An Enterprise Energy Management System Can Reduce Your Energy Risk

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Whether the need is to reduce costs or improve yields, increase uptime or improve customer satisfaction, the top priority for any facility manager is always a question of risk. The supply of reliable, clean and cost effective energy is mission-critical, yet this continues to be one of the least carefully managed inputs to a business, and this translates to poorly managed risk. Fluctuating energy prices in a deregulated market might spike one month, wiping out an entire quarter's profits. Unplanned production downtime caused by utility interruptions or on-site equipment failure can be costly.

Managing these risks requires accurate measurement of the cost, quality and reliability of power from source to load. An enterprise energy management (EEM) system reduces risk by providing key performance indicators that help managers determine whether critical operating parameters are within expectations. It typically includes cost/revenue metering, embedded power quality/reliability monitoring, and an Internet-based communications infrastructure that delivers information in a timely fashion. With an EEM system, risk can be managed in terms of understanding what is going on, understanding what will happen if a particular action is taken, and helping make decisions to reduce risk, improve profitability, and maximize return on the energy investment across the entire enterprise.

Understanding electricity-related risk

Identifying and controlling anything that puts the business at risk helps avoid the unexpected. These include unforeseen operating costs, unexplained drop in production yields, uncontrolled environmental emissions, and other events. Electrical energy is almost always mission-critical, and other energy commodities and the energy assets that deliver them may be equally critical to the financial viability of the business. These include water, air, gas and steam. The value of these commodities is a balance between cost, reliability and quality.

Remarkably, the technologies used to manage these attributes often operate in isolation, if at all. They traditionally include a mix of utility metering and billing systems to quantify cost and revenue, supervisory control and data acquisition (SCADA) systems to measure operating parameters of the infrastructure, and dedicated portable instruments to measure power quality. The result is usually high cost for poor access to incomplete information. The impact is that there is only limited knowledge of risk exposure. An EEM system offers a holistic approach to managing this exposure.

With deregulation, the consumer is often trading off energy cost against quality and reliability through energy-services contracts that allow loads to be shed or

generators to be controlled remotely. It may make financial sense, for example, to switch to on-site generation if spot prices are too high. It may also be worthwhile to negotiate a supply agreement for multiple locations. Accounting practices may also justify more careful tracking of energy usage for specific manufacturing processes.

Conventional energy cost-analysis systems can record and track energy consumption patterns in a given section, department or area. With these, it is easy to do multi-dimensional analyses: for example compare usage trends for week 1 with week 3, or from Plant A to Plant B. Most systems offer some kind of cost allocation, utility-bill verification and sub-tenant billing. The best might integrate real-time energy pricing to allow "what-if" scenarios to be worked out by energy traders.

However, conventional systems cannot manage all aspects of cost, reliability or quality delivered directly to the load, measured in terms of financial risk to the enterprise. For example, a supermarket chain's efforts to reduce consumption are usually made one building at a time, while tracking and comparing the efficiencies of all locations against industry benchmarks could identify advantages in bulk energy contracts or local generation. In another example, high-efficiency compressor motors installed by a pharmaceutical manufacturing plant may show reduced energy costs, but the resulting harmonics generated by their electronically controlled windings may impact the stability of neighboring equipment. The key is to be able to ensure high reliability and good quality at a reasonable total energy cost, where this is measured in terms of financial risk to the company.

For manufacturing facilities, a lower energy infrastructure cost (cheap components) will decrease reliability and increase the risk of reduced yields. For commercial buildings, a weaker infrastructure will also increase risk of business interruptions that can be significantly more costly. Thus, in a chemical plant it could be acceptable to reduce yields by 1% if it means a 10% energy savings. For an equity trading company, however, a loss of 1% of transactions would be unacceptable.

The Enterprise Energy Management system

An enterprise energy management (EEM) system delivers key performance indicators to identify areas of potential financial risk. Multi-dimensional energy analytics are used to deliver timely information that will help avoid unexpected costs, unexpected reliability problems and unacceptable power quality. An EEM system must deliver key performance indicators in a timely manner, and it must provide sufficiently complete information to allow useful analysis. To accomplish this, sensors for cost-related data (billing metering), reliability-related data (operational metering) and quality-related data (power quality metering) are deployed at every key asset or distribution point.

These sensors require on-board intelligence to reduce data load to meaningful information and key performance indicators. A high-speed, flexible and open communications infrastructure (Ethernet, wireless, serial links, telephone) ensures that information and performance indicators can be passed to decision makers quickly. Sub-metering across the enterprise and throughout each facility enables

the EEM system to accurately track the consumption levels for each building, tenant, department, process or other cost centers. This helps ensure that commercial building owners, for example, are properly compensated for energy used by each tenant. It also supports the normalization of energy costs for different types of tenants, which helps in planning reliable power systems for new buildings.

Trending and prediction data also help a facility avoid utility penalties for exceeding high peak demand or low power-factor limits. Loads can be rescheduled to "smooth out" a consumption curve, and generators or other equipment can be manually or automatically engaged in response to EEM-system alarms. And since environmental standards and fines are a consideration for some industries, an EEM system can support normalization of emissions levels versus energy consumption to help avoid the risk of emitting excessive pollutants.

In a commercial building, consumption and temperature will be closely correlated, unless there is a large shift in loads - perhaps from a new tenant that requires a large server room, for example. In this case, an EEM system can deliver the indicators that will help avoid exceeding the infrastructure's capacity. In multiple facilities, an EEM system can reveal energy consumption trends per square foot. Energy managers for any business with multiple plants or facilities will be able to determine which facilities are least energy efficient, so that capital costs to save energy can be applied in the most effective manner. The EEM system will also record historical load trends, for individual sites as well as aggregated across the enterprise. With this information, energy managers can better project energy needs and negotiate bulk-energy purchase contracts.

All businesses can benefit from auditing and comparing expected monthly energy expenditures to plan. An EEM system can accurately "shadow bill" against utility billing meters to ensure actual billing charges match predictions, and catch any utility billing errors. Any other energy-related commodity such as water, compressed air, gas and steam can be profiled over time and between facilities to identify anomalies in supply or demand.

Of course, any investment in information systems must offer a reasonable total cost of ownership over the life of the system. In some circumstances, manual meter reading and portable power-quality instruments could provide data similar to what the EEM provides. Yet the cost of collecting, transmitting, storing and processing all that data would be high relative to the amount of information obtained, and the fact that it would need to be gathered on a regular basis. An integrated EEM solution combines the permanent metering, monitoring, analysis, communications and reporting tools required in one, cost-effective solution.