



Going Green

How to Get Started with a Green IT Initiative.



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EXECUTIVE SUMMARY

One can hardly open a business or IT publication today without seeing an article about “going green.” Many people think this simply means lessening our impact on the environment. That is partially true, however it can mean much more. From an IT perspective, it means becoming more energy efficient. It can also mean reducing costs and boosting the bottom line.

This whitepaper is designed to give executives an overview of why green IT initiatives are becoming so important, some of the steps that your organization can take to launch a green initiative and why you should consider doing this. It also discusses the future of green computing and what to expect in the years to come.

The focus of this whitepaper is primarily on efficiency initiatives within the data center. However, readers should recognize that the majority of power usage in IT is outside the data center, spread across the enterprise. This can be more difficult to define and control, but should be a part of any corporate move towards better power management.

Becoming more energy efficient is a task that all organizations will have to face sometime soon. Forces outside the organization are seeing to that. By starting a dialogue now both internally and with vendor partners, companies can begin to plan their own green initiative and realize its accompanying benefits.

WHAT'S ALL THE BUZZ ABOUT GOING GREEN?

Over the past few years there has been an ever growing emphasis within society in general to “go green.” To most people, that means becoming more environmentally sensitive and changing old habits to be more resource conservative. However, in the business technology community, it can mean something quite different.

Many companies today are putting more emphasis on being environmentally astute, either by their own efforts or by pressure from regulatory or other outside agencies. The interesting thing is that by doing so, organizations are realizing that they can, in many cases, save money, and a lot of it. This is great news for IT departments that are always being pressured to reduce costs while still maintaining service levels.

There are a number of motivational forces at play that are driving companies toward a “green” computing mindset other than just being a good corporate citizen.

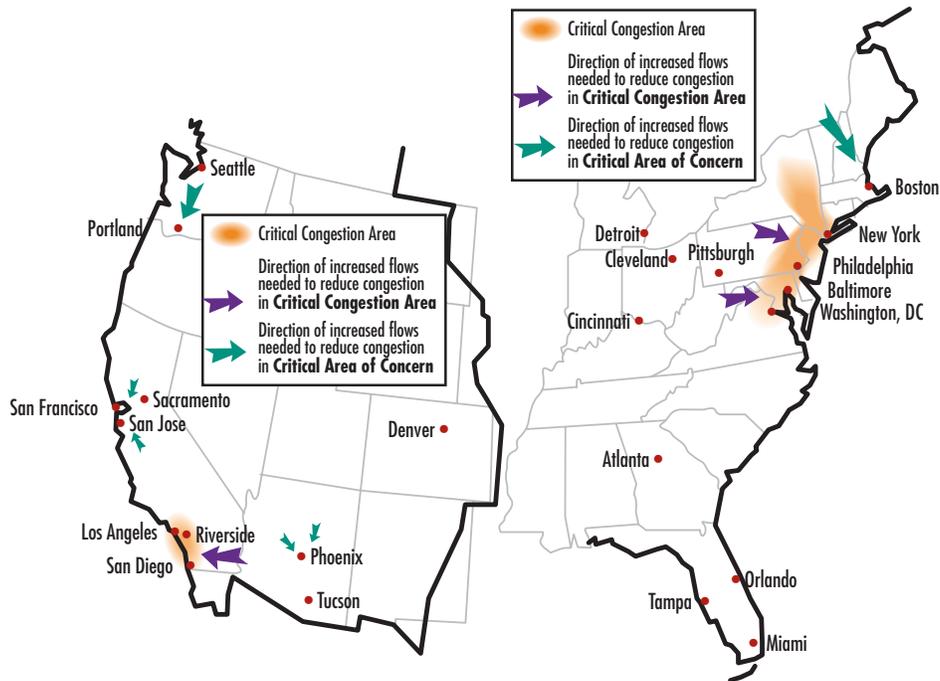
- **The rising cost of electricity:** According to The Edison Electric Institute, since 2000, the price of electricity has risen at a 2.5% annual rate, which is only slightly higher than the inflation rate.¹ However, the recent upsurge in the market prices of natural gas, oil and coal, the main fuels used in electricity production, can only mean more pressure on power producers to raise prices. Environmental concerns about pollution and the use of nuclear energy are also putting pressure on utilities. Since most utilities are highly regulated monopolies, there is much opposition to their raising prices. However, if the market forces continue to push the cost of fossil fuels upward, the utilities will have no choice but to raise their prices.
- **The availability of electricity:** Within many areas of the US, the aging power grid is not capable of being expanded and some utilities cannot increase production at their existing facilities. Therefore as the demand for more electricity increases, organizations are going to be limited in how much they can grow their IT infrastructure. The US Department of Energy projects that overall (electricity) consumption will increase by 45 percent in 2030 from today's levels.² Unless, the political climate towards power production changes, electricity will start to be limited in some areas. The map on the next page illustrates the impact of congestion on the power grid.

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1 "Rising Electricity Costs: A Challenge for Consumers, Regulators, and Utilities", Edison Electric Institute, May 2006.

2 "Rising Electricity Costs: A Challenge for Consumers, Regulators, and Utilities", Edison Electric Institute, May 2006.

Critical Areas and Areas of Concern for Transmission Congestion



Source: US DOE 2006b

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- Factors within co-location centers:** Because of the two preceding factors, many data co-location facilities have changed the way they charge their customers. Instead of a flat per rack, per cage or per square foot pricing model, they are adding an additional charge for actual power used. It is therefore critical that co-lo customers deploy the most energy efficient equipment that they can.
- Incentives from power producers:** Because of their inability to grow their production or delivery infrastructure, many utilities are now offering discounts to customers that deploy the latest computing technology using less power and producing less heat. Pacific Gas & Electric in California has been one of the leaders in offering rebates to data centers that use the most energy efficient servers.
- Advances in virtualization technology:** Over the last 5 years, great strides have been made in developing and implementing new technologies that allow servers, desktops and storage arrays to work in "virtual" mode. This ability to consolidate multiple physical devices into a single physical device has several obvious benefits: the reduction of the amount of power required to run enterprise applications and services as well as a reduction in the cooling systems requirements for those devices. Coupled with better management features, virtualization has moved to a main-stream strategy in making data centers more efficient and less costly to operate.

- **Stresses on data center cooling systems:** Because of escalating growth rates and other factors, many data centers are so tightly packed with equipment that many times, the cooling systems can not keep up with the load. Sometimes these systems can be enlarged to handle the load but that also requires more electricity to operate. If the cooling system is not expanded, the risk of device failure is elevated as the temperature within the data center rises.
- **The high cost of real estate: Many organizations are** physically constrained from expanding their data centers, whether they are internal or at a co-location site. Even if not physically constrained, the high cost of adding additional square footage can be prohibitive. In designing new data centers or additions, you must plan for peak computing consumption, not normal usage. This can drive up initial capital expenditures.
- **Government regulations concerning energy conservation are coming:** The Environmental Protection Agency has already issued non-regulatory guidance concerning the reduction of power consumption in data centers. The Department of Energy's EnergyStar Program is studying issues regarding data center energy consumption with the goal of establishing an energy usage standard for IT environments. One can only speculate that eventually Congress will pass legislation enforcing these new standards.³

³ "Report to Congress on Server and Data Center Efficiency", U.S. Environmental Protection Agency, February, 2008, <http://www.energystar.gov/datacenters>.

HOW TO GET STARTED

Planning and implementing a strategy for making your IT environment more energy efficient can be a complex and daunting task. To further complicate the issue, it is not just a data center problem. Energy conservation needs to take place across the whole organization, not just in the data center. It has been estimated that in a large company, personal computers and printers account for up to 80% of the electricity used for computing. These need to be addressed as well. Because this is an enterprise problem, other business units must buy into the strategy and pledge to do their part for it to be a success. Senior management should promote a business strategy that strives to obtain the most business value from IT infrastructure and data center investments while contributing positively to organizational and environmental goals.

The best way to get started is to develop a structured plan. Emtec's Data Center Efficiency Workout/Workshop Methodology can provide a practical hands-on way to kick start the planning process. Whether you bring in outside help or develop one internally, here are some components you may want to consider.

- **Appoint a person to be the corporate sponsor and leader for energy conservation:** The best fit would be someone who understands both the enterprise IT environment as well as the business units of the organization. This person must be able to cross organizational lines to gain consensus and buy-in, which is not an easy job. They should also have the authority to make decisions based on an enterprise perspective, not just a department perspective.
- **Conduct an initial energy audit:** Before you can track how much you save you need to know what you are really using. There are a number of firms who specialize in conducting energy and cooling audits. Let the experts do it, do not try to do it yourself. There are two schools of thought on how to measure power consumption in a data center. One is to measure down to the individual device level and aggregate all the data up to get a total. The other way is to measure at the PDU (Power Distribution Unit) level, (typically at the rack level), and statistically determine individual device usage by extrapolation based on server type. The second approach is less expensive, faster and yields similar results as the first. Cooling audits will point out hot spots in the data center that need additional cooling, and will help in designing the most efficient equipment layout.
- **Develop an energy initiative strategy:** Green data center efficiency is broken down into 4 areas:
 1. **IT Strategy:** How can you achieve your business objectives with less energy by considering different IT configurations, architecture and hardware designs?
 2. **IT Hardware Asset Utilization:** How can you maximize the portion of your IT hardware assets which are actually deployed for production?
 3. **IT Energy and Power Efficient Hardware Deployment:** How do you select and justify buying IT hardware that delivers the most effective computing performance per Watt of power consumption at the plug?

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4. Site Physical Infrastructure Overhead: How can you maximize the amount of useful power/energy delivered to the power plugs of IT hardware for each unit of power/energy consumed at the data center utility meter?

- **Implement a process to measure energy usage:** There are a number of tools in the marketplace that provide continuous monitoring and logging of energy usage, down to the device level. These will be the real measure of how effective your green initiative will be and can help you spot deviations that can be quickly remedied.
- **Prioritize potential energy savings areas:** After conducting an initial audit, you should be able to categorize devices based on their energy usage. Focus on the ones that will yield the biggest returns first, such as turning off unused servers, which usually make up 15-30% of servers in a data center.⁴ When doing this, be sure to remove any related hardware service contracts from those devices you shut down for additional cost savings.
- **Look at IT equipment outside of the data center:** IDC reports that its research shows that 80% of all power consumed by IT equipment is outside the data center. That means that all those PC's and printers that are left on 7x24 are using massive amounts of electricity. Simply invoking a policy that everyone turns their PC off when not in use can be very effective. There are also devices that turn off peripheral items when the PC is shut down, eliminating phantom power usage. It could also be as simple as setting power management on desktop and laptop PCs. Another strategy many companies are implementing is the use of "thin clients" instead of PC's. A thin client uses only 20% of the power of a PC and offers many other advantages as well.
- **Review energy requirements for new equipment purchases:** All IT hardware vendors are on the "green" bandwagon. They all view the green initiative as a new reason for customers to refresh their hardware. Therefore, they are all working feverously to make their products more energy efficient. Some have done better than others. There are a number of areas to consider, including processors, memory, hard drives, backplanes, and interfaces. Most manufacturers have power usage numbers on their equipment available but are careful when comparing to look at like specifications. Most vendors will show power usage at idle, not peak load. You need to know both.
- **Seriously look at implementing virtualization technologies:** Virtualization is another topic that has garnered huge interest. Essentially, virtualization means consolidating "virtual" servers and desktops on fewer physical pieces of equipment to better utilize those resources. The benefits can be enormous. Energy usage can drop by 80%, security is much better and management tools are very good. Virtualization technology is now mature and offered by a number of vendors. There are ROI and operating expense calculators that make it easy to determine the cost savings. Virtualization is not just for servers but for storage and networking infrastructure as well.

- **Develop a corporate data retention policy:** Many companies do not have a published data retention policy in place. Having too much data can be as bad as having too little. Old, rarely-used information or duplicate files can take up valuable space on disk arrays. This leads to slower response times and increased costs to maintain it. Having a retention policy also insures that the organization is in compliance with government and industry regulations.
- **Consider a tiered storage architecture strategy:** Most companies have kept their data on hard disk arrays and then periodically backed it up to tape. Even data that is hardly, if ever accessed, resides on expensive, first-line storage devices. A more practical and less expensive approach is to tier data, based on a set of criteria. As data grows older or is accessed less, it gets moved to less expensive, more energy efficient storage. As an example, a 7200 RPM drive uses 8 times the power of a 3600 RPM drive. Though the 3600 RPM drive is slower, it is much less expensive to buy and operate. There are a number of vendors that offer excellent archiving tools that can manage this process automatically.⁵
- **Investigate data management techniques:** There are many tools and techniques on the market today that allow for much better observation and management of data. Thinprovisioning of applications and data de-duplication are just two of the techniques that can significantly increase data center efficiency and lower costs.
- **Establish cost goals and objectives for future periods:** Once your initiative has been started, you should be able to establish baselines and goals for future costs. By monitoring your usage and resulting costs, then measuring them against your benchmarks, you can tell how effective your initiative is and make corrections if necessary.

THE FUTURE OF GREEN COMPUTING

As companies and their employees learn more about how to become energy efficient and begin to see the benefits, interest will rise even further. In the entrepreneurial economy of the United States, these types of challenges always motivate innovators to find a better way. New technologies, processes, and strategies are emerging which will benefit everyone in the long run. Following are several things that are likely to happen:

It is likely that the government, both state and Federal, is going to intervene in the topic of energy conservation. Congress has already held hearings and has had the Department of Energy compile a report on issues and initiatives in electricity production and consumption.⁶ There have been no nuclear power plants built in the past three decades and there is active interest but there will likely be continued objections from environmental groups. Consumer advocates are openly battling utilities over rate hikes. All of these areas have historically incurred government intervention. That is not likely to change.

Research is being conducted on replacing copper wires in microprocessors with light pulses and lasers. Physical conductors such as copper create heat and are not efficient at energy transfer. Initial indications are that significant savings in electricity could be attained with this new technology. If perfected, the applications could be endless.

Another technology focus is on Solid State Disk Drives (SSD's). Vendor claims of only 20% consumption of energy over traditional moving disk-based drives have proven accurate. Additional benefits of SSD's are phenomenal performance and reliability. To build a traditional storage array that rivals the SSD in performance, you must use many 15K RPM disks inside of enclosures with fast, power-hungry I/O compute engines and lots of cache memory. All of these components require lots of power and thus are costly to operate. As soon as the purchase price of SSD's comes down a little they will become a viable alternative.

Software tools that allow servers and storage arrays to go into hibernation mode during off-peak times and then wake up when needed are beginning to emerge. Coupled with future generations of IT equipment that will be designed to draw only the amount of power needed to run at the current load required, data centers will become much more energy efficient.

The DCeP metric (Data Center energy Productivity) is becoming an important tool to track and compare the energy efficiency of data centers. Although just in its infancy, the metric, or one like it, is likely to become the standard by which green data centers are measured.⁷

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6 "Report to Congress on Server and Data Center Efficiency", U.S. Environmental Protection Agency, February, 2008, <http://www.energystar.gov/datacenters>.

7 "A Framework for Data Center Productivity, White Paper #13, The Green Grid, 2008.

CONCLUSION

Turning a traditional IT enterprise into an energy efficient one is a complicated task. There are many things that need to be considered in devising a strategy to move in that direction. The benefits can be huge. Not only can an organization become more socially conscious of the environment and become a better corporate citizen, but real, measurable costs can be saved.

All organizations are not in a position to implement a massive “green” initiative, but there are a number of things that can be easily implemented that will return immediate results. Every organization should at least start a dialogue to ascertain what they can do. There are many resources available to help companies start in the right direction.

RESOURCE LINKS

Industry Links

- The Green Grid: <http://www.thegreengrid.org/home>
- Uptime Institute: <http://uptimeinstitute.org/>
- US Green Building Council: <http://www.usgbc.org/>
- The Energy Star Program: http://www.energystar.gov/index.cfm?c=business.bus_index
- Green Data Center Info: <http://www.greendatacenterinfo.com/>
- Green Data Center Blog: <http://www.greenm3.com/>

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Emtec Links

- Emtec Blog
- Emtec Event Archive
- Emtec Whitepapers
- Emtec Website

ABOUT US

Emtec, Inc.

Emtec is the right size provider of technology-empowered business solutions for world-class organizations. Our local offices, highly-skilled associates, and global delivery capabilities ensure the accessibility and scale to align your technology solutions with your business needs. Our collective focus is to continue to build clients for life: long-term enterprise relationships that deliver rapid, meaningful, and lasting business value.

At Emtec, our mission is to help our clients improve IT systems and processes – to transform IT into an investment that returns true value to their respective organizations. For more information visit: www.emtecinc.com.

Emtec's Green Offerings

Emtec Inc has a four pronged approach built on the core findings of the Uptime Institute and Mckinsey & Co to improve efficiencies within the datacenter.

- Executive alignment and planning between IT and facilities leadership.
- Targeted consulting initiatives to address issues such energy audits, datacenter usage assessments, architecture selection etc.
- Selection and implementation of tools to not only measure power and cooling but provide actionable intelligence at the device level.
- Comprehensive virtualization and application mobility capabilities brought to bear across a wide range of Operating Systems.

Please contact us if we can help your organization meet these challenges and opportunities.