TECHNOLOGY
BRIEFINGS

Common Sense About Green IT and Sustainability

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THE POWER TO KNOW

Sustainability: Putting IT in the Driver's Seat

BI solutions provide a 360-degree view of business operations

BY TOM FARRE

> IT has always helped enterprises reduce costs through more efficient processes, but when efficiency is viewed through a sustainability lens, the results can be startling.

Consider this your wakeup call: If you're in executive-level IT, you should be involved in your company's sustainability initiatives.

Why the urgency? Because sustainability offers a watershed opportunity for better business performance through innovation, while also benefiting the planet and perhaps your own career. By deploying the right technologies, IT can play a crucial role in furthering a company's ability to monitor, analyze and implement more sustainable, or "green," business practices, defined as those that meet the needs of the present without compromising the ability of future generations to meet their own needs. In many cases, making small, incremental changes in IT processes can lead to observable benefits.

"Lessening our impact on the environment and mitigating the future risk of depleting our planet's natural resources is becoming a priority in shaping every organization's strategy," says Jim Goodnight, CEO of SAS, a leading provider of business intelligence technology. "Information technology is essential to driving sustainability initiatives that not only reduce costs and preserve resources, but also provide an engine for innovation that can improve an organization's economic, environmental and social performance."

Indeed, a growing body of evidence suggests that green business is better business, says Andrew Winston, president of Winston Eco-Strategies LLC, an environmental consulting firm, and co-author of the book, *Green to Gold: When Smart Companies Use Environmental Strategy to Innovate, Create Value and Build Competitive Advantage*.

"The greening movement is a fundamental shift in how we all do business, helping enterprises to slash costs, drive new revenues, reduce risk and enhance brand value," Winston says. "Going green offers a vital new path to innovation and creating enduring value and competitive advantage."

This briefing explores sustainability as a driver for business innovation and the positive role that information technology can play.

The Larger Opportunity

A majority of IT departments are already involved in sustainability initiatives, most likely the greening of the data center. A February 2008 *Computerworld* research study found that more than six in 10 IT executives rated sustainable IT projects/initiatives as important or very important to their organization's overall IT strategy.

More than one-third of respondents reported work in progress or plans within the next 12 months to

reduce and manage waste, expand grid computing or virtualization, include green considerations in procurement processes, and conduct energy-efficient assessments. Other IT-driven projects include modifying physical data center infrastructure to gain eco-efficiencies, documenting policies that state what sustainable IT means to the organization, and assessing where IT can have the most impact on organizational greenhouse gas reduction goals and at what relative cost. Such initiatives can reduce operational costs while lowering energy consumption and greenhouse gas emissions—all laudable contributions to the sustainable enterprise.

Seven in 10 survey respondents also indicated that their green IT initiatives are tied to a larger organizational strategy for sustainability, and rightly so. The direct contribution of IT to greenhouse gas emissions, according to research company Gartner Inc., is estimated to be 2%, a considerable figure that should be reduced. But it pales in comparison to the larger opportunity of applying IT to reduce the remaining 98%—implementing technology solutions that provide insight into the best sustainability options and the right actions to effect change. Unfortunately, the office of the CIO is often not invited to the table for enterprise-wide sustainability planning and strategy.

"At a recent CIO roundtable, only three of 13 CIOs were involved in company-wide executive decision-making about sustainability practices," says Alyssa Farrell, marketing manager for sustainability solutions at SAS. "Most were involved in the greening of the data center, but the reality is that the CIO can facilitate the data collection, the analysis, and the support for robust business intelligence that can help non-IT executives make the right decisions about sustainability, such as assessing the financial tradeoffs around new products or production lines, more envi-

"By systematically collecting sustainability information from applications and providing the tools for analysis, the office of the CIO becomes an essential participant."

RANDY BETANCOURT
PROGRAM MANAGER, SAS

ronmentally friendly facilities, and the impact of changes in the supply chain. And IT can help companies address compliance with government regulations related to sustainability."

The takeaway from the CIO roundtable: "CIOs should be involved in enterprise sustainability discussions," Farrell says. "They should be investigating best practices and technologies that provide insight into sustainability decisions and performance management throughout the enterprise."

What stakeholders want

A key reason for the upside potential of sustainability is stakeholder demand. A growing number of today's consumers, as well as corporate buyers, suppliers, business partners, employees, and even banks that provide financing, are pushing enterprises to produce sustainable products and services in the broadest sense. They're concerned about energy usage, carbon emissions, pollutants, and social practices, and they expect transparency in the sustainability information chain. If they don't get it, they're prepared to do business elsewhere.

Even enterprises outside of traditional manufacturing are feeling the pressure. "SAS' products are our software and the intellectual property that uniquely solve a customer's business issue," says Farrell, "but even so, our customers have an interest in understanding the environmental management policies, procurement practices and social strategy of their strategic suppliers, including SAS." SAS recently published its sustainability profile in an online document, *SAS Corporate Social Responsibility Report*. Based on the Global Reporting Initiative (GRI), the most widely used sustainability reporting framework, the report provides insight into the qualitative and quantitative metrics that SAS employs for sustainable development. SAS uses its own sustainability management software to gather and analyze information about environmental, social and economic performance (see "SAS® for Sustainability Management," page 6).

Another telling point is that Wal-Mart and other value-chain giants are beginning to ask suppliers for details about the carbon footprints of their products. In addition, Home Depot's Eco Options label spotlights

products with less impact on the environment than competitors' products. Clearly, suppliers that can document their products' sustainability are likely to get more shelf space.

Beyond Green IT

Gathering data for such initiatives is just the tip of the sustainability iceberg for IT. Technology for sustainability data collection, analysis and decision support has enormous potential in helping companies to develop greener products and business processes, increase revenue by marketing to environmentally conscious customers, create greener product cycles from conception to end of life, and improve intangibles like brand loyalty, employee retention and employee recruitment.

IT has always helped enterprises reduce costs through more efficient processes, but when efficiency is viewed through a sustainability lens, the results can be startling. UPS, for instance, uses "package-flow" software to arrange packages in its trucks and map out the most efficient delivery routes. In part from drastically limiting left-hand turns, which waste energy as drivers sit idle, UPS estimates that in 2007 its software shaved nearly 30 million miles off its delivery routes, saved 3 million gallons of gas and reduced CO2 emissions by 32,000 metric tons.

In a typical enterprise, IT can make operations more sustainable through online collaboration by lessening the need for energy-wasting land or air travel. Collaboration initiatives can rise to new levels of significance, however, when CIOs have the data and tools to analyze how employee travel affects the

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>
> **ALYSSA FARRELL**
> **MARKETING MANAGER, SAS**

company's carbon footprint, perhaps applying different carbon values to short-, medium-, and long-haul trips. These and related metrics can help to quantify return on investment in collaboration technology, or provide an incentive for employees to embrace digital meetings. "Good data gets you to the starting line," says Winston of Winston Eco-Strategies, "but using the information in interesting, relevant ways can focus employee attention on the right things."

A similar methodology can help CIOs influence high-profile capital-expense projects, such as whether to build a greener facility or production line, says Randy Betancourt, program manager at SAS. "Executive management needs to understand the cost benefits in terms of the carbon footprint, profitability, brand image, payback timeframe and other parameters," he says. "By systematically collecting sustainability information from applications and providing the tools for analysis, the office of the CIO becomes an essential participant."

More Sustainable Products

There's also the chance to drive innovation in product development, sales and marketing. "The real upside of sustainability for IT executives is the role they can play in better understanding customers' needs and selling more goods and services," says Winston. "If you collect data across the value chain, then you know where your environmental impacts are. You can satisfy customers wanting greener options by redesigning your products to use less energy, for example. Then you can use that data to make credible claims in your customer marketing."

On the product development side, companies are beginning to analyze their supply chains and processes to assess sustainability gains from changing ingredients, suppliers or production methods. One fabrics manufacturer used business intelligence to see if it could design more sustainable materials that still met the brand's quality standards. Rather than physically sourcing new fibers and re-engineering production for the test, it used analytical tools to successfully model production processes and the characteristics of experimental fabrics.

Furniture manufacturer Herman Miller Inc. provides another example of IT in the service of sustainable product design. As reported in the book *Green to Gold*, Herman Miller created a database of materials for the designers of its environmentally sound Mirra Chair. Project managers asked suppliers for a list of the ingredients in every component in the chair's manufacture, assigning each a score of green, yellow or red based on its toxicity and other sustainability attributes. The designers were told to use green materials without

reservation, but to minimize yellows and reds. "This simple database has helped Herman Miller design one of the greener chairs," says Winston. "It also gave the company the ability to say in marketing messages legitimately what they know—that this product has no PVCs or other pollutants because every supplier has certified the composition of its components."

Marketing is another fertile area for sustainable IT. Digital marketing technology, by eschewing printing, paper and physical transportation, is inherently sustainable. Now that business units are starting to attach a value to natural resources consumed, marketing applications can be customized to quantify variables such as energy usage and waste. "If a company is going to optimize its digital marketing campaigns," says Farrell of SAS, "it would be good to know how many physical mailers were eliminated, how many tons of paper this represented, and how much energy was saved."

IT can also help with business intelligence for analysis and market segmentation of customers most inclined to purchase green products. SAS customer intelligence applications already contain segmentation tools, but they are now being used to identify and market to green customers, including searching for and integrating publicly available online data.

Regulatory compliance provides another hotbed of influence and innovation for sustainability-minded CIOs. GE, for instance, is a world leader in environmental management systems. As reported in *Green to Gold*, GE utilizes an intranet program that provides detailed process information related to environmental regulations, as well as a real-time "digital cockpit" that includes metrics for environmental performance, resource use, safety and compliance. The authors report that the system has produced outstanding environmental management results, including saving tens of millions of dollars through environmental and safety productivity improvements.

Worth the Effort

These anecdotes show a few of the many ways that IT executives can leverage sustainability to drive business innovation. Not that there aren't challenges, such as identifying, collecting, integrating and analyzing sustainability data that may come from previously untapped sources. "The data needs are going to be extensive," says Winston, "but the payback can be enormous in knowing your business better, in knowing where to invest and which decisions will most benefit the environment and the bottom line."

Experts advise putting one's own house in order first through the greening of the data center. Beyond that, the door's open for IT to partner with the business units on enterprise initiatives. "With sustainability such a high priority today, business executives are hungry for a decision-making platform for measuring, managing and determining environmental performance around the enterprise," says Farrell. "CIOs who can facilitate a decision support system will have a high profile in enterprise-wide planning for emissions reduction and sustainable business innovations." ▶

SAS® for Sustainability Management

A greener shade of business intelligence

BY TOM FARRE

Your IT team can lay the foundation for innovative sustainability strategies, yet this requires some initial groundwork. Many organizations have yet to adopt technology and best practices that provide insight into the best greenhouse gas reduction options and the actions that will deliver an eco-advantage.

"While most executives agree that a green strategy is a good idea, few know how to value and prioritize their initiatives," says Kimberly Knickle, Emerging Agenda practice director for Manufacturing Insights, an IDC company. "They struggle with the business case, waiting to implement strategies until outcomes can be predicted more reliably."

A McKinsey survey confirms the challenge: Although environmental initiatives top the agenda in executive suites worldwide, measuring and managing environmental impact is difficult, intricate work that stretches across an organization's operations. Causal relationships connecting issues such as greenhouse gas emissions, use of scarce resources, ethical sourcing and regulatory compliance make it extremely complex to invest in green technology and expand sales of products and services with measurably better environmental performance. [1]

However, this job just got easier, thanks to the recent introduction of SAS for Sustainability Management. A business intelligence application for helping organizations accurately measure and manage their environmental impact, SAS for Sustainability Management is the first decision-support platform for proactively identifying innovative strategies that address complex environmental, social and economic situations while achieving stakeholder objectives.

"With SAS, organizations can optimize business strategies for minimizing risks and costs, developing new lines of business, and improving resource use, environmental or otherwise," says Jim Goodnight, CEO of SAS.

Cisco Systems, the San Jose-based networking giant committed to sustainability, offers an example of SAS' technology in action. "By collaborating with SAS and utilizing SAS for Sustainability Management, Cisco can better prioritize projects and resources that create a positive return for the environment, shareholders, and our employees," says Laura Ipsen, co-chair of Cisco's EcoBoard and senior vice president of Cisco Global Policy and Government Affairs. "The SAS solution is enabling us to simulate the impact on carbon footprint, waste reduction targets, greenhouse gas emissions and other goals so we can more effectively predict and manage the impact of our operations on the environment."

[1] *The McKinsey Quarterly*, September 2007.

BI for Sustainability

At the heart of the new application is SAS Enterprise Integration Platform 9.2, which provides the unique ability to manage the complete business intelligence process within one integrated environment. With the power to integrate data from multiple sources, to manage trusted data for fast on-demand answers, to analyze data for meaningful insights, and to easily deploy information to a diverse user community, SAS delivers performance management that becomes a continuous process of improvement across the enterprise.

SAS EIP 9.2 is itself an efficient software product, optimized to execute quickly and efficiently with large data volumes, while delivering the broadest possible data integration and data warehouse capabilities, as well as BI applications for key business functions and major industries. SAS for Sustainability Management leverages all the power of SAS' data integration, analytics and BI technology to measure, manage and report on the Triple Bottom Line—environmental, social and economic sustainability indicators. Managing performance across these areas can help any organization do the following:

- Learn where it stands in terms of critical sustainability indicators
- Set goals and chart a plan for improving the environmental footprint
- Manage brand risk by reducing environmental exposure or anticipating competitive advantage
- Track performance against goals by integrating sustainability strategy into the corporate culture and evaluating the outcomes
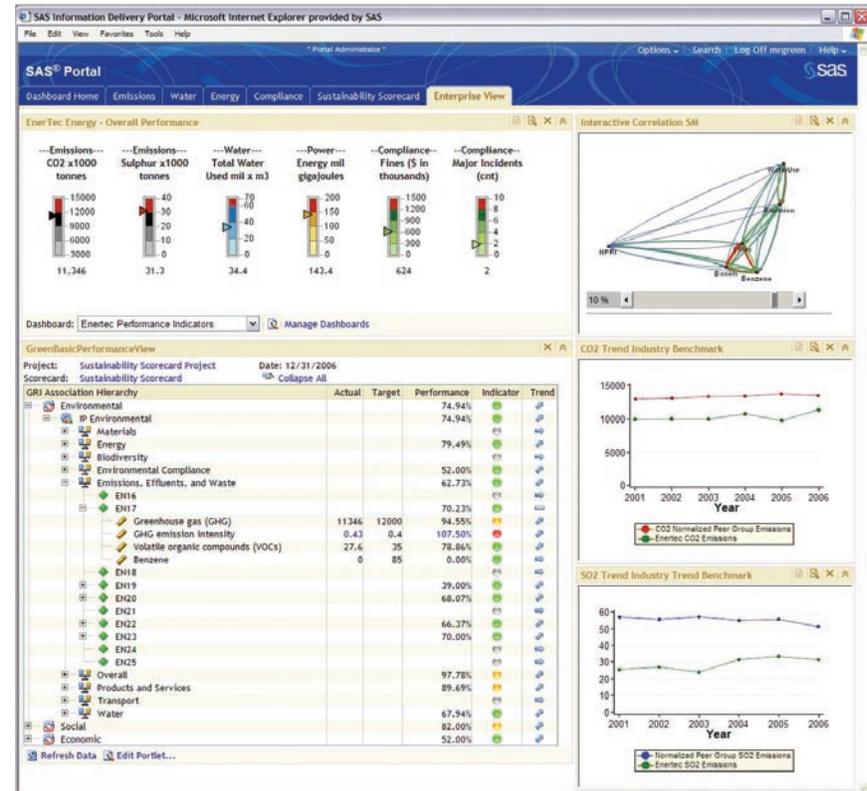
The SAS® for Sustainability Management scorecard template is flexible for industry accepted reporting standards. It is an analytic performance management framework for measuring, analyzing and optimizing key sustainability indicators.

Such benefits accrue from a predefined performance management framework based on generally accepted sustainability reporting metrics. These include the 10-year-old Global Reporting Initiative (GRI), the world's most widely used sustainability reporting framework, and the Greenhouse Gas Protocol, an accounting tool for understanding, quantifying and managing greenhouse gas emissions. Some sustainability data will come from unfamiliar sources, such as utility meters and building management systems; by predefining sustainability variables, SAS for Sustainability Management gives decision makers an edge in sustainability strategy and performance management.

"It is important for CIOs to have a role in identifying, selecting and rallying support behind emerging carbon accounting metrics, such as the Greenhouse Gas Protocol," says Alyssa Farrell, marketing manager for sustainability solutions at SAS. "The next step would be to assess available data to support the protocol, and to begin automating data collection and integration for modeling and analysis." As a leader in data integration from multiple applications and sources, both inside and outside the enterprise, SAS delivers information that can be trusted as a basis for corporate decisions. SAS for Sustainability Management also offers powerful predictive capabilities, allowing executives to validate strategies, identify relationships, forecast improvement scenarios and drive innovation.

A Real-World Advantage

A key feature of SAS for Sustainability Management is its ability to help an organization quantify and model its carbon footprint, a measure of environmental impact in terms of the amount of greenhouse gases produced. The built-in data framework enables companies to gather data about greenhouse gases, and then allocate those values to different business processes, products or customers. This leads to a multidimensional model for evaluating the drivers of carbon footprints. The model can be used for what-if analyses to evaluate the ROI of sustainability decisions, such as changing 10,000 light bulbs, refreshing a production process, outsourcing a datacenter, replacing a key supplier—or doing nothing.

"We've embedded performance forecasting capabilities," Farrell says. "If I don't take certain steps,

> "Companies that use indicators and information technology for environmental management stay a step ahead of the competition."
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> ▪ **ANDREW WINSTON, PRESIDENT WINSTON ECO-STRATEGIES LLC**

for instance, what would my carbon footprint be in 12 or 24 months? What is the cost and carbon impact of Scenario A versus Scenario B?"

The software also includes a Sustainability Scorecard portal, a graphical tool for furthering corporate alignment behind sustainability initiatives. "An organization can utilize

SAS analytics to identify which measurements are significantly impacting its achievement of sustainability goals, then surface performance information about those key metrics in executive dashboards," says Farrell. "You can set alerts and targets for your most important indicators, and map them to your overall business strategy." Executives thus gain the power to incorporate sustainability through all of their business decisions and raise its profile among stakeholders—just what forward-thinking organizations require.

"Companies that use indicators and information technology for environmental management stay a step ahead of the competition," says Andrew Winston, president of Winston Eco-Strategies LLC, an environment consulting organization, and co-author of *Green to Gold*. "Good information lays the foundation for generating an eco-advantage." ▪

Green-sizing the Data Center

The key to data center consolidation lies in optimizing both virtual and physical environments.

BY TOM FARRE

With green IT gaining unstoppable momentum, savvy executives are beating the bushes for ways to lower greenhouse gas emissions and reduce costs. Procuring green equipment, managing power-on and power-off schedules, and recycling computers at end-of-life are promising initiatives. The largest gains, however, can arise from better IT resource utilization, more accurate capacity planning and the "right-sizing" of IT infrastructure.

Research firm IDC estimates that more than 20 million servers are unutilized, each one emitting 4 tons of carbon dioxide annually for a total of 80 million tons per year, whereas server consolidation through virtualization can reduce energy usage as much as 80% to 90%, according to VMware.

Nice savings if you can get them, but consolidation can be risky without the facts about the efficiencies and capabilities of your current infrastructure. "Before investing in new technology, IT executives need to understand existing server utilization rates and how to optimize the footprint," says Tapan Patel, product marketing manager at SAS. "They also should be able to forecast future IT capacity that will meet the needs of the business."

Most enterprises have plenty of data for such calculations, generated by core operational applications, financial applications, mainframe systems, system management and monitoring software such as BMC Patrol, HP OpenView, and IBM Tivoli, and virtual data sources like VMware VirtualCenter. But often the data isn't integrated into a unified model that can be analyzed for IT performance monitoring, resource utilization and capacity planning. SAS® IT Intelligence delivers such capabilities. A comprehensive solution for optimizing IT resources, services and the financial impact in support of strategic business goals, SAS IT Intelligence offers analytical and BI tools that support green IT in a number of ways.

Better Virtualization

SAS® IT Resource Management provides a holistic view of all IT assets and can accurately track utilization rates and forecast resource requirements. This allows the reduction of data center facilities and energy consumption through rightsizing. SAS also provides technology to create and maintain scorecards and dashboards that monitor essential IT performance. By including green metrics such as power consumption and carbon footprint, IT executives can track and tune their eco-performance.

In addition, the new SAS® IT Intelligence for VMware Infrastructure offers enhanced resource optimization for virtual environments. An integration of SAS technology with VMware's, the software streamlines and simplifies resource utilization, providing a universal view for capacity planning, resource forecasting and server consolidation.

"Combining SAS business intelligence and analytics software with VMware virtualization gives customers greater transparency into the utilization and performance of their IT resources across both physical and virtual environments," says Parag Patel, vice president of alliances at VMware. "This combined solution offers new functionality that customers are increasingly demanding."

SAS itself offers a related technology to server virtualization, called grid computing, in the form of SAS® Grid Manager. Originally designed to speed the processing of compute-intensive BI and analytic workloads, SAS Grid Manager can help in the job scheduling, dynamic load balancing and utilization of any grid clusters, leading to more efficient and greener processing.

What's the bottom line for proceeding with grid, virtualization and other green IT initiatives? "Green projects should be analyzed in terms of the time, cost and effort required versus their ROI and alignment with corporate business goals," says Patel. "SAS IT Intelligence offers powerful tools for making such decisions based upon the facts." ▸

Data Integration for Sustainability

From the greening of the data center to leveraging business intelligence for better decisions, information technology has a vital role to play in sustainability initiatives. The impact of IT can be limited and even counterproductive, however, if decisions are made using inconsistent, inaccurate or otherwise flawed data. In addition, inefficient data stores can waste energy in the data center. The solution lies in enterprise data integration, a crucial capability for organizations working to become more sustainable. In an interview with Computerworld, Ken Hausman, product marketing manager for SAS'® Data Integration product line, explains the real-world benefits that accrue from a robust data integration solution.

Computerworld: What is the connection between data integration and sustainability?

Hausman: The data integration part of sustainability is very exciting, because it relates to concrete tasks and initiatives that benefit the bottom line. We know that sustainability projects can provide real value to the business, such as cost reduction, revenue growth from new products, opening new markets or channels, improved regulatory compliance and enhancements to the brand. To make the right decisions for such initiatives, executives need useful, trusted and timely information. This is the province of business intelligence and advanced analytics, but you need to start with sustainability data that is clean, consistent and of the

Hausman

highest quality. A robust data integration solution provides that, through capabilities such as data connectivity, data quality, ETL (extract, transform and load), data migration, data synchronization and data federation. What's more, these capabilities support data consolidation and migration that can energize green IT initiatives.

Computerworld: How can data integration lead to greener data centers?

Hausman: The green IT movement is about reducing waste in the data center, and the highest payback in reduced energy costs comes from reducing the number of servers. Data profiling is important here, a data quality process that is complementary to virtualization. By reviewing data sources and cleansing them of unusable data and archiving older data, we can compress the amount of data that servers, whether virtual or physical, store and process. Decreased utilization means we can start consolidating servers, which can be accomplished through data migration. In migration, first we move the data off the servers, transforming it from a quality perspective to make it consistent across servers. Then as we consolidate the data from underutilized servers, we can shut down those that are no longer needed.

Enterprises also benefit from data deduplication, a data quality initiative that reduces the number of times a piece of master information exists in the system, such as different spellings or versions of a customer's name. This is useful in sustainability because it reduces the overall size of the database and the processing requirements. In a broader sense, it also pays to review the number of duplicated applications or files—for example, a spreadsheet

or presentation that is stored on a thousand different hard drives. Finding such files and storing them centrally can save energy by conserving digital resources and speeding processes such as backup.

Computerworld: Despite their energy inefficiency, how likely are enterprises to shut down older, legacy systems?

Hausman: Historically they are hesitant to do so, especially older mainframe systems that may have been running for decades. Typically IT administrators use another data integration process called synchronization—trickle-feeding data across a pipe from an older system to a current system. But this is highly inefficient, and perhaps only a few people are familiar with the older applications. Through data profiling to understand what's in the older system and data migration to move the data to more current systems, administrators can gain the confidence to decommission older systems. The result is cost savings and a reduced carbon footprint.

Computerworld: What role can data integration play in broader enterprise sustainability initiatives?

Hausman: Data integration provides several benefits. First there's the streamlined workload of IT staff who have integrated their data and consolidated servers. When you aren't distracted by the busywork of maintaining so many siloed applications and servers, you not only conserve disk space and can consolidate servers, but you also gain time to focus on business priorities such as sustainability.

Now, comprehensive solutions such as SAS Data Integration have always offered connectivity to virtually all common data sources, including more

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than 20 different databases and ERP applications. But the latest version with text mining and unstructured data access enables access to sources you may never have considered or had access to before, including sources like handwritten notes from call center agents, audio files, video files and the wealth of information on the Internet. You can mine these sources for customers' emotional content, what they liked and disliked about various products and services,

and process it through BI querying and reporting capabilities into actionable information. This can deliver valuable input to sustainable product development and marketing.

Computerworld: How can data integration support sustainability monitoring, dashboards and performance management?

Hausman: Enterprises need to settle on the key indicators that will drive sustainability initiatives, and gather input through the data integration process from both inside and outside the enterprise. These metrics can then populate sustainability frameworks and performance dashboards that pinpoint progress against the strategy in real time. Power consumption is an obvious example, but IT executives will also need to access and monitor non-traditional data sources such as greenhouse gas emissions and waste products up and down the value chain. And there are numerous metrics related to green IT, such as the number of servers, disk capacity, resource utilization and power and cooling efficiency.

To analyze this data, enterprises need to work with partners who are attuned to sustainability-oriented data integration and business intelligence. As an example, SAS for IT Intelligence breaks new ground by integrating data on utilization and efficiency related to server virtualization; and SAS for Sustainability provides a framework for external reporting and internal progress of sustainability initiatives based on the Global Reporting Initiative, the world's most widely used framework. Such tools can help executives drive sustainability initiatives through fact-based analysis and performance management. ▸

ABC: An Introduction to Environmentally Sustainable IT

BY KATHERINE WALSH

The following article was first published in the October 29, 2007 edition of CIO *magazine.*

Rising energy prices. Global warming. Old equipment piling up in storage (and landfills). Environmental issues—and IT's role in them—are getting more attention than ever. If you want to use technology in a more sustainable way, here are the answers you need to begin.

What is sustainable IT?

Sustainable, or "green," IT is a catch-all term used to describe the manufacture, management, use and disposal of information technology in a way that minimizes damage to the environment. As a result, the term has many different meanings, depending on whether you are a manufacturer, manager or user of technology.

What is sustainable IT manufacturing?

Sustainable IT manufacturing refers to methods of producing products in a way that does not harm the environment. It encompasses everything from reducing the amount of harmful chemicals used in products to making them more energy efficient and packaging them with recycled materials.

European Union regulations require computer manufacturers such as Dell, HP and Lenovo to abide by green manufacturing laws that limit the use of some toxic substances, such as lead and mercury, in their products. These products are also available in the United States.

What is sustainable IT management and use?

Sustainable IT management and use has to do with the way a company manages its IT assets. It includes purchasing energy-efficient desktops, notebooks, servers and other IT equipment, as well as managing the power consumption of that equipment. It also refers to the environmentally safe disposal of that equipment, through recycling or donation at the end of its lifecycle.

What is sustainable IT disposal?

Sustainable IT disposal refers to the safe disposal of IT assets at the end of their lifecycle. It ensures that old computer equipment (otherwise known as e-waste) does not end up in a landfill, where the toxic substances it contains can leach into groundwater, among other problems. Many of the major hardware manufacturers offer take-back programs, so IT departments don't have to take responsibility for disposal. Some U.S. states and the European Union have laws requiring that e-waste be recycled.

What is the goal of sustainable IT?

The goal behind most green business initiatives, including green IT, is to

promote environmental sustainability. In 1987, the World Commission on Environment and Development defined sustainability as an approach to economic development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."

What does it have to do with me?

No one seriously disputes that global warming is due to human activity. And information technology is an energy hog. Gartner estimates that power consumption by computers accounts for 2 percent of global carbon dioxide (CO2) emissions. That's roughly equal to the carbon output of the airline industry.

It can be hard to determine how much CO2 any single company's computers generate, although researchers are trying to come up with better ways to calculate this. Howard Rubin, a research associate with the MIT Center for Information Systems Research, suggests that the IT operations of computing-intensive industries like financial services and telecommunications generate more CO2 per $1 million in revenue than other industries. IT may account for about 10 percent of a company's energy consumption and 10 percent of its CO2 emissions, according to Chris Mines, senior vice president with Forrester Research.

Many companies also have to comply with regulations that restrict plant emissions or the use and disposal of toxic materials. Or they simply want to make environmentally friendly products. Just as IT improves business processes, it can improve how companies manage what goes into their products.

For example, furniture maker Herman Miller uses IT to help inform designers about the chemistry and the sustainable properties of hundreds of materials. A materials database, created using Microsoft Access, captures information on potential manufacturing materials and communicates it to the design team. "The IT function and IT support is vital to that process," says Mike McCluskey, project manager for Product Development IT.

In a *CIO* magazine column, Dan Esty, co-author of *Green to Gold*, writes that "marrying information-age tools such as data mining and advanced modeling techniques to environmental challenges holds potential to propel some companies ahead of their competitors because they can 'see' through data where their industry is headed."

Mines of Forrester Research says that CEOs will eventually see environmental sustainability as a better way to do business, not just because it's the right thing to do, but because major stakeholders—including shareholders, nonprofit environmental organizations and customers—will demand it. Because IT is a large contributor to the greenhouse gas emission problem, it also has an opportunity to be a big part of the solution.

Can it help my company?

There are some steps IT departments can take toward becoming green that don't cost a lot. You can start by reminding your IT staff to turn off their PCs or shut off the lights before leaving for the day—and championing such behavior companywide.

Meanwhile, there are many IT investments you probably want to make anyway that will also reduce your impact on the environment. Virtualization technologies, server consolidation, PC power management and de-

ployment of more efficient equipment when you do a refresh can reduce energy consumption while simultaneously improving IT operations.

Then, there are the intangible benefits. Mines says a green reputation helps with employee retention and recruitment. Employers "see the surveys that say young people are greener, and that's a differentiator for them in the war for talent." There's some evidence that more people seek to do business with companies that offer green services and products, or that have a proven track record in corporate social responsibility. An October 2007 study on climate change conducted by Accenture found that nine out of 10 consumers worldwide would switch to energy providers whose products and services are designed to reduce carbon emissions, even if it meant having to pay a little extra.

Systems you need to comply with environmental regulations may cost you, and there's not much you can do about it. But there is packaged software that can help. For example, Synapsis, a software and consulting company, offers an Environmental Material Aggregation and Reporting System, which helps companies track, manage and report the material content of their products. The application also helps with reporting on compliance with E.U. environmental regulations. Eviance offers similar tools for environmental health and safety management and compliance reporting.

How can I cut my energy bills?

There are two ways that IT managers can help to reduce their companies' energy consumption: run data centers more efficiently and manage desktops more efficiently.

How can I make my data center more efficient?

An August 2007 EPA report on data center efficiency concluded that unless U.S. companies change the way they design, build and operate data centers, annual data center electricity costs could reach $7.4 billion in 2011. That means your costs are headed up, too.

The first step for IT managers who want to cut data center energy costs is to get to know their data centers in detail. A good place to start is with a True Total Cost of Ownership (TCO) assessment, which accounts for the cost of building and owning a data center facility, along with the usual hardware purchase and maintenance costs that go along with operating it. (The term True TCO was coined by The Uptime Institute, an IT research organization, which provides a tool for modeling it.)

It's also a good idea to get to know your facilities managers. According to Jonathan Koomey, a staff scientist with Lawrence Berkeley National Laboratory, the facilities department usually pays the power bills, and therefore, IT generally is unaware of how much energy it consumes running servers and air conditioners. "Traditional IT metrics like response time and uptime are what they are measured on, not energy efficiency," says Mines. But without an understanding of the data center's energy consumption, IT managers have no starting point for improving energy efficiency. "Without an integrated budget for these things, you will end up spending much more than you need to," says Koomey.

Some improvements don't cost much money. For example, says Mines, you can remove obstructions to air-flow, such as blocked cabling, piping or air-conditioning ducts.

Before you invest in new servers, examine whether changing the layout of your equipment can help you use air conditioning more efficiently. Thermal mapping tools (sold by vendors including IBM and HP) can help you pinpoint hot and cold spots by how densely your equipment is populated and the flow of hot and cold air through the space. Traditional energy-efficiency assessment services

> The first step for IT managers who want to cut data center energy costs is to get to know their data centers in detail.

are also offered by vendors such as EYP Mission Critical, Syska Hennessy and APC.

Once you have the data, you may decide to implement in-row, on-rack cooling systems, which allow you to bring cold air just to hot spots, or to rearrange server aisles so that air conditioning is aimed at hot aisles. Sealing gaps on server rack cabinets with blanking panels and placing ventilated tiles away from equipment exhaust areas also helps maximize air-conditioning efficiency.

Finally, there's your hardware. By reducing the number of boxes you operate through virtualization or server consolidation, you'll use less power. And turning off servers you aren't using can cut power consumption by between 10 percent and 30 percent, says Ken Brill, executive director of The Uptime Institute. A large company can save as much as $250 million, Brill says, by improving airflow, maximizing air conditioning and optimizing servers.

Next time you upgrade your servers, you can look for more energy-efficient models, although currently, there are no standard benchmarks for comparing energy efficiency between products by different vendors.

The EPA is working with vendors to develop new energy-efficiency specifications for enterprise servers by 2008.

Meanwhile, says Lawrence Berkley's Koomey, vendors have been improving server efficiency through more efficient chips and power supplies. Someone purchasing many servers could go to the manufacturer and ask it to provide a power supply that is well above 80 percent efficient, Koomey suggests. "It doesn't matter what the processor is; if the power supply is more efficient, you are going to save energy," he says. Koomey adds that it's cost-effective to spend extra money on a more efficient power supply because it now costs more to run the data center than it does to purchase the equipment.

How can I reduce my electricity consumption on the desktop?

If you want to know what your PCs are made of before you buy, you can use the Electronic Product Environmental Assessment Tool (EPEAT) developed by the Zero Waste Alliance to evaluate your purchases. Products that meet EPEAT's voluntary standards have smaller levels of mercury, cadmium and lead, are more energy efficient, and are easier to refresh and recycle.

The EPA recently recognized six organizations for their use of EPEAT, including the city of San Jose, Kaiser Permanente, the California Integrated Waste Management Board, the California Department of General Services, healthcare services and IT provider McKesson, and the city of Phoenix. Together, these organizations have saved more than $5 million buying greener equipment.

PCs and laptops that meet EPEAT standards also carry the EPA's Energy Star 4.0 label. Such computers use half the electricity of other computers and automatically go into sleep mode after a period of inactivity (they use 75 percent less energy in sleep mode). Energy Star certification also requires that equipment use more energy-efficient internal and external power supplies. If you purchased an Energy Star-labeled computer on or after July 20, 2007 (the date the newest requirements took effect), your machine complies with the new standards.

According to the EPA, if all businesses were to purchase only Energy Star-certified equipment, they would save $1.2 billion over the life of the computers.

You can also deploy PC power management tools. Vendors like Verdiem and 1E offer products that you can use to customize en masse when PCs shut down or enter sleep mode. "In call centers or universities, or anyplace that has many desktops running, PC management products are no-brainers that pay themselves back quickly," says John Davies, vice president of green technology research with AMR Research. Verdiem estimates that its Surveyor product saves $15 to $40 in energy costs per PC per year.

Is the government forcing me to be green?

Eventually. Environmental policy experts say inevitably, the U.S. government will impose limits on carbon emissions. The European Union already has such limits. Since 2005, the Emission Trading Scheme has required 12,000 iron, steel, glass and power plants to buy CO2 permits,

> Environmental policy experts say inevitably, the U.S. government will impose limits on carbon emissions. The European Union already has such limits.

which allows them to emit the gas into the atmosphere. If a company exceeds its limit, it can buy unused permits from other companies that have successfully cut their emissions. If they are unable to buy spare permits, however, they are fined for every excess ton of CO2. Because IT contributes to the total carbon emissions in a company, carbon cap and trade or tax laws will impact how technology is managed.

The E.U. and many U.S. states also have laws that require computer equipment, which contains many toxic substances, be recycled.

For example, the E.U.'s Waste Electrical and Electronic Equipment Directive requires equipment manufacturers to take responsibility for the disposal of their products at the end of their lifecycle. One

way is through take-back programs, where the equipment is returned to the manufacturer, which then must dispose of it in an environmentally responsible manner.

According to the Computer Take-Back Campaign, several states, including Maine, California, Texas, Oregon, Maryland, Washington and Minnesota, have e-waste laws. Some of these laws apply only to equipment manufacturers; others apply to end users. In 2007, e-waste bills were introduced in 23 states. Companies that mind their energy consumption and dispose of used equipment responsibly now will be better off when regulations are imposed, says Forrester's Mines.

The good news is that complying with e-waste regulations should become easier for IT managers due to new manufacturing regulations. The E.U. Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, which took effect on July 1, 2006, restricts the use of six hazardous materials in the manufacture of certain electronics: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ether (the last two are flame retardants used in plastics). Such requirements reduce the toxicity of electronics, and thus, the e-waste they produce.

How do I recycle IT equipment?

There are a few different ways to get rid of IT equipment without throwing it in the dumpster.

Most computer equipment manufacturers offer take-back programs through which they assume responsibility for proper disposal.

For example, Dell and Sony will take back any of their products for free and Toshiba will take back its laptops. Apple charges a fee, but will waive it if you are purchasing a new product. HP also will charge you, but will give you a credit toward future HP purchases. For a complete list of recycling programs in the U.S., visit the Computer TakeBack Campaign website.

IT departments can also hire a lifecycle asset disposal company to take used equipment off their hands, although not all of these companies have expertise in environmentally safe disposal. "Most of them are very local or regional and often lack the ability to provide in-depth reporting and auditing," says David Daoud, research manager at IDC, so you can't review their performance. He says to pick a company that is well known and has a good track record—not just anyone listed in the local yellow pages. Some companies that offer take-back services also offer data security services to insure that intellectual property and confidential information is removed from the hardware, notes Daoud.

Start now, and you can make a dent in a mountain of electronic trash. Daoud says that in 2006, obsolete desktops, laptops and servers accounted for 18 billion pounds of electronic trash worldwide, but the major companies involved in e-waste recovery (Dell, HP and IBM) recovered only 356 million pounds—about 2 percent.

Only about one-third of all U.S. companies have an IT asset disposal policy, adds Daoud. The rest are either doing nothing or dumping them into municipal landfills.

According to National Geographic's *Green Guide*, 50 percent to 80 percent of recycled electronics end up in developing nations, where they are disassembled by untrained workers without the proper equipment. This exposes them to toxic sub-stances like mercury, cadmium and lead. If the equipment is left in landfills, those same toxins end up in water sources.

How can IT make my operations greener?

IT can help almost any part of the business lessen its environmental impact. For example, technologists can help reduce the amount of paper employees use for printing or deploy tracking systems to measure plant emissions. Such practices can save companies money and also generate revenue.

At Sun Microsystems, Open-Work, the company's telecommuting program, provides employees with shared office space, home equipment and subsidies for DSL and electricity, according to Dave Douglas, VP of eco responsibility at Sun. More than 56 percent of Sun's employees are currently in the program. "In the last five years we have cut our office space by one-sixth and have saved over $60 million a year on space and power," Douglas said in a roundtable interview about energy-efficient IT for CIO.com. Sun also saves an estimated 29,000 tons of CO2 per year due to reduced employee commuting. That's equivalent to taking 5,694 cars off the road for one year, according to the EPA's carbon calculator.

Dow Chemical's process control automation system will shut a plant down if it is not compliant with air and water emissions requirements. Dow also uses a monitoring system to measure the air and water emissions at its plants and is deploying an environmental reporting system to manage reporting of this data to state and federal authorities, says CIO and Chief Sustainability Officer David Kepler.

IT systems can also help save energy by controlling heat and air conditioning in office buildings. Wireless sensors can be used to measure airflow and room occupancy. If the occupancy sensors (which turn lights on and off when people enter or leave a room) are networked to airflow sensors, the amount of air conditioning used when people are not in a room can be reduced, says Lawrence Berkeley's Koomey. "The basic idea is to collect data on how the facility is using energy and use that information to define patterns that can help change what you are doing and reduce operating costs."

How can I get executives' attention?

Arguing that going green is the right thing to do won't get you anywhere. The best way is to make a business case based on energy savings, operational efficiency or new revenue opportunities. In other words, you need to find a way to make going green fit with the corporate agenda. "When the CEO and the Board of Directors recognize that it's the right thing to do for shareholders, employees, customers and the brand, that's the catalyst," says Mines. "Then, things start to happen." ›

Why Going Green is Harder than You Think

BY MARY BRANDEL

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A few months ago, Harvey Betan, a business continuity consultant in New York, was helping a client interview a potential disaster recovery facility provider. There was nothing unusual about the meeting until the client asked an eye-opening question: Did the provider use alternative sources of energy, like solar or wind power? No, it didn't, but the discussion continued as Betan and his client—Jeff Saper, CIO at strategic communications firm Robinson Lerer & Montgomery LLC—drove away in Saper's hybrid Ford Escape.

"I thought it was the perfect opportunity," Saper says. "They were on top of a hill with a flat warehouse facility that easily could have housed solar." Saper passed on that provider and is continuing his search farther north, in upstate New York.

Clearly, environmental concerns are near and dear to Saper's heart, and not just for the sake of the bottom line. In his mind, it is IT's responsibility as the biggest consumer of electricity in the company to set the table not just for reduced energy consumption and efficient computer use, but for all things green. Through his own IT-initiated green program, backed by the CEO, he has reduced servers by 50% to 75% through virtualization; has adjusted the data center's cooling system for peak efficiency; and purchases only Energy Star equipment that also meets environmental criteria set by the Green Electronics Council and the U.S. Environmental Protection Agency. The firm also donates old equipment to charitable organizations or uses Dell Inc.'s asset recovery program; has moved some users to thin clients and all to LCD monitors; equipped employees with laptops and broadband so they can telecommute; purchased solar-powered battery adapters for users' BlackBerry devices and Razr phones; and configured Microsoft Active Directory to automatically power down users' PCs and monitors. Plus, employees are continuously educated on environmental actions they can take, like printing documents double-sided and buying reusable water bottles and coffee mugs.

"There's no question that my personal, social mind-set goes a long way toward why we're implementing green initiatives," Saper says.

Brick Walls

But there's always more you can do, he says, and it doesn't take long before you hit a brick wall (note his ongoing search for a green disaster recovery facility). The fact is, while it's become fairly straightforward to buy energy-efficient PCs and reduce the electrical load of the data center, there's nothing simple about tackling the full gamut of environmental is-

sues raised by the corporate world's dependence on technology.

Outside the data center, the trade-offs and complexities of going green are rampant. Before purchasing an energy-efficient fluorescent light bulb, for instance, you might want to research how to dispose of it, considering that it contains small amounts of mercury. And if you purchase natural products from environmentally conscious companies, you might be surprised to learn how often those Earth-friendly ingredients are shipped from overseas locales, adding to the world's carbon emission load.

It's no different in IT. As Simon Mingay, an analyst at Gartner Inc., puts it, "The more you know, the more you know you don't know."

Take the European Union's RoHS (Restriction of Hazardous Substances) directive. Because RoHS requires electronics manufacturers to remove substances like lead from their products, the new manufacturing processes they developed for their circuit boards end up consuming more energy because they run at higher temperatures. Mingay also points to the Green Electronics Council's Electronic Product Environmental Assessment Tool (EPEAT), for example. The online tool helps companies compare computer equipment based on a seemingly exhaustive list of environmental attributes, such as percentage of toxic and recycled materials, energy efficiency, ease of disassembly, upgradability, packaging, take-back options and performance criteria. However, EPEAT currently evaluates only monitors and PCs, and it doesn't yet compare the equipment's "embodied energy," or the amount of energy that went into manufacturing,

assembling, shipping and distributing the product and all its parts. "It only looks at the end-use phase, because that's what everyone understands," Mingay says. But research suggests that embodied energy is where the focus should eventually be, because there's about an 80-20 split between the energy consumed in making and distributing the product vs. using it, he says. That is the next frontier for vendors to begin differentiating themselves, says Mingay.

Not Just About ROI

Indeed, it takes a truly green mentality to tackle such complexities, which are less easy to cost-justify than, say, adjusting the cooling system in your data center or moving to energy-efficient equipment. A truly green approach involves taking strategic measures like re-architecting your computing infrastructure, researching renewable energy, recycling responsibly and rethinking how technology can improve material efficiency and even reduce carbon and greenhouse-gas emissions. An example is investing in videoconferencing and remote collaboration tools to cut down on travel, or using Web portals rather than paper to disseminate information.

Initiatives like Energy Star and EPEAT "only address one question, which is what you buy," Mingay says. "The essence of green IT is what you buy, how you use it, how you get rid of it and what problems you apply it to."

In other words, while it's pretty easy today to create a business case for minimizing energy consumption, the easy ROI stuff goes only so far. Organizations can cut costs 10% to 25% in the first year of an energy-saving program, with little expenditure, Min-

gay says. "But the challenge will come after the low-hanging fruit—what do you do then?" he says. "In the U.S., what's motivating most organizations to act is primarily about saving energy or money, and the environmental benefits are at best secondary, if not incidental."

Above the Low-hanging Fruit

One company that's reaching pretty far up the tree is Citigroup Inc. In 2003, it launched an initiative to reduce the number of its more than 54 data centers around the world and determined that wherever possible, any new data centers it built would conform to the Leadership in Energy and Environmental Design (LEED) standard, developed by the U.S. Green Building Council.

One of the biggest challenges, says James Carney, head of data center planning and analysis in Citigroup's technology infrastructure group, was finding building designers and suppliers who understood that while sustainability was a top goal, the company couldn't compromise on performance and reliability. It also required a lot of research to select materials that were environmentally sound from cradle to grave. For instance, it wasn't easy to find a manufacturer of precast walls that used a large amount of recycled materials and whose plant was relatively close to the building site to keep transportation costs and emissions low.

Citigroup also worked to choose geographic locations where the utility companies had enough supplemental power that they could service the data center without building new infra-structure. It also tried to find providers of green energy, which was easier

in Europe than in the U.S. Its data center in Frankfurt, for instance, will run on zero carbon electricity, primarily hydro-generated, according to John Killey, head of Citi Realty Services for Europe, the Middle East and Africa. By the end of 2008 in Europe, he says, 30% of Citigroup's data center energy will have a zero-carbon footprint. In its Texas data center, some power will be supplied by the Lower Colorado River Basin and from wind farms, Killey says. But according to Carney, it's getting easier to go green, now that the notion of sustainability has grown in the computing world. "Five years ago, vendors said, 'Why are you even asking us these questions?'" he says. "Now, they can tell us their equipment has X amount of reduction in terms of embedded carbon." Citigroup also found that the goals of sustainability often went hand in hand with its other goals of reliability, performance and cost optimization.

A big advantage that Citigroup had is that its technology infrastructure group already worked closely with its realty services group, which isn't the case at many companies. The groups worked together on site selection, design, construction and disposal of the old data center equipment. "If people have different mind-sets from the IT and facilities worlds, it creates a lot of tension, and you won't have a successful project," Carney says.

Getting to Square One

Indeed, until both IT and the facilities groups share responsibility for the electric bill, IT has little incentive to care about reducing its power usage, says Chris Mines, an analyst at Forrester Research Inc. In fact, for some companies, just making IT and the

end-user community more environmentally aware is a challenge itself.

For example, according to Betan, it's rare to find an IT organization concerned about properly disposing of its computer equipment after a disaster. And in many cases, he says, he still sees data centers with big air conditioners blowing out cold air in-

> "As hard as it is to reconfigure the data center, it's even harder to get people to change, even when it comes to basic stuff like turning off the lights."

CHRIS MINES, ANALYST
FORRESTER RESEARCH INC.

discriminately to the entire room. "We talk to them about other options, but they haven't yet thought of it themselves," Betan says.

Lloyd Mainers, U.S. East Coast manager for Sandy, Utah-based Sub-Zero Engineering, agrees that awareness is low. His company develops computational fluid dynamic (CFD) models to visually illustrate how hot and cold air is flowing in the data center. Companies can then take simple steps—like balancing airflow, filling holes in the floor or moving the perforated tiles that blow air—to more precisely cool their computer equipment, which increases efficiency.

"We find that most data centers have far more AC than they could ever need, but no real thought has been given to moving the cool air

to where it's needed," Mainers says. According to The Green Grid consortium, companies could save 25% of their energy costs by implementing recommendations that result from CFD models.

Indeed, according to Mines, while there's a growing awareness of environmental concerns in enterprise IT organizations, there aren't many tangible activities backing up that awareness. In a recent Forrester survey of 124 procurement and operations professionals in IT, he says, only 29% identified data center power and cooling as important issues.

Beyond the data center lie even more challenges, Mines says, particularly in terms of changing behaviors and developing well-followed green policies and processes. "As hard as it is to reconfigure the data center," he says, "it's even harder to get people to change, even when it comes to basic stuff like turning off the lights." For instance, he says, very few companies—just 20% of survey respondents—said they have rewritten their procurement policies to include environmental criteria. Other policies that need to be reviewed are how companies dispose of old equipment. "It's a classic issue where IT people, facilities, finance and security all have to be involved because they all have a stake and somewhat contradictory and overlapping goals," Mines says. Facilities might see it as old junk it just wants out of the building, while finance wants to maximize the return on investment.

The EPA is all too aware of the difficulty of behavior change. It recently launched a multipronged campaign to educate companies on the merits of using power management

features on PCs, which switch the computer to low-power mode after a period of disuse. The EPA is fighting a long tradition of IT organizations disabling power management settings because in the past they caused computer freeze-ups and interfered with automated maintenance processes, such as overnight patch management.

"Computers have changed drastically in how they handle power management, but the myth and attitude has stayed for a long time," says Steven Ryan, product manager at the EPA. The EPA is now working with companies to provide free estimates on the energy savings they can reap by activating power management features, along with free technical service to ease any glitches that these features cause. It also created educational materials for IT to disseminate to users who have questions on why their PCs act differently with the power management features enabled. According to Ryan, businesses can save $25 to $75 annually per PC using power management.

Despite the challenges of adopting an environmental mind-set, the direction that companies have to head in is clear, and it's clear that IT has a key role to play. According to Gartner, by 2009 one-third of IT organizations will include environmental sustainability in their top-six buying criteria for hardware and services vendors.

Meanwhile, Forrester believes customers' efforts will evolve from the short-term ROI of energy efficiency to longer-term programs aimed at reducing their overall carbon footprint.

"When people start understanding the strategic risk and strategic opportunities of climate change in terms of its impact on brand value, their market and their operations," Mingay says, "they'll get engaged in a much broader environmental agenda." ◗

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