Cost-Effective, Non-Invasive Systems for Reducing Commercial Energy Costs

Executive Summary

Energy technologies (hardware and software along with energy analysis and reporting tools) can help end-use customers, energy providers and system operators implement an energy efficiency philosophy, take control of energy usage, and manage energy costs. Energy can now be managed like an asset instead of a liability, but first business owners must adopt the asset management mindset to fully realize the benefits of an energy management program. With the right systems and procedures in place, electricity costs can be reduced in many cases by as much as 25%.

In addition, studies indicate that companies committed to greater energy efficiency are 10% more effective than their competitors and are strategically positioned for better performance in the future. A study conducted by the Aberdeen Group found that 35 % of top performing companies are using building intelligence technology to transform legacy building systems and processes, and use the systems to monitor and measure on an on-going basis. Buildings with energy improvements are also more valuable: every energy efficiency dollar invested in a building adds three dollars to its value.

This paper discusses the initial steps in developing energy savings strategies for businesses, including assessing the true cost of energy on operating costs and the bottom line. Energy audits are examined as a means to implementing a broader energy plan. One cost-effective component of any plan is building automation systems—hardware and software for monitoring and controlling energy use throughout a business.

Next-generation, Internet-based building automation systems provide the most cost-effective means to implement energy savings. This paper describes Luminix SmarterEnergy^{tm} system, a building automation system to reduce energy costs and improve the environment using wireless, Web-based hardware and software. Securing access to government resources, incentives, and grants to implement such business automation systems is also discussed, as well as integration of automation systems with smart metering and the smart grid.

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Introduction

To succeed, businesses need to reduce expenses to improve profit margins, particularly during lean economic times. One expense that lands on business owners' desks every month with little or no scrutiny is the electric bill. Most pay the amount due and move on to the next account payable, believing there is little they can do about energy costs. But virtually all companies can gain greater control of their energy budgets by trimming energy use and reducing greenhouse gas emissions. Few business owners realize how much energy they can save each month. The process begins by eliminating the mindset that electric and utility bills are fixed and cannot be significantly reduced.

In a 2008 study of small and medium commercial and industrial business energy use, the United States Small Business Association found that small to medium-sized companies paid a disproportionately higher rate for electricity than larger businesses or residential customers. [1] In fact, according to the report, "…businesses in the commercial sector faced a 30 percent price differential for electricity." This means that businesses are paying the bulk of the country's electric bills and will bear the brunt of anticipated rate increases in the coming years. If cutting today's energy costs is not incentive enough to develop new energy strategies, rate increases certainly will convince any business to take another look at its energy use.

Viewing energy efficiency as a business advantage, the California Efficiency Partnership found that companies that deploy energy-saving strategies outperform their competitors by 10 percent.[2] This higher productivity level goes beyond simple cost-cutting: Companies with proactive energy policies are more motivated and better strategically positioned than competitors.

In fact, according to a report by AMR Research, businesses must begin to look at asset management in a far broader sense, incorporating energy management as well. From the intense electricity demands of data centers to manufacturing shop floors, businesses can gain strategic marketplace advantage with better energy management. [2]

Businesses also impact the environment through the energy they consume. As small to large businesses consume over half of all electricity in the U.S., greenhouse gas emissions and reliance on fossil fuel-generated power could be cut dramatically if every business in the U.S. made even moderate cuts in their electricity use. [3]

But Where Do Businesses Start?

Commercial businesses of all sizes have their hands full competing for customers, containing costs, and staying profitable. Few, if any, have expertise in energy conservation or energy efficiency. Understandably, they are focused on their core competencies, such as running a restaurant, manufacturing products, or providing services to their customers. It is not surprising that most business owners and managers have little idea how to begin containing their energy costs. In order to develop and get the maximum benefit from an energy strategy program, business owners need to remodel the way they think about their businesses.

The first step toward this change is education. In particular, business owners need a clearer picture of their current energy usage. Owners should first assemble a chronological history of their utility bills and total up how much is spent for energy over one, two, or even three years. In itself, this can be a financial and environmental eye-opener. Managers will see the effect of utility costs on their annual bottom line not only in dollars and cents, but also in the number of kilowatt hours of electricity they consume. In fact, energy costs can be 30 percent or more of a building's operating costs.[4]

Once businesses gain a better understanding of how much energy they use and what it is costing them, they can begin to develop a strategy for conservation, but even more information is needed before companies can formulate a cohesive energy strategy.

Businesses may not know where to begin to make improvements, particularly changes that may have an impact on their business. How do companies determine the most efficient use of electricity when so much of their day-to-day operations depend on it? Should they turn down lights, cut back on displays or computer use, or reduce off-peak air conditioning and heating? But what are the potential negative business consequences of these actions? Furthermore, companies may not be able to determine where the bulk of their energy is being consumed, and how much energy individual appliances, fixtures, and HVAC systems are using. Many of these "energy sinkholes" are hidden and not readily obvious, such as inefficient computer peripherals, wasted stand-by power, or lighting fixtures. Knowing precisely what will have the most impact on reducing energy use is critical before making investments.

Independent Energy Audits

Fortunately, independent energy audits by licensed contractors can help businesses sort out exactly where their energy is being used and which uses could most benefit from energy efficiencies.

Energy auditing engineers can inspect the building shell, lighting and fixtures, HVAC, and other premises equipment such as office and manufacturing machinery. The result of a detailed audit may include specific recommendations for improvements or a range of options that provide the most energy savings for the site. This provides businesses a blueprint for taking action. Many state governments now offer energy audit assistance for businesses for precisely this purpose.

Infrastructure Upgrades

As a part of an energy audit, engineers may recommend infrastructure changes such as weatherproofing, HVAC replacement, additional insulation, or other facility upgrades. Many of these solutions, particularly new HVAC systems, are costly. Because many businesses do not have the capital required to make such infrastructure upgrades to their facilities, companies need to perform calculations to determine the return on investment for these infrastructure improvements.

Other improvements may be less costly financially but carry a heavy burden on day-to-day operations. Weatherproofing, insulation, rewiring, and other upgrades may completely disrupt business for a period of days or even weeks during installation. Owners and managers need to factor these intangible costs into potential projects.

In addition, many businesses lease rather than own their property and may have no right or opportunity to make substantive physical changes to the premises. Even if rental agreements allow infrastructure improvements by the tenant, the benefits fall to the lessor if and when the tenant company moves.

For all these reasons, many infrastructure upgrades may not be the best initial investment for reducing energy consumption for most businesses.

Building Automation

According to industry analysts at the Yankee Group, "Enterprises and governments are increasingly relying on M2M (machine-to-machine) technologies to help meet energy and environmental challenges, as energy costs and environmental concerns escalate." [5] A major component of this emerging M2M marketplace is building automation. Perhaps the single most cost-effective way to save energy is automated energy monitoring and management. Building automation systems (BAS) integrate with lighting, HVAC, and other electrical systems to track usage and, after a period of analysis, to automatically control electricity to key components in the building for optimum efficiency. These systems are typically wired into the existing electrical network, with sensors and controls installed throughout the building.

BAS have the advantage of costing far less than most infrastructure investments and may yield a far better return over a shorter period of time. Annual energy savings, depending on the type of business and condition of the building, range from 5 percent to as much as 20 percent according to a report in *Buildings* magazine.[6]

A Bevy of Drawbacks to First-Generation Building Automation Systems

One of the chief disadvantages of many first-generation building automation systems is the high level of disruption caused by installing the sensor and control systems, as well as the maintenance and protection of the BAS network. Wiring and rewiring nearly every electrical device in a building may take weeks. In older buildings, walls need to be cut to lay network cable. In most communities, construction of this kind requires building permits and on-site inspections to make certain the wiring is done properly and doesn't pose safety issues or violate local building codes.

Additional drawbacks include:

- Housing and maintenance of a dedicated central computer on the premises
- Complex operating system which requires time intensive training along with weekly and manual system maintenance
- Expensive equipment upgrades, modifications, and a high degree of obsolescence.

The Alternative: Wireless and Web-based Building Automation Systems

Monitoring and controlling electricity usage through automated systems has clear benefits, but hard-wired systems or those that use complex software and expensive on-site computer servers have many limitations.. Next-generation systems using wireless sensors and switches with Web-based interfaces, deliver all the expected results of automation systems without the drawbacks of hard-wired solutions. With wireless, Web-based solutions, invasive installation of wire runs and costly computer servers are eliminated.

The Luminix SmarterEnergy System

SmarterEnergy is a wireless, next-generation energy management system that is easily deployed in any commercial building. Customers currently using SmarterEnergy have reported energy savings from 15 to 25 percent with virtually no disruption to their business, no construction, and no complicated software training required. Because it is Web-based, SmarterEnergy does not require a dedicated server on the premises, thereby saving equipment costs, space, and system maintenance time.

Energy Audit, Site Plan and Installation

The first step in the Luminix SmarterEnergy process is an energy audit by an independent energy engineer who performs a thorough energy assessment of the business premises, including building shell, insulation, windows, fixtures, machinery, and HVAC systems. The audit is critically important in determining the best energy plan for each business and its unique architecture and business activities. A thorough audit may cover the following:

- A preliminary site analysis to collect general building data such as location, size, types of uses in specific building areas, and sources of energy.
- An analysis of utility bills and top-down examination of the building infrastructure to determine overall efficiency of the building shell, insulation, windows, and entryways.
- Test metering of major appliances, machinery, and HVAC equipment during non-business hours to provide baseline measurements of energy efficiency. Comparisons can then be made for the equipment when used during normal business operations.
- Some businesses may require multiple metering and readings to determine fluctuations in energy consumption throughout various areas of the building under a range of conditions.

Because each business is unique, the detail and breadth of the audit is dependent on not only the type of activity in the business—a restaurant versus an accounting firm, for example—but also the age, size, and construction of the premises. Obvious methods for improving a site may yield negligible returns, while hidden faults may be the source of tremendous energy losses; therefore, only a thorough audit can provide the groundwork for a successful energy strategy.[7]

Armed with the detailed data from the energy audit gathered into one synchronized application, Luminix engineers, in consultation with the building owner, develop a site plan for the automation system. The engineers can determine which systems will yield the greatest energy savings and map out the location and function of all proposed wireless sensors and switches. In a final planning meeting with the building owner, engineers explain the installation process, estimated completion date, and what the business can expect in terms of potential savings and efficiencies.

Once plans are approved, the hardware installation team, usually during off-peak hours, installs the wireless monitoring and control system throughout the building. Off site, the software team creates the custom tailored Web-based monitoring and control software for the building on a Web server at a secure location and sets up the link from the building site to the Internet. The entire installation of wireless hardware and Web-based software usually requires only a few days.

> ***"In our initial pilot program, the goal was to monitor and reduce our energy costs, but maximize the return on investment," said Steve Socrates, Operations Manager at a top-ten fast food franchising group with 30 outlets. "Luminix provided a system (SmarterEnergy) that significantly decreased our buildings energy consumption without sacrificing the comfort of our employees or customers. To date, we've saved over 21% on our historical utility bills in over thirty site locations."***

Business Benefits

Wireless energy monitoring and automation systems have many advantages beyond the 15 to 25 percent savings in energy costs. Wireless systems are less expensive to install and manage, have a shorter return on investment, and lay the foundation for next-generation energy systems that utilize high-efficiency HVAC, lighting, and appliances.

Depending on the size and scope of the monitoring and control installation, automation systems can realize a payback in two years or less. Wireless systems not only have a lower purchase and installation cost than first-generation automation systems, but they also require less ongoing maintenance. Because Luminix SmarterEnergy is managed with a user-friendly and intuitive Web-based interface, customers require far less technical support or training.

If customers own their building, SmarterEnergy adds resale value to the property. Potential buyers will be more attracted to property that is energy efficient. If the premises are rented, the Luminix wireless components can be easily moved for use at a new facility.

Easy Management

SmarterEnergy is operated through a secure, Web-based interface, so business owners or managers can log on to monitor and control their buildings through any Internet connection anytime, anywhere. All data is stored and backed up via a central repository. No complicated

servers or on-site computer hardware is required. When new capabilities or upgrades are released, Luminix offers seamless updates to the Web application —with no complicated re-installations or fees for engineering site visits.

The Luminix SmarterEnergy Web-based management interface.

The system is easy to use and provides customers with a wealth of data, including dynamic reporting and controls, long-term analysis of systems, and automatic or manual control of appliances, lighting, fixtures, and HVAC systems.

With system operation and control running on a secure, off-site server, users never have to worry about the safety of their data or the 24X7 availability of their energy control systems. The Web server application is housed at one of the nation's most reliable and trusted Internet hosting sites.

Ready for the Future

Luminix SmarterEnergy software is based on open software standards and is capable of integrating to smart metering and smart grid technologies in the future. Once fully deployed, the nationwide smart grid will ease spikes in demand, prevent outages, and help move energy more easily across the country from point of power generation to businesses and homes. Many smart grid capabilities are dependent on smart metering, which is a new type electricity meter that automates the distribution and measurement of electricity use. The Federal Energy Regulatory Commission (FERC) tracks regulations and makes recommendations concerning the development and deployment of smart metering throughout the U.S. In its latest report, FERC details the installation of hundreds of thousands of smart meters throughout the U.S. [8] The key data suggest that most of the U.S. is trending towards smart meter technology in the near future. Only open standards platforms, such as those used by Luminix, will easily interface with this next-generation power grid. Other automation systems may require costly retrofits to take advantage of smart grid and smart metering benefits.

In addition, potential mandates on carbon emissions and carbon offsets will require companies to keep extensive, verifiable data on their corporate carbon footprints. As a result, Forrester Research predicts companies must deploy energy management software that easily interfaces with enterprise carbon and energy management (ECEM) systems.

Green Incentives

In addition to cutting energy costs, businesses make a positive contribution socially and environmentally when installing a Luminix energy automation system. Buildings across the United States account for over 39 percent of CO_2 emissions and 40 percent of all energy use.[9] For these reasons, businesses that reduce energy consumption will help protect the environment. In many cases, federal and local agencies are now mandating specific energy-efficient measures that businesses and commercial properties must meet in the coming years.

Recognizing these realities, state, local, and federal agencies have launched a number of initiatives, tax incentives, and monetary grants and awards to assist businesses in upgrading the energy efficiency of their facilities. For example, energy tax incentives for buildings are available through the federal government; energy audit incentives are being offered by state offices; and the Department of Energy provides grants for energy efficient construction. Luminix, with its extensive expertise in energy system design and deployment, can provide valuable consulting services to businesses in identifying and applying for appropriate government programs.

Conclusion

Businesses today are especially vulnerable to high electricity rates and rate increases, yet many solutions for decreasing electricity use require significant capital investment—money businesses cannot spare. While building automation systems deliver the best return on investment for cutting energy costs, many existing systems require significant construction, permits and inspections, need ongoing maintenance, and disrupt normal business activities. Due to these challenges, the vast majority of companies have taken little action over the last decade in building automation.

On the other hand, next-generation systems such as those offered by Luminix present the following benefits:

- Energy savings of 15 to 25 percent
- Fast hardware and software installation
- No business disruption
- Easy management and low maintenance
- Web-based interface, no complex server equipment on premises
- Equipment portability
- Short payback period with high return on investment
- Easily track why, when, and where money is spent on electricity
- Centralized system to obtain significant benefits in operational and energy efficiency
- Ready for smart grid and smart metering next- generation power systems.

The Luminix SmarterEnergy solution includes a comprehensive building energy audit, detailed site plan, hardware and software installation, and ongoing support of its building automation systems. For the first time, Luminix customers have control over their electricity costs. The Luminix energy audit, while a critical part of the automation system installation, is also a good starting point for businesses to make further energy efficiency modifications to their property, saving even more money and making even greater contributions to the environment. Studies show that for every $1 invested in energy efficiency, asset values increase by an estimated $3, making energy systems a prime means for raising a building's market value.[3] In the end, green buildings are not just good for the environment — they are a solid business investment.

About Luminix

Luminix is a next-generation building automation company based in Chicago, Illinois. The company is focused on serving the unique energy and environmental needs of its customers by providing energy solutions that save money and energy while increasing the value of commercial buildings. Luminix SmarterEnergy installations run the gamut of small retail stores and restaurants to large corporate buildings throughout the United States. Luminix software, at the heart of the Luminix SmarterEnergy automation system, is a proprietary, Web-based energy monitoring and automation package built on open standards, giving its customers a clear path to future enhancements and breakthroughs in energy management.

Contact Information

For more information, visit www.luminix.com or call 312-243-9380.

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