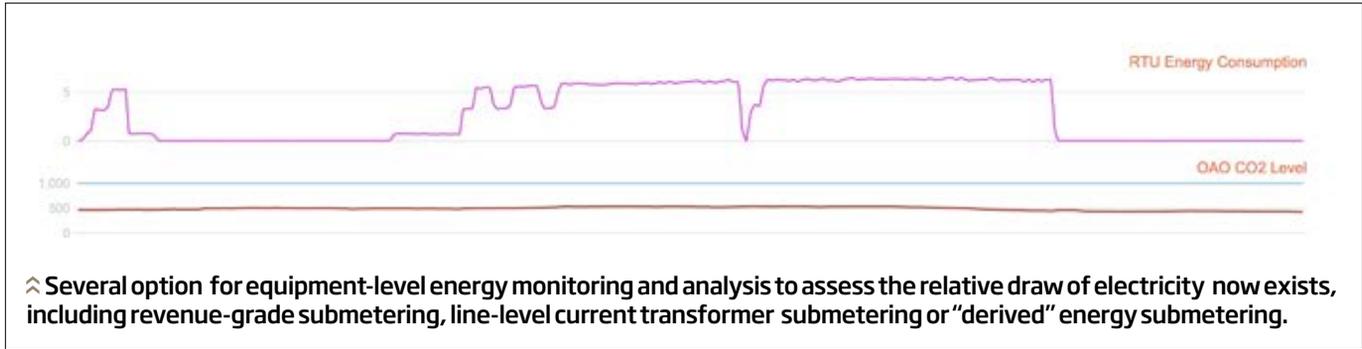
Other sensing for humidity, occupancy and light levels can factor into the energy-efficiency equation too, given your building's HVAC controls systems is smart enough to make use of the information.

## Smart algorithms

The more sophisticated building automation solutions can take into account a complex set of factors, including:

- Building orientation and solar gain through the day;
- Occupancy and building load patterns;
- Inside and outside enthalpy;
- A balance of comfort vs. efficiency in temperature set point bands;
- An understanding across multiple equipment types; and
- Individual zone setpoints.

With data, insights, and well-developed algorithms, a smart building automation system can deliver predictive and proactive controls sequences for optimized energy use, even in the face of constantly changing building dynamics. This continuous commissioning approach is constantly sensing and determining controls to balance the building in the most efficient manner. This new era of building management offers significant energy savings while also reducing time required by facility teams doing hands-on adjustments and delivering an optimized internal environment for occupants.



## Outside air and “free cooling days”

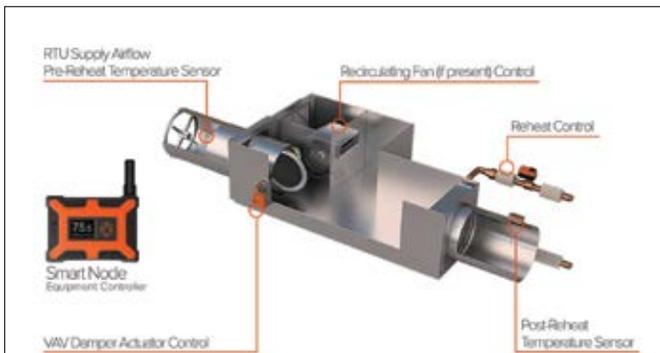
Outside air can often be used to condition a space instead of using energy on compressors. Informed by outside and inside air temperature and humidity sensors, and also by weather data, smart HVAC systems can deliver comparative enthalpy economy, optimizing the outside air damper position based on outside enthalpy compared with calculated indoor enthalpy. Cloud computing maximizes free cooling by predicting needs via live weather data. This strategy significantly improves comfort by optimizing diffuser discharge air temperatures and reducing room temperature variations.

Packaged rooftop unit economizers present a major opportunity to improve both energy efficiency and occupant comfort through smart controls solutions with outside air optimization, managing much more efficiently than the standard economizer controller found in existing units.

Many economizers in the field are not working to full potential, often due to stuck dampers or faulty sensors exposed to the environment. So, economizer maintenance and health checks are rewarding efforts to get them working at baseline levels. Even greater savings can be realized by retrofitting your economizer with outside air optimization smart building automation systems (BAS), saving up to 40% and delivering payback in as little as one year.

## Smart VAV system and reheat box

New smart HVAC controls offer unique system-wide controller approaches to maximizing variable air volume (VAV) system and reheat box performance. Typical VAV with reheat systems have inherent inefficiencies when first cooling and then heating the same air at terminal VAV boxes.



^ Smart VAV systems and reheat boxes sense outside supply and system-wide temperatures, treating air only when required.

New cost-effective smart VAV with reheat controls solutions improve efficiency and performance in new or existing buildings. This innovative approach senses outside supply temperatures and then treats air appropriately at the RTU or re-heating elements only when required, eliminating the waste and energy associated with the traditional 55°F target temperature treatment in VAV systems. Reheat performance is verified through pre- and post-heating element temperature sensing.

## Energy management systems

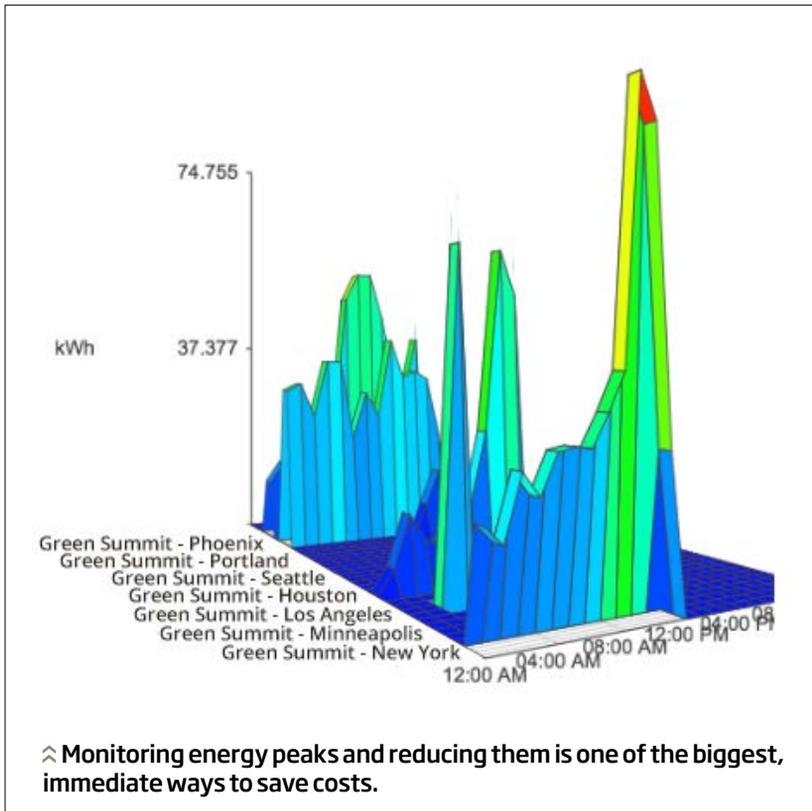
Energy management systems (EMS) have been around since the 1990s, and they have changed little since then. The energy management landscape has shifted drastically with the emergence of enabling technologies including low-cost IoT sensors, wireless machine-to-machine communications, big data analytics, machine learning, cloud-based massively parallel processing and smart grids. Newer, smart BAS can offer more automated and active energy solutions, using the data and analytics in real-time with predictive and proactive controls to optimize for energy and comfort.

**Submetering options**—There are now have several choices in the approach for equipment-level energy monitoring and analysis to assess the relative draw of electricity at your locations. You can choose to implement revenue-grade submetering, line-level current transformer submetering (as seen in for RTU Energy Consumption in the chart above), or a cost-effective option of “derived” energy submetering. Derived energy metering is a cost-effective means of gaining insight on HVAC and other equipment relative consumption based on runtimes and normed plate data without the expense of installing physical meters.

**Energy consumption analysis/benchmarking**—Portfolio energy-management tools offer visibility and insights on gas and electric energy consumption, intensity and costs, offering the ability for analysis and benchmarking. Some offer 3D visualization of your electric and gas energy data by consumption (kWh), intensity (kWh/sf) and cost per square foot, with the option to normalize for weather. Compare across sites visually to identify patterns and anomalies in your buildings’ energy use and costs, and rank sites by kWh usage and cost and cost per square foot.

Benchmarking energy consumption and efficiency is available through a range of organizations and programs, including EnergyStar Portfolio Manager, LEED and Arc, as well as utility data platforms such as EnergyPrint.

**Peak load saving**—Utilities add special peak demand fees based upon monthly consumption spikes in your building, so gaining visibility into where you have energy spikes and taking measures to reduce those peaks can have a major



impact on utility fees. This is one of the biggest immediate savings opportunities for companies to reduce energy costs. Modern smart BAS can help to incrementally and predictively manage to a building's load patterns, inherently helping to cut down peak demand spikes and the corresponding utility charges.

**Automated demand response (ADR)**—California's Title 24 is leading the country in requirements for energy functionality, including the requirement for buildings that are more than 10,000 sq. ft to have the capability to receive and automatically respond to a signal from the grid, using at least one standards-based messaging protocol, such as OpenADR.

Buildings are required to take signals from the utility grid when demand is high and set into motion energy consumption reduction measures across the building. Smart building automation and controls solutions are offering this grid integration to meet California's Title 24, but also to enable the fast-followers across the U.S. and beyond.

**ROI payback/incentives**—Advanced building automation systems can save 30-50% in utility expenses, offering a compelling payback, often within 1-3 years. Utilities and other incentives can help accelerate the payback time-frame, so, working with utilities and local sustainability groups can help reduce the cost of projects that offer energy-efficiency improvements.

While the solutions for building automation controls get more sophisticated with energy management, they also get easier to manage. New, affordable building intelligence solutions are quick and easy to install and manage, making smart building savings accessible to all today. 📧

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