

Going Green: A Strategic Guide to Green IT Management

An ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) White Paper
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Executive Summary

Green IT solutions have established themselves as important – and in some cases, critical – deployments for increasing energy efficiencies in order to reduce operational costs, achieve power utilization objectives and ensure sustainable value in IT investments. Rising energy costs and, in some cases, limited power availability are driving institutions to find solutions that will ensure long-term sustainability for IT assets that are essential to on-going business success and profitability. Nonetheless, with the increased number of available solutions, it is often unclear to IT managers which green IT implementations will maximize their energy efficiency to achieve business goals. The answer to this is the development of an organizational green IT management strategy that takes into account real-world power consumption requirements along with business IT needs in order to establish clear processes for power reduction that will enhance IT value to the organization.

Introduction – The Value of Green IT

Until recently, power utilization has generally not been a major concern in the development and implementation of technology components. As businesses have grown increasingly dependent on IT to achieve organizational goals and drive productivity, the consumption of energy has proportionally increased. This has introduced a new set of operational burdens, including not only larger energy costs, but also in ensuring sufficient power availability to support IT operations. Rising energy costs and increased global demand for available power have only exasperated the problem. At the same time, increased concern over the global climate crisis has led to social pressures and the introduction of regulatory compliance focused on reducing energy consumption. Responding to these challenges, new technologies and solutions have been developed to assist organizations in achieving power utilization goals.

Green IT solutions are products, services and practices designed to improve the efficiency of computing resources in such a way as to reduce the environmental impact of IT utilization. Although now broader in scope, green IT was initially founded on the “triple bottom line” principle which defines an enterprise’s success based on its economic, environmental and social performance. This philosophy purports that given that there is a finite amount of available natural resources, it is in the interest of the business community as a whole to decrease their dependence on those limited resources to ensure long-term economic viability. Just as the logging industry long ago learned they need to plant a tree for each one they cut down, today’s power consumption enterprises must maximize the conservation of energy until renewable forms become more readily available. This is often referred to as “sustainability” – that is, the necessity for maintaining a consistent availability of natural resources to ensure the continuance of the existing level of society and commercial enterprise.

For many organizations, the true challenge in achieving sustainability lies in seeing beyond annual or even quarterly budgets to institute green IT strategies that will ultimately reduce costs and guarantee long-term power availability. Clearly, however, it is in an enterprise’s best interest to ensure sustained profitability, so taking steps early to maximize energy effi-

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ciency will have a direct impact on staving off increased costs of electricity over time. According to the U.S. Department of Energy, the average commercial cost of electricity has increased 24% since 2000 (from 7.43 cents/KwH to 9.77 cents/KwH), and there is every indication this trend will continue as national power requirements increase. Data center power utilization alone has doubled since 2000 (according to a 2007 report released by the U.S. Environmental Protection Agency) and now accounts for roughly 1.5% of all U.S. electricity consumption (or 61 billion KwH). To put this in perspective, this is almost twice the estimated level of electricity consumed by the nation's color televisions (34 billion kWh) and more than half the electricity utilized by all U.S. household lighting (101 billion kWh). The EPA report projected data center power consumption to double again by 2011 to more than 100 billion kWh, resulting in a staggering \$7.4 billion annual national electric bill for servers and data centers.

Increased power consumption has created an even greater challenge for many businesses in areas where power companies have had to place limits on power availability to their facilities. In order to expand data center capacity to meet new and increasing business requirements, these enterprises must invest in green IT strategies to reduce existing power consumption or either face the whopping costs associated with building new facilities or abandon the new revenue generating projects entirely. As an additional benefit, green IT solutions promoting consolidation in the data center also increase physical available space, further enabling IT growth.

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The introduction of regulatory compliance initiatives around power consumption in many locations is also a strong driver for implementing green IT solutions. Fueled by international concerns over the global climate crisis, government and industry bodies have established compliance standards that not only promote responsible power utilization, but also apply stiff fines for failure to meet established limits. As a further incentive, many countries (and a few U.S. States) have developed a market for “white certificates” that allows the trading of carbon reduction points as a commodity. Certainly, the future expansion of regulatory compliance is in the hands of politicians and ambassadors, but it seems very likely this practice will grow significantly over the next few years and impact locations that are currently unaffected.

Finally, the value of introducing green IT initiatives cannot be dismissed when it comes to corporate image, marketing and public relations. No business has ever gone wrong with good publicity, and environmentally friendly businesses are very often rewarded by the news of their social commitments and good corporate citizenship. With the increased interest in green solutions, there is greater opportunity for free publicity and a broader marketing message beyond mainstream outlets. Further, potential investors are typically impressed when businesses streamline operations and reduce costs, and socially conscious businesses are further benefited by gaining special consideration by like-minded investors and fund managers.

It appears we've turned a corner on the topic of green IT – the question is no longer about how valuable green IT solutions are, but about which solutions provide the greatest benefits. To achieve maximum power efficiency and return on investment, organizations need to develop a strategy for identifying and implementing energy-efficient solutions that will reduce costs, increase operational performance, and ensure long-term, sustainable profitability.

Understanding IT Power Consumption in the Data Center

The key to establishing a green IT strategy that will address power concerns across an IT infrastructure is developing a complete holistic view of the environment that is intuitive, accurate and easily accessible. This is not nearly as easy as it sounds. Today's dynamic IT

implementations are extremely complex and consist of thousands of configuration points and a continuous flurry of performance and status conditions. Collecting and sorting through all this data through purely manual methods and in a way that will facilitate informed decision making is simply impractical – and, in large implementations, impossible. Fortunately, automated solutions are available that are designed to assist in the data gathering process, and it is highly recommended that these be employed for this purpose.

The obvious place to start gathering data is by determining the actual power consumption of each IT asset. For servers, power consumption should be tracked over time so that it can be later correlated with system utilization. There are several methods for achieving this. Some recently developed chip sets, such as

the Intel VPRO™ Technology, already track energy consumption data at the system level and can be accessed to provide detailed reports. Similarly, many of today's intelligent power distribution units record power utilization for each of their supported outlets, which can then be correlated to particular IT components. Often, this data is accessible through a direct network interface within the power distribution unit. Lacking these direct methods of acquiring power usage data, some software based solutions are available today that can automatically interpolate system power consumption based on system performance data (uptime, disk IO, etc.). These typically maintain an internal database of average power draw for a wide variety of IT component architectures so that fairly accurate calculations on energy usage can be attained. Failing all these, IT managers can develop a very basic understanding of an IT component's energy consumption by simply multiplying the systems power draw (in Watts) by the number of hours the system is running. This will not provide detailed trending data, but it will give an indication of how wasteful or efficient the particular component is. Industry metrics, such as those being proposed by the business consortium, Green Grid, will additionally aid in determining the actual efficiency of an IT infrastructure.

Certainly, power consumption in the data center is not limited to servers. Networking units, HVAC (heating, ventilation and air-condition), physical security systems, lighting and other facilities components all contribute to total data center power consumption. Some of the

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methods mentioned above – such as data from power distribution units and software based power monitoring packages – can also be used to gather data from many of these components. HVAC systems, in particular, pose a more challenging problem for data collection. Although overall power draw can be measured for each of these units, understanding if they are being utilized appropriately is dependent on understanding thermal conditions in the data center. Again, some chip technologies and power distribution units can provide this data, but if these are not available, thermal and air flow detectors can be deployed at strategic locations across the data center. Air conditioning units are set based on the location of their own sensor. If this happens to be located in a “hot spot,” the unit may run far more often than necessary. Conversely, if a stack of servers are in a “hot spot” not detected by the HVAC unit, cooling may be insufficient causing the servers’ fans to run overtime and possibly even damaging the assets. Understanding thermal conditions in the data center allows IT and facilities managers to distribute systems and racks appropriately to minimize energy costs associated with system cooling.

In addition to collecting power consumption data for IT and data center components, it is also important to collect system utilization information. Included in this would be system uptime, performance indicators, account access, application usage, storage capacity and any other relevant data necessary to determine the value each unit has to the business. By correlating this information with the power usage data, a holistic view of the IT infrastructure is established from which informed decisions can be made for developing a green IT strategy.

Developing a Green IT Management Strategy

Before developing any management strategy, clear goals need to be established to ensure all implementations bring quantifiable value to the business. In the case of green IT, these would include goals such as for power reduction, regulatory compliance, decreased carbon

footprint, and operational cost savings. The scope of these goals (i.e., how much power reduction or cost savings, etc.) should also be established to determine at what point appropriate return on investment has been achieved. Measurements can then be set and monitored determining the on-going success of the implementation. During the development phase of the project, these goals will be the deciding factor in determining which green IT solutions to implement.

Keeping the goals in mind, the power and system utilization data that has been collected is now evaluated. This is where having a centralized software solution for data analysis becomes

critical. By utilizing a single interface to access and correlate all relevant data, IT managers can deduce which green IT implementations will provide the greatest value. For instance, if system utilization data indicates servers that are drawing a great deal of power, but are rarely utilized, these might be candidates for retirement, consolidation or power management. If, on the other hand, a system is heavily utilized and consumes significant power, perhaps it is time to upgrade to newer and more efficient hardware platform.

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Here are a few of the most common green IT solutions that can be incorporated into an overall strategy:

Decommissioning Unused Systems – Systems that are rarely or never used but draw power should be retired. Any relevant data or services should be moved to an alternate server.

Consolidation – If a number of servers are not being utilized to their storage and performance capacity, they should be consolidated onto a fewer number of systems and the excess servers retired. It is important to ensure that the consolidated systems are able to handle peak loads for the combined services they will support, and when possible, the retired systems should be those that are the least power efficient. For large consolidation projects, mainframes or blade servers can be employed for even greater power efficiency. To determine if this solution is the most appropriate for a particular infrastructure, evaluate the collected data to determine the number of systems to consolidate and their actual power consumption. Then compare this data to the published power consumption rates of the large hardware platforms to determine if there is a justifiable return on investment.

Utilization Management – As an extension to consolidation, utilization management processes allows computing services to be distributed across available servers to maximize their utilization. Unused systems can then be retired and new systems will not need to be purchased unless absolutely necessary.

Virtualization – Also closely related to consolidation, virtualization allows multiple system implementations to be combined onto a single power efficient server while at the same time allowing them to operate “independently” within separate virtual containers. Since virtualized environments can utilize common operating system and application components, overall storage and processor requirements are reduced along with their associated power utilization. Beyond the data center, virtualization can extend the same functionality and benefits to client workstations, enabling hundreds or even thousands of desktop environments to take advantage of the more power efficient processing available from a mainframe or blade server architecture.

Power Management – Traditionally, data center servers are left operational 24x7x365. Often this is done to facilitate after-hours functions like backups and maintenance, but more often it is because the manual process of daily shutdowns is both cumbersome and impractical. Many systems management solutions now allow the automation of shutdown and power-up processes to ensure servers are only running when they need to be available. Power management schemas can also be extended to desktops to ensure they are turned off when employees are not in the office and to enforce the use of power usage options, like hibernation and sleep modes.

Upgraded Hardware Technology – As hardware manufacturers continue to improve power efficiencies and develop new features (like CPU throttling during low use periods), the incentive to upgrade aging IT components increases proportionally. Here again, evaluation of system power and performance data versus expected improvements can help determine if an upgrade is warranted.

Thin Clients – Extremely energy efficient workstations with little or no disk capacity can take advantage of virtualization and streaming technology to significantly reduce desktop power consumption.

A green IT strategy can include any one or combination of these solutions. Utilizing management best practices, like the Information Technology Infrastructure Library (ITIL), can help prioritize solutions and build strategies to ensure they achieve business goals. For example, ITIL recommends that solutions are chosen based on two principle criteria: how much value they bring to the business and how well they address critical pain points. In the case of green IT, both criteria are served by how much reduction in power would be provided by each solution. Those that would bring the greatest reduction should be deployed first. This seems obvious, but understanding which solutions achieve the greatest energy efficiency can only be determined through careful evaluation of the applicable power and systems utilization data as it relates to the business.

Implementing Green Solutions

Many businesses face significant challenges in actually implementing green IT solutions even after a detailed strategy has been developed. Often this arises from the business management structure itself. In many organizations, data centers are governed by facilities managers and servers are governed by IT managers. Since each of these roles operate independently with separate requirements, budgets and priorities, coordinating a green IT implementation can be difficult. The problem is exacerbated in large organizations that employ multiple IT managers to support independent projects or operational platforms. Since a comprehensive green IT strategy will impact an entire data center infrastructure, all affected managers will need to be involved in the implementation process. This, in turn, raises questions about who will perform the work and from which budget will the cost of the new solution be applied?

To address these concerns, many organizations have implemented governance teams that operate above IT and facilities support teams. These governance organizations have the ability to implement solutions that address overall green IT goals in a manner very similar to standard change management processes. Each new implementation follows an approval and tracking process to ensure all participants are on-board with their respective roles and responsibilities. Governance can also ensure green IT services are employed in conjunction with other business and IT initiatives to maximize their value to the business and avoid silo implementations.

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To deal with the challenges associated with ensuring reliable deployment of solutions to the IT infrastructure, automation processes should be employed for provisioning and data transfer. This will significantly reduce the risk of faulty implementations, decrease the impact to the production environment, simplify the process and reduce the time for task completion. In this way, IT implementations are better able to dynamically support constantly changing business requirements.

Identifying Solutions for Success

Essential to the success of a green IT strategy is utilizing better management solutions for data collection, analysis and implementation. As mentioned earlier, detailed monitoring and reporting on both power consumption and system utilization are impossible if

performed by purely manual processes or solutions which are not connected to the rest of IT. Automated services also greatly assist in the data analysis and deployment processes necessary for successful green IT solution development and introduction.

Fortunately, solutions do exist today that can provide the enhanced IT management functionality necessary to establish and implement a successful green IT strategy. When evaluating software packages, there are a few basic concepts to keep in mind. First, the software product should have a centralized interface. By enabling a single view for reviewing applicable data, quick and accurate decisions can be made on the best green IT solutions for a particular IT infrastructure. The product should also be fully integrated with a variety of data collection sources to ensure a complete and holistic view of the environment. It should also employ at least some level of automation. Automation improves data collection and deployment supportability and reliability. This is particularly necessary for achieving compliance initiatives where processes need to be performed in a repeatable and recordable fashion. With automated solutions, compliance can be enforced, out-of-compliance configurations are promptly reported and remediated, and proof-of-compliance is easily provided. To ensure the successful implementation of a green IT strategy, look for systems management solutions that excel in all these critical areas.

As an example, IT management software vendor CA provides integrated solutions within six key Enterprise IT Management focus segments for green IT initiatives:

Data Center Automation – Enables the agility necessary to quickly and effectively implement and adjust IT service delivery, empowering efficient use of capacity with little or no impact on business production.

Application Performance Management – Measures end-user and customer facing performance of business services which enables dynamic adjustments to optimize resource consumption and meet service levels.

Infrastructure Management – Monitors utilization across the infrastructure and provides the visibility and details necessary to optimize overall data center energy efficiency.

Service Management – Ensures green IT services provide end-to-end visibility into the IT infrastructure, conform to best practices like ITIL, and are designed to achieve business goals.

IT Security Management – Reduces risk and maintains reliable protection during transition and on-going operation of green IT implementations.

IT Governance – Provides the tools necessary to track, authorize and manage green IT projects, services and resources from inception through final implementation.

Each of these solution areas include a centralized interface that caters to the particular users of each solution. Together, these solutions enable a holistic approach to green IT deployment. With broad platform support, CA's solutions provide the detailed data collection and analysis capabilities necessary for making informed decisions on the green IT approaches to implement.

Regardless of which products are chosen and utilized, it is essential to understand that a detail-oriented, centralized green IT systems management software solution is the glue that holds together an enterprise green IT strategy which maximizes energy efficiency, ensures sustainable business-focused IT operations and facilitates better overall IT management.

EMA Perspective

There's no question green IT solutions have taken center stage as one of the premier IT topics in recent days. You can't seem to open a trade magazine or connect to a blog without reading something about "power utilizations" and "carbon footprints." In principle, however, this is one topic where the hype is justified. Green IT implementations bring real, quantifiable value to a business. It's simple numbers – the greater the energy efficiency, the greater the cost savings and the greater the return on IT investment value achieved by an organization.

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Recognizing the marketing value, a large number of IT vendors have jumped on-board the green IT bandwagon in an attempt to shore up the value of their existing solutions. Many of these have been almost laughable in how peripherally they actually address green IT issues. Others actually do bring real value, but only to certain organizations with specific goals and requirements. Sorting through this challenging maze of products and services can be quite daunting. This is a principle reason why standardizing on a solution that helps develop and incorporate green IT goals and strategies into existing business and IT processes and policies, through simplified data collection and analysis, is essential to developing an enterprise-wide policy.

Large businesses in particular will find value in a solution that evaluates all the disparate elements in their infrastructure and helps facilitate a governance program to ensure sustainability-related compliance across the business enterprise. Small- and medium-size businesses will be less advantaged by this approach, but will still find great value in automated solutions that can monitor power consumption details, correlate that information with IT assets, and assist in deployment processes. Balancing functionality and ROI with business needs and available budget is always a wise course for determining an appropriate management solution.

Enterprise Management Associates (EMA) recommends that all businesses interested in reducing operational costs and achieving long-term IT power sustainability invest in an integrated, centralized solution, like those provided by CA, to develop and deploy effective green IT strategies.

About CA

CA, Inc. (NYSE:CA), positions itself as one of the world's largest management software companies. It delivers software and services across operations, security, storage, life cycle, and service management, to help organizations optimize the performance, reliability, and efficiency of their enterprise IT environments. Founded in 1976, CA is headquartered in Islandia, N.Y., has 14,500 employees, operates in more than 100 countries, and has achieved ISO 9001:2000 certification.

About Enterprise Management Associates, Inc.

Founded in 1996, Enterprise Management Associates (EMA) is a leading industry analyst and consulting firm dedicated to the IT management market. The firm provides IT vendors and enterprise IT professionals with objective insight into the real-world business value of long-established and emerging technologies, ranging from security, storage and IT Service Management (ITSM) to the Configuration Management Database (CMDB), virtualization and service-oriented architecture (SOA). Even with its rapid growth, EMA has never lost sight of the client, and continues to offer personalized support and convenient access to its analysts. For more information on the firm's extensive library of IT management research, free online IT Management Solutions Center and IT consulting offerings, visit www.enterprisemanagement.com.

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Corporate Headquarters:
5777 Central Avenue, Suite 105
Boulder, CO 80301
Phone: +1 303.543.9500
Fax: +1 303.543.7687
www.enterprisemanagement.com

