Monitoring Energy Use: The Power of Information

Seize cost-saving opportunities and improve building performance with a proven solution.

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Make the most of your energy

Schneider Electric

Summary

I. You Cannot Manage What You Do Not Measure

Reducing energy use and waste is now widely seen as being good for business, as well as good for the environment. However, executives typically do not have the information they need to make informed, proactive decisions about their facility's energy use. Energy initiatives too often are one-time improvements that are not monitored and measured properly over time. As a result, the benefits of these improvements are soon lost. The key to improving and sustaining energy use is providing executives with the right information, so they can make informed decisions that balance energy use with other objectives such as building comfort and employee productivity.

Energy Remote Monitoring is a proven solution that delivers a visible impact to the bottom line. Using Web-based technology, energy remote monitoring delivers information, analysis, and guidance that allow executives to understand their energy use, take appropriate action, and continually improve energy efficiency and building performance.

II. The Link between Economic Success and Environmental Responsibility

At one time, corporate executives considered environmental concerns secondary to, or even opposed to, running a profitable business. Not anymore. Most firms recognize that economic success is intertwined with environmental responsibility, and nowhere is this more evident than in energy use. Reducing energy use is "green" for both the environment and business. Consider the following statistics:

- The European Builders Confederation estimates that energy use in buildings is responsible for about 40% of final energy consumption in the E.U.
- The U.S. Green Buildings Council estimates that commercial office buildings use 20% more energy on average than necessary.

Fortunately, there are many ways to cut energy costs in business facilities. Equipment efficiency can be improved to limit the use or consumption of energy. The facility itself can be improved and controls can be utilized to limit the loss of energy and conserve electricity. Reducing energy use, as well as energy loss due to leakage and waste, can significantly reduce the cost of running a facility.

Knowing the bottom-line impact is one thing; having the information needed to manage energy costs is something else. In many companies, the capability to evaluate and utilize energy information may not exist. Energy data may be available, but often is not presented in a way that enables business leaders to make improvements that can deliver an acceptable return on investment.

Economic success is intertwined with environmental responsibility.

This combination of factors—the economic importance of energy and the lack of actionable information—leads many companies to partner with an energy specialist to help them identify, evaluate, and act on key energy initiatives. Such a partnership can bring not only tangible economic benefits, but many intangible benefits as well, such as corporate social responsibility and enhancing market perception.

Table 1 outlines many of the benefits of energy-related facility improvements that can be achieved when C-level executives have the information they need to manage energy, as they do other aspects of business.

Tangible	Intangible
• Energy savings	• Occupant satisfaction
• Operational savings	• Occupant comfort
• Personnel savings	• Productivity
• Time savings	• Goodwill
• Reducing occupant complaints	• Environmental impact
• Property value	• Social responsibility
• Avoiding lost business	

Table 1:
Benefits of Energy-Related Facility Improvements

III. What Should You Measure and Why?

Tracking passive and active improvements

One challenge in managing energy use is that not all improvements require the same oversight. In general, energy improvements can be grouped into two categories: active and passive. A minority of improvements are passive, such as insulation or LED “Exit” signs. These deliver the same results without any adjustment, calibration, lubrication, or monitoring. The only question is whether they are there, or not. Checking on their existence requires only minimal effort.

Most improvements, however, are active, meaning they require periodic action in order to continue delivering a benefit. Active improvements include awareness programs, lighting schedules, economizers, automated flushers, and many other activities that require attention and ongoing maintenance after the initial project checkout.

Unfortunately, active improvements can be easily derailed by inattention. They can be stopped, turned off, bypassed, corrode away, or simply be forgotten. All benefit is then lost, and the result is potentially poorer performance than if no attempt was made in the first place. Any energy plan needs to go beyond the initial planning and implementation stage, and include a long-term strategy for monitoring and sustaining the improvements.

Active improvements require ongoing monitoring to sustain benefits.

Does it work?

The basic question for any energy improvement is, “Does it work as designed?” This is the building block for sustained benefit and continuous improvement. It is expected of any project, yet all too often left for another day. Both passive and active improvements need to pass this hurdle. For passive improvements, however, this is the extent of any measurement needed, and then sustained benefit is assured.

Active improvements must continue to revisit this question. For example, the proof of an improvement, such as time scheduling, can be the creation of time schedules in building spaces and on equipment. Initial operation can demonstrate implementation, but does nothing to show that a strategy is still in place and working a year from now.

Continuous improvements

Just as “you can’t manage what you don’t measure,” you can’t improve it either. Businesses have embraced programs, such as Six Sigma, in order to better respond to their customer’s expectations. Customers have expectations of their building environments, so continuous improvement approaches apply to building environments as well. The same strategies and data measurements used to show a strategy is working, can also help determine and prioritize further improvement.

IV. Valuable Information and Actionable Measures

The key to energy management is, of course, actionable measures based on real information. But top-level energy metrics are the culmination of daily operations and many decisions made by people, processes, and technology. By the time a top-level issue is recognized, it can already be costly. What strategies deliver the information to act, before a problem develops? In practice, a combination of methods will produce the information to assess and control an active improvement without becoming overly expensive.

Measurement methods take the following three general forms:

- Comparison
- Indirect measurement
- Direct measurement

As long as the measurements are taken on a regular basis, over time they show trends, which can be periodically reviewed to determine if the improvement is performing as intended. The measurement method that is selected depends on the level of information required.

	Level	Metering System	Data Requirements
1	Comparison	Monthly bill comparison	Finance/Administration department
2	Indirect measurement	Building management system	Maintenance/Engineering department
3	Direct measurement	Metering and sub-metering	Billing use to individual departments, integrated with business

Comparison

Comparison methods compare the current measurement with a previous period. For building environment measurements, complexities such as the weather, changing operational hours, and building uses may be a cause, but these factors make it difficult to use this method. There are services and software on the market that model the building and account for these complexities, but the model must be kept accurate in order to be effective.

Bill comparison is simply comparing the current bill with last month's bill or the bill produced a year ago. This method will indicate how a program is performing, but doesn't usually deliver information about which improvements are still working. It shows overall performance of large projects or those with interrelated improvements, but won't show what other effects are occurring, for example how energy use is affecting productivity or operating improvements, such as maintenance.

Indirect measurement

Many measures can be taken indirectly, based on assumptions. Impractical or expensive measurements, cost or time constraints, and unknown conditions all contribute to the need to take this approach.

Indirect measurement is effective when any assumptions and measurements for a performance metric have little impact on the metric. In the lighting example used earlier, the consumption is the total wattage of all the lamps multiplied by how many hours they are on. In this case, the only measurement needed is total current (amperage), because voltage can be assumed unchanged. If the amperage is higher than it was right after removing lamps, more lights were added or the wrong lamps were used.

Control systems are capable of logging measurements over time. This requires that the device is wired to or somehow controlled by the control system. The system logs a time-stamped

measurement, which becomes available on one or more system reports. For example, we might need to determine if a scheduling strategy is still in effect. A look at logged amperage readings over time or the on/off events may show if the scheduling strategy remains in effect.

Looking at events reported to a control system is also effective for devices that automatically respond to an event. If an access-control system logs room occupancy, then runtime for the lights and possibly exhaust fans is available if they have been turned on because the room is occupied.

Direct measurement

Direct measures show the performance directly, without assumption. If the performance in a critical room is to be 68°F +/- 1°F, that can be inexpensively measured and reported. There are a wide variety of manual and automated sensors for these measurements and a host of systems to record the data produced by them. Measurements can also be captured without automation, as a part of regular maintenance.

Installing a meter on a sub-circuit or component of a system gives a direct measure of that system's performance. For instance, it may be desired to operate a warehouse under different environmental conditions than the associated office area, which is using an energy awareness program. Sub-metering the electricity consumption in the office area would demonstrate if the energy awareness program was effective in motivating personnel to turn off the task lighting and PC equipment at the end of the day.

Sub-meters can isolate a specific building area to show if a behavior program is beneficial and should continue. Where the expected change is less than 10% in each specific building area, comparing bills will not be accurate. Variations in the month-to-month consumptions, billing periods, and estimated bills make it impractical for use.

V. Which Methodology Should You Use?

Choosing a methodology will depend on the size of the project and the degree to which results can be impacted. For example, a small project may only justify an indirect measurement. An example of an appropriate use of indirect measurement would be using runtime data from a BMS coupled with assumptions to measure change in kW.

On the other end of the spectrum, if one meter measures electrical use for a large complex and the energy project is for just a single building, then bill comparison does not make sense because the improvement in one building will not likely have a significant impact on the entire utility bill of the complex. A direct measurement, such as adding a sub-meter, would make more sense in this situation.

VI. Information You Can Act On

Buildings are dynamic entities, with constantly changing needs and occupancy. One-time energy audits show only a snapshot of energy use and monthly utility bills only act as a “rear-view mirror.” Busy operations staff may not have the time, tools, or training to analyze monthly/annual energy use and investigate causes.

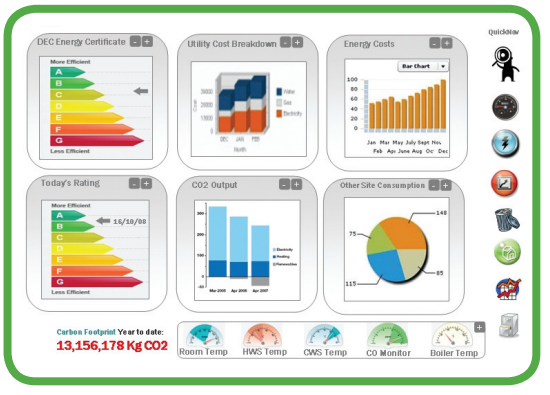
Because of the complexities of energy use and its large economic impact, a growing number of firms are turning to Energy Remote Monitoring to provide the technology and know-how to guide, measure, and help manage energy costs. Using a Web-based system, Energy Remote Monitoring automatically collects energy consumption data via smart meters, data loggers, the BMS, and network controllers, or directly from an organization’s utility provider. Information is provided about your building’s energy reporting, alarming, and monitoring, as well utility analysis for electricity, gas, heat, steam, oil.

Monitoring your energy use can provide up-to-date information on energy use and carbon emissions so companies can identify energy conservation measures, adjust usage quickly, and reallocate savings where needed. Energy engineers can monitor a building’s energy efficiency and actively look for opportunities to further energy-saving opportunities. In addition, energy alarms can be investigated and long-term trends analyzed to help sustain reduced energy consumption efforts.

VII. Customization and Flexibility

When selecting an energy monitoring system, look for a system that provides the ability to report and analyze the data, as well as help the customer take action and improve performance. A variety of communication methods can provide the information that you need in the most cost-efficient way possible. These methods could include IP, autodial, and cellular connectivity. Your system should also be designed to send email alarms to key users if, for example, there is an excessive variation in demand, showing the difference in consumption and cost. Data from a specific meter can be compared from different intervals, for example, by day or by month, or several meters can be compared over a specified period.

Customized reports are key to providing the right information to the right person at the right time. For example, the CFO may be concerned with total cost and carbon emissions, while the CFO may need to see costs compared to budget. The Facilities Manager would be most interested in load profiles, total consumption, and cost savings. A high-level dashboard can provide executives with a holistic view of energy use across facilities, as well as allow the Facility Manager to drill down into details such as goals vs. actuals, month-to-month comparisons, and more.



Typical ERM Dashboard

Case Study: Westom Macau

In the extremely competitive environment of luxury resorts, the Westin Macau in China must create a superior guest experience while aggressively monitoring gross operating profit (GOP).

The key metric for this upscale hotel is occupancy, and the facility's chief engineer closely monitors the energy use of unoccupied areas. Even with the impact of dramatic weather fluctuations and the resort's focus on a very high level of guest comfort, the TAC solution has delivered between 1,602,499 MOP$ ($200,000 USD) and 2,003,124 MOP$ ($250,000 USD) in energy savings annually since its installation in 1995. Monitoring, control, and management of the Westin Macau's energy use and loss have added to the resort's GOP in dollar amounts that the Westin's CFO can see.

The measures have also increased the ease of operating the resort for the staff, which in turn has led to a decrease in the number of guest complaints and an increase in guest comfort.

VIII. TAC Energy Remote Monitoring: A Proven Solution

With rising utility costs and shrinking operational budgets, it has become a vital necessity for organizations to reduce their energy bills. Yet while most companies have large amounts of energy data, executives find they do not have the actionable information they need to make early and informed decisions that would reduce costs and avoid waste.

Instead of one-time energy improvements, companies need to focus on sustaining and improving energy use over time, and this requires continuous monitoring, analysis, and reporting of building performance. TAC has installed more than 4,900 meters that proactively monitor and measure energy performance.

Over 200 businesses in 10 countries have benefitted from TAC Energy Remote Monitoring, since its development in 2004.

TAC ERM is a **proven** solution for gathering and reporting energy data, resulting in **cost-saving opportunities** and **improved**

TAC Energy Remote Monitoring is a proven solution that uses Web-based technology to gather and report on a company's energy data, combined with the expertise to advise and guide companies on how to take action, seize cost-saving opportunities, and continually improve performance. This approach results in significant energy savings and a visible impact on the bottom line.

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On October 1st, 2009, TAC became the Buildings Business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

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