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Risk Management

A Sound Justification for Making Power Quality Investments

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A Fact of Life

When it comes to an organization's budget and balance sheet, requests for funds are met with commonly asked questions such as "How much does it cost?, Why do we need it?, How will we pay for it?" Whether an organization is a for-profit business or a not-for-profit entity, these financial issues are important ones.

Technology managers requesting funding for such items as power conditioners and uninterruptible power supplies often face stiff opposition from other forces in their organization. How does one justify thousands of dollars for power quality products in the face of a marketing VP who wants to buy new CRM software, a sales VP who wants to hire two new sales representatives, or a VP of finance who wants to reduce overall spending by 15%?

It's a fact of life that many organizations make investments in power quality only after electrical power problems have caused identifiable operational damage and conspicuous financial pain. Only then, do power problems become important to those whose job it is to make financial decisions and calculate ROI.

New Terms for the Power Quality Advocate

When decision makers ask about cost and need, there are really two far more fundamental questions at the heart of their inquiry. These questions are "What is the risk to my organization if I do not make this investment? What is the probable benefit to my organization if I do make this investment?" It's clear then that those who promote investments in power quality need to do so in a way that positions the investment as an important part of the organization's *risk management portfolio*.

This means that power quality advocates must understand some fundamentals of risk management and how their recommendations will reduce risk and demonstrate return on investment. The ability to speak in terms of risk management increases the likelihood that power quality investments will be made.

What is Risk Management?

Risk management is a methodical process for managing uncertainty in a business. The process typically involves three steps – assessment, determination of management strategy, and mitigation.

As its name suggests, assessment determines exactly how much risk is posed by a specific factor or potential event. Frequently, assessment is quantified in financial terms. For a business, this may be how the risk might affect revenues, expenses, or profitability. For an organization such as a hospital, assessment may be expressed in terms of how the risk might affect operating costs, the hospital's accreditation, or the non-financial impact the risk might pose for quality of care or patient safety.

Determining management strategy usually involves decisions on transferring the risk to another party, reducing the negative effect of the risk, accepting some or all of the consequences of a particular risk, or best of all, avoiding the risk altogether.

Finally, mitigation pertains to how an organization uses its own managerial and financial resources to lessen the impact of those risks which cannot be transferred, reduced, avoided, or which are voluntarily accepted.

The risk management process takes place within a logical hierarchy in which those risks with the greatest probability and greatest potential loss for the organization are handled first before those with lesser probability and impact are handled in descending order.

The risk management process itself competes for financial resources since an organization's management is always in tune with its opportunity costs. Management's common question is "Should money be spent on mitigating a risk of uncertain probability or on an opportunity with a high probability of generating revenue and earning profit?" For this very reason, the ideal risk management scenario minimizes spending and maximizes the reduction of a risk's negative effects.

As a result, power quality investments will only be made when power quality disturbances are viewed as high probability events which represent an unacceptable financial or operational risk to the organization.

A Snapshot of Today

Global society was once revolutionized by the *industrial age*. It was an age of mechanical devices, belching smokestacks, and factory assembly lines. Global society is now being revolutionized by the *digital age*. Computers and computer controls are everywhere and are even prominent fixtures in the realm of their industrial ancestors. Foundries and assembly lines that were once dependent on significant amounts of manpower now operate under computer control and use robotic hands instead of human ones. Massive amounts of financial, customer, personal and other data are stored on corporate computers and in data centers and server farms. Entertainment, leisure, communications, travel, healthcare, and commerce are all managed, improved, or somehow controlled by the microprocessor. The global computer population is expected to reach one billion by the end of 2008 – a benchmark that took 27 years to attain. Research indicates that over the next seven years, by 2015, global computer population will double to two billion units.

The microprocessor has become a systemic part of global society, business, and security. Yet for all our dependence on the computer, we provide power for these devices with an electrical grid that was designed during the industrial revolution. The current electrical system was designed to provide reliable power for traditional loads such as lights and motors. If a snapshot were taken of today's electrical infrastructure, it would show a picture of an electrical grid that is woefully inadequate for the needs of sophisticated computer technology.

Power Quality Risk

For the manager who wishes to position power quality needs in terms of risk, there are several important factors to understand. These include power availability, power reliability, and cost of downtime.

Power Availability

The electrical grid was (and still is) designed to provide power for the largest number of customers for the longest period of time. That's why power utility companies place most of their focus on *power availability*. Generally speaking, power availability is good throughout most of the developed world. According to studies done by the Electric Power Research Institute (EPRI)[1] and the Organization for Economic Cooperation and Development[2] (OECD) the average "well managed" electrical system has an availability level of 99.9% to 99.99%. This is also known as three 9s to four 9s of availability. Four nines of availability equates to approximately 50 minutes per year of power outages for a facility operating on a 24 x 7 schedule.

Power Reliability

EPRI and the OECD, however, both distinguish between availability and *reliability*. In fact, EPRI has stated in its research that *"When potentially disruptive power quality disturbances such as voltage sags, voltage swells, switching surges, poor voltage regulation, harmonics, and other factors are considered, the availability of what we can call "disruption free power" can be one or two orders of magnitude worse than a more standard interruption based availability index."*

In reality, we find that the "well managed" part of the global power grid is really only about one to two 9's reliable. This means that power consumers can expect to experience from 5000 to 50,000 minutes per year (3.5 to 35 days) in which the *quality* of electrical power is unsatisfactory for the needs of sophisticated computer systems. Given that microprocessors make decisions in billionths of a second, 35 days of sub-quality electrical power represents a lifetime of risks for a computer.

Cost of Downtime

Cost of downtime is directly related to the process that is disrupted and to the complexity of that process. A downtime event causes continuous manufacturing operations (such as those used to fabricate glass, plastic, and steel) to waste labor, expensive raw materials and work in progress.

The semiconductor fabrication process turns pennies worth of silicon into thousands of dollars worth of integrated circuits. When a semiconductor fabrication line shuts down, it may take 30 hours or more to recalibrate its tools and instrumentation and bring it back to full production.

A digital printing press running at full capacity may print 100,000 color catalogs at pennies per copy. Yet if the production run is disrupted, the "make-ready" process used to prepare the press to run the job must be repeated, and make-ready is the most expensive non-material cost factor in the job process.

An internet data center may take a day or more to recover from a system failure because rebooting computers is only part of the process. The data center must also re-establish all its communications connectivity, identify and restore corrupted databases, and verify the integrity of the system.

Healthcare providers suffer downtime costs of their own, but frequently the effects of downtime are most immediately experienced by the patient whose treatment is delayed because a clinical instrument is unable to provide the results of a diagnostic test, a PACS failure prevents diagnostic images from being interpreted, or a records system is unable to produce an operative report, history and physical, or discharge summary.

Retail operations face unique costs of their own. In both grocery and general merchandise stores, prices are no longer found on shelves but rather are represented by barcodes on cans, bottles, jars, and packaging – barcodes which cannot be read when store systems are down. Without their computer systems, these stores cannot sell food, clothing, sporting goods, books, CDs, televisions, or even computers themselves.

Restaurants face the unique dilemma of selling items without barcodes or sales tags of any kind. Not only are the products completely consumed in the establishment, but the only record of their consumption is in the mind of the wait staff and in the memory chips or on the hard drive of a POS system, which when it's non-functional, cannot print out a dinner check or process a credit card transaction.

Presenting the Case for Power Quality

At the heart of the thought process, it's critical to keep in mind that risk management is designed to give priority to those risks with the greatest probability and the greatest potential loss. That means that today's power quality advocate must clearly communicate that power quality problems are high probability events that cause major financial losses. This is the only way of elevating power quality issues to a higher level in the risk management hierarchy.

In terms of risk probability, it's important to remember that the electrical system is constructed by man of manmade materials, that it is maintained by man and that it interacts with other manmade systems. All of these will ultimately fail over time. Indeed, mathematical calculations show that the reliability distribution curve for the electrical system will eventually *always* reach zero. Research data from EPRI reinforces the fact that the probability of downtime from power quality problems is very high.

With respect to loss potential, the technology professional must learn to state the cost of downtime in terms other than the replacement cost of hardware. The cost of repairing or replacing today's computer systems pales in comparison to the cost associated with interruption of the process they are controlling or the loss of the information they store.

In order to accurately represent the potential cost of loss, it's important to calculate the costs associated with:

- Idled labor
- Missed delivery schedules
- Performance penalties for missed deadlines
- Wasted raw materials
- Damaged or destroyed work in progress
- Spoiled or out-of-spec product
- Productivity lost to re-work
- Lost data or customer records
- Customer inconvenience
- Impact on quality or timeliness of customer service

Conclusions

In risk management terms, business leaders today must understand that:

1. The probability of economic loss as a result of power quality problems is extremely high.
2. The risk from power quality problems cannot be transferred to others.
3. A management strategy that involves investment in preventative power quality programs and solutions is the most effective way to avoid the risk.

Given the complexity of today's technology and our reliance on it, it is the duty of today's technology professionals to be strong advocates for aggressively managing the risk that occurs from marrying an obsolete electrical system to state of the art technology.

Because CFOs do not deal in computer design tolerances, CBEMA electrical curves, and the other bits and bytes that enable technology to operate, today's technology professional must be capable of presenting power quality needs in terms that can be appreciated by the risk manager.

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[1] Electric Power Security, Quality, Reliability, and Availability for the Digital Age, Samotyj, Von Dollen, Howe, EPRI/CEIDS, Power Systems World 2002, Rosemont, IL

[2] World Energy Council, 18th Congress, Buenos Aries, 2001