

Powering Through the Economy

Five strategies for protecting the environment and boosting your bottom line

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Executive Summary

Today's lean, more tightly-regulated economy and the ever-increasing importance of IT have many organizations caught in a bind. On one hand, reliable access to power is vital to keeping data centers operational, and the costs associated with loss of power can be devastating. On the other hand, IT departments are being asked to get more done with less money even as energy rates continue to rise.

Indeed, the cost of electricity is already outpacing the cost of hardware. According to The Green Grid, a non-profit organization focused on data centers globally, \$1 million worth of servers purchased in 2009 will consume \$1.2 million of electricity over a three-year lifespan. Moreover, servers in aggregate account for approximately two percent of US electricity usage. It's no surprise, then, that for many organizations electrical power now constitutes the largest component of total cost of ownership.

However, any organization can get past this predicament by tapping into a different kind of power—the *power of returns* on smart, strategic investments. This white paper explores five specific steps you can take to power your way through these difficult times.

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1. Increase ROI through organizational alignment

At most companies, responsibility for the data center is split between two departments: IT, which manages servers, networking and applications, and facilities, which oversees power and cooling. In most cases, IT managers report up to the CIO, while facilities managers report into the COO or vice president of corporate real estate.

Unfortunately, however, this divided organizational structure can produce conflicting goals around technology, energy spend and sustainability. For example, while IT buys server equipment, facilities often pays the energy bill. As a result, power efficiency is sometimes a bigger priority for facilities managers than it is for their IT counterparts.

Today, however, more and more organizations are recognizing the wisdom of preventing waste and downtime by promoting closer collaboration between facilities and the IT organization. Changing your organizational structure such that both the IT and facilities departments report up to the same executive will help you align everyone in your data center around common goals, metrics and objectives. That, in turn, can drive greater efficiencies by ensuring that IT and facilities managers are equally motivated to improve performance and lower power bills.

Moreover, by promoting better communication across data center disciplines, aligning your IT and facilities departments will also reduce the downtime that can result when IT managers relocate server hardware without considering the potential effects on power and cooling systems, or when facilities managers resize power and cooling systems without fully weighing near-term operating requirements.

2. Reduce costs by investing in more efficient power technologies

At first glance, installing new power chain components isn't the most logical way to cope with tough economic times. But the latest power systems are so much more efficient than their predecessors that they can quickly pay for themselves.

For example, in the 1990s, the average Uninterruptible Power Supply (UPS) was generally about 85 to 90 percent efficient. Today's models, however, routinely achieve 90 to 94 percent efficiency, and UPSs equipped with Energy Saver System (ESS) deliver up to *99 percent* efficiency.

Moreover, late-model UPS systems enable you to achieve such dramatic efficiency improvements without sacrificing reliability. Traditionally, data center managers have had to choose between comprehensive power protection and high efficiency in UPS products. UPSs equipped with ESS technology, however, continuously monitor incoming power conditions and dynamically balance the need for efficiency against the need for premium protection. The upshot is a power infrastructure that lowers energy and cooling costs without depriving mission-critical IT resources of nonstop access to clean, dependable power.

For most companies, that can quickly translate into considerable savings. For instance, a 10-year-old UPS delivering 60 kW at 90 percent efficiency uses an average of 584,000 kW hours per year. A UPS delivering 99 percent efficiency, by contrast, would consume only 535,909 kW hours annually, a reduction of more than 48,000 kW hours. Assuming a utility rate of 10 cents per kW, you'd save approximately \$39,800 on energy in less than five years, assuming appropriate cooling efficiency.

Upgrading your UPS hardware, however, is just the beginning. Upgrading your UPS hardware not only improves power cost, but also frees up 20 to 25 percent of additional UPS capacity for server equipment. In addition, there are two more ways to save money by modernizing your data center hardware:

- **Deploy state-of-the-art, energy-efficient power distribution units (PDUs):** Modern PDUs utilize energy-efficient transformers and incorporate branch circuit monitoring, which allows you to securely view the status of every circuit in the data center and receive automated alerts should signs of impending trouble appear. That can measurably lower your exposure to costly server outages.
- **Upgrade to newer, more energy-efficient servers:** Replacing your server hardware with newer models, and operating them in energy saver mode, can cut your electricity bill over three years almost as much as the hardware itself will cost you.

3. Enhance efficiency and flexibility by employing modular power system design principles

No business ever wants to get caught with less power than it needs to support current operations and future growth. Yet arming yourself with excess capacity in case you eventually require it pointlessly drives up capital outlays while lowering overall efficiency.

As a result, experts increasingly recommend taking a modular approach to power system design, in which you deploy only the capacity you need in the short term and gradually plug in additional resources as your business grows. That allows you to keep pace with expanding needs economically, rather than pay heavily in advance for capacity you may never even require.

Moreover, a modular power system also offers:

- **Improved reliability:** Building a power chain around multiple modular components instead of a single big one increases redundancy. If a module goes down, others can compensate automatically, saving you money by preserving uptime.
- **Greater flexibility:** Modular systems are smaller and easier to install, making them ideal for today's fast-paced data centers, in which technicians are constantly moving, changing and adding infrastructure resources.

Of course, to make a modular power system design work you need modular power system products. That's why newer UPSs let you add capacity in building blocks to optimize what your final configurations require. Similarly, the latest PDUs enable technicians to quickly add more power capacity or configure racks for new equipment.

4. Boost efficiency and uptime by implementing enterprise monitoring to see real-time effects of improvement

At many companies, the IT department monitors storage, network and computer assets with one set of monitoring tools while facilities uses separate systems to monitor power and cooling. With Web-based convergence solutions, however, organizations can use a "single pane of glass" to monitor their entire enterprise.

Utilizing this secure, holistic view, IT and facilities can increase server availability and optimize power utilization. Convergence solutions correlate specific power circuits to specific servers and applications, enabling data center managers to spot potentially dangerous electrical conditions in real time, see exactly which business services they jeopardize and take prompt preventive action.

Additionally, most enterprise monitoring solutions collect historical data on power usage patterns. Drawing on that information, facilities managers can levy precise chargebacks to business managers based on the actual amount of energy they consume, or perform "what if" analyses to find the most efficient data center configuration for their environment.

5. Save money by using sustainable data center practices to reduce your carbon footprint

Data centers have an enormous appetite for electricity. In fact, a typical data center consumes 10 to 30 times more energy per square foot than the average office building—a figure that has doubled in the last five years.

All of that power usage harms the environment as well as corporate balance sheets. Fortunately, however, organizations can reduce both carbon footprint and their energy spending by implementing environmentally-responsible "green IT" practices such as these:

- **Consolidating servers through virtualization:** Most data centers are filled with legions of underutilized yet energy-hungry servers. Virtualization technology enables businesses to reduce such waste. Under virtualization, a single physical server supports multiple "virtual machines," each with its own operating system and applications. This enables organizations to convert underused

physical servers into virtual devices, and turn off or shut down devices that are not needed. The end results are greater hardware utilization and significant energy savings.

- **Creating hot and cold aisles:** Every server in your data center takes in cool air through one vent and expels hot air through another. Simply positioning servers such that only hot air exhausts or cool air intakes face each other in a given aisle can generate a continuous air flow in your data center that lowers operating temperatures and reduces the burden on cooling systems.
- **Deploying modern UPSs:** In 2008, Eaton worked with a consulting firm to conduct a UPS lifecycle assessment study. The results showed that operating a UPS accounts for more than 97 percent of its total environmental impact, versus just three percent for manufacture, delivery and disposal. Moreover, the study found that energy-efficient UPSs impact the environment only 11 to 14 percent as much as older models. Upgrading to more efficient UPS hardware, then, can have a significant positive impact on an organization's carbon footprint.

Though relatively easy to implement, practices like these can make a big impact on operational spending. In fact, coupling ideas like those above with deployment of more efficient power and cooling technologies can enable a midsize data center with 1,500 servers to save millions of dollars while dramatically shrinking its contribution to global warming.

However, effective change starts at the top, so the first step in any green IT initiative should be gaining executive sponsorship. Only if senior leaders clearly proclaim their commitment to doing business sustainably will green practices become embedded throughout a company's entire culture.

Eaton's contribution to the industry and environment

Here at Eaton, we're doing our part to help organizations power their way through these tough times. Most importantly, of course, we continue to develop leading-edge technologies that equip our customers to use power more efficiently, effectively and safely. But we're also setting new standards for operational efficiency and environmental stewardship in our own business practices.

Eaton data centers

For example, Eaton is currently completing two state-of-the-art data centers that are designed from the ground up to take maximum advantage of the strategies discussed in this white paper.

Increase ROI through organizational alignment: Three years ago, Eaton re-aligned its organizational structure such that the vice president of facilities now reports to the CIO. As a result, one executive is now responsible for driving both IT efficiencies and power and cooling efficiencies.

Reduce costs by investing in more efficient power technologies: Eaton's new data centers will use only energy-efficient servers and switches, as well as the latest and most efficient power quality and distribution systems. Though such components will cost us a little more up front, they will significantly reduce our energy bills and carbon footprint over the long term.

Enhance efficiency and flexibility by employing modular power system design principles: Our data centers have been designed to support Eaton's needs for at least the next 10 to 15 years. However, we will initially use only 30 percent of that capacity. As our requirements increase or decrease over time, modular design principles will enable us to scale capacity up or down flexibly as needed. As a result, we don't have to buy 15 years worth of anticipated power resources in advance.

Boost efficiency and uptime by implementing enterprise monitoring: Our IT and facilities departments will both enjoy access to the same enterprise-wide monitoring technology, enabling our technicians to identify and address power issues as quickly and effectively as they do network and storage problems.

Save money by using sustainable data center practices to reduce your carbon footprint: In keeping with a company-wide commitment to "doing business right" that has the complete support of our chairman and CEO, Eaton's new data centers employ a variety of technologies and practices aimed at conserving power and shrinking our impact on the environment.

Sustainability

When it comes to environmental responsibility, Eaton has a long heritage of going above and beyond mere compliance with regulatory requirements. We're dedicated to making sustainability an integral part of everything we do. That's why we like to call Eaton the business that's "sustainable by design". Here are just two examples of that credo in action:

Eaton Green Leaf products

Though all of Eaton's products and solutions are designed to meet or exceed government standards for protecting the environment, products and solutions that bear our Green Leaf designation go well beyond normal standards to provide exceptional environmental benefit.

To earn the Green Leaf designation, a product or solution must exceed our existing environmental standards by meeting additional, even tougher requirements, including:

- Analysis of potential negative attributes, trade-offs and risks
- Thorough documentation
- Higher level of customer environmental benefits

A panel of representatives from across Eaton reviews the application and makes a decision on whether or not to award the Green Leaf. Ultimately, however, our customers and consumers provide the final—and highest—level of approval by choosing our products for their superior environmental performance.

Eaton Electrical Group headquarters

When Eaton needed to construct a 120,000 square foot addition to the headquarters of our Electrical Group, located near Pittsburgh, Pa., we challenged ourselves to meet the highest standards for energy and water efficiency, CO2 emissions reduction, indoor environmental quality and responsible stewardship of resources.

As a result, the facility we opened in August 2008 reflected innovation in sustainability from top to bottom. For example, the building is equipped with Eaton's Pow-R-Command lighting control systems, which take advantage of daylight by dimming artificial lights automatically as the sun rises. The building also uses variable frequency drives to control heating and air conditioning motor speeds. Drawing on real-time building temperature and air quality readings, variable frequency drives enable facilities to exceed required ventilation rates by more than 30 percent while reducing energy usage by 25 percent.

Conclusion

Given the strategic importance of information technology, access to clean, dependable power is more important than ever. Yet the cost of obtaining that energy is continually climbing, worsening the impact of economic pressures on already stretched operating budgets.

As a result, businesses of every size are looking for ways to power ahead through today's difficult economy. The strategies discussed in this white paper represent five viable answers. By creating organizational alignment, investing in more efficient power systems, employing modular data center design principles, installing enterprise monitoring systems and implementing green IT practices, organizations can substantially reduce costs by measurably improving their operating efficiency.

Of course, sharing best practices like these isn't the only way Eaton is helping businesses cope with the impact of rising energy costs amid economic uncertainty. We're also developing some of the most energy-efficient power technologies available, and dedicating ourselves not only to lowering our own emissions, energy use and water consumption but to helping our customers and suppliers do the same. Furthermore, Eaton is committed to helping customers implement sustainable materials and practices so they may realize environmental benefits and financial savings. It's all part of our passionate conviction that any organization can power their way to success through our turbulent economy by making wise investments that deliver powerful returns.

About Eaton

Eaton Corporation is a diversified power management company with 2009 sales of \$11.9 billion. Eaton is a global technology leader in electrical components and systems for power quality, distribution and control; hydraulics components, systems and services for industrial and mobile equipment; aerospace fuel, hydraulics and pneumatic systems for commercial and military use; and truck and automotive drivetrain and powertrain systems for performance, fuel economy and safety. Eaton has approximately 70,000 employees and sells products to customers in more than 150 countries. For more information, visit www.eaton.com.

About the Author

Born and brought up in Sweden, Lennart completed his MS degree in electrical engineering from Chalmers University of Technology in 1974. In 2004 he was appointed as Director of Engineering at Eaton Power Quality Corporation, with the responsibility to develop and grow all Power Quality products globally. The product lines included UPS, Power Factor Correction, Power Distribution, Surge Protection Devices, other products and services that improve that improve power quality, reliability and efficiency in critical applications.

With a diverse and rich experience of 35 years in power industry, Lennart currently holds the title of Vice President and Chief Technology Officer for Eaton Electrical Group.

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