Data-Driven EMS

How one big box retailer weathered the aftermath of Hurricane Sandy through its energy management system. BY MARK STRATON

In October 2012, Hurricane Sandy's damage spread far and wide as the storm made its way up the East Coast, causing more than $50 billion in damage and forcing retailers to rethink their natural disaster readiness plans.1 Once the storm passed, many business owners were unable to visit store locations due to dangerous road conditions and debris.

In addition, many national retailers did not have sufficient local resources to assess the storm damage or have the necessary information to deploy emergency power supplies. However, a leading North American retailer used a unique technology to assess storm damage, mobilize stores and maintain business continuity: its energy management system (EMS).

For years, the big box retailer, which also has a grocery component, has placed a high priority on facility and operational cost savings, as well as sustainability efforts for its several thousand locations. To achieve these savings and sustainability goals, the retailer's facility management team deployed a data-driven EMS, with device-level submetering, to allow them to obtain a greater understanding of water, gas and electricity usage, identify energy savings opportunities, boost staff productivity, evaluate equipment performance, and engage in preventative maintenance. During the storm, the retailer used the EMS to monitor the storm's impact on the retailer's facilities that were in the storm path. Once the storm subsided, the retailer utilized the data analytics capabilities of the solution to triage facility operations in the impacted areas and support community recovery efforts.

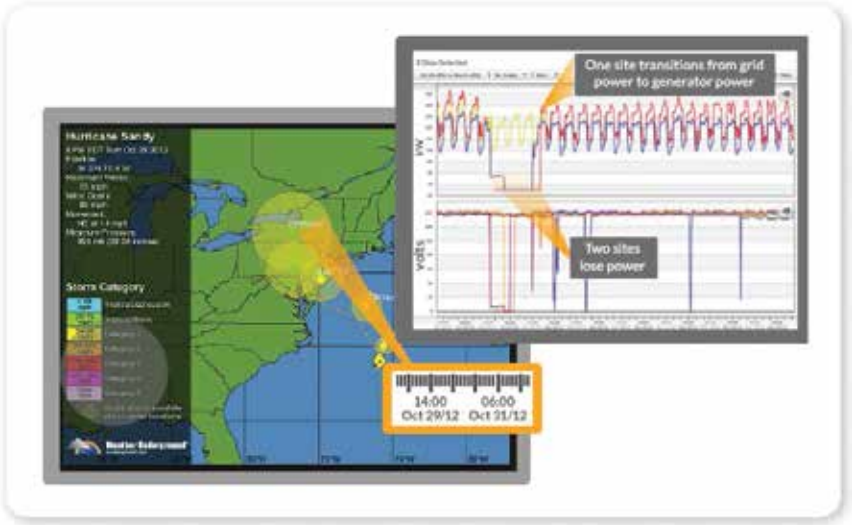

Figure 1. This energy manager details site operability as Hurricane Sandy passes through the region.

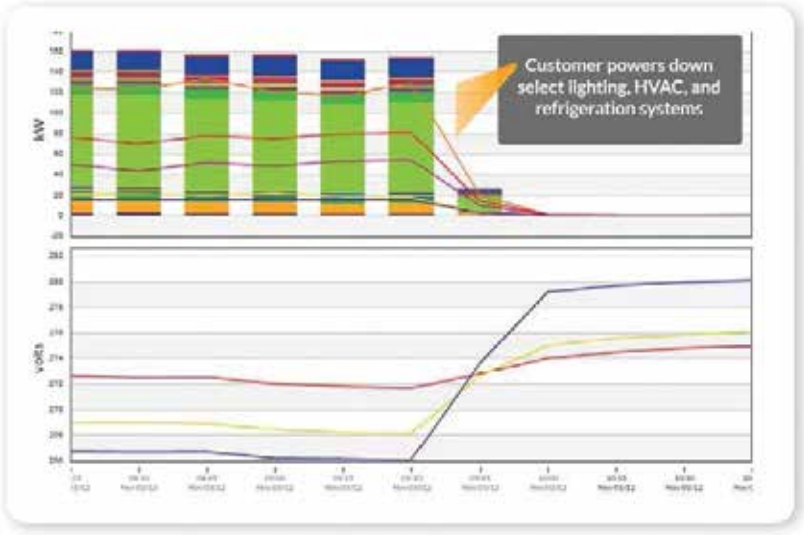

Figure 2. Track energy reduction activities in near real-time.

GRANULAR VISIBILITY ENABLES EFFICIENT STORM PREPARATION AND RESPONSE MANAGEMENT

In preparation for Hurricane Sandy, the facility management team relied on its EMS and cloud-based energy management software, to provide a holistic enterprise-wide view of facility energy and operational performance. By using the data-driven solution, each facility manager tracked store activities as Hurricane Sandy crossed the region.

Figure 1 details the energy usage at three sites in New Jersey and New York with each of the lines representing a single site. The yellow line stops trending as the site transitioned from using grid power to generator power, while the other two sites, represented by the red and blue lines, lost power supply and did not transition to any form of backup power supply.

In addition, the retailer's facility managers used controls embedded in the energy management software to power down select equipment to reduce electrical consumption, a key part of any emergency energy management plan. By systematically turning off high-voltage devices, such as lighting and HVAC systems, possible damage to these systems due to erratic electricity supply may be avoided during a storm. In this situation, the EMS became a critical tool to track electricity reduction efforts. By logging into the portal, facility management teams could view which systems were being powered down in near real-time across the fleet of stores in the storm's path (*Figure 2*).

REMOTE ENTERPRISE-WIDE VISIBILITY ENABLES RAPID ASSESSMENT AND ISSUE RESOLUTION

In the days leading up to the storm, the retailer shipped several whole-store generators from across the country to the anticipated storm path area. The facility management teams were able to remotely view the sites that received generators to ensure they had sufficient power to operate critical pieces of equipment. Figure 3 details a store that has regained power from a generator.

In addition to assessing whether generators were operating at specific locations, the EMS played a critical role in verifying when utility power was restored, allowing generators to be relocated to other sites still without power, maximizing the impact of limited generation resources in the affected areas.

NEAR REAL-TIME VISIBILITY ALLOWS EQUIPMENT PERFORMANCE MONITORING AND PROBLEM DIAGNOSIS

Facility management teams know all too well that while deploying generators may sound like a 'set and forget' task — it isn't. Once a generator is deployed, continued verification is needed to ensure it is running efficiently and supplying the correct power voltage to each site. If the generator goes unchecked and suffers a phase imbalance, other critical equipment, such as lighting and HVAC, may not operate properly or may even be in jeopardy of damage.

In one instance, facility management could see that a generator was not operating correctly — the generator was running, but not supplying power to critical assets. Detailed visibility of submetered equipment voltage levels

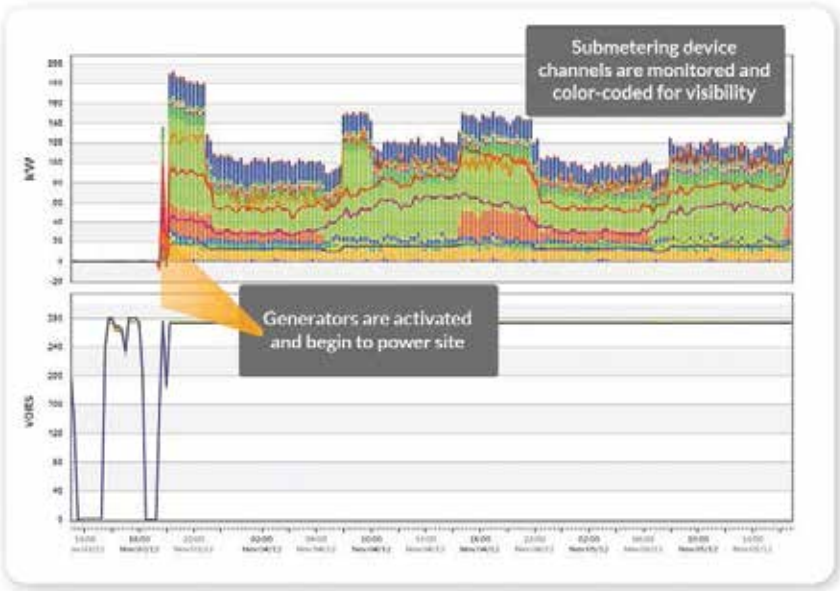

Figure 3. Ensure sites are receiving generator power with detailed visibility of voltage levels.

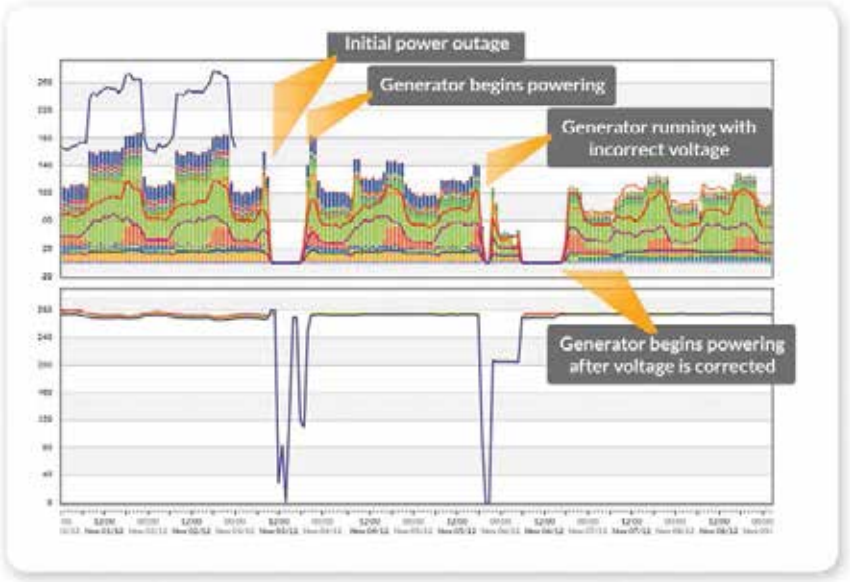

Figure 4. The energy manager details generator performance.

showed that the generator was operating at an incorrect voltage, preventing all three phase motors in the store from running, affecting critical assets, such as refrigerators. This insight allowed facility management to immediately and remotely diagnose the issue, dispatch the generator company to make the necessary voltage adjustment, and return site operations to normal (*Figure 4*).

Once the generators were running at the proper voltage and performance levels, advanced submetering data were used to ensure that all equipment, ranging from refrigeration systems to doors to HVAC to lighting, was operating within preset parameters.

VISIBILITY INTO EQUIPMENT PERFORMANCE PREVENTS LOSS OF VALUABLE INVENTORY

In many cases, when utility power is restored to a location after an outage, not all equipment automatically turns back on. If it does, it may not return to peak performance, a common problem with refrigeration systems. In the absence of a data-driven EMS, the retailer's facility management team would have been required to manually check each piece of equipment individually — a time-consuming and potentially costly exercise considering that an estimated 10% of the retailer's average site inventory is perishable food and pharmaceutical inventory at risk of damage.

After the storm had passed, the facility management team used the cloud-based software to assess each store's operability and determine which stores were receiving power from the local utility, and which were not. The team's preliminary assessment showed a large number of stores were no longer feeding data to the software, indicating a probable loss of utility power.

Utilizing the EMS, the retailer's facility management teams leveraged the granular submetering data and detailed visibility and analysis to monitor how equipment recovered from the loss of power during the disaster. For example, the facility management team was able to identify which stores had an active security system in place and which needed a security team sent to protect the site and its inventory.

Additionally, the facility management team relied on the granular detail provided by the software to pinpoint when refrigeration systems were not operating at the preset temperature parameters and identify malfunctioning equipment.

For example, the software identified that one type of refrigerator rack had been automatically shut off because the unit was not receiving the proper voltage to cool appropriately, as a result of the storm. Armed with this information, the facility manager was able to move the perishable contents to working refrigerators and avoid thousands of dollars in destroyed inventory (*Figure 5*).

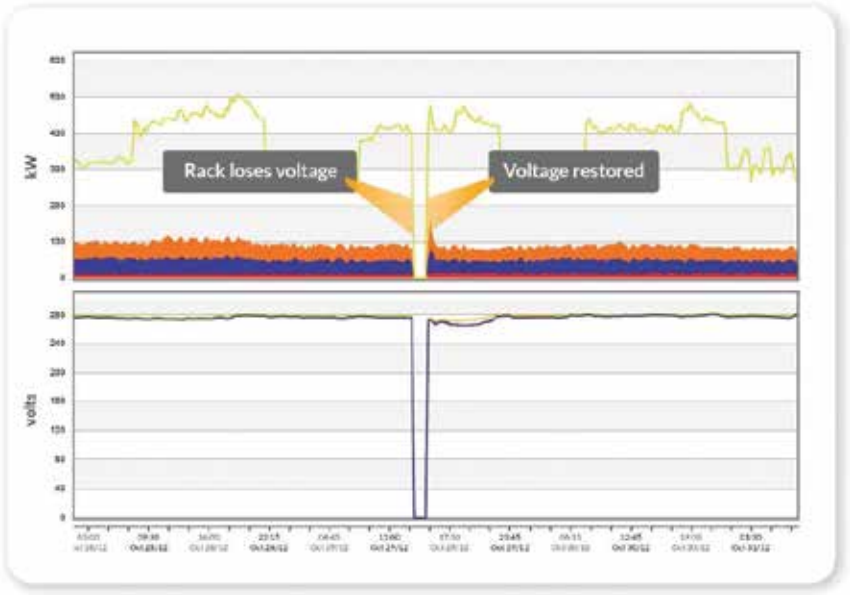

Figure 5. The energy manager monitors refrigeration rack voltage performance.

CUSTOMER SUPPORT AND FINANCIAL IMPLICATIONS FOR INCOMPLETE DISASTER PLANNING

It goes without saying that the financial toll of a natural disaster can be devastating, even to the largest of enterprises. For food storage, pharmaceutical inventory, and climate-sensitive inventory, it is vital to capture and maintain visibility into the extent of inventory exposure to unsafe climate conditions. Temperature Logging Sensors with battery backup were used by the retailer to capture temperature values and their associated time periods during the storm-induced power outage and allowed the retailer to prevent unnecessary inventory loss, maintain regulatory compliance and, most importantly, ensure community members were given access to safe medicines and food products (*Figure 6*).

MANAGED SERVICES ALLOWS RETAILER TO FOCUS ON PHYSICAL DAMAGE

Once Hurricane Sandy dissipated and all utility power was restored, the retailer relied on the energy management company to provide daily damage, triage and recovery reporting so that on-the-ground facility management resources could focus their attention on the physical problems incurred at sites, such as roof, glass and structural damage. The Managed

Opportunity Cost per Site for a Three Day Store Closure

Metric	Quick Serve Restaurant	C-Store	Small Box Retail	Big Box Retail
Annual Revenue per Site (365 days)	$1,600,000	$4,000,000	$18,000,000	$40,000,000
Lost Daily Revenue per Site	$4,384	$10,959	$49,315	$109,589
Average Inventory Value per Site[1]	$26,674	$75,539	$309,442	$767,123
% of Refrigerated Inventory per Site	75%	30%	5%	10%
Lost Refrigerated Inventory per Site	$20,006	$22,662	$15,472	$73,575
Total Opportunity Cost per Site[2]	$33,156	$55,538	$163,417	$402,342

Figure 6. Opportunity cost per site for a 3-day store closure.

Figure 7. Disaster recovery framework.

Services team worked with the retailer to identify which sites were down, determine what equipment or support was necessary to restore sites and equipment to operational status, and minimize the recovery time for the affected stores. As a result, facility managers were able to maintain business continuity by tracking the recovery progress via the cloud-based energy management software across the entire fleet of affected stores, ensuring resources were deployed efficiently and returning stores to operational capacity.

ESTABLISHING A NEW DISASTER READINESS FRAMEWORK

It is essential that enterprise retailers have disaster readiness procedures in place. The Disaster Recovery Framework shown in Figure 7 allows retailers to quickly assess site power and equipment performance through a variety of sophisticated reports and dashboards. This enables facility management teams to focus their attention on re-opening stores and optimizing on-the-ground operations.

RECOVERY AND PLANNING FOR THE FUTURE

The data-driven EMS allowed a top North American retailer to proactively plan for the anticipated storm, and then remotely monitor and manage their recovery after the storm had passed. This approach ensured perishable inventories were salvaged and stores returned to full operating mode as quickly as possible to support local recovery efforts. Perhaps most important, the retailer was able to assist the communities that were most severely impacted by the storm and access the emergency supplies, medicine, and food items that are so vital in a disaster situation. **RFB**

[1] *National Hurricane Center, Tropical Cyclone Report, Hurricane Sandy, February 12, 2013. http://www.nhc.noaa.gov/data/tcr/AL182012_Sandy.pdf*

[2] *The average inventory value per site assumes that each site carries one week's worth of inventory*

[3] *The opportunity cost assumes that all refrigerated inventory would need to be replaced and that each site would be closed for three days (one day for the power outage and two additional days to restock and restore operations)."*

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