



Power Management Systems - Part 1

White Paper 93
Revision 1

Life Is On



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EXECUTIVE SUMMARY

With the growing demand for emergency power in many buildings, and the increasing priority placed on energy efficiency, power management systems are a logical option for facility managers to consider. Many facility executives are already aware of the benefits of power management systems, and believe that expanded power management capabilities would benefit both emergency and non-emergency power systems, according to a survey by ASCO and Building Operating Management (BOM) magazine. While obstacles to greater use of power management systems remain — notably, the challenge of justifying the cost — some facility executives have identified strategies to overcome those hurdles.

With increasing interest in power management systems comes another development that facility executives should be aware of: the convergence of emergency and non-emergency power systems under a single power management system. While that trend is still in a very early phase, the benefits of a converged system may make it worth considering.

GROWING NEED FOR EMERGENCY POWER

The starting point for any analysis of power management systems is an understanding of the new imperative for reliable power. That has long been true for facilities like hospitals that are required by code to provide emergency power. “As a hospital, we have to be ready and open during all types of conditions,” explains Jeff Mace, director of plant operations at Putnam County Hospital. “We use emergency backup power for life safety, lighting, egress and critical hospital equipment.”

“On a scale of one to 10, emergency backup power is a 10,” says Ali Abdulbarr, director of engineering at Stoddard Baptist Global Care. “We absolutely need backup power today.”

The need for reliable power extends well beyond healthcare facilities. Many corporations rely on data centers for critical business operations; whether the data center is inhouse, in a colocation data center, or in a cloud provider’s facility, power reliability is essential. It’s also vital for a laboratory where a power outage could jeopardize years of research or endanger lives. And in many other facilities, emergency power is required to ensure life safety during weather events and electrical grid outages, as well as to prevent business interruption.

“Recent storms like Sandy opened a lot of eyes to the need for emergency backup power,” observes Eric Speenburgh, electrical group leader at Integrated Design Group.

To understand the need for emergency power, it’s worth noting that electricity customers on average experienced 1.4 power interruptions lasting longer than five minutes, leaving them without utility-generated power for an average of 7.8 hours during 2017, [according to the federal Energy Information Administration \(EIA\)](#). The average length of interruption was almost double the average from 2016. “More major events such as hurricanes and winter storms occurred in 2017, and the total duration of interruptions caused by major events was longer,” reported EIA.

Power outages in the United States cost the commercial sector roughly \$31 billion annually, [according to a 2018 study conducted by Lawrence Berkeley National Laboratory](#).²

Editor’s Note:

In 2018, Building Operating Management Magazine surveyed its readership regarding perceptions and knowledge of internet-enabled power management systems. The first of a two-part series, this document summarizes reader responses and attitudes about modern power management systems and their role in critical power. Part 2 will explain how power management systems and their communication networks provide added value to building owners and operators.



“We are an always-on society. We are used to being connected constantly, so day-to-day operations continue,” says Dennis Julian, principal and data center power management systems expert for Integrated Design Group. “Electricity is essential for pretty much everything we do.”

Tom Erdman, senior vice president of Zeller Realty Group, agrees. “Tenants are always concerned with their IT systems being up.”

Given the cost and frequency of outages, it’s no surprise that the use of backup power is on the rise. According to surveys conducted by ASCO and Building Operating Management, the percentage of survey respondents who reported that 75 percent or more of the facility load is on emergency power increased by 50 percent from 2012 to 2018, rising from 12 percent in 2012 to 18 percent in 2018. (See Figure 1 for 2018 results.) And the percentage of respondents who would like to have 75 percent or more of the facility load on emergency power climbed from 30 percent in 2012 to 38 percent in 2018. (See Figure 2 for 2018 results.)

Figure 1. What percentage of your facility load is on emergency power? R = 564

| | |
|----------------------------|-----|
| Less than 25 percent | 50% |
| 25 to less than 50 percent | 20% |
| 50 to less than 75 percent | 12% |
| 75 percent or more | 18% |

Figure 2. Ideally, what percentage of your facility load would you like to have on emergency power? R=560

| | |
|----------------------------|-----|
| Less than 25 percent | 24% |
| 25 to less than 50 percent | 20% |
| 50 to less than 75 percent | 18% |
| 75 percent or more | 38% |

¹ United States Energy Information Administration. Average U.S. electricity customer interruptions totaled nearly 8 hours in 2017. November 30, 2018. <https://www.eia.gov/todayinenergy/detail.php?id=37652>, viewed December 17, 2018.

² Energy. Improving the Estimated Cost of Sustained Power Interruptions to Electricity Customers, June 15, 2018, Pages 1038-1047. Kristina Hamachi LaCommare, Joseph H. Eto, Laurel N. Dunn, and Michael D. Sohn. <https://emp.lbl.gov/publications/improving-estimated-cost-sustained>, viewed December 19, 2018.

VALUE OF POWER MANAGEMENT SYSTEMS

The need for reliable power, combined with the risk and cost of outages of utility power, has shone a spotlight on power management systems that aggregate and communicate information about power equipment and conditions. Power management systems can help facility executives to maximize the benefits of the emergency power system as well as the non-emergency power systems that serve everyday building needs.

Power management systems monitor loads and the current power status, says Julian of Integrated Design Group. “A power management system needs to be able to add and remove loads. Facilities executives need to be able to move loads as they are required.”

In emergency power applications, power management systems can ensure that priority loads are energized. “Ideally, the power management system can monitor the overall load and contain logic to shed noncritical loads during emergencies to prevent overloading the emergency back-up generators,” says Speenburgh of Integrated Design Group.

Those capabilities deliver important benefits to building owners. “Power management systems provide power to various pieces of equipment within a tenant’s IT system,” Erdman of Zeller Realty Group says. “They are capable of providing various outputs in varying voltages as needed by the types of systems being used.”

Power management systems should be able to respond to utility demand-response signals for energy savings, offer analytics for troubleshooting, and provide data trending to streamline maintenance, says Nicole Hammer, associate and smart buildings consultant in the Boulder (Colorado) Innovation Center at WSP.

To handle critical functions, it’s essential that power management systems are robust and reliable, says Paul Nicholas, engineering manager City of Lake Worth Electric Utility. “Our main control operations and dispatch centers need to be able to handle customer service calls even when there’s been critical damage to infrastructure under high category hurricanes,” he says.

The ASCO/BOM survey highlighted the importance of power management systems for facility executives. Sixty eight percent of respondents rated management of the emergency backup power system a 4 or 5 on a scale of 5, where 5 is “critically important.” (See Figure 3.) And 61 percent said that their operations would benefit from having greater power monitoring and control capabilities for the emergency backup power system. (See Figure 4.)

Figure 3. On a scale of 1 to 5, where 1 is not important and 5 is critically important, how important is the power management of your emergency backup power system?

| 1 (Not important) | 2 | 3 | 4 | 5 (Critically important) |
|----------------------|-----|-----|-----|-----------------------------|
| 6% | 11% | 15% | 20% | 48% |

Figure 4. Would your operations benefit from having greater power system monitoring and control capabilities for your emergency/backup power system? R = 484

| | |
|-----|-----|
| Yes | 61% |
| No | 39% |



Industry experts note that there are many operational benefits to power management systems. “A power management system provides flexibility and reliability, and allows facility executives to add or remove loads, depending on their priority in emergency situations,” says Julian. “They also provide status updates on power usage and help facilities executives know that equipment is working correctly.”

“Power management systems offer the best use of your facility’s generating power,” points out Hammer from WSP. “The life of your generators is managed more efficiently and you are able to operate them a bit more gently.”

Nicholas of Lake Worth Electric Utility says power management systems help facility executives understand their loads. “You need to know your loads and your generation system,” Nicholas stresses. “You can trip out a generator if you power it up too fast.”

Facility executives report that power management systems for emergency power can help them achieve a range of critical objectives. At the top of the list is preventing power outages, cited by 54 percent of respondents to the ASCO/BOM survey. Other widely cited benefits include improving energy efficiency, reducing costs, centralizing monitoring and control functions, automating operations, and analyzing power issues. (See Figure 5.)

| Figure 5. What are the primary benefits of having greater power system monitoring and control capabilities for your emergency/backup power system? R=461 | |
|--|-----|
| Preventing power outages | 54% |
| Improving energy efficiency | 48% |
| Reducing costs | 43% |
| Centralizing monitoring and control functions | 42% |
| Automating operations | 41% |
| Analyzing power issues | 40% |
| Streamlining compliance | 17% |
| Paralleling power sources | 16% |

The benefits of power management systems aren’t limited to critical emergency power applications.

“Power management systems are used for both emergency/backup power and non-emergency power to monitor power events such as swells and sags,” says Alex Roberts, supervisor – plant operations at Froedtert Health. “The more data we have access to, the better we can understand the causes and impacts of power events, which leads to faster resolution capabilities. Data can also be used to determine growth capacities of systems.”

“Oftentimes, emergency and non-emergency power management systems operate on the same generator system,” points out Joshua Zweback, vice president at Cosentini. The operational flexibility of handling non-emergency loads on the facilities generators can be a real asset. “Of course, you must respect all codes, and emergency [power applications have] priority,” says Zweback.

The ASCO/BOM survey indicates that many facility executives understand the value of power management systems for non-emergency power: Fifty six percent of respondents rated its importance a 4 or 5 on a scale of 1 to 5, where 5 is critically important. (See Figure 6.) What’s more, 64 percent reported that their non-emergency power systems would benefit from greater monitoring and control capabilities. (See Figure 7.)

| Figure 6. On a scale of 1 to 5, where 1 is not important and 5 is critically important, how important is power management of your non-emergency power system? R=420 | | | | |
|---|----|-----|-----|-----------------------------|
| 1 (Not important) | 2 | 3 | 4 | 5 (Critically important) |
| 8% | 8% | 28% | 34% | 22% |

| Figure 7. Would your operations benefit from having greater power system monitoring and control capabilities for your non-emergency power system? R=416 | |
|---|-----|
| Yes | 64% |
| No | 36% |

In the survey, energy efficiency was the most often cited benefit of having power system monitoring and control capabilities for the non-emergency power system (61 percent of respondents), followed closely by reducing costs (59 percent). (See Figure 8.)

| Figure 8. What are the primary benefits of having greater power system monitoring control capabilities for your non-emergency power system? R =394 | |
|--|-----|
| Improving energy efficiency | 61% |
| Reducing costs | 59% |
| Analyzing power issues | 52% |
| Preventing power outages | 47% |
| Centralizing monitoring and control functions | 37% |
| Automating operations | 17% |
| Paralleling power sources | 15% |
| Streamlining compliance | 15% |



Abdulbarr of Stoddard Baptist Global Care is one facility executive who sees energy cost saving rewards in non-emergency power management applications. “When you work with your utilities, you can reduce your load on the grid during peak times by using your generators,” he says.

Power management systems can help save energy in other ways. “If you do trending, you can chart where you are drawing more load,” says Nicholas. “Trending will show you where an electrical issue is happening and help identify premature failure of [equipment] prior to catastrophic failure.”



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