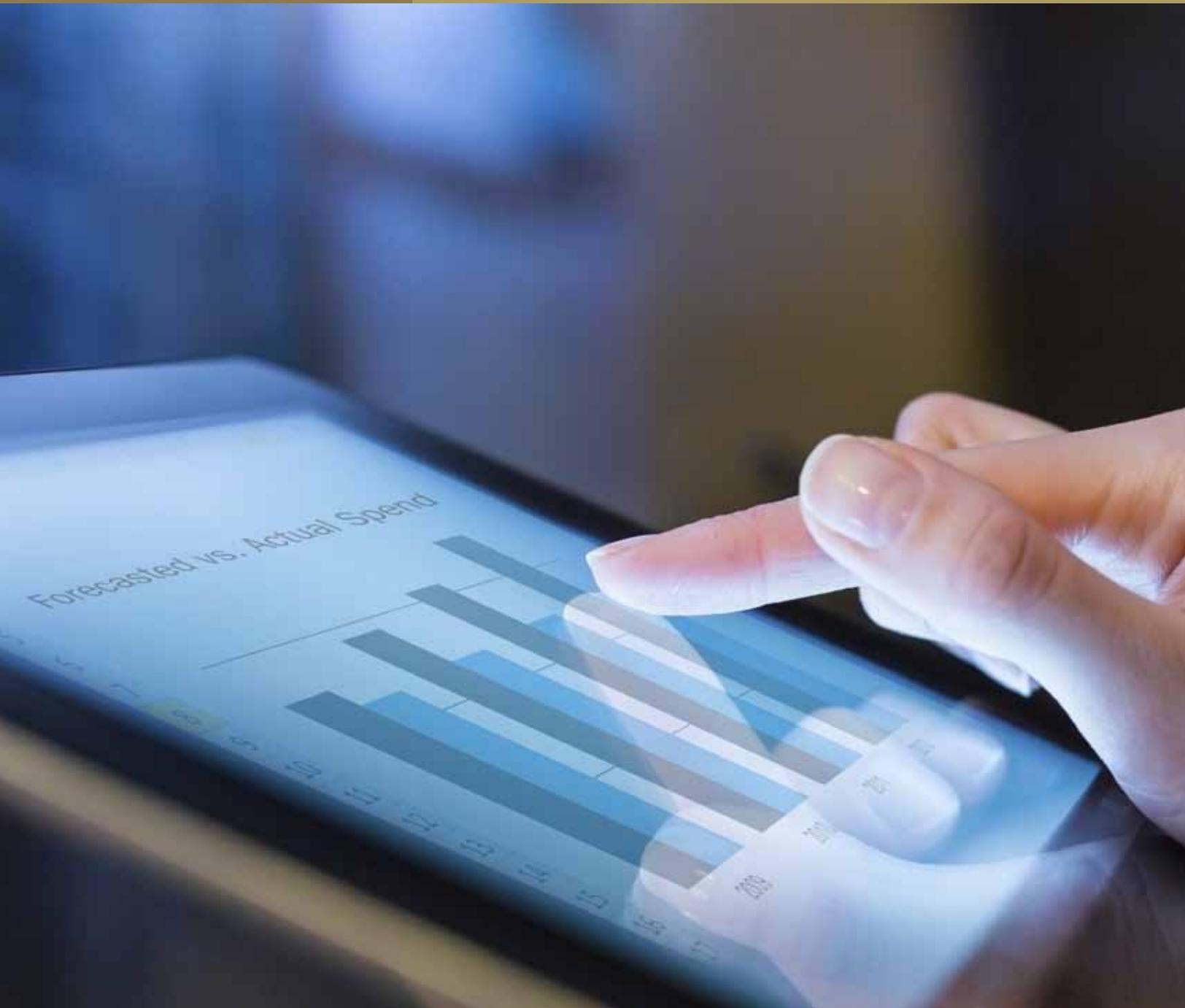


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NO MORE WASTED ENERGY

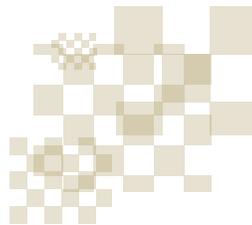
THE POWER OF ENERGY
INTELLIGENCE SOFTWARE



IN ASSOCIATION WITH:  ENERNOC

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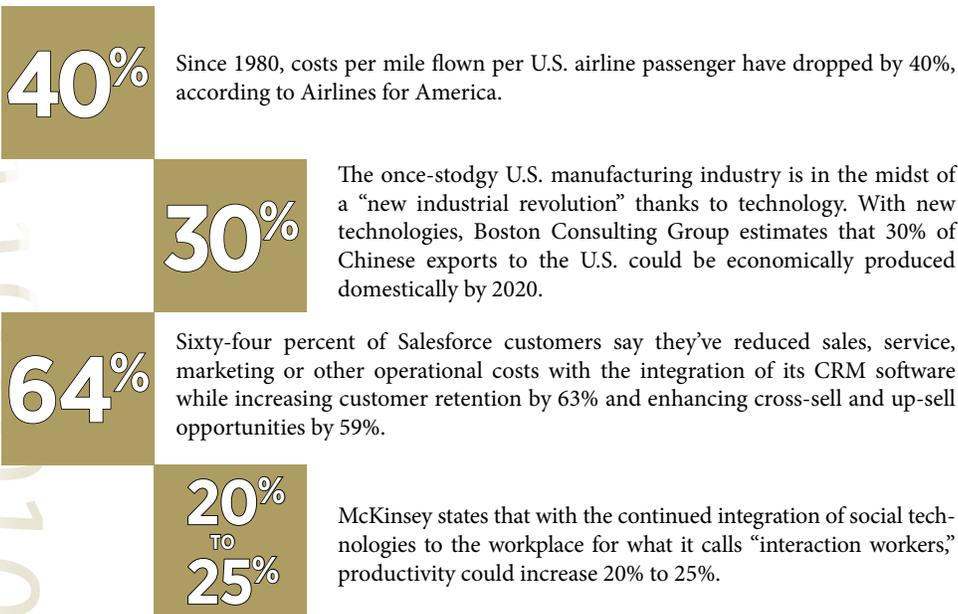


FOREWORD

—TIM HEALY, CHAIRMAN AND CEO, ENERNOC INC.

Technology has been incredibly effective at increasing productivity and reducing operating costs for the enterprise. Companies use advanced software systems across every business function to track and analyze data, forecast trends, maintain a competitive edge and, ultimately, make each of us more productive.

Consider these examples:



So why hasn't technology played a more significant role in helping U.S. enterprises effectively measure and manage the billions of dollars they spend annually on energy consumption? It's not as if we don't have room to improve: despite the fact that the U.S. is the technological epicenter of the world, we're not even among the top 25 most energy-efficient countries. My hypothesis: it stems from an inability to make sense of the largely fragmented, muddled landscape of energy management. Decision making is decentralized, there is lack of clear organizational accountability, and the vendor landscape is fragmented and often disjointed. A person responsible for procurement doesn't necessarily have insight into the operational requirements of a plant manager. A CFO is more concerned about budget risk, whereas a facility manager understands the dynamic nature of his building. The result: organizations either don't know they have a problem, can't quantify how big the problem is financially, don't believe that the problem can be fixed or don't even know where to start looking for a solution.

So how should organizations start to think about these issues? It's all about getting back to the basics. First, understand what drives energy costs. Second, accept that energy is, in fact, a controllable expense. Third, arm your teams with the right tools that bring together all of the moving pieces and inform better decision making. The outcomes will be clear: reduced costs, mitigated risk, streamlined compliance, improved collaboration and increased operational efficiency.



THE CHALLENGE

Energy is a top three operating expense for many organizations, top five for most. Many organizations pay lip service to controlling energy costs—15% of Fortune 500 companies now have explicit energy reduction targets as part of their operating plan; but in reality, most organizations treat energy like a fixed cost: monthly bills come in, checks go out. According to a recent report¹ by Imperial College London, there are many reasons for the disparity between stated goals and the resulting action. For instance, energy efficiency projects often must meet a greater hurdle rate when they are perceived as having the same or lower risk as “core” business investments, and energy-saving-related investment opportunities are often unfairly subjected to longer payback periods.

Efforts to realize cost savings and productivity gains through smart energy management are also sometimes hindered by legacy issues such as inertia and questions of accountability. For some commercial and industrial organizations, energy is sourced without a purchase order. Accounts payable simply cuts a check for the monthly bill. And even if there is a PO, the problems still persist. Procurement departments typically buy energy, while facilities management or operations has oversight over energy consumption. Who “owns” energy in the organization is often decentralized and disconnected. These silos mean there’s often a lack of accountability or connectivity between the person cutting the check and the person using the energy, resulting in a situation ripe for inefficiency and higher costs. Moreover, neither of these people likely has the bandwidth to try to better understand how the other’s department operates, so dysfunction persists. Finding someone who can see the forest for the trees with respect to energy usage and costs across one facility, let alone a portfolio, is challenging.

And it’s not as though executives are necessarily any more knowledgeable. “How much do you spend on energy?” When Gregg Dixon, senior vice president of marketing and sales at EnerNOC, puts that question to C-level executives, nine times out of 10 they will answer: “I don’t know.” Commercial or industrial organizations with \$10 billion of annual revenue typically spend somewhere between 3% and 5% of their revenue on energy, or as much as \$500 million a year.

“As consumers, we really don’t understand our utility bills,” says Dixon. “Most people don’t know what a kilowatt is or a kilowatt-hour, when they consumed it or when they didn’t. The same is true in the corporate world. We largely take it for granted because energy has been—at least in the U.S.—cheap, it’s been abundant, it’s been incredibly reliable, and, as a result, we tend to waste it.”



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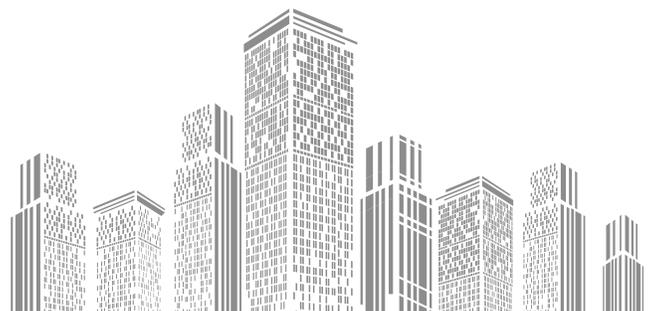
— **Gregg Dixon**
Senior Vice President of Marketing and Sales
EnerNOC

¹ <http://about.bnef.com/white-papers/are-companies-under-investing-in-energy-efficiency/>

As recent events like the polar vortex proved, though, organizations can no longer afford not to take a closer look at their energy costs—but putting energy costs under the magnifying glass takes more effort than most commodities require. Most purchases are defined by two factors: the price per unit and how much is used. P times Q. Energy, however, is a little different. There's a third dimension to energy use—time, or when you use it—that also makes understanding and managing it even more complex. In California, New York, the mid-Atlantic region and other restructured markets, large commercial and industrial energy users incur peak demand charges—based on the single 15- or 30-minute period during the month when a facility uses the most electricity—that can add thousands of dollars to a monthly utility bill. Nuances like this across the time dimension of energy use, coupled with ongoing volatility in energy pricing, can confound even the most proactive energy managers.

These obstacles are further compounded by the scale of the challenge. There are more than 5 million commercial, industrial and institutional buildings in the United States but just 14,000 energy managers—one for every 360 buildings. Inside those buildings, energy waste abounds. Twenty percent of commercial buildings operate HVAC systems and lighting outside operating hours, according to research from the Carbon War Room. In total, building energy waste costs commercial and industrial entities \$60 billion in unnecessary energy spend annually.

Building energy managers have traditionally focused on large pieces of equipment such as boilers and chillers, but the proliferation of servers, desktop computers, smartphones and other power-hungry electronic devices in the workplace makes energy planning even more difficult. According to the U.S. General Services Administration (GSA), these “plug loads” can average approximately 30% of electricity use in conventional office buildings and more than 50% in high-efficiency buildings. By 2030, according to the U.S. Department of Energy (DOE), commercial building energy consumption is expected to increase by 24%; plug and process loads energy consumption is anticipated to increase by 49% over the same period. In California alone, GSA found that plug loads in office buildings account for \$400 million in energy spend annually.



And because approximately 85% of existing commercial buildings and industrial facilities in the U.S. will still be standing in 2030, we can't expect newer, more energy-efficient construction to solve the energy waste challenge. It's up to energy managers and building operators to ensure that equipment and components in our existing inventory are operating optimally and efficiently.

These challenges might be unique to energy management, but virtually every major cost center in an organization—payroll, supply chain management, enterprise resource planning—faced similar issues in their early stages with organizational silos, lack of visibility into cost drivers and limited executive awareness. These challenges were largely solved by the emergence of IT-based solutions. A CFO for a large enterprise wouldn't consider managing her payroll through spreadsheets, yet that's how the majority of energy data is collected today. A COO wouldn't manage his inventory on paper slips stored in a filing cabinet, yet that's where a lot of energy bills end up. Human capital management software by companies like Concur and ADP, supply chain management software by Oracle and SAP, ERP software by Epicor and Microsoft: they all changed how business was conducted by giving real-time data that addresses key questions for business decision makers. Are resources being used effectively? Is a facility or business unit performing as expected? Is the business exposed to risk? These are the key questions that need to be answered for virtually every major operational line item, yet with respect to energy most enterprises lack the ability to even compile the data needed to answer these critical questions.

To get a handle on energy expenses, executives need to understand a simple truth. "One thing that I have working for me is that people have started to recognize that energy is not rent," says Eric Bliss, senior engineering manager, Blommer Chocolate. "It's an actual, manageable cost."

 *"One thing that I have working for me is that people have started to recognize that energy is not rent—it's an actual, manageable cost."*

— **Eric Bliss**
Senior Engineering Manager
Blommer Chocolate



A WILLING AND READY MARKET

In the past, resignation was often the default response to energy bills—but no longer. Early adopters have discovered that information technology tools have transformed energy into a controllable cost that can be proactively managed. The power of big data has arrived in the energy space in the form of software that manages how and when customers use energy: energy intelligence software, or EIS. But there's room to grow, as evidenced by Deloitte's 2014 ReSources report² citing only 30% of respondents saying that “new/innovative solutions are actively encouraged, experimented with, and deployed,” when describing their companies' use of energy management measures, and only 52% saying they have “some standard solutions (e.g., HVAC, lighting) in place.”

So what's changing?

Two factors have put energy management at the top of many executives' to-do list. The first is the aforementioned polar vortex, which caused temperatures to plunge in much of the continental U.S. in January 2014. “Energy prices had been pretty stable, or even gone down in some places over the past four or five years,” explains Micah Remley, vice president, product strategy and technology, EnerNOC Inc. The polar vortex triggered “a huge spike in energy prices. That caught people off guard and got them thinking a lot about their energy spend and how they can help manage that cost item on their bill.”

Second, Remley says, is the emergence of energy disclosure laws. In a growing number of jurisdictions, buildings of a certain size must disclose either total energy consumption or a rating, such as an ENERGY STAR score, and track it over time. “What that created,” Remley says, “is a regulatory mandate for many of our customers and many of our potential customers. The market in general has created complexity that is perfectly solved by energy intelligence software.”

Disclosure and benchmarking requirements are also among the factors that have spurred interest in energy management software. According to Verdantix, an independent analyst firm, demand for carbon and energy management software is booming.³ Over the past five years, the market has increased by a compound annual growth rate of 51%, and, for large firms in the U.S. alone, will be worth more than half a billion dollars by the end of 2014. Research published by the Carbon War Room found that the simple act of benchmarking a commercial building can yield a 5% energy consumption savings.⁴

“We hit a real inflection point in terms of business drivers,” Boston Properties CIO Jim Whalen says. “Our commitment to participate in industry-wide programs, benchmarks and surveys has elevated the need to rationalize an inefficient process of prepping data that can often be highly manual and spreadsheet intensive. It's both a data and business process challenge to improve the accuracy of this information, normalize it across different building types and different practices.

² <http://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-er-resources%202014-study.pdf>

³ http://www.verdantix.com/index.cfm/papers/Products.Details/product_id/196/us-carbon-energy-software-market-2010-2014/

⁴ http://www.carbonwarroom.com/sites/default/files/reports/CWR2012_FinanceWhite_E6_0.pdf

“In our case,” he adds, “it’s all about moving up the curve and introducing efficiencies in processing, handling and packaging data for varied requirements. I think we hit a point of awareness and consensus where internal stakeholders across various disciplines all came together and said, there’s got to be a better way to do this.”

“Information technology has been applied ubiquitously in most parts of an organization, unlocking a tremendous amount of value. In the energy world, it’s barely been applied,” says Dixon. “With information technology, enterprises can gain complete visibility into how much they consume, identify patterns and behaviors, prioritize action against that and eliminate the waste.”

In much the same way that software has simplified payroll or health insurance claims processing, streamlining energy management with energy intelligence software gives managers another tool to improve operational efficiency, increase productivity, reduce costs and forecast—and hold to—energy budgets. “Our property management companies are responsible for paying the bills and engaging with the utilities at the building level, but we don’t have a portfolio-wide idea where our energy spend is and how efficient we’re being,” says Scott Edwards, vice president of asset management at AEW Capital Management. “Software does that for us because we can roll it up as a portfolio.”



“It’s all about making it easy for users,” says Remley. “It’s a time issue. They know that there is low-hanging fruit, and they know there are cost savings.”

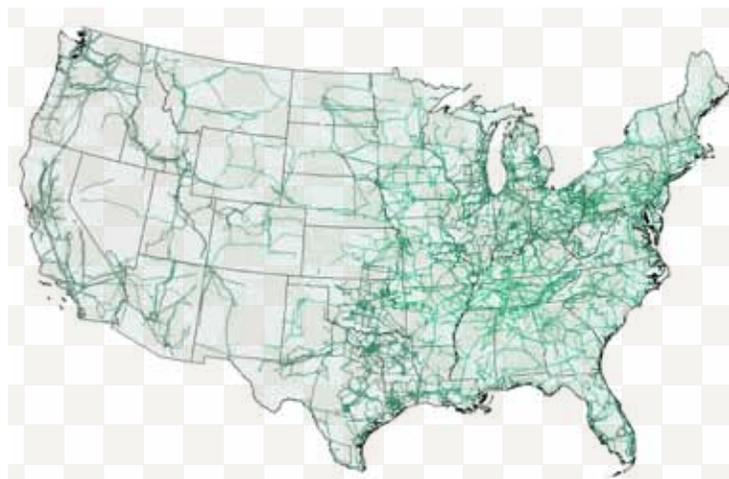
As the saying goes, necessity is often the mother of invention. According to Jason Richards, Sodexo’s vice president of energy and construction services, higher education campuses forced to make do with less coming out of a recession are looking for ways to drive down expenses anywhere they can. The typical facilities budget on a college campus, he says, runs about \$3 million to \$5 million annually, with more than half of that spend related to utilities. “In the past, they viewed it as: ‘Just pay the utility bill.’ But I think more and more of them are becoming keenly aware of the fact that that represents over 40% of the total facility spend,” he says. “The old adage is true that if you have the ability to save a dollar in your net energy expenses, it’s almost like generating \$10 in revenue,” says Richards.

Asked why the application of information technology to energy management has lagged behind other areas of the business, Boston Properties’ Whalen cites the lack of mature solutions in the market. “Not all owners, at least in the office sector, bring a long-term perspective to manage in a way that provides for these kinds of investments,” he says. Just five years ago, he adds, “there weren’t necessarily viable options for meeting these types of data requirements. I think we’re seeing an alignment of market dynamics to deliver new features and platforms right now.”

Early attempts to deploy the power of big data to solve problems in the energy space rested on personal computer dashboards, but the potential for impact was limited, says Remley. “The way you close the loop,” he adds, “is to catalog those energy management opportunities and quantify the opportunity in real dollars. A dashboard doesn’t do that. You need to combine it with software analytics to identify the opportunities for eliminating waste, calculate the opportunity based on actual financial impact, and then you need to assign an action to an individual to actually get it done.

“Energy dashboards present things to customers in terms of kilowatts and BTUs; no business cares about kilowatts or BTUs. They care about dollars,” continues Remley. “We have found that the best way to drive urgency and change is to drive that point home. For example, our software will trigger emails to customers that say, ‘Our data analytics engine has forecast that you’re going to have peak energy demand between 2 p.m. and 3 p.m. tomorrow, and that peak demand is going to cost you an extra \$1,100 to run your operation.’” With information like that, he says, people can make decisions that weigh the pros and cons of reducing energy consumption and set a course of action that makes sense in that specific case.

“EIS helps us understand what’s going on at our buildings around the clock, in real time. Armed with that data, we can make the most informed decisions about how to best run our buildings,” says Jeffrey B. Carter, sustainability committee chair of Franklin Street Properties.





PARLAYING EARLY SUCCESS STORIES TO SCALE EIS

While there are still many businesses that manage energy use in silos and don't holistically manage the three cost drivers, that is changing. Early adopters are seeing gains—and demand for software-based energy management solutions is growing. According to Remley, companies such as General Motors, Perdue Farms, Leggett & Platt and Stop & Shop are now evangelizing the benefits of this type of solution to industry peers.

For General Motors, for example, one of the world's largest and oldest automotive manufacturers, energy represents a significant portion of overall operating costs.⁵ The company, which manufactures cars in more than 35 countries, realized that in order to get a handle on basic energy costs, it needed a robust software platform to centralize and analyze utility bill data. It now leverages a global utility bill management platform to manage its 1,700 electricity, natural gas and other energy bills from 29 countries around the globe. The software automates bill checks and supports utility tariffs from around the world. In another example, Great Lakes Cold Storage, a large refrigerated distribution company in Ohio and Pennsylvania, realized after analyzing its energy data that based on the way one of the facilities was billed, the company would save money by flattening out the load curve in that location and running it 24/7.⁶

Demand is such for energy management solutions that some 400 companies—from industry veterans such as Schneider Electric, Siemens, Johnson Controls and EnerNOC to software startups—now compete in the building energy management systems (BEMS) space. Navigant Research projects⁷ that the global BEMS market will reach \$5.6 billion in 2020, up from \$1.9 billion in 2011. Even accounting for such strong growth, the untapped market is vast. Vendors interviewed for a 2012 Pike Research report⁸ estimated that up to 85% of existing buildings in the U.S. can be categorized as “dumb” buildings—that is, buildings with non-digital building control elements, such as thermostats, installed.

Energy intelligence software platforms that measure billions of data points monthly and use data analytics to deliver users actionable insights not only mark the evolution of building energy management solutions into a comprehensive strategy, but they are also where frontline energy managers themselves predict the market is going. “The rise of BEMS has enabled new levels of insight into and analysis of energy and operational data that was not possible just five years ago,” according to Eric Bloom, principal research analyst with Navigant Research. Seventy percent of respondents to a survey⁹ by the automation and controls firm Echelon reported that they plan to integrate building automation systems into one platform, with a third planning to do so within the next 12 to 18 months. “Regardless of whether the [Internet of Things] is overhyped or unfamiliar, it's coming to commercial building automation systems soon,” adds Benjamin Freas, a research analyst also with Navigant Research.

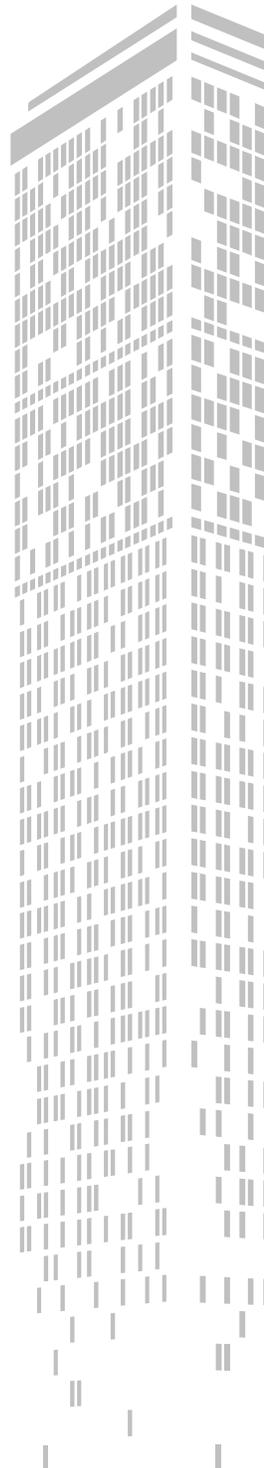
⁵ <http://www.enernoc.com/our-resources/case-studies/general-motors-saves-over-21-million-with-energy-intelligence-software>

⁶ <http://www.enernoc.com/our-resources/case-studies/great-lakes-cold-storage-freezes-rising-energy-costs>

⁷ <http://www.navigantresearch.com/research/navigant-research-leaderboard-report-building-energy-management-systems>

⁸ <http://www.navigantresearch.com/wp-content/uploads/2012/01/BEMS-12-Executive-Summary.pdf>

⁹ <http://www.achrnews.com/articles/126266-march-31-2014-building-automation-projects-moving-toward-convergence-onto-a-common-platform>





ENERGY INTELLIGENCE SOFTWARE IN ACTION

Boston Properties owns or operates over 170 properties in Boston, New York, San Francisco, and Washington, D.C. CIO Jim Whalen says many of the company's Fortune 500 customers care deeply about the energy performance of their rented space. With this in mind, Boston Properties has long relied on the use of energy meter data as a "bread-and-butter tool" that provides real-time visibility into a building's energy performance.

Sensing that energy intelligence software can help the company harvest even more energy cost savings, Whalen says Boston Properties is "moving up the curve" in starting to aggregate that information from a perspective of benchmarking buildings against one another, thus enabling new insights and best practices.

"You have your meter data, which is your live pulse on the building, and then you have your monthly cost and consumption information, which complement each other and provide the ability to do analytics and reporting—whether for internal or industry benchmarking," Whalen says. "That's all about moving up to an enterprise-level platform for how your data is aggregated and leveraged."

Whalen notes, real-time data and analytics have enabled the company to troubleshoot and correct faults or inefficiencies in three broad areas. The first is simply being alerted as to the status of a malfunctioning piece of equipment. Another is being able to effectively manage set points and overrides if, for instance, an HVAC system is running outside its normal window. Third is the ability to adapt to changing occupancy patterns in a building. "Let's say you have a tenant move out, and you have downtime before a tenant moves in. The time needs to be managed. A toolset allows us to have near real-time visibility into what's going on from a consumption perspective," he says.

The California State University system is preparing to make a similar move to a more robust energy management solution. In 2004, CSU initiated a program of monitoring-based commissioning, including installation of permanent metering in buildings, across its 23 campuses. To date, about 300 of the system's 1,700 buildings have gone through the monitoring-based commissioning process, says Len Pettis, chief of energy and utilities. The campus wants to better leverage data analytics at each campus and system-wide but faces significant integration challenges with legacy equipment and energy management systems installed over the years.

"Our goal is to leverage energy information analytics from many different sources into one enterprise platform, as well as giving the campuses the opportunity to expand the analytics capability on their individual campuses," says Pettis. The system will provide campuses actionable information for procurement, demand-response and online electronic reporting. "Right now, we do it the old-fashioned way with spreadsheets via email," he says.

Over the next three to five years, says Pettis, CSU believes it can achieve up to a 20% reduction in energy consumption with the help of data analytics by improving utilization of equipment, optimizing control sequences and improving comfort levels. With measures already undertaken, he says, “we’ve reduced maintenance. We’ve reduced trouble calls. We’ve reduced hot and cold calls as a result of having better analytics. We’re very encouraged by what the new world of energy analytics has to offer facility folks.”

CSU isn’t alone; many organizations are setting aggressive goals designed to address all three energy cost drivers, and they see analytics as the tool to achieve those goals. Sodexo, for instance, manages \$160 million in annual utility spend, representing almost 3,000 utility accounts, for education, healthcare and corporate clients across North America using its own utility expense management product. “That allows us to input the bills into software, be able to look at trends, abnormalities with bills, determine correct rate structures. It really is a source of information that allows us to extract meaningful data and help our clients make informed decisions,” says Jason Richards.

Using proprietary software that links to many existing building automation systems, Sodexo remotely monitors more than 8,000 buildings and the equipment therein. With analytics, Richards says, “we can determine behavioral practices, operational practices that are very inefficient, and quantify them such that clients know what’s going on, the cost impact to how they’re running a facility, and be able to look at those trends over time to make good decisions. Having the ability to link to our remote monitoring from almost any building adds that very efficient way, or cost-effective way, for our clients to have their energy monitored without the need for full-time employees.”





CONCLUSION

A paradigm shift is under way in energy management. Until recently, energy was treated as a fixed cost, a bill to be paid each month. But the application of information technology in the energy space has unlocked opportunities to use software to manage how and when customers use energy. Energy intelligence software creates fertile ground to actively manage energy using real-time data, data analytics and client engagement.

For many businesses, energy spend can be the difference between a good and bad year. “What we’ve learned over the years is that as customers become more sophisticated with energy management, they’re seeing the benefits,” says EnerNOC’s Dixon. “They’re really valuing those benefits because the return on investment on energy management is among the very best ROI of any opportunity that a CFO sees in their organization.”

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