Thought leadership
White paper

Building Management Systems vs Electrical Power Monitoring Systems: Is a combination the right solution for your facility?

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Introduction

It is well known that optimizing power system monitoring and control can go a long way toward enhancing power reliability, efficiency and safety. Today, building management teams are increasingly relying on the combination of two solutions to deliver insight into energy consumption and equipment: Building Management Systems (BMS) and Electrical Power Monitoring Systems (EPMS).

Your facility may already employ a BMS to provide management of the control and monitoring of your core electrical and mechanical equipment. Generally, BMS platforms are used to keep an eye on heating and ventilation systems, as well as lighting, security, fire safety, plumbing and water systems.

Although BMS platforms do not provide the capabilities needed for sophisticated power quality monitoring, they can be used to provide detection of electrical system issues through basic alarm and control notifications. So, why would you need to build upon these capabilities with an EPMS?

The Benefits of EPMS Integration

Even in today's energy-conscious world, many who are involved with buildings do not know where energy is being used or, worse, wasted. Addressing the high cost energy and imperative need for critical uptime have become major keys to success.

Electrical consumption and demand should be closely managed to help address other rising costs that are more difficult to control. To this end, the more effective you can make energy monitoring, the greater impact it will have on your overall system reliability and bottom line.

Although rudimentary monitoring and management can be achieved through an existing BMS system, its ability to function properly is dependent on underlying power distribution systems, IT and environmental equipment, safety and security systems and building controls.

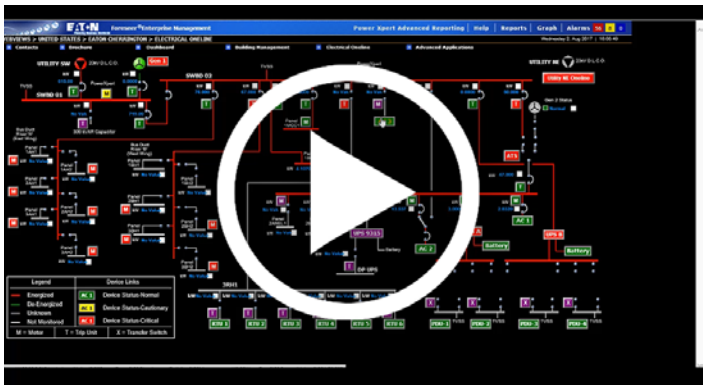
Monitoring and managing these systems is critical to successful and uninterrupted operations. However, most of these systems were acquired from different vendors and often communicate using proprietary protocols.

Solving this challenge, an EPMS provides a communications infrastructure that serves as an avenue by which different, even competing, manufacturers of building products and electrical systems can interoperate – giving users complete insight into real-time energy consumption and trended data.

These EPMS platforms can offer intelligent and detailed power quality data on the electrical distribution network that goes far beyond what is capable with a BMS. By providing detailed analysis and reporting on power quality and other important metrics, users can perform detailed analysis to optimize energy use and identify opportunities to reduce electrical power consumption

Powering Business Worldwide

Figure 1. An EPMS system should provide an user-defined overall view of your power consumption



Video 1. An EPMS should provide once per second sample rates, helping with failure analysis

Today's EPMS platforms also provide full-scale integration of third-party products and other critical facility systems, including the BMS, security systems and fire-alarm systems. Through this capability, users can easily compile complex data across multiple facilities into a unified management platform for informed decision-making.

Many of the industry leading standards (ISO 50001, SS564 & Green Mark) require organizations to monitor key metrics from both mechanical and electrical systems and take actions for continuous improvement. Integrating EPMS platforms with BMS platforms will allow the facilities to clearly monitor these key metrics and root cause any metric that is not complying with the standard.

BMS vs. EMPS: the most common misconceptions

Selecting a platform for energy monitoring and control, or upgrading existing solutions, involves justifying the investment and demonstrating a return on that investment.

The cost of maintaining power distribution systems also represents a huge investment. Downtime and the accelerated aging of equipment can be directly related to harmonics, improper voltage regulation and poor power factor. However, when it comes to implementing a new solution to mitigate these issues, there are a few common misconceptions. The following will address the most common feedback we've encountered and explain why an EPMS may be a logical solution

Misconception 1: Our BMS already performs adequate energy monitoring and control

BMS systems are traditionally responsible for general oversight and control of comfort, life, safety and lighting management of a building. Most often, the act of "monitoring" via a BMS is simply the remote annunciation of a general alarm. This then requires manual investigation to determine the specific nature of the alarm.

Additionally, BMS platforms are traditionally not designed to monitor or communicate at the speed that is necessary to analyze electrical events and anomalies, which makes it extremely difficult to regularly capture sensitive power quality data such as harmonic displays or waveform capture.

By capturing and communicating electrical system data rapidly, alarm conditions can be propagated immediately and in many cases event correlations can be reconstructed in a forensic analysis. EPMS systems can request each piece of equipment to report once per second, and most pieces of equipment can and will respond that quickly. Those that cannot will respond as fast as they are capable.

Systems that leverage RS485 daisy chaining and slow protocols such as Modbus may slow even further to the point of not responding for over a minute. Additionally, a BMS would normally max out 64 or more devices per segment for the sake of wiring efficiency regardless of communication speed.

However, with an EPMS platform such as Eaton's Foreseer software, sample rates are available every second for every parameter of every device on a system of up to 3,000 devices per server. In theory, if you have a device that exceeds the alarm set point, you'll be able to receive notification within one second. These types of platforms can also time stamp to one millisecond, which can prove incredibly helpful when analyzing failures.

In comparison, one of the most common BMS platforms in the market details that the maximum acceptable response time from any alarm occurrence (at the point of origin) should not exceed 5 seconds for network connected user interfaces or 60 seconds for remote or dial-up connected user interfaces. This is a dramatic difference when compared to response times that average under a single second.

Further, most BMS architectures are normally distributed meaning there is an intelligent controller assigned to a certain number of control points with a limited amount of space to store historical data. This could mean the inability to store months and years worth of energy data, which would prevent users from being able to perform historical trend analysis and reporting.

Alternatively, an EPMS can work with your existing BMS to provide an enterprise monitoring solution that connects your operation's vast array devices (WAGES – water, air, gas, electric, and steam), giving them the ability to be monitored, regardless of manufacturer or model, to help you reduce energy consumption and help avoid unplanned downtime due to the failure of critical systems.

Our philosophy, which has been validated by many of our customers, is that we want as much data as possible, captured as quickly as possible, and data based for as long as possible. The reasoning behind these points is that the more we know about these systems, specifically the analog values of inputs and outputs, the more detailed a picture we can provide of the overall functional health of a piece of equipment or the entire site.

Using your BMS as part of a larger energy management system has the potential of offering an abundance of value. A well-implemented system offers a centralized, clear and concise view of what would otherwise be a complex and diverse ecosystem of different components. As a result, the EPMS and BMS can work together to log information with automated reporting tools to ensure resources are efficiently used, planned for, and maintained for high reliability. All completed with much less human resources and interaction required.

Misconception 2: I'd need to upgrade my entire monitoring infrastructure to facilitate an EPMS system

Most people have been educated as to how expensive it is to obtain a point of information in a traditional BMS architecture. BMS platforms are generally configured to monitor only a few points per device, with license costs approaching thousands of dollars.

When an EPMS platform is recommended and thousands of points are mentioned, the price calculator goes off. However, EPMS integration does not fit the traditional BMS pricing model and therefore can provide vast quantities of information without destroying the bank.

EPMS platforms offer many benefits beyond simple monitoring – such as canned integration capabilities, graphics, automated reporting and in-depth alarms – which means a direct price comparison simply is not accurate.

Some EPMS providers even go the extra mile to help ease integration into existing facility infrastructures. For example, Eaton has developed extensive expertise integrating various infrastructures and environments, working together with major hardware manufacturers and developed a software driver database of over 1,600 device variants.

This library of software drivers for most all communication interfaces and protocols enables the full-scale integration of third-party products throughout your organization, regardless of size.

Additionally, modern EPMS platforms can leverage the serial communication or other high level interface found on legacy power system equipment. This typically provides 10-50 times more data points than would be available from dry contact outputs, especially in regards to the measured (or metered) values. Only by gathering these values is it possible to provide insight to capacities, trends and balancing.

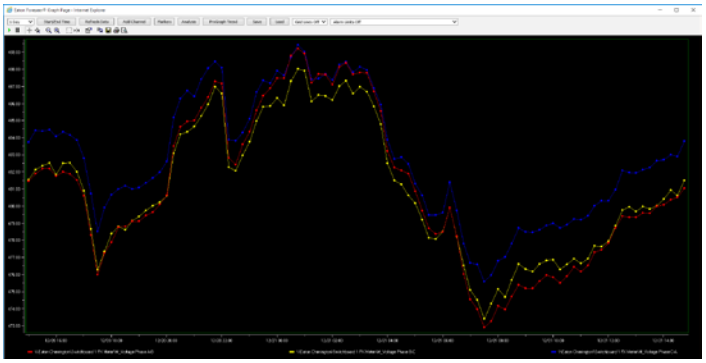


Figure 2. By gathering a multitude of data points, an EPMS system can provide insight to capacities, trends and balancing

This approach also has the added benefit of requiring only one communication cable for all of these points rather than a separate run for each dry contact – a major cost saver when you need a lot of points captured.

Misconception 3: We don't have the resources or knowledge available to analyze energy system data

In the instance that robust facility monitoring is required, but limited resources are available, it is important to look for a scalable platform that can provide the right solution at the right price for your individual needs.

The information gathered from multiple sources and systems can then be automatically inserted into pre-defined formulas, reports and dashboards, turning complex data into valuable knowledge for informed decision-making that is accessible at the touch of a button.

Some EPMS platforms even offer high performance analysis and forecasting tools that makes assessing equipment performance specifications easy. Cause analysis, impact analysis, capacity planning, preventive maintenance assessments and trending can be achieved with simplicity.

Nowadays, non-linear loads are becoming more common in office and industrial applications and this leads to harmonic distortions. An EPMS can automatically track load levels by phase, giving instant notification when extreme imbalances begin to occur, and provide the knowledge to take the necessary steps to re-distribute the load before a catastrophic problem occurs. Modern platforms even visually illustrate the load balance of a device or system in real-time, while showing what the balanced model should be – allowing the user to see the current state, the worst-case scenario and the proper load.

Figure 3. An EPMS can automatically track load levels by phase, giving instant notification when extreme imbalances begin to occur

Maintenance procedures can also be simplified to help combat costs. Scheduling programs offer the ability to preset scheduled (weekly or periodic) maintenance windows within the system to disarm selected devices on which maintenance will be performed. Disarming the devices allows continued monitoring and archiving during the maintenance period while disabling alarms and preventing unnecessary notification of personnel

The Benefits of EPMS and BMS Integration

Turnkey software and connectivity solutions coupled with state-of-the-art project management, systems design, third-party device integration, testing and custom application development services will meet your requirements and exceed your expectations. Here are a few of the major values an integrated EPMS and BMS architecture can provide your business:

1. **The ability to easily gather and analyze energy information**

   Monitoring and managing power distribution systems is critical to successful, energy efficient and reliable operations. With an integrated EPMS, you can track real-time and historical data to identify, monitor and improve wasteful energy practices.

   Today, it's easier than ever to obtain power and energy information to make operating decisions proactively and efficiently. Power monitoring no longer needs to involve solutions that are expensive to install and update, and are outdated when the electrical system changes

   New web-based software solutions are designed to be quick to install and configure so systems can be up and running quickly. Additionally, updates are intuitive, making it easy to add or remove devices as electrical systems change; so that the EPMS continues to provide an accurate picture of the electrical system over time.

   Further, an EPMS can integrate third-party products and other critical facility systems (including BMSs, security systems and fire alarm systems). This will help compile complex data in to a unified management platform for informed decision-making.

2. **The power to ensure system reliability**

   The critical purpose of an EPMS is to keep systems up and running. This is accomplished by consolidating real-time information on electrical systems across an entire facility. Many buildings are already measuring energy consumption or keeping an eye on harmonics, voltages, and other power-quality events. However, EPMS systems go a step further to provide accurate data on details such as circuit loading, peak demand, equipment status, and hundreds of alarms that warn building managers about under-performing equipment and conditions that threaten uptime.

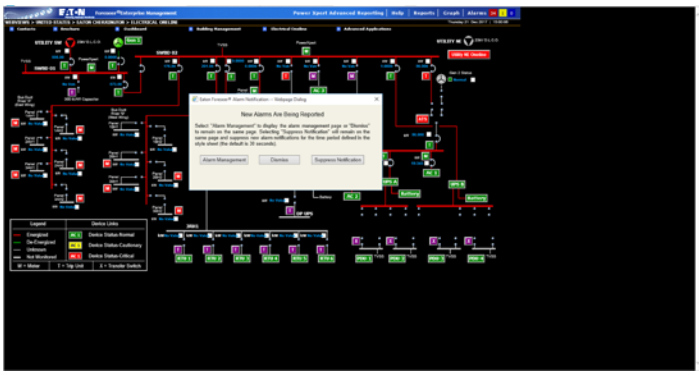


Figure 4. An EPMS system should provide hundreds of alarms that warn building managers about under-performing equipment and conditions that threaten uptime

An EPMS can also help verify that a facility's power distribution systems are installed, commissioned , and perform according to expectations and goals. Know that your system is working according to plan and make adjustments as needed. Electrical distribution systems evolve over time as new equipment is acquired, systems are adjusted, and processes change. An EPMS can help you make sure that all your electrical distribution equipment is working as effectively as possible and can identify improvements if not.

By simply monitoring your power distribution equipment, you are likely to find ways to reduce energy costs. As the Hawthorne effect indicates, you are likely to modify your behavior by simply measuring it. By keeping tabs on energy consumption, you can usually find ways to realize new savings.

3. The data needed to streamline operations

An EPMS constantly collects information and provides the ability to measure availability, loading, and consumption in real time. For facilities with hundreds of devices to manage, monitor and track, a central system is required to pool data from the device, circuit or load into understandable, actionable information.

An EPMS makes it possible to monitor the operation and status of all of the electrical components that are running in the buildings, and trends measurements on those components over time looking for changes. When changes are detected, the information can be used to investigate and respond proactively prior to service-impacting failures.

By using an EPMS in tandem with your BMS, you can compare equipment or facility energy consumption and identify inefficient practices. The software can help you calculate the return on changing habits and replacing equipment.

4. The insight required to avoid potential issues and capture money-saving opportunities

An EPMS' user-defined dashboard view provides the information needed at a glance, so you can pinpoint the energy and power anomalies required to achieve cost savings, prevent equipment or process downtime and support sustainability initiatives. A dashboard view also helps to identify equipment or system issues before major problems occur.

An important aspect of any successful energy-monitoring program is identification of those facility loads that consume the most energy. This will allow users to prioritize energy-reduction efforts, including shedding non-critical loads, shifting loads to an off-peak rate period, and targeting inefficient operations for further action.

Today's EPMS solutions make it possible to monitor the operation and status of all electrical components that are running in buildings and provide trend measurements on those components over time. When changes are detected, the information can be used to investigate and respond proactively to electricity-hogging devices and faulty equipment, prior to failures that could cause service interruptions.

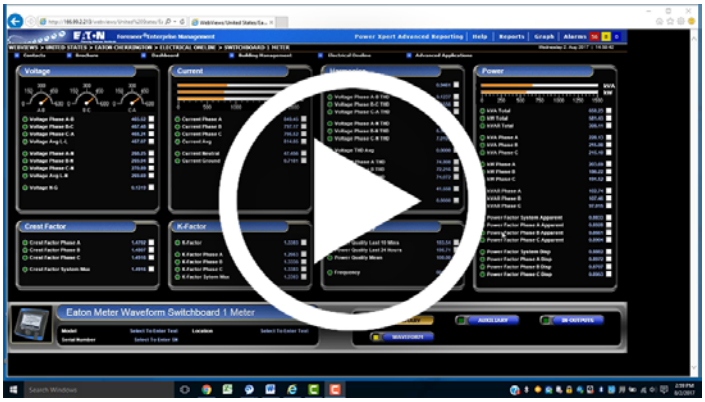
Intelligent software also makes it easier to see where energy is being wasted and savings can be realized. Whether it is a matter of simply turning off the lights at night, staging motors or equipment to reduce demand charges, or shifting operations to take advantage of cheaper electricity rates, you can leverage the capabilities of an EPMS system to optimize your facility's energy use.

By using an EPMS, you can also establish goals toward reducing peak power demand by shifting operations to reduce energy costs – all without the need to update or upgrade equipment.

5. The data needed to simplify future planning

Similar to preventing the downtime of today, planning the electrical usage and energy demands of tomorrow can be a difficult job. As site loads increase and usage patterns change, demand on a device may grow beyond its intended capacity. And, while average demand may not be a concern, peak demand always is, as even a momentary spike has the potential to bring down an entire network.

Today's EPMS products track energy usage over time, immediately inform facility management of peak levels, and project future demands based on past usage. This knowledge is critical in planning for electrical upgrades, avoiding unnecessary expenditures and making changes to the power chain to support load patterns.



Video 2. Today's EPMS products track energy usage over time and can project future demands based on past usage

The most recent advancements in EPMS systems even allow users to simulate electrical load increases, set capacity thresholds, and model potential system impacts prior to the addition of new electrical equipment to help reduce the risk of unplanned downtime and ensure adequate system protection.

Closing Thoughts

How valuable would it be to detect the threats that could cripple your operation? To receive automatic notifications when issues arise, giving you the opportunity to fix them before they become problems? And, to do all of this regardless of the brand of your equipment and systems?

In theory, every power monitoring system should be integrated within a building's other engineered systems – however this is seldom the case. You often find that solution providers compete to provide the lowest bid without considering the impact on power system monitoring and management. Any power monitoring system that does not have real-time electrical load information will limit the effectiveness of building management teams, and at a minimum, power system monitoring should always include basic insight into incoming power, current and voltage for critical pieces of equipment.

By installing an EPMS to work alongside your BMS, facility management can accurately manage, analyze, and trend electrical availability to set the proactive alarms needed to spot problems before they result in costly downtime, while easily identifying areas for energy efficiency improvement. The integration can also help with demand response programs, as well as providing accurate consumption levels for calculating power usage effectiveness or utility rebates.

But most importantly, the power monitoring and management capabilities delivered through an EPMS provide confidence—confidence that power systems are doing what they should, that personnel will be immediately notified of alert conditions in time to resolve, not just react, and the confidence of being able to predict and prevent problems before they occur.

For today's complex facilities, these capabilities are no longer a luxury, but necessary tools to keep your operations running effectively and efficiently.

However, it is important to keep in mind that there are many different suppliers of EPMS and many different levels and cost points. When searching for the solution that is right for your facility, select the one that best meets your business needs, while always keeping in mind that an effective EPMS should provide simple expansion as your system grows and greater value over time.

To learn more, visit Eaton.com/foreseer.

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