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Better Building Management with Power Monitoring



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Introduction

Building management systems (BMS) have become commonplace tools to help building owners and managers oversee and control heating, ventilating and air-conditioning (HVAC) systems, along with lighting and other large electrical loads. Drawing on data from occupancy and daylighting sensors, along with programmed occupancy schedules, a BMS also can optimize when and how connected systems operate, boosting overall building efficiency.

However, despite their current sophistication, some BMS offerings overlook a key element in any building's daily operations, which is the condition of the electrical distribution system supplying the HVAC and lighting equipment the BMS, itself, controls. As a result, facilities personnel might be missing key indicators of problems that could be reducing the energy efficiency the BMS is meant to improve – or even damaging fan motors, lighting ballasts and other expensive devices that are critical to how well a building functions.

Pairing a BMS with a power management system can bring such overlooked issues to light, leading to both improved operations and greater occupant satisfaction.



Building management systems have become commonplace tools to help building owners and managers oversee and control heating, ventilating and air-conditioning (HVAC) systems.

Pairing a BMS with a power management system can bring such overlooked issues to light, leading to both improved operations and greater occupant satisfaction. These systems include meters to measure both energy consumptions and other electrical parameters, along with software that analyzes data the meters generate and presents it in an easy-to-understand format for facilities staff who aren't electrical specialists.

This eGuide describes the components and capabilities of today's power management systems and offers examples of how they are aiding BMS operations. Read on to learn how a power management system could green-up your building's operations along with your bottom line.



With a BMS (Building Management System), Get Greener and Improve Power Quality

Author: [Chris Collins](#)

It's not easy being green, a point first made by a [talking frog](#). Building owners and managers can become environmentally and financially greener by monitoring electricity and its usage. Doing this correctly requires tracking a variety of key building metrics, a challenging task that can help achieve a goal of greater sustainability. It also can pay off in terms of reduced expenses and longer equipment life. Finally, it can enable the extraction of value out of building data, creating opportunities for preventive maintenance and uncovering information for business level decisions.

First, consider the challenge. A typical building management system (BMS) handles, among other things,



Building owners and managers can become environmentally and financially greener by monitoring electricity and its usage.

HVAC, or heating, ventilating and air conditioning. These systems are often among the biggest energy consumers in a building and so maximizing their efficiency can lower operating costs.

A BMS can make a facility greener by adjusting room temperature based upon occupancy or usage pattern. Doing so can save a [percent of HVAC energy consumption for each degree of setback](#) over an eight-hour period. The result of this and other adjustments can add up to a 30% energy savings overall.

However, that is only part of the total picture and ignores an important aspect: power quality. What happens as HVAC systems cycle on and off? Lights may flicker, a visual indication of the effect of switching large loads. What's more, there can be a host of other factors that impact electrical quality, with some of these issues likely to grow greater over time. For instance, regulators warn that increasing the percentage of renewables [may lower electrical quality](#) because renewable supplies are often variable.

These internal and external factors have an effect on the health of a building's power. The result can be harmonics, voltage disturbances, and faults. Such problems can be fixed or at least mitigated if what is happening is known.

Now, let's look at the payoff. First, power monitoring can reduce operating expenses by reducing power consumption and improving energy accountability in non-critical systems. Depending on the situation, some of these savings will benefit building owners while others will advantage tenants. Turning off office equipment at night or

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With a BMS (Building Management System), Get Greener and Improve Power Quality (cont.)

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installing systems that idle vending machines when no one is around can save up to [\\$300 per year per piece of gear](#). Office and IT equipment, in particular, represent fertile ground for energy savings. For instance, the typical server can be effectively idle yet drawing full power the entire workweek, thanks to [operating at only an average 18% of capacity](#).

On demand energy information can enable building owners to ensure the safety and performance of facilities.

There is another aspect to reducing expenses. Power monitoring can detect faults and thereby avoid problems, which helps protect costly office and IT equipment. In the extreme, an electrical disturbance can kill equipment, but even less severe issues can shorten lifespans. Monitoring can supply the information to diagnose such problems, saving money in multiple ways and improving the satisfaction of building occupants.

As can be seen, on demand energy information can enable building owners to ensure the safety and performance of facilities. It also can allow them to optimize buildings for the comfort of employees and customers.

Electrical system monitoring may help achieve sustainability and financial goals, but adding such a capability is not

possible with most building management systems. Hence, getting greener in this way has, in the past, taken too much green. The cost of a power monitoring system has often been too great.

Importantly, power monitoring is not beyond the reach of every BMS. There is a trend in building management systems to integrate backend solutions so that information from disparate systems is displayed in a single pane of glass. A BMS that has embraced this approach can offer the ability to monitor electrical power and systems in a well-understood, cost effective, convenient and simple interface. Consequently, the real-time health of the electrical network can then be easily displayed and comprehensive reports on energy usage generated.

For an example of what can be done, check out [Power Manager for SmartStruxure solution](#). It combines Schneider Electric's expertise in building management systems and power management. Together, they help derive greater value out of building data, while satisfying the business imperative to control costs and mitigate risks.

It's also a combination that makes it a lot easier, in many different ways, to be green.



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Elements of Power...Power Management for Buildings

Author: Carol LaRosa

In the previous article, I discussed the idea of adding power management capabilities to your building management toolbox and the various benefits it can bring even to buildings with non-critical power needs, including lower electricity costs, improved equipment performance and help with equipment maintenance. In this article, we'll walk through the components that make up a power management system and some deployment options.

The system consists of power meters for metering the energy consumption and monitoring the other electrical parameters, as well as software for pinpointing issues and viewing, reporting and analyzing power usage.



To manage power, you need to measure power, and for that you need meters.

Implementing these features may be easier than you think and well worth the effort.

Meters – the foundation of the power management system

To manage power, you need to measure energy, and for that you need meters. Power management systems typically use two types of meters, the first being energy meters (also called PMD1 according to IEC 61557-12), measuring energy consumption. As the name implies, they measure the quantity of energy flowing through any part of an electrical system. They can correlate energy use to equipment performance and identify consumption trends as well as anomalies that could signify problems.

On the other hand, some devices such as power meters (PMD2 or PMD3 according to IEC 61557-12) can measure energy consumption and also monitor electrical parameters (frequency, voltage, unbalance, power and power demand, unbalance, current) while some devices such as power quality instruments can measure anomalies that affect the quality of power flowing through a building. Common power disturbances such as voltage dips, harmonics and transients can all have negative impacts on electrical systems and equipment, including power outages, damaging devices and equipment, and degraded performance. (Read more about the different types of meters and how to choose those best for your facility's needs in our free [Power Meter Selection Guide for Large Buildings.](#))

Power management software

Power management systems can operate either as stand-alone entities or they can be embedded in an

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Integrating power management in a BMS provides additional benefits, including convenience and efficiency.

existing building management system (BMS). Stand-alone applications will provide centralized visibility of power use. Capabilities may include dashboards for real-time visibility of energy use, alerts for out-of-norm conditions, reports for compliance and management reviews, comparisons across facilities, and analytics for deeper insights.

Integrating power management in a BMS provides additional benefits, including convenience and efficiency. This is a preferred option for buildings with non-critical power needs, such as commercial office buildings, and educational and retail buildings. It makes power information more accessible to facilities personnel who may not have extensive experience with electrical systems.

Power management deployment options

In terms of how it's deployed, a power management system can be rolled out all at once or phased in over time, which makes it more affordable. Either way, first you'll want to identify the core areas to be measured and review any power management capabilities that are already in place. Otherwise, placement of monitoring may depend on the



Power management systems can operate either as stand-alone entities or they can be embedded in an existing building management system.

biggest areas of concern. If it's energy bills, you'll monitor the incomer meter, for example.

Learn more about how to implement a power management system and the benefits it can bring, download the free Schneider Electric white paper, "[The Impact of Power Management on Building Performance and Energy Costs.](#)"



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Embedded Power Management in Action

Author: Carol LaRosa

By now, the features of power management – specifically power management that’s embedded in a building management system – are clear. If a refresher is needed, take a look at these articles: Empowering Building Performance and Elements of Power.

Given that HVAC and lighting, which consume more than half of a building’s energy, are affected by power, it makes sense to incorporate power monitoring and management – including in those facilities with non-critical power needs, such as office and retail buildings and educational campuses. That’s nearly [half the buildings](#) in the world!

An integrated power and BMS system helps both electrical and mechanical systems run better. That’s because mechanical and electrical systems traditionally reside in separate data and operational silos. But when power management is embedded into a BMS, managers can monitor electrical systems in the same way they manage HVAC systems, with a single set of data, alerts and reports. Such an integrated system makes it easier to determine



Buildings with noncritical power needs, such as office, retail or educational facilities, can benefit greatly from power monitoring and management.

if the root cause of an equipment problem is due to a mechanical issue or to an electrical issue.

Take the example of how power monitoring can help troubleshoot a mechanical issue. Say a building’s chiller is running more than it should, and thus consuming more energy than it ought to. The building facility manager would likely notice the situation and send a maintenance crew to investigate. If the chiller is failing for some mechanical reason, they would be able to fix it. But if the problem is a power quality issue,

neither the facility manager nor the maintenance crew would have any visibility to the issue without a power management system in place. Without it, they’d have to rely on guesswork and potentially fruitless repair efforts.

Embedded power management systems can provide a number of other benefits, including improving equipment performance by identifying power problems that can cause HVAC and other equipment to run hot or inefficiently. They can also prevent loss of system capacity due to common power quality issues such as [harmonic distortion](#), which can easily result in a 25% loss of capacity in a transformer, for example.



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The systems also help organizations track electrical load profiles to identify early signs of trouble, such as changes in typical power usage patterns that may indicate equipment malfunction. They can also tip off facility managers to equipment that's showing signs of wear or that need repairs.

An integrated power and BMS system helps both electrical and mechanical systems run better.



Power monitoring enables building management, operations and maintenance teams to see how different building systems and equipment affect the electrical system.

In summary, power monitoring enables building management, operations and maintenance teams who are not electrical experts to see how different building systems and equipment affect the electrical system. It also highlights how different systems and equipment affect each other. This visibility allows facilities staff to detect and resolve problems more quickly, minimize electrical waste, and operate the building more efficiently. For inspiration, read how [Lake Land College](#) in the US is integrating HVAC and power management to help create an efficient and productive learning environment, as well as educating a new generation of energy stewards!

Also learn more about the benefits and features of embedded power management in the free Schneider Electric white paper, "[The Impact of Power Management on Building Performance and Energy Costs.](#)"



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Non-Critical Buildings...Critical Information

Author: [Aubrey Oates](#)

Power management is essential in critical buildings such as data centers or hospitals where data and lives are kept safe...but what can a power management system bring to a non-power critical application such as a commercial building or college campus? The answer lies in the information the power and energy management system can provide to the facility managers and maintenance staff:

- **Information to plan for Building Maintenance**

Most facility managers would like to have data that helps predict building maintenance needs. As equipment ages or begins to fail, it uses power differently, making it easier to see which equipment is not running at peak performance.

- **Information to plan for renovations**

When a building goes through renovations, data from a power management system takes the guesswork out of determining whether new service drops are needed and where they should be placed.

- **Information to reduce Energy Costs**

With ongoing changes to the structure of [power pricing](#), the ability to analyze energy bills and reduce costs is an essential part of a facility manager's job. A power and

energy management system can be monitored throughout the month to make adjustments and avoid unnecessary additional fees.

- **Information to develop and track Energy Conservation methods**

Many facility managers are also being asked to act as energy managers. Setting and enacting a sustainability strategy is easier with the right data. In fact, many tenants are making it a point to choose locations with [green buildings](#) initiatives.

So, with all the benefits to put power and energy management into non-power critical buildings, what is stopping facility managers from doing so? There is a



For non-critical buildings, power and energy management systems can provide valuable information to facility managers and maintenance staff.



Non-Critical Buildings...Critical Information (cont.)

With all the benefits to put power and energy management into non-power critical buildings, what is stopping facility managers from doing so?

perception that power management systems are too complex and expensive to put into most commercial or retail spaces. Fortunately, [Embedded Power and Energy Management Systems \(ePEMS\)](#) are designed with the facility manager in mind. Power management software is embedded into the BMS, making it a seamless, cost-effective offer that is easily understood by the facility manager and maintenance team. Using the information from an ePEMS, facility managers of non-critical buildings can make incremental changes to improve efficiency, reduce energy costs, and document improvements in their energy conservation programs.



Setting and enacting a sustainability strategy is easier with the right data. In fact, many tenants are making it a point to choose locations with green buildings initiatives.

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Empower Building Performance with Power Management

Author: Carol LaRosa

Power management systems are often used in facilities such as hospitals and data centers, where power use and availability are critical. But nearly half the world's buildings are non-critical, including schools, retailers and office buildings. By not employing a power management system, owners and managers of these facilities are missing out on an opportunity to reduce energy costs and improve the overall performance of their buildings.

Most buildings have a building management system (BMS) that enables them to monitor and control heating, cooling and ventilation systems in order to keep employees comfortable. But a power management system goes a step further, by monitoring the electrical system that supports them. That's a need because from 30 to 40% of all unscheduled HVAC downtime is related to power quality



By not employing a power management system facility managers and owners are missing out on an opportunity to reduce energy costs and improve the overall performance of their buildings.

Power management provides real-time visibility into the properties of a building's electrical supply and helps identify which building systems or pieces of equipment are contributing the most to electrical energy waste.

problems. Such problems have significant consequences, as research by the World Green Building Council shows employee productivity increases by 11% from better ventilation and by 23% from better lighting, while performance suffers when temperatures are too warm or too cool.

It stands to reason, then, that adding power management to a BMS will improve the performance of these systems – and of employees. What's more, effective power management can reduce energy costs.

Now it may be that facility managers are simply not used to dealing with electrical equipment, or that building owners think power management systems are too expensive and complicated to install and use. But that perspective on the need is changing.

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Such systems are focused on managing electrical distribution systems in order to maximize the efficiency and reliability of a facility's electrical infrastructure. They utilize power meters to measure the energy flowing through the electrical system, and to monitor the other electrical parameters. Power management provides real-time visibility into the properties of a building's electrical supply and helps identify which building systems or pieces of equipment are contributing the most to electrical energy waste.

Still unsure if power management is needed in your non-critical building? Consider these questions:

- Do you know where power is being used in your building?
- Does the power use indicate equipment problems or maintenance needs?
- Is your utility company's billing accurate?
- Is there a problem with power quality in the building?
- How do similar buildings compare in their power consumption and what do the variations signify?

Now consider how much time, energy and money could be saved by having such valuable information!

Learn more about how power management systems can help buildings run more effectively and efficiently, download the free Schneider Electric white paper, "[The Impact of Power Management on Building Performance and Energy Costs.](#)"



Employee productivity increases by 11% from better ventilation and by 23% from better lighting, while performance suffers when temperatures are too warm or too cool.

Additional Resources

[Guide to using IEC 61557-12 standard to simplify the setup of an energy measurement plan](#)

[Guide to energy measurement applications and standards](#)

[Power Meter Selection Guide for Large Buildings](#)

