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green IT

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Green IT Is Essential to Green Government

By Darlene Meskell
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The worldwide growth in the use of consumer electronic products, which include computers and communications and entertainment devices—cellular phones, VCRs, televisions, DVD players, video cameras, stereos, copying machines and faxes, and video game consoles—has had both positive and negative effects. Electronics enable us to make information exchange quicker and easier; reduce our need to physically move people, products, and information; and allow us to cut traffic, save energy, and reduce pollution. But the manufacture, use and disposal of these products, compiled from plastics, metals, silicon, and various chemicals, have an increasingly detrimental effect on the environment and human health. Waste from electronics is the fastest growing waste stream in the U.S., and the overall electronics recycling rate, at only 12.5%, is low. When these items become obsolete and are thrown away, they quickly clog landfills. When they are destroyed, the chemicals and heavy metals in their composition pose environmental risks to human health and the environment.

There is a growing awareness that governments, businesses, and non-governmental organizations need to better manage their use of technology in an environmentally responsible manner. As large purchasers of electronic products and services, they have an opportunity, and a responsibility, to provide leadership through environmentally sound practices and cost-effective, life-cycle management of their electronic assets. Accordingly, many governments are taking a closer look at the design, procurement, operations, and end-of-life management of electronics to identify steps that can be taken to reduce the burdens that these products have on the environment.

Information technology products and processes have a significant impact on the environment. They contain chemicals known to be a threat to human health and the environment—lead, mercury, cadmium and brominated flame retardants among them. And like all electronics, IT products create electronics waste at the end of their lifecycle. Desktop

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and enterprise computer equipment require significant energy to operate, leading to increased greenhouse gas emissions. Today, large consolidated data centers alone use more than 5% of all electricity consumed in the United States.

This newsletter offers several examples of how environmental principles can be applied to the world of desktop and enterprise computer technologies. Environmentally conscious, or “green” IT encompasses everything from examining the use of pollutants in the manufacture of technology, to

Projections to the Test. The Leadership Group is one of many organizations focusing attention on the growing challenges of improving energy efficiency within data centers.

The Green Grid is working toward **Establishing Greater Energy Efficiency in Data Centers** by defining and promoting energy-efficient practices. The Green Electronics Council describes the **Environmental Benefits of the EPEAT Purchasing System** as a tool to help purchasers evaluate dozens of environmental performance attributes of electronic products.

need for travel, workspace, paper, time and even online storage space required to share documents via email, these wiki-supported programs save their users time, achieve buy-in, and help generate better work than many face-to-face task forces. Adopting new technology is only one of the many ways governments and other organizations can reduce their carbon footprints. Another way is to be disposed of old technology carefully. **The Economics of IT Asset Disposal** lays out Dell Computer’s program for reusing and recycling old technology.

EPA and its partners are establishing environmental standards and tools to help control energy use in government IT. But this is only a small step toward achieving an environmentally-neutral future.

reducing the energy and environmental footprint of the buildings that house computer enterprise operations, recycling manufactured equipment, and much more. The articles describe many of the ways governments are working toward socially responsible, environmentally friendly and fiscally sound practices.

EPA and Its Partners

Governments are trying hard to be “green” but are not sure how to go about it. The U.S. Environmental Protection Agency addresses this topic in **What Does Going Green with Information Technology Mean?** EPA challenges us to take a holistic look at the lifecycle of our IT purchases from “cradle to grave,” and to find ways to intervene at critical junctures. Citing EPA’s recent *Report to Congress on Server and Data Center Energy Efficiency*, the Silicon Valley Leadership Group, a consortium of public—and private—sector organizations, reports on how it used real-life data **Putting EPA Data Center Energy Efficiency**

Looking Into the Future

EPA and its partners are establishing environmental standards and tools to help control energy use in government IT. But this is only a small step toward achieving an environmentally-neutral future. Technologies, methodologies, and work practices now being developed and implemented by the environmentally concerned and economically strapped in all sectors. IBM presents a new computing paradigm that helps organizations go green by providing a shared infrastructure with virtualization capabilities. **Achieving a Green IT Strategy through Cloud Computing** shows how government and business can access services on an as-needed basis and maintain distributed workforces.

Collaborative Work is Green by Nature describes how Web-enabled collaborative work environments, allow tens, hundreds or even thousands of individuals to collaborate on important work products without moving away from their computer screens. Reducing the

The U.S. General Services Administration is leading by example and **Helping Government Go Green**, using its unique position as the government’s supply arm and property manager to help customer agencies become better stewards of the environment. As the government’s premier procurement agency, GSA incorporates principles of sustainable design in our building projects and offers some 10,000 green goods and services. In addition, as the promulgator of the government’s telework policies, GSA is well on its way to achieve its goal of having 50% its workforce teleworking by 2010. **The Environmental and Corporate Benefits of Telework** are also recognized as not just environmental but as a way to improve work/life balance, and the productivity of employees.

State and Local Pioneers

Much of the innovation in “green” government is taking place at the state and local levels in the unending effort to control costs. **The Virtual State of Tennessee**, for instance,

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has embraced virtualization and not only reduced staffing costs but lowered energy costs and harmful carbon dioxide emissions. Luckily, many funding options are available to state and local governments for **Solar Photovoltaic Financing**, which has seen “exponential increases” in the capital available for solar projects, and tremendous creativity in the development of third-party ownership structures. With rising energy costs, on the mind of nearly every citizen and lawmaker, green initiatives will likely be met with unprecedented support, the National Association of Chief Information Officers predicts. State CIOs are uniquely poised to become leaders in the green IT revolution, according to the NASCIO brief, **How State CIOs Can Get to Greener Pastures**.

Although many governments are just coming to terms with the strategic importance of sustainability, Oregon and other states have fielded sustainability programs for a decade or so. Some jurisdictions are even looking at putting all their sustainability programs under a single high-level official. **Public CIOs, Green Czars and their Span of Control** considers the benefits and disadvantages of establishing a sustainability point person.

Cascade County, Montana, known for having strong and predictable winds, created wind speed and power maps by combining federal wind map data, local land ownership, roads transmission lines and other county-specific data. **Cascade County Wind Marketing** used these plans to attract clean-power developers.

As the largest employer in Florida, the government of **The Sunshine State Keeps IT Green**. The state’s goal is to reduce greenhouse gas emissions by 40% by 2025—through programs aimed at reducing vehicle emissions, making facilities energy efficient, and green purchasing.

Green IT Is Important Around the World

Other countries are equally, if not more, concerned about the impact of IT on the environment. **Green IT Approaches Span the Globe** brings in to focus the steps large English-speaking nations are taking to reduce the carbon footprint of information technology at every point in the life-cycle of their government systems, from purchase and production through usage and ultimate disposal. The Australian government chief information officer has issued a checklist for **Managing the Environmental Impact of Information and Communications Technology**, as part of a comprehensive green IT effort.

The stories in this newsletter clearly represent only a sampling of the increasingly aggressive programs that governments have undertaken to reduce the impact of their operations on the state of the environment. As large organizations, with a relatively large effect, their ability to control their own operations and to lead others to adopt eco-friendly practices will have a beneficial impact on the environment. ■

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What Does “Going Green” with Information Technology Mean?

By Molly A. O'Neill
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Chief Information Officer
U.S. Environmental Protection Agency

Search the Web for the term “Green IT” and you will quickly come up with millions of results. As EPA’s chief information officer, I’ve received more than my share of requests from individuals looking for practical help. People are conscientious about being “green,” but they’re not quite sure how to go about it.

EPA’s mission is to protect human health and the environment. It’s only fitting that we carry this mission into the IT realm by ensuring our IT investments are socially responsible, environmentally friendly, and fiscally sound. While these are great reasons for embracing Green IT, what many of us have seen firsthand is that savings from “greener” technologies or business approaches can offset the costs. One of the key reasons Green IT has taken hold is because it’s not just the right thing to do for the environment; it actually puts “green” back into your organization’s pocket.

Right at the top of my wish list is to get everyone thinking about incorporating and architecting Green IT into every step of the IT lifecycle. I think this is something we can all do now – examine our IT infrastructure with a holistic cradle-to-grave philosophy. In fact, we call this the Green IT Lifecycle where there are ways to be green at each lifecycle “stage” of designing, buying, using, recycling and disposing of IT. The staff here designed a one-stop Web page with that can help reduce your energy usage and carbon footprint while saving money, select

technologies that are environmentally preferable, and recycle unwanted equipment to conserve natural resources (<http://epa.gov/greenit/>).

One of the most common questions I get is, “What can CIOs do to save on energy costs?” Well, here are some key things I tell people to focus on:

- Save energy by encouraging staff to power down their equipment when not in use
- Make energy conservation an acquisition objective for how you evaluate and procure technologies
- Embrace virtualization technologies (using IT environments more efficiently) and explore the consolidation of data processing and storage
- Manage, measure, and regulate how your technologies consume energy (the days of set it and forget it are over!)
- Dispose of your technologies in a sound and environmentally friendly manner, and
- Utilize technologies that allow staff to stay connected in remote locations, participate in meetings without travel, and respond quickly during emergency situations.

Another question I receive frequently is, “What is EPA doing to green its own data centers?” EPA’s central data center, the National Computing Center (NCC), is a remarkable success story for the agency. From inception, this building was designed to incorporate environmentally friendly technologies.



The NCC was completed in 2002 and features impressive energy saving capabilities including green lighting, “smart” heating and cooling systems, and solar roof panels (http://www.epa.gov/greeningepa/facilities/rtp_ncc.htm). In January 2005, EPA received the Leadership in Energy and Environmental Design (LEED®) silver certification from the U.S. Green Building Council for the NCC. Through strategic improvements and operational modifications made at the NCC since then, total annual power consumption has been reduced by 20% (4.5 billion BTUs), despite a rise in the number of servers in use. In our quest for continuous improvement, we have teamed with the Department of Energy to perform a more robust energy assessment of the NCC. With this baseline, we are better able to measure energy efficiency improvements and plan practical strategies for the future.

But not every organization has a large data center; many have a collection of small data centers or server rooms. Across the nation, data centers combine for 1.5% of our country’s energy usage. At first blush that may not seem like a lot, but it equates to the energy consumed by 5.8 million U.S. households at a cost of \$4.5 billion. Recognizing this, EPA entered into an agreement with The Green Grid to evaluate the numerous small EPA data centers and server rooms (<http://www.thegreengrid.org/home>). Through this partnership, we are developing best practices that will benefit the wider community by addressing energy usage solutions for

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small data centers. And we'll be sure to let this intergovernmental community know when these best practices become available.

There is a lot of information out there and a growing field of experts in the Green IT area. Ultimately, the best way to get started is to begin with a few projects where you can get some

measurable results. For those interested in learning more about greening IT, view a roundtable discussion held earlier this year with myself and several other leaders in this area (<http://www.federalnewsradio.com/?sid=1339342&nid=5>). For more discussion on the return on investment of Green IT, listen to a CIO Talk Radio

interview held on March 26th (<http://www.ciotalkradio.com/archives.html>). And of course, be sure to check out EPA's Green IT Web site (<http://epa.gov/greenit/>). ■

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Putting EPA Data Center Energy Efficiency Projections to the Test

By Teresa Tung PhD
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Background

In August 2007, the U.S. Environmental Protection Agency released a Report to Congress on Server and Data Center Energy Efficiency. This report had US organizations across industries—from financial services to universities, high-tech corporations to government institutions—sitting up

maximized value from organizations' IT assets and spending.

Intrigued by the EPA's findings, a group of companies organized by the Silicon Valley Leadership Group, or Leadership Group, saw a gap between theoretical discussion and proof in a commercial (not a research lab) environment. This group rose to

Accenture), the Leadership Group's objectives were simple: to help data centers accelerate the adoption of energy-saving technology by:

- Making better-informed decisions on the effectiveness of energy saving initiatives
- Guiding policymakers on potential regulation and certification by demonstrating achievable results
- Educating the public on the impact of data centers on energy use and on how data centers can save energy by implementing technology and applying leading practices.

A quick word on our approach

Our methodology for this "Data Center Demonstration Project" likewise was straightforward. We recomputed energy projections from the EPA

Data centers already consume a considerable amount of the nation's total supply of electricity—approximately equivalent to the electricity consumed by 5.8 million average U.S. households and growing.

and taking notice. Data centers already consume a considerable amount of the nation's total supply of electricity—approximately equivalent to the electricity consumed by 5.8 million average U.S. households and growing. The potential energy efficiencies outlined in that report have implications for the environment and increased sustainability, as well as for business bottom line costs and

answer the challenge in the EPA's report, that "objective, credible information is needed about the performance of new technologies and about best practices, as well as the effect of both on data center availability." The Leadership Group would put the theories to the test through real-life, practical application.

Working with a number of public- and private-sector partners (including

Report by populating EPA's formulas with data gathered through a series of 11 real-life technology implementations across 17 case studies, which were then compiled into four defined scenarios. We based these scenarios on the differences in data center types, which affect the applicability and effectiveness of potential technology implementation initiatives:

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- Implementing retrofit changes in a legacy production data center
- Implementing retrofit changes in a legacy R&D data center
- Implementing brand-new technologies in a built-from-scratch production data center
- Implementing brand-new technologies in a built-from-scratch R&D data center.

Our scenarios assumed that implementing certain technologies in certain situations simply does not make sense. For example, in new data centers, energy cost savings create the incentive to buy more expensive solutions that are highly energy efficient. In legacy data centers, however, the cost savings from energy consumption over a long lifespan may not justify the replacement of existing equipment with more efficient new purchases.

Finally, we presented side-by-side comparisons of EPA projections with what our 17 case-study companies actually achieved in their data center environments in terms of energy, cost and carbon savings.

The EPA projections are realistic and achievable

Most important among all our findings is that even the most optimistic of the EPA's "best-case" energy projections can be achieved.

By 2011, our trajectories (using the measured results of our case studies) showed significant savings over current trends. For example, we demonstrated that with legacy retrofits, data centers can:

- Save between 59.9 and 64.6 billion kWh/year
- Save up to \$4.5 billion annually
- Cut 40.9 million metric tons of carbon (more than 7 million cars)

With a combination of both new commissions and legacy retrofits, they can:

- Save between 64.2 and 68.9 billion kWh/year annually.
- Save up to \$4.8 billion annually
- Cut 43.6 million metric tons of carbon (almost 8 million cars) annually.

More specifically, in terms of site infrastructure efficiency (as evaluated using the Power Usage Effectiveness ratio of data center power to IT power draw), high-efficiency site initiatives already exist and are achieving EPA state-of-the-art estimates.

Interestingly, legacy retrofits can almost be as efficient as new centers. While legacy retrofits may not optimize power delivery for cost reasons, they can optimize cooling via a unique set of technologies, including air management, variable frequency drives, and water-side economizers.

In terms of IT infrastructure efficiency (as evaluated by energy draw, percentage of power management adopted and the EPA's Physical Server Reduction Ratio), we found that holistic IT transformation initiatives deliver a greater impact than site improvements. Companies need to more aggressively reduce IT infrastructure, as plenty of opportunity exists to gain efficiencies through servers, storage and networks. With more aggressive IT optimization, we believe data centers can exceed the EPA estimates.

Conclusion

Although data centers will continue to be large energy consumers (due to the necessity of keeping up with increased business demands), our demonstrated results show that in terms of technology maturity, best practice levels defined in the EPA

report are achievable in all types of data centers: whether legacy or new, R&D or production.

IT initiatives offer large savings; however, there is a gap between what we have achieved and what is possible. For example, we have yet to fully harness the efficiencies inherent in IT capabilities such as virtualization or rationalization. Furthermore, today's available site technology can achieve state-of-the-art efficiencies defined by the EPA, with legacy upgrades nearly matching new centers in terms of potential efficiency. Clearly, the onus for reducing energy use falls on everyone.

Those of us who participated in the Data Center Demonstration Project feel passionate about encouraging individual data centers to consider implementing our demonstrated initiatives to save energy and cost and reduce pollution. Our measured results already track the best-case scenarios in the EPA Report. By increasing adoption of the demonstrated technologies and by improving IT optimization, we believe data centers can meet or exceed the EPA scenarios and, as a group, can significantly reduce carbon dioxide emissions by 2011 by reducing carbon dioxide emissions equivalent to that put out by more than 7 million cars annually. ■

See the Silicon Valley Leadership Group Report at:
<http://accenture.com/datacenterreport>.

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The Green Grid: Establishing Greater Energy Efficiency in Data Centers

By The Green Grid

Until recently, electricity usage wasn't near the top of IT concerns. The cost of running and cooling the IT infrastructure generally wasn't even considered part of the IT budget within most organizations. For instance, server density in data centers wasn't significant enough to create any real power management issues, and the cost of electricity was low enough to not raise concerns across organizations.

As the amount of data circulating within the Internet and across computing devices continues to increase exponentially, businesses, governments and other institutions around the world are aggressively filling data center racks with powerful servers to keep pace. At the same time, energy shortages and energy costs are quickly rising to the top of the list of economic and environmental concerns for organizations worldwide. Accordingly, a movement to increase data center and IT energy efficiency is gaining momentum.

The Green Grid, an industry consortium dedicated to improving energy efficiency within data centers and business computing ecosystems, is helping focus attention on this growing challenge. Founded in early 2007, this fast-growing organization is working to define and promote the most effective energy-efficiency practices in data center operations, construction and design in order to help solve the numerous problems related to power consumption, power conversion and energy efficiency that are plaguing data centers across the globe.

Rising power consumption is among the many problems related to energy efficiency within data centers. Electrical power needed to run today's high-performing data center servers is only part of the problem. Storage and networking gear, non-IT devices such as transformers, uninterruptible power supplies, fans, air conditioners, pumps, humidifiers and lighting also collectively account for a substantial amount of power consumption within data centers.

Inefficiencies within data centers are easy to find. From the time power enters into a data center until the time it reaches a server's microprocessors, power is converted numerous times, affording numerous opportunities for inefficiencies. IT data centers typically burn more power in power conversion and cooling at light loads (zero to 25 percent platform utilization) than the computer systems themselves are using to produce real work. This represents a sizeable opportunity for energy savings in the design of power conversion and cooling systems that scale better with the load.

Until recently, there has been no unified method for establishing and reporting server energy consumption. Fair comparisons for data center energy efficiency (and the components that comprise it) require a standardized set of performance and energy efficiency metrics. The Green Grid believes data center managers need a standard set of metrics similar to how miles-per-gallon comparisons for vehicles allow buyers to compare how well a car converts fuel (in gallons) into work (in miles), to understand the efficiency of their data

centers, improve the performance-per-watt of their IT equipment, and make smarter, energy-efficient IT purchases.

Addressing all of these issues and establishing viable solutions will require an industry-wide effort. The Green Grid's broad scope includes defining meaningful, end-user-centric models and metrics as well as developing and promoting standards, measurement methods, processes and technologies to improve performance against the defined efficiency metrics. Member companies are working together to identify solutions that can be embraced by both the industry and data center managers.

The Green Grid is a consortium of leading technology companies including AMD, APC, Dell, HP, IBM, Intel, Microsoft, Rackable Systems, SprayCool, Sun Microsystems and VMware. It's focused on providing industry-wide recommendations on best practices, metrics and technologies designed to improve overall data center energy efficiencies. It does not endorse any vendor-specific products or solutions.

With established programs in North America, Europe and Japan, The Green Grid's membership has grown in the past year to more than 190 companies from across the globe. In addition, The Green Grid has developed strategic alliances with government agencies and industry organizations to help further its cause. The Green Grid is actively collaborating with industry's Distributed Management Task Force, the U.S. Department of Energy, and U.S. Environmental Protection Agency, the Green IT Promotion Council, Storage Network Industry Association and other organizations to help ensure a higher degree of energy efficiency in data centers world over.

Member organizations are looking to take a proactive role in ensuring greater IT energy efficiency. Through active engagement in The Green Grid, members collaborate to help develop standard workload and deployment models and get an opportunity to

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engage directly with other standards organizations, industry stakeholders and data center operators to define key energy efficiency requirements.

Achieving this goal will require a systematic approach to addressing energy related problems within data centers. The Green Grid's early emphasis has centered on developing better data center metrics, as the consortium strives to define a way for facilities organizations, IT managers, CIOs, regional power utilities, and government regulatory agencies to evaluate the performance-per-watt of data centers and their components. The Green Grid supports metrics such as Power Usage Effectiveness and its

reciprocal, Data Center Infrastructure Efficiency which are starting to receive broad support within the industry. Additionally, The Green Grid believes recently introduced Data Center Energy Productivity shows promise of becoming a true productivity metric.

Moving forward, The Green Grid will work to define a new data center power efficiency architecture to implement energy-efficiency policies natively through the instrumentation of devices. This architecture will include automatic control of data center components via management policies geared towards power efficiency.

The Green Grid's approach recognizes

that establishing greater energy efficiency within data centers will not happen overnight, but rather will require a sustained, industry-wide effort. By leveraging the extensive knowledge of its members and working with relevant government and industry organizations to develop data center energy efficiency metrics and on best practices, The Green Grid will help eliminate costly data center inefficiencies. ■

*For more information, visit:
www.thegreengrid.org*

Environmental Benefits of EPEAT IT Purchasing System

By Sarah O'Brien
EPEAT Outreach Director
Green Electronics Council

Information technology has enabled significant improvements in the standard of living of much of the developed world, and through its contributions to greater transport efficiency, improved design, reduced materials consumption and other shifts in current practices, may offer a key to long term sustainability. However, the production, purchase, use and disposal of electronic products such as personal computers and monitors also can have significant negative environmental impact.

The EPEAT (Electronic Product Environmental Assessment Tool) system for greener electronics purchasing addresses many of these issues. The tool was developed by the Green Electronics Council to enable purchasers looking for greener IT products to address dozens of environmental performance attributes

in a meaningful way.

The EPEAT System

EPEAT was launched in 2006 to help purchasers identify environmentally preferable electronic products – starting with a product standard and registry addressing personal computers and monitors.

The EPEAT environmental performance criteria and registry system were developed through a multi-year, multi-stakeholder process supported by EPA that included participants from the public and private purchasing sectors, manufacturers, environmental advocates, recyclers, technology researchers and other interested parties.

The development of EPEAT was prompted by a growing demand for an easy-to-use evaluation tool for



comparison and selection of electronic products based on environmental performance attributes. IT purchasers needed a simple way to assess products' environmental impacts, and electronics manufacturers in turn wanted consistent guidance to ensure their green design efforts met with success in the marketplace.

EPEAT meets both constituencies' needs with a user-friendly system designed and guided by stakeholders that is accessible to purchasers and manufacturers of any size. As a result, EPEAT has revolutionized the electronic product sector, with significant manufacturer and purchaser participation and an extensive registry of hundreds of electronic

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products that meet the system's demanding criteria.

The EPEAT system, with its 51 environmental performance criteria, a registry where products meeting those criteria are listed, and a verification system for vetting product declarations – offers purchasers an easy-to-use environmental screen for products based on a wide array of lifecycle impacts.

The system also provides manufacturers with guidelines for development of environmentally preferable products that will meet market demand. And it establishes competition among manufacturers to meet higher rating levels, which pushes innovation and environmental excellence forward.

Launched only 20 months ago, EPEAT has so effectively met the purchasing community's need for a tool to measure environmental performance in IT hardware that purchasers are adopting the tool in larger numbers every day. (See www.epeat.net/RFP.aspx for a sampling of purchasers using EPEAT.)

For a detailed overview of EPEAT's development, see http://www.zero-waste.org/epeat/epeat_development.htm. Increased purchase of EPEAT-registered products rewards manufacturers directly for their environmental design and service efforts. With more than 580 products currently registered by more than 25 manufacturers, EPEAT has grown to be the most comprehensive and effective environmental purchasing tool available for IT hardware. The rapid expansion of the EPEAT system is a clear indication of its value in the world of environmentally preferable purchasing.

Environmental Benefits of 2007 EPEAT Purchases

To enable purchasers to measure the benefits of EPEAT vs. conventional products, EPA supported the development of a lifecycle environmental benefits calculator by the

University of Tennessee Center for Clean Products and Clean Technologies. The calculator assesses environmental benefits from electronic product purchases based on specific EPEAT criteria and tiers. By entering information provided by EPEAT's subscribing manufacturers on unit sales of registered products, it is possible to estimate the environmental benefits of overall EPEAT purchasing year by year.

Sales of EPEAT-registered products worldwide in 2007 totaled more than 109 million individual units. Growth in market share has been rapid – EPEAT registered desktop and laptop sales constituted more than 22% of total worldwide units shipped in 2007. The lifecycle environmental benefit of those sales is huge compared to the purchase of conventional products.

2007 purchases of EPEAT-registered laptops, desktops, and monitors over conventional products will:

- Reduce use of primary materials by 75.5 million metric tons, equivalent to the weight of more than 585 million refrigerators
- Reduce use of toxic materials, including mercury, by 3,220 metric tons, equivalent to the weight of 1.6 million bricks
- Eliminate use of enough mercury to fill 482,381 household fever thermometers
- Avoid the disposal of 124,000 metric tons of hazardous waste, equivalent to the weight of 62 million bricks.

In addition, due to EPEAT's requirement that registered products meet ENERGY STAR's energy efficiency specifications, these products will consume less energy throughout their life, resulting in:

- Savings of 42.2 billion kWh of electricity – enough to power 3.7 million U.S. homes for a year
- Elimination of the release of 174 million metric tons of air emissions (including greenhouse gas emissions) and almost 365,000

metric tons of water pollutant emissions

- Reduction of 3.31 million metric tons of carbon equivalent greenhouse gas emissions – equivalent to removing over 2.6 million U.S. cars from the road for a year. Remarkably, these benefits will not come at a cost premium – in fact, manufacturers and purchasers will actually save almost \$4 billion over the life of the EPEAT products sold in 2007, primarily from reduced energy use.

The immense volume of EPEAT rated products sold worldwide in 2007, and the very significant environmental and financial benefits resulting, confirm the EPEAT system's success as a driver for environmental change in the electronic products market. Credit for these benefits goes to the many purchasers who are demanding EPEAT products, and to the manufacturers who are developing products and services to meet EPEAT's requirements and reduce environmental impact.

The Green Electronics Council anticipates robust continued growth in EPEAT product registrations and resulting benefits in coming years. As more products are designed to meet the current EPEAT standard, as standards covering additional electronic products come on line, as global use of EPEAT continues to grow, as purchasers world-wide buy more EPEAT registered products, and as the current EPEAT standard is revised to become increasingly stringent, these tangible benefits will continue to grow in scope and value.

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For the 2007 EPEAT Environmental Benefits Report, see: <http://www.epeat.net/Docs/EnvironmentalBenefits2007.pdf>



Achieving a Green IT Strategy through Cloud Computing

By David McQueeney
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Introduction

With today's challenging market conditions – rising energy costs, commercial real estate costs, increased regulatory scrutiny and higher customer expectations – going green is not only about being socially responsible, it is an economic and regulatory imperative. A recent *CIO* magazine survey of IT executives revealed that cost-cutting and social responsibilities are the two main factors driving green IT initiatives. At the same time, CIOs are considering how to best undertake green IT initiatives, especially in time of shrinking IT budgets. Organizations

are looking to maximize energy efficiency while simultaneously meeting more challenging business needs and productivity requirements.

Cloud computing may serve as a good answer to the Green IT puzzle, especially for those who are looking to avoid upfront costs associated with building their own IT infrastructures; IT departments that do not have the internal resources to maintain an enterprise-level data center and associated services; or enterprises that want to add supplemental computing capacity or services that are not already built into the company's infrastructure. Cloud

computing, which leverages shared infrastructure to deploy and balance IT resources for computing tasks in realtime, can significantly reduce carbon footprints while maintaining service levels.

Going Green in the Cloud

Cloud computing is a new computing paradigm that connects rapidly proliferating end-user devices and enables rapid deployment of services over the network. In essence, cloud computing helps organizations tap into a vast network of IT resources, which are dynamically shared and provisioned and can be accessed by

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multiple users in disparate locations. With cloud computing centers, organizations can tap into established computing power, software and services; and end users can access services from remote locations by laptop, cell phone or other devices.

Cloud computing can help organizations of all sizes go green by providing a shared infrastructure with virtualization capabilities. Companies can access services and infrastructure on an as-needed basis, and promote the ability to maintain distributed workforces.

Infrastructure is a major consumer of energy, and data centers are a major piece of any organization's IT

floor space in the data center, virtualization helps to reduce energy consumption and costs. In fact, virtualization has been shown to reduce floor space by 80 % and energy consumption in data centers by 40%. Cloud computing can offer energy savings through reducing hardware usage by a ratio of 4:1 and administration by a ratio of 7:1.

Cloud computing enables IT organizations and individuals to be smarter about the way they operate, both bolstering the bottom line and promoting energy efficiency in the process. For instance, services that reside in cloud computing can be accessed on an as-needed basis; organizations are charged based on usage. Cloud computing centers

Cloud around the World

Cloud computing is a new paradigm that is already being used by organizations around the world.

Wuxi, a historical Chinese city founded three thousand years ago during the Zhou Dynasty, is not only dubbed the "Little Shanghai" due to its fast economic growth today, but also becomes known as the home of the "China Cloud Computing Center." In February this year, Wuxi Tai Lake Industry Investment and Development Company Limited decided to establish China's first cloud computing center, which will offer emerging software companies the ability to tap into a virtual computing environment to support their

Enterprise-grade cloud computing centers feature green hardware and software, saving companies all the upfront cost of deploying and upgrading the technology.

infrastructure. In 2007, the Environmental Protection Agency (EPA) released a report to Congress detailing the impact of increasing power consumption and energy costs within data centers, forecasting that by 2011, data centers will consume 100 billion kWh of energy at a total annual cost of \$7.4 billion. An immediate benefit of cloud computing is that companies will no longer need to maintain their own data centers, freeing up IT resources and decreasing infrastructure operating and maintenance costs.

Another benefit is that enterprise-grade cloud computing centers feature green hardware and software, saving companies all the upfront cost of deploying and upgrading the technology.

Virtualization drives consolidation of the IT infrastructure. It is an example of energy-efficient technology found in cloud computing centers today. By increasing utilization, and decreasing the number of servers and physical

house real-time efficiency monitoring capabilities to gauge power consumption and thermal awareness. Energy monitoring software can easily show where most of the energy consumption is taking place, whether by resource, group or location. Resources can then be allocated and provisioned dynamically, decreasing the idling time of servers and unnecessary cooling cost.

These types of changes have a large impact on energy and cost, but an added benefit is to deliver higher value services to end users, enabling business users within the organization to maintain their work styles and routines. In fact, cloud computing can help companies further reduce global emissions by helping workers access services remotely, whether from home or on mobile devices while traveling. The elimination of commercial office space can help companies save on commercial real estate costs and the energy to power offices.

development activities. Customers will be able to access these common services provided by the center at any time -- just as they use utilities and other shared services. They do not need to own and manage hardware and software as they would in traditional business models. This initiative is expected to generate multi-million dollar business opportunities.

Moreover, collaboration technologies available through cloud computing have helped companies like the Sogeti Group, a specialist provider of local professional IT services. In April this year, Sogeti successfully used a cloud computing environment to facilitate a 72-hour global employee brainstorm in order to generate new business ideas about building the "Sogeti of the Future." The Web-based event involved 18,000 employees, saving both energy and travel costs.

With a similar cloud computing infrastructure, the Vietnam Information for Science and

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Technology Advance Innovation Portal went live in May this year. The interactive online portal is used by Vietnamese universities to develop education programs for Service Science, Management and Engineering, an emerging academic discipline that integrates engineering, management, business, and social science. The portal virtually connects experts and on-line communities to create ideas, share experiences and debate opinions. Such real-time exchanges save time and energy to destinations. The ability is highly advantageous for geographically distributed communities.

Summary

Cloud computing allows companies to optimize people, resources and collaboration beyond boundaries, driving efficiency and growth while reducing costs such as IT investment, travel, and physical real estate. In addition to detailing the impact of data center energy use on the environment, the 2007 EPA report also suggested that by changing the way companies use and operate data centers, energy consumption in 2011 can potentially be reduced to 2001 levels – a net swing of nearly 90 billion kilowatt hours. Cloud computing is one viable green technology model that organizations can consider in helping to achieve the goal of energy efficiency, while also enhancing the work environment for business users, boosting the bottom line and helping companies serve as responsible corporate citizens. With some analyst estimates placing the cloud computing market at more than \$100 billion by 2011, it is a technology that will both explode in importance and grow in pervasiveness. ■

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Collaborative Work is Green by Nature

By Susan Turnbull
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GSA Office of Citizen Services and Communications
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As communities strategize on ways to reduce human impact on climate change, virtual collaborative work environments offer double dividends—reducing the need to move people and their artifacts and helping groups more effectively to achieve timely results and buy-in to their joint work products.

Green by Nature

Given today's urgencies for communities to form and become productive quickly, limitations of teleconferences, email, and face-to-face meetings are readily apparent. Using a collaborative work environment that includes a wiki, archived discussion forum, file-sharing repository, search and hyperlink pointers is a simple, yet powerful way to dramatically reduce time, energy and resource requirements. A wiki is a website used by one or more communities to do work together. Members edit, contribute, and link web page content using a browser. A wiki enables effective sharing within a community whether members are located down the hall or thousands of miles away, so travel to meetings is dramatically reduced.

All work products, resources and discussions of the community are fully archived by meeting date, materials, and member information using hyperlinks. Everything is easy to find and right at hand for all members and during all virtual meetings. Rather than attaching documents in emails, members just include the link to the document's location in the community repository. This eliminates delays and

network congestion associated with large emails. In addition, because everything is stored in a coherent manner by all the members at the level of the community, each member doesn't have to take the time to store and organize each document and email locally. Much less storage is required and less time is spent by each member storing and finding items. Versioning problems go away and all content is available to any member who is traveling and has Internet access only.

Spanning Boundaries

Collaborative work environments address not only distance barriers, but also the continuity and cohesiveness needed to develop effective community strategies and products. High performing teams require quality dialogue, openness, and transparency in order to build trust that leads to credible actions at all levels – from local to global. Unfortunately, few organizations have the staffing and resources to support communities with the level of communications, coherence, and continuity needed to reach desired performance levels. Collaborative work environments, when added to existing communication tools (teleconferences, videoconferences and webinars), can fill that gap.

Engagement

Use of collaborative work environments doesn't change existing rules and procedures underpinning how government work is conducted. Because the tools, such as wikis, are so simple to use, however, it's much

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easier for government teams, particularly interagency and intergovernmental teams, to become high-performing and results-oriented. Community purpose and charter determines how each collaborative work environment evolves; newcomers have the full context needed to get up to speed.

Transparency

The shared knowledge of a community is available to all members, which builds trust. Every change on a wiki page is recorded and

hosting site), volunteers from around the world established “light” governance principles and worked tirelessly to organize and unify precious bits of information and communications needed by all parties as multi-institutional response got underway. Volunteers worked on the wiki into the waning hours of a day and were then relieved by the next wave of volunteers, up at dawn in their own time zone. Like a neighborhood bucket brigade, it spanned the globe and drew upon diverse languages, cultures, tools, and skills of people who had never met,

work environment, the DRM Public Forum, to invite public comment and draw upon interested state and local government participants. Over 130 people subscribed to the Public Forum and six DRM open workshops were held with 585 participants. The document was so widely accepted that a number of states and other countries are using the Data Reference Model to rationalize their databases and make it easier to share information across jurisdictional boundaries.

The technology that enabled

Using a collaborative work environment that includes a wiki, archived discussion forum, file-sharing repository, search and hyperlink pointers is a simple, yet powerful way to dramatically reduce time, energy and resource requirements.

viewable. Each wiki page version includes name, date, and all changes made by every member. Some collaborative work environments are public-facing, where anyone can view content, but only members can edit content. Some collaborative work environments are closed, available to members only, and no content is viewable by the public. One of the most well-known public collaborative work environments, Wikipedia, has become a primary source of information for people around the world.

Global Impact and Implications

A less familiar, but riveting example of virtual collaboration potential for public service is the tsunami wiki created by a global community of volunteers in the aftermath of the South Asia tsunami in 2005. Using four light-weight Internet tools that included a wiki, discussion group, blog, and Flickr (a photo and video

but were not deterred from working together. See: www.tsunamihelp.info/wiki/index.php/Main_Page

Closer to home, the GSA Intergovernmental Solutions collaborative work environment (with wiki) supported development of the Federal Enterprise Architecture Data Reference Model (DRM). This unprecedented government-wide project was completed in 180 days and was issued as policy soon afterwards by the White House Office of Management and Budget. The wiki-based online environment provided the DRM Working Group with the quiet, “closed” community space needed for its 125 members to share, deliberate, and transparently document its entire work process, including meeting notes, conversations, drafts, and related resources, numbering over 300 documents. In addition, the working group used an “open” collaborative

hundreds of individuals across the government to collaborate on this foundational document without requiring the carbon-based movement of people will have a significant impact on society’s ability to reduce its carbon footprint today and in the future. Not only does it eliminate the need for local, interstate and even international transportation, it also reduces the amount of paper, time and Web storage space required to share documents and versions of documents via email, fax or mail. ■

For additional information contact susan.turnbull@gsa.gov. The Intergovernmental Solutions wiki can be accessed at: <http://colab.cim3.net/cgi-bin/wiki.pl?WikiHomePage>



The New Challenge of IT Asset Disposal

By Joe Strathmann
Americas Takeback Organization
Dell

IT managers whose primary concern has long been keeping systems and servers up and running to meet service level agreements are facing a whole new set of concerns that stem from increased environmental awareness in society. Today, constituents expect government IT organizations at every level to practice environmental responsibility everywhere, from desktop to data center. The most widely publicized green issue is power consumption, and a new metric – performance per watt – is beginning to play a role in purchasing decisions. But now, a second environmentally important issue is gaining prominence: how to handle the disposal of decommissioned desktops, notebooks, servers and other IT assets at the end of their life cycle and how to protect the data residing on those systems.

There was a time not so long ago when old IT assets were simply stored

in the nearest closet with the hope that someone would eventually get around to finding a school or charity that could put them to use. Now, the process of dealing with used IT equipment has a name (IT Asset Disposal) and an acronym (ITAD). Governmental ITAD needs include data security, compliance with applicable regulations and government agency policies, capturing residual value, and the need to set an example of environmental stewardship. In this new, more structured ITAD landscape, decisions about ITAD have two important components: manner and timing – the “how” and the “when.”

How ITAD is handled basically determines whether or not an organization is in compliance with data security rules and environmental regulations. When assets are disposed of is a factor that can affect the IT budget.

IT System Life Cycles, Value Recovery and Total Cost of Operations

IT systems that have come to the end of their useful life in the office or data center are not “very expensive doorstops” anymore. They have potential value on three levels:

- as functioning systems
- as a source of parts
- as a source of raw materials.

The precise value of IT equipment, such as a server at the time of its decommissioning, is affected by a number of factors including supply and demand, configuration of systems, functionality and cosmetic condition of the equipment. The prices buyers are willing to pay for systems, components and scrap are determined by market forces, not unlike those that determine the price of used cars. Still, IT managers do

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have some control over the value recovery numbers. They can, for example, adjust server life cycles.

For example, after three years, if a server is worth about 10 percent of its acquisition cost, that figure can easily be about 5 percent at the end of the fourth year. If the acquisition cost of a server was \$3,000, one hundred servers could be worth as much as \$30,000 on the resale market at the end of three years, less the cost of data “wiping” and sales commissions. But, at the end of four years, that figure could easily be about \$15,000.

From these examples, it's clear that

The “How” of ITAD

Decisions about how to asset disposal is handled are as important as timing decisions, and developments in the broader IT environment have made the whole process more important. These developments include:

- The sheer growth in the number of assets. It is estimated that the federal government alone disposes of up to 10,000 computers per day.
- The corresponding rise in the risk that improper disposal of used IT equipment can pose to the

which vendor to trust with this important task is a serious matter. To evaluate these providers, IT managers should focus on two areas:

- **Data Security.** ITAD vendors should provide a certificate of destruction that lists the serial number, provides a description of how data was cleansed, and indicates whether the system was recycled or sold. Good data cleansing systems will use multiple pass overwriting, test all hard drives, and destroy drives that fail testing. They should also guarantee third-party auditing to ensure that

A second environmentally important issue is gaining prominence: how to handle the disposal of decommissioned desktops, notebooks, servers and other IT assets...

the value recovery number alone is probably not large enough to impact decisions about optimal life cycle times. But value recovery is not the only economic factor involved in deciding when to dispose of IT assets.

A second factor is energy consumption. IT equipment is becoming much more energy-efficient. At Dell, for example, we are constantly reducing the energy consumption of our products while also increasing performance. In data centers, where the total energy cost of powering servers (with cooling, power conditioning etc.) is fast approaching the cost of the servers themselves, reduced power consumption can have a major impact on TCO.

When virtualization initiatives are part of the picture, the energy-saving potential is even greater. Obviously, every data center has its own unique cost structure, but value recovery from ITAD should not be left out of the calculation when managers are making decisions about when to replace servers.

environment – particularly in the form of heavy metals.

- The emerging global market for sensitive data, which puts new pressure on IT organizations to ensure data security and preserve privacy.
- The growing body of ITAD-related regulations, which govern not only best practices related to data security and physical disposal, but documentation requirements as well
- The need for government at all levels to set a good example of environmental stewardship.

Given the net effect of these factors, ITAD is no longer a viable do-it-yourself activity, except perhaps when it pertains to highly classified information at the federal level. In all other cases, ITAD is too complex, too difficult and too time-consuming to merit the use of IT personnel who are already in limited supply. Fortunately, IT organizations can now select from a growing number of third party ITAD providers to do the job. Choosing

these practices are strictly observed.

- **Physical Disposition.** ITAD vendors should ensure 100 percent downstream traceability, with full transparency and pound-for-pound accounting at every level of the process. They should also follow strict export policies so that no end-of-life materials are sent to developing countries.

The new reality of structured ITAD adds yet another item to the data center manager's regulatory already long task list, and with it comes a new set of responsibilities. But when internal resources are scarce, third party ITAD providers stand ready to handle all the details. It's just a matter of choosing a provider wisely. ■

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The GSA-built National Oceanic and Atmospheric Administration's Satellite Operations Building has a "green roof."

GSA Helps Government Go Green

By David L. Bibb
Acting Administrator
U.S. General Services Administration

Preserving the environment and its precious natural resources was a key priority at the U.S. General Services Administration (GSA) long before green moved to the top of the national color chart.

As Acting Administrator and Senior Environmental Official, I have urged GSA leaders to move aggressively to help client agencies meet their environmental mandates through a vast array of eco-friendly products, services and buildings.

As the government's premier procurement agency, GSA:

- Incorporates principles of sustainable design in our building projects
- Offers some 10,000 green goods and services
- Has simplified eco-friendly procurement for federal agencies
- And for many years has helped agencies with energy-efficient, cost-effective recycling programs.

In fact, at this moment, GSA recycling programs are serving more than 650,000 government employees and contractors in more than 1,100 government-owned and leased buildings.

Green Buildings

While recycling the old, GSA has also focused on the new, commissioning buildings that demonstrate we are committed to the world outside our structures as well as the workers within. For instance, GSA offers:

- **Green roofs**, which can be found in the design of the NOAA Satellite Operations Building in Suitland, Md., the Social Security Administration building in New Bedford, Mass., and the U. S. Department of Transportation headquarters in Washington, D.C. These planted roofs can substantially reduce rainwater run-off during storms and provide significant insulation for the buildings.
- **Underfloor air distribution** is a feature we've incorporated in facilities we build, like the regional headquarters building of the Environmental Protection Agency

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in Denver, and the Wayne I. Morse Courthouse in Eugene, Ore. Underfloor air distribution delivers cooling and heating air at floor level instead of from the ceiling. It's energy-efficient, enhances indoor air quality, and increases flexibility for space configuration.

- **Power generation** at the San Francisco Federal Building and Denver Federal Center Solar Park are wonderful examples that prove we can co-exist with our environment, and in spectacular fashion. The latter facility produces enough energy to power 145 homes for a year. At the dedication ceremony in June, I noted that in producing this clean energy, we are not burning about 6.5 railcars of coal, which means 1,244 less metric tons of CO₂ in the atmosphere. That's like taking 228 cars off I-70 here in Denver.
- **Sustainable design.** GSA, in keeping with the President's Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management, has created an Office of High-Performance Green Buildings. Housed in the GSA Public Buildings Service, the office ensures that all federal buildings are meeting sustainable design and energy-reduction targets mandated by the Energy Independence and Security Act of 2007.
- **Teaching eco-friendly habits.** A new initiative has even begun to green up the 110 child care centers we manage in federal buildings. We are implementing a "learning healthy early" initiative designed to help parents and children make healthier choices and become more environmentally aware.

Buildings, however, are only part of GSA's green agenda. Telework and green procurement are some of the other improved processes we are pioneering.

Telework

The agency is leading by example in the vital area of telework. Telework not only helps preserve precious natural resources by keeping cars off the road, it helps with employee attraction and retention and gets us better prepared for times of national emergency. Nearly 30% of GSA's eligible workforce is teleworking at least one day per week.

GSA has also developed 14 Telework Centers in rural and suburban areas surrounding Washington, DC that provide a professional work environment convenient to home, well-equipped with high-speed computers and Internet access and technical support. Government employees who use these centers to work closer to home each year save 2.8 million travel miles and keep 2.3 million pounds of emissions out of the air we breathe.

Green Procurement

GSA's green procurement program promotes the purchase and use of recovered material products, environmentally preferable services and bio-based products. We have a special "environmental aisle" on GSA Advantage, the agency's online ordering system that offers safer paints, green cleaning supplies and other non-ozone depleting materials. Buyers for federal agencies can also find Energy Star compliant products. This online store allows federal buyers to purchase literally thousands of energy efficient products and services online. Other GSA procurement programs also offer green alternatives:

- In Fiscal 2008, GSA Fleet purchased over 22,000 alternative fuel vehicles (AFVs) for client agencies, plus 239 hybrid electric vehicles. Moreover, the agency sold 13,862 AFVs at public auctions, putting more of these energy efficient vehicles into the hands of private consumers.
- GSA schedule contracts promote

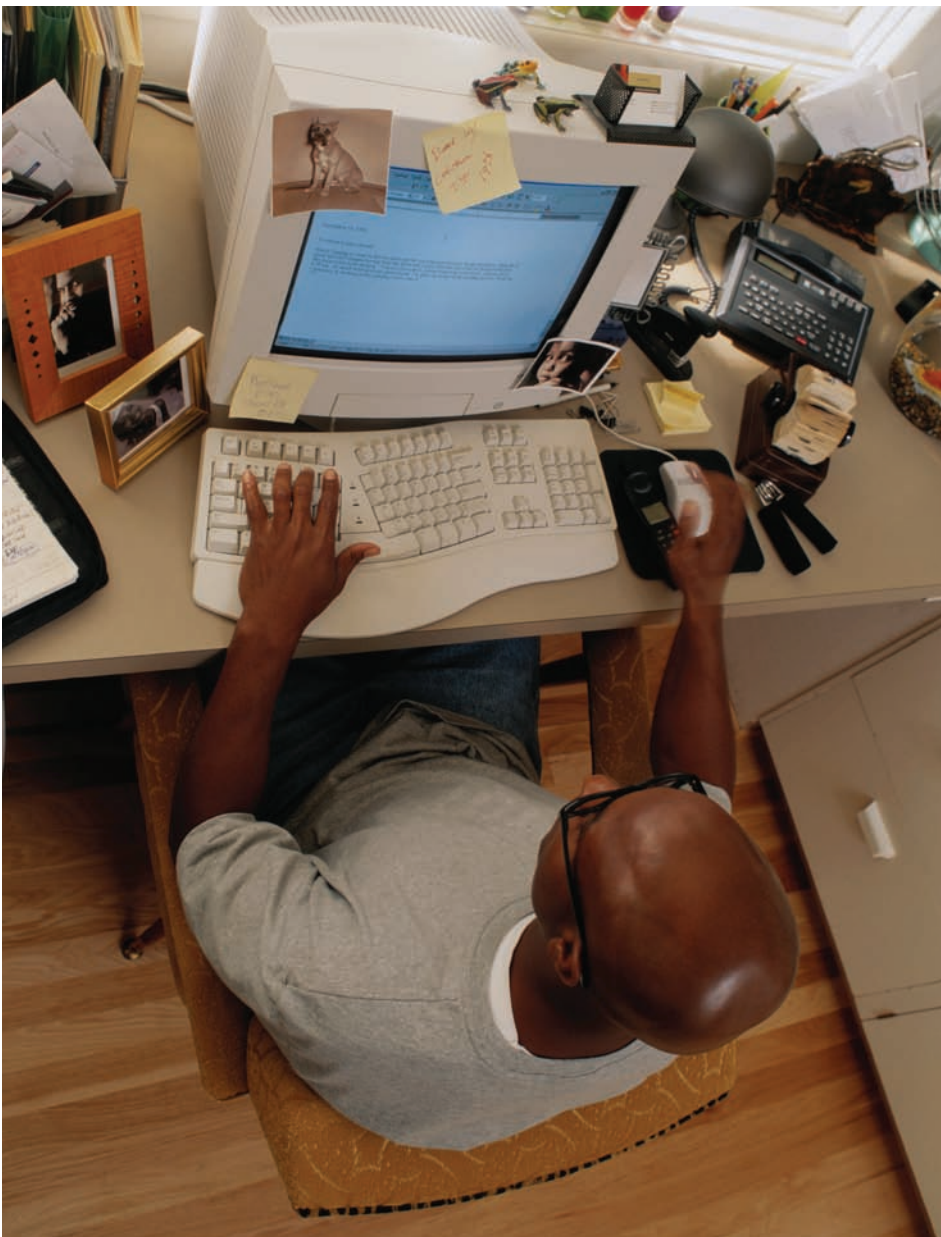
big-picture energy initiatives, such as energy management program support and energy audit services. Some schedules also offer management and procurement services for natural gas, electricity and energy from renewable sources.

- Closely aligned with the procurement program is GSA's effort to green public and private data centers nationwide. These centers house computer servers, databases, and related systems. Agencies could make data centers more energy efficient by consolidating the number of centers and optimizing the number of servers within centers by having one machine run several virtual servers. Typically, servers are idle 85 percent of the time, the key here is that consolidation presents opportunities for tremendous energy savings and operational efficiency. The centers account for roughly 1.5 percent of the total energy consumption in the U.S.

GSA is working hard to lead by example and help other federal agencies meet their environmental obligations. From telework to hybrids and green roofs, GSA is using its unique position as the government's supply arm and property manager to help customer agencies become better stewards of the environment. No single individual, organization or government entity can clear the path to a pristine environment or American energy independence, but individuals, organizations and government entities must all take advantage when opportunities arise to "go green."

As government leaders, it is our responsibility to safeguard our natural resources. The rule should be: we will not take more than we need, and we will replace what we take. ■

David L. Bibb was Acting Administrator and Chief Environmental Officer of the U.S. General Services Administration until his retirement August 29 after 37 years at GSA.



Environmental and Corporate Benefits of Telework

By TANDBERG Federal

Corporate Commuting and Its Affect on the Environment

The impact an organization has on the environment extends beyond its own direct actions. Although employees who commute to work are

individually consuming energy and adding to pollution problems, they are doing so in the interest of their employers.

Fuel costs are rising and commuting distances are getting longer as

employees move farther away from their workplaces. In addition, geographically dispersed work teams, progressively more complex supply chains, and globalization are all increasing business-related travel. As a result, direct costs and harmful CO₂ emissions from transportation are rising.

In the United States, the average employee spends more time commuting each year than on vacation. Using a distance of 18 miles each way and highway mileage of 23.4 mpg as standards, the daily fuel consumption due to commuting comes to a minimum of 1.5 gallons per round trip. Thus, for each employee commuting five days per week, a whopping 5,154 pounds of CO₂ is released into the atmosphere each year. That's using relatively low standards for commuting distance and mileage; many individuals live much farther than 20 miles from their work places and travel in stop-and-go, rush hour traffic, which increases the amount of gas consumed and CO₂ emitted into the atmosphere.

The Socially Responsible Organization

There are several steps a company can take to improve its standing as an environmentally conscious organization, focusing on manufacturing processes, recycling and disposal, product design, and – addressing the corporate commuting issue -- teleworking.

“Telework continues to receive attention within Congress and federal agencies as a human capital strategy that offers various flexibilities to both employers and employees, including the capacity to continue operations during emergency events, as well as benefits to society, such as decreased energy use and pollution,” according to the Government Accountability Office.

The Benefits of Telework

According to research conducted by the Telework Exchange, if federal

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workers in the Washington, D.C., metropolitan area worked from their homes rather than commuting to their offices, they could save 12.4 million gallons of gasoline each week. As recently as late 2005, the cost of commuting for federal workers was \$19 million per day.

Aside from enabling organizations to become positive global citizens, implementing a teleworking program as part of a green initiative yields benefits that are measured not just in CO2 reduction, but also in lower costs, increased brand value, and stronger competitive advantage.

For example, a 2007 survey of 15 countries by global survey firm Ipsos Mori revealed that 50% of global consumers are more likely to purchase from companies with strong environmental reputations, increasing brand value. Further, with 80% of people indicating that they prefer to work for organizations that are environmentally friendly, green organizations have access to more talent, strengthening their competitive advantage.

In addition, according to the Telework Coalition, companies save an average \$3,000 to \$10,000 per employee just by reducing office space. For example, AT&T's telework initiatives saved the company approximately \$550 million by eliminating or consolidating unneeded office space. And roughly 25 percent of IBM's 320,000 workers telecommute from home offices, saving Big Blue \$700 million in real estate costs.

An article published in 2005 in the Telework Coalition in the Association of Contingency Planners Newsletter, November 2005 and authored by Chuck Wilsker and John Edwards, focused on the importance of teleworking to business continuity: "Employers go to great lengths to back up their data and infrastructure, but the inability of workers to get to either their offices or other assigned alternate work locations, whether they are destroyed, quarantined, or the staff itself is quarantined, will have a

devastating impact on an organization's ability to survive."

The article goes on to point out the positive effect of teleworking on an organization's bottom line as a result of reduced real estate requirements, increased employee productivity, and reduced absenteeism: "In 2004 at AT&T, for example, almost one third (30%) of all their management employees worked full time outside of the traditional office. The company realized an estimated \$180 million in bottom line benefits."

Others who have embraced the eco-friendly proposition of telework have seen similar results. German manufacturer BJB accelerates decision making by having international project teams, customers, and suppliers weigh in on product design via videoconference, cutting time to market by four months. Statoil, a major oil and gas company, scales knowledge by using video for

- Increased productivity;
- Lower operating costs due to a reduction in office space requirements;
- Reduced business travel, which further lowers operating costs and improves employee morale;
- The ability to ensure business continuity in the event of natural disasters or other incidents causing loss of connectivity; and
- Increased brand value as consumers seek out eco-friendly organizations.

Solutions

As telework programs are on the rise, video has become an essential tool for home-based employees who want to maintain a visual connection with their workplace. What's more, their companies appreciate the reduction in cost and increase in worker productivity gained through

telework.gov

remote diagnostics and repair, linking people visually from land to oil platforms in the North Sea. Many companies use video communications products to unify their organizations, enabling executives and staff to communicate across the country and across continents – not only eliminating the ill effects of travel on the environment, but improving work/life balance for their employees who are less stressed and more productive as a result of not having to travel.

The Bottom Line: Telework is More Than a Green Initiative

As more and more organizations adopt telework as an environmentally friendly initiative, they are enjoying a multitude of additional advantages, including:

teleworking. For the tens of thousands of companies and government offices worldwide that already have videoconferencing solutions installed, extending the benefit to teleworkers is the natural next step in technology adoption. For companies that have been seeking a way to jumpstart telework programs, implementing a video network is an effective way to realize tangible benefits right away. ■

TANDBERG is a leading global provider of telepresence and high-definition videoconferencing. For additional information www.TANDBERG.com.



The Virtual State of Tennessee

By Mark Hackney
Information Systems Director
Office for Information Resources
State of Tennessee

As IT operational issues became more complex and associated costs continued to rise, the State of Tennessee needed to find a way to minimize complexity and spending while maintaining quality of services delivered to its citizens. It became apparent that virtualization would be one solution to do just that. As an added benefit, we found a

greener way to do business and are reducing our footprint on the state environment.

Virtualization is a server technique used to provide a complete simulation of the underlying hardware, allowing multiple virtual machines to run a mix of operating systems on one piece of physical hardware. This results in a

system that allows all software normally run on physical machines to be run on the virtual machine. There are multiple forms of virtualization, including platform, resource, application, and desktop. This discussion will refer to primarily platform and resource virtualization.

The advantages of server virtualization have allowed the State of Tennessee to reduce staffing costs, lower energy costs and harmful carbon dioxide emissions, and offer better disaster recovery options. High availability is more easily maintained as well, with almost zero downtime realized for planned and unplanned outages. We have also found that our customers are pleased with the faster provisioning of a virtual server over the customary lag time needed to procure a physical piece of server hardware.

When the state first reviewed the concept of a virtualization strategy, we were very skeptical about the theory of under-utilized physical servers. VMware, Inc., a global leader in virtualization, provided us with statistics stating that physical servers only use about five to six percent of the resources available to them at any given point in time, which means that about 95% of the energy costs to operate a machine are wasted. To fully utilize the server hardware resources, multiple guest servers are placed on a physical host server to use all available resources to full capacity. Our servers met these criteria and were good candidates for virtualization, which allows us to save physical space in the Data Center, as well as power, cooling costs, network connections, server racks, and storage connections. VMware's analysis¹ shows that by virtualizing 450 physical servers, we should be saving almost \$3 million annually in energy costs and almost four million pounds of carbon dioxide emissions, which is the equivalent of planting 9,000 trees or taking 675 cars off the highway.

Further research provided by a May

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2008 *Tech News World* story² indicates that at the rate it is currently growing, the power demand for data centers will reach such heights by 2020 that it will become a larger cause for carbon emissions than the airline industry. Additionally, a recent article³ in *Business Week* predicts that surging power consumption, along with rising energy costs, will soon make it more expensive to keep a server going for a year than to acquire one in the first place. And this year's June issue of *CFO.com* explains why virtualization is a key part of broader efforts to make data centers more efficient.⁴ The research is compelling. Virtualization is "in."

After reviewing various virtualization products, the State of Tennessee partnered with VMware. The first step in our process was to virtualize enterprise servers housed at the data center to ensure that the virtual servers performed at the level of our expectations and minimized any impact on our customers, state agencies, in the process. Once we achieved success in this area, we began to target agency-owned server hardware candidates for virtualization. However, we first needed to educate some of the agencies in the concept of virtualization.

Many agencies expressed concern as to how their applications would run on virtual servers. We also encountered stiff resistance from vendors who had contracted with state agencies to provide application solutions. We provided a great deal of education and assurance to the agencies and vendors as we demonstrated for them how well the virtual servers performed with the overwhelming majority of their applications. As time has elapsed, the transition to virtual servers has been embraced by both state agencies and application vendors; in fact, two of the largest information system projects in the state have taken advantage of our robust host farms to support their mission-critical applications. Capacity and load testing on virtual servers was performed and the results were equal to that of testing on

physical servers, or better, in some cases, with these two application systems. Based on these successes, the State of Tennessee now employs a default virtual model on all new applications that are planned to be housed at the data center. Both web and application servers are virtualized in this model and in the rare instances where performance cannot be deemed satisfactory, physical servers are then used.

Our current environment houses over 450 virtual guest servers running on only 50 host servers (actual physical server hardware) in the state's data center. This would equate to 400+ physical servers that would require rack space, electricity, and air cooling in the data center. The State of Tennessee's IT organizations are committed to Governor Phil Bredesen's pro-active conservation initiatives, and virtualization has become one strategy that is already giving us Green IT payback.

We have found that virtualization provides excellent uptime solutions for mission-critical agency applications. The use of a VMware tool allows virtual servers to automatically migrate to another host server in the farm, based on predefined settings determined by a perceived hardware failure or crossing a threshold percentage of resource usage on a server. This means that if a physical server fails, or server resources become fully utilized, the tool will automatically migrate the virtual server to another physical host server without the customer being aware that a problem occurred. This feature is directly comparable to clustering of physical servers in providing customers constant access to their servers.

Disaster recovery capabilities are being realized for virtual servers as well. Another tool allows the replication of virtual servers and their associated data to occur at both the primary and disaster recovery locations of the data center. This allows the state agency to continue to conduct business operations in the event of a disaster that would cause

the primary data center to become nonfunctional. With this type of tool, the amount of downtime experienced by the customer can be greatly reduced for routine maintenance and software patching by switching the customer from the primary to the secondary site during these maintenance outages.

The State of Tennessee currently outsources disaster recovery of critical agency applications to a vendor-housed location. Looking ahead, as the state's new data center comes online, the ability to provide state agencies a wide range of disaster recovery solutions through virtualization will greatly enhance current service offerings and provide economies of scale. The state will be able to realize considerable cost savings in server hardware, energy, and indirect labor services as a result of the virtual implementation.

The State of Tennessee has fully embraced virtualization as a means of reducing complexity, staffing and utility costs, while maintaining and even improving the level of quality services we can offer to our customers and citizens. We can consistently meet our service level agreements for server uptime and minimal downtime with this solution, which will hopefully assist in ensuring maximum Earth uptime for future generations. ■

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Solar Photovoltaic Financing

Deployment on Public Property by State and Local Governments

By Karlynn Cory, Jason Coughlin, and Charles Coggeshall
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State and local governments have grown increasingly aware of the economic, environmental, and societal benefits of taking a lead role in U.S. implementation of renewable energy, particularly distributed photovoltaic (PV) installations, those familiar solar panels that produce electricity from sunlight. Recently, solar energy's cost premium has declined as a result of technology improvements and an increase in the cost of traditional energy generation. At the same time, a nationwide public policy focus on carbon-free, renewable energy has created a wide range of financial incentives to lower the costs of deploying PV even further. These changes have led to exponential increases in the availability of capital for solar projects, and tremendous creativity in the development of third-party ownership structures.

As significant users of electricity, state and local governments offer excellent examples for solar PV system deployment on a national scale. Many public entities are not only considering deployment on public building rooftops, but also large-scale applications on available public lands. The changing marketplace requires that state and local governments be financially sophisticated to capture as much of the economic potential of a PV system as possible. Therefore, a key issue facing policy makers at the state and local level is how to most efficiently allocate public dollars and leverage incentives to develop a significant amount of energy

generation from public-sector PV. This report examines ways that state and local governments can optimize the financial structure of deploying solar PV for public uses.

A number of revenue streams, incentives, and financial structures can be utilized by state and municipal governments who want to support solar projects. PV systems produce two products that can be sold in the marketplace: electricity and the green attributes of this electricity. Revenue from any particular solar PV project will depend on its geographic location, the quality of the resource, and access to purchasers that place a high value on solar renewable energy certificates (SRECs).

For state and local governments, several methods of financing the production of these goods are available, including:

- systems benefit charge (SBC) funds
- issuance of energy bonds
- clean renewable energy bonds (CREBs) approved by the Internal Revenue Service and
- federal renewable energy production incentives (REPI).

Additionally, private sector financiers are able to take advantage of another set of incentives, which include the federal investment tax credit and accelerated depreciation under the federal Modified Accelerated Cost Recovery System (MACRS). Finally, there may be additional state, local, or utility incentives available to further

reduce the installed costs of PV.

The primary vehicle that has emerged to finance public-sector PV is the third-party ownership model because it allows the public-sector systems to take advantage of federal tax incentives without a large up-front outlay of capital. Under this structure the government entity hosts, but does not own, a solar PV system and is able to secure, on average, 15- to 25-year fixed-price power at or below current retail rates. The combination of these options has led to the installation of many PV systems with the transactions increasing both in terms of size and complexity.

In this paper, the mechanisms underlying these transactions are analyzed and their specific relevance to state and local governments is explored. Based on the research and analysis conducted, several themes emerge that highlight the opportunities and challenges with deploying PV on public-sector buildings and lands:

- **Reduce electricity bills.** State and local governments can reduce electricity bills by producing electricity on-site with a solar PV system. However, the savings are not currently enough to justify deployment solely based on these savings, even over a 20-year payback period.
- **Value of green attributes.** Solar renewable energy certificates offer an additional revenue stream that can be combined with incentives to offset the high cost of PV deployment. The value of an SREC is highest in states with solar tiers in their renewable portfolio standard (RPS) requirements; voluntary SRECs command a smaller, but sizable premium as well.
- **Use state incentives.** SBC funds provide a significant source of capital to lower the up-front costs of installing PV, including public-sector applications. There is significant flexibility in how SBC-

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funded programs can be designed and administered.

- **Take advantage of third-party ownership.**
 - **Capture federal incentives.** As many state and local governments pursue aggressive PV expansion programs, the third-party ownership model will be a key financing structure to take advantage of federal tax incentives like the ITC and MACRS. However, unless significant rebates are available or if the system is being installed in or near a state with a solar tier in its RPS, the economics of on-site solar in many states may still be marginal when compared to average retail electric rates, even with the federal incentives.
 - **Consider an option for ownership.** Two relatively new structures, the sale-leaseback and partnership flip, create the

financing mechanism for third-party ownership model. Both of these structures allow an option for the public entity to ultimately own the project after year six, or at the end of the power purchase agreement or lease. However, each structure has complicated tax issues that must be addressed.

- **Defray up-front costs.** In certain states, the transition to performance-based incentive programs and away from up-front incentives may change the nature of how PV projects are financed. This may encourage a greater reliance on third-party structures, especially for the public sector and residential markets.
- **Own and finance public-sector solar PV.** For those state and local governments that desire to own the PV system on their site, there are several options for structuring the financing:

- **Issue bonds.** Securing up-front capital through general obligation bonds is how public renewable energy projects have traditionally been financed, though they do require voter approval.
- **Issue energy bonds.** Issuing state or municipal energy revenue bonds that are repaid with energy savings is an attractive concept; however bringing these bonds to market can be challenging.
- **Apply to the IRS for a clean renewable energy bond allocation.** For approved applicants, the federal incentive CREBs can be a valuable source of low-cost financing, if steps are taken to reduce the high transaction costs associated with their issuance.
- **Use federal renewable energy production incentives.** While the REPI is designed to provide a production incentive to public projects like the production tax credit, the incentive is consistently underfunded by annual congressional appropriations; therefore, it is difficult to depend on it for supporting significant public deployment of solar PV.
- **Understand insurance requirements.** Utility insurance requirements for PV systems, including general liability and property, can be onerous. Their cost can significantly negatively impact the economics of solar PV projects and can be large enough to derail public-sector PV projects. ■

The full report on Solar Photovoltaic Financing: Deployment on Public Property by State and Local Governments is online at www.nrel.gov/docs/fy08osti/43115.pdf For additional information contact christine.carter@go.doe.gov.



How State CIOs Can Get to Greener Pastures

Recommendations from Green IT in Enterprise Practices: The Essential Role of the State CIO, a publication of the National Association of State Chief Information Officers

State CIOs are now finding themselves to be crucial players in areas such as healthcare IT, Medicaid reform, e-discovery, and a host of other issues that have just recently begun to garner state CIO attention. Green IT is among these emerging trends and state CIOs are beginning to find their role among the many stakeholders involved in green practices. State CIOs must now utilize existing technologies, and work to incorporate new ones, into their enterprise green IT policies and practices. To do this, state CIOs must take steps to move green benefits to the forefront of their strategic thinking.

- **Think Green:** State CIOs can achieve green results in the short term using technologies and ratings systems that already exist and can significantly reduce the

environmental impacts of project operations in the longer term by establishing systems and planning now. Yet, working to think “green” strategically, and to see its benefits with an enterprise view, will require a shift in not only the way new projects are pitched, but also in the mindset of the state CIO

Projects such as data center consolidation, integrating virtualization technology, and incorporating telework programs typically are done for reasons other than the immediate green benefits they pose. However, by articulating the enterprise vision and emphasizing a sense of urgency in implementing green initiatives, advocating for the green benefits at the outset of a project, and making these green benefits part of the

driver for a project, state CIOs may increase stakeholder buy-in and foster a sense of greater good in the initiative in which they are working to implement.

- **Develop a Plan:** Working to develop a green IT plan for the enterprise can be a first step toward implementation of greener practices. Those states that have developed green IT plans, including Missouri, Kansas and Oregon, have incorporated ideas for green efforts in nearly every aspect of their jurisdiction as state CIOs. These include areas such as equipment purchasing, recycling, data center consolidation and virtualization, among others. Reaching out to states that have developed plans, and learning about steps they are taking, can help in implementing green IT initiatives.
- **Establish a Baseline and Determine a Metric:** Before a state CIO can move a project forward, they must ascertain where their state is at currently in regard to energy consumed, greenhouse gas emitted, etc. To adequately measure success, you must know or have an estimate of where you

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began before you can decipher how far you've come at a project's completion. Developing a baseline and a way to measure progress can be built into a total carbon footprint reduction plan at the outset of an initiative and can be key to overall project success.

For example, one way to determine a state's energy use in its data center is to conduct an audit to assess how much energy is used and how energy efficiently a data center is operating. The Green Grid and other industry groups have published a metric which can tell state CIOs how much energy is spent on the productive use of IT versus the amount wasted on physical infrastructure. Getting the facts is a good way to start managing the problem—and yet less than 20% of companies in the United States have done a basic energy audit.

- **Track and Monitor Success:**

Once a metric is determined, state CIOs must continue to track and monitor a project's success rate. For example, in following a data center consolidation initiative, examining the energy usage rate prior to consolidation and then comparing that to energy usage after consolidation can help determine success and show the benefits accrued from the project. Making sure those benefits continue to be realized and that the project maintains a level of success is an important way that state CIOs can continue to justify maintenance costs.

- **Become a Transformational Leader:**

State CIOs may not immediately have authority to implement certain programs or initiatives designed to have green benefits. Utilizing existing authority through enterprise architecture or other means can help state CIOs drive toward greener practices without making major jurisdictional policy changes. In other cases,

such as telework, state CIOs must often work to gain authority to implement these programs for their employees.

State CIOs using enterprise-wide leadership skills can work across organizational boundaries to transform existing practices into green practices. For instance, despite the significant increases in employer adoption of telework, it still remains a subject of debate, particularly among older workers. In order to incorporate a telework process, state policy issues must first be resolved, some of which may pose significant obstacles. However, by emphasizing the green benefits of telework, state CIOs may be better poised to advocate for the implementation of these initiatives.

- **Don't Go It Alone—Enlist Your Partners:** Collaborate with other agencies within your state to establish jurisdiction and authority and to gain buy-in for a green IT initiative or agenda. Also, reach out to other states to gather best practices and lessons learned, gauge success stories and assess project failures before deciding to embark on a similar initiative. Often, your greatest resource can be your peers. Also, engage your staff in these initiatives—they also hold a stake in enterprise success and may be eager to help drive these green efforts.

Collaboration with vendors is also critical for green IT success. There is a multitude of vendors that offer green components to their products and services, as well as those solely dedicated to incorporating green practices. Communicating with existing vendors that green initiatives are important to your state will drive them to incorporate greener practices as well.

- **Leverage the Circumstances:** With rising energy costs, particularly fuel prices, on the mind of nearly every citizen and lawmaker, green

initiatives will likely be met with unprecedented support. Now, more than ever before, the green benefits of a program will be seen as a major advantage by legislatures and executive offices. State CIOs are uniquely poised to become leaders in the green IT revolution.

Much as with other emerging IT trends, state CIOs can either choose to take the lead at the outset, or risk missing an opportunity to shape policies that will likely affect them eventually. Green IT efforts appear certain to become more prevalent—and in turn, mandated—as public opinion and therefore legislative action increasingly favor environmentally friendly initiatives. State CIOs who begin to explore green practices now will be ahead of the curve when these mandates become effective. By advocating for green practices in the use of IT, reducing energy consumption, and by helping to reduce greenhouse gas emissions, state CIOs can have a significant impact on reducing their states' carbon footprint. These actions are not just good for the environment, they also position state IT organizations and systems to better manage future demands and achieve more effective outcomes for the state business applications they support. Taking public service to the next level, state CIOs now have a chance to contribute to the greater good far beyond their IT departments by working to establish more sustainable IT practices and policies that will have a lasting effect on generations to come. ■

Excerpted from Green IT in Enterprise Practices: The Essential Role of the State CIO, a white paper published in May 2008 by the National Association of State CIOs. See www.nascio.org/publications/.

Public CIOs, Green Czars and their Span of Control

By Paul Taylor, Ph. D
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Center for Digital Government

Chief information officers came into their own as organizations recognized the strategic importance of information technology. As organizations come to terms with the strategic importance of sustainability, it leaves open the possibility of the ascendancy of a “Chief Sustainability Officer.” The proponents of such a development envision a “Chief Green Officer” as being on point for a broad agenda to

CIO. “Sustainability is a concern and responsibility of all organizational members. As such, it should be given prominence in strategic plans and policies. Various performance metrics can be established that will readily provide current state and trend information to management and staff. Measures should be global within an organization since all areas consume power and all parts can take steps to reduce consumption. The other reality

Aneesh Chopra. He says CIOs should not be confused with being green czars because “the skills are totally different,” but “the CIO is an important stakeholder for states that plan to lead by example in lowering our energy footprint.”

Sustainability brings with it technologies of its own, particularly where green or energy-efficient buildings are concerned. Like physical controls in manufacturing and other mechanical processes, green technologies rely on digital technologies to control the controls — including a growing range of products alternatively known as operational technology (OT) or embedded IT. Digital physical controls have been outside the purview of CIOs in manufacturing, warehousing and the operation of bridges. The public CIOs interviewed

On the downside, Green Czars represent the thin edge of the wedge in creating a new bureaucracy, the carbon footprint of which would have to be mitigated.

“reduce the environmental footprint, engage with a diverse group of stakeholders, and discover new revenue opportunities.”

On the downside, green czars represent the thin edge of the wedge in creating a new bureaucracy, the carbon footprint of which would have to be mitigated. There are other organizational constraints. The sustainability point person would be less likely than her C-level executive colleagues to be able to see into particular operating environments and understand the opportunities and pitfalls in harvesting environmental gains. Moreover, a Chief Green Officer is primarily a policy and policing role, which makes it difficult to be genuinely collegial in the executive suite.

“I do not believe it is necessary to establish a Chief Green Officer position,” suggests Dr. Mike Mittleman, New York state deputy

is most power metering and billing systems are not sufficiently granular to isolate power consumption by floor or office.”

California CIO Teri Takai, who previously served in the same role in Michigan and is a past president of the National Association of State Chief Information Officers, agrees. “I think a Green C (Chief Green Officer) is overkill. Once the governor sets a policy, it is up to the cabinet agencies to determine what their role is in energy efficiency,” says Takai. “I am [also] not sure that the CIO should be the focal point for all of the state’s greening efforts. I believe that the CIO should take a leadership role in ensuring that [everything IT is] green.”

The Commonwealth of Virginia has found a different balance point. “We appointed a senior advisor to the governor as our ‘energy czar,’” remembers Secretary of Technology

agreed that the CIO’s span of control was unlikely to change as green control and other technologies become mainstream — nor should it.

Mittleman and Chopra pointed to appropriateness of fit between business needs and skill sets. According to Mittleman, “The CIO does not generally have special knowledge, training or skills that automatically proffer credentials for managing outside of the usual sphere of influence — that is, information technology.” For her part, Takai says the integration of digital, network technologies into control technologies notwithstanding, state and local governments “all have an active facilities management organization who are responsible for overall power consumption.” Her only caveat is that all such devices need to be well behaved as they connect to the state network. “My view is that the role of the CIO is to ensure that any

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devices that utilize state networks should be vetted by the CISO (chief information security officer)," she says, but "the selection and control should be the responsibility of (the) facilities (department)."

Richard H. J. Varn, CIO for the city of San Antonio, Texas, and long-serving senior fellow with the Center for Digital Government, says, "We are responsible for the flows of actionable data on which people or systems depend. That's where we have a role." Noting that public sector IT departments are "already so big and inappropriately staffed," Varn insists that CIOs should not buy trouble. "Sustainability is at the logical nexus of physics, fluid and thermal dynamics and mechanical engineering, not IT. But when the information systems on which that nexus relies need support, we're there." With a wink and a nod to the marketing campaign of a major manufacturing concern, Varn concludes, "We don't make green technologies; we may make them more useful."

"All things technical are not IT," agrees Mittleman, because chasing everything digital could take CIOs to places they do not want to go. "Automobiles represent compendiums of several technologies, including computers, network infrastructure and software, but that does not necessarily translate to the CIO being qualified to manage the carpool." ■

This is an excerpt from Simply Green: A Few Steps in the Right Direction toward Integrating Sustainability into Public Sector IT published by the Center for Digital Government. To review the report in its entirety, go to <http://www.centerdigitalgov.com/story.php?id=106657>.

Cascade County Wind Marketing

By Madelyn Krezowski and Steffen Thie
Cascade County, Montana

It was a bitterly cold winter night in early 2003. The mercury hadn't been above the zero mark at any point that day and snow banks lined the sides of every street. But in a conference room at Great Falls College of Technology, more than 200 people, including landowners, stakeholders, wind developers and a handful of the curious, had packed in

GIS mapping technology in the mid 1990's. It had worked with the National Renewable Energy Lab to add this newest GIS layer, which would become the center of the Cascade County wind marketing program. GIS is a mapping tool in which maps of the area are enhanced with layers that contain the local road system, topography, power lines, property ownership records and,



to see the unveiling of Cascade County's wind map and the first steps into a new era.

The locals who braved the night were excited to learn about the new economic development that this could bring to struggling rural communities. Wind energy would build the tax base to pay for schools, libraries, roads and other vital services and provide additional income to landowners. The newest electronic layer to the county's Geographic Information Systems (GIS) map outlining the county's wind potential was projected on the wall. Cascade County had embraced the

in Cascade County, wind potential.

Cascade County Commissioner Peggy Beltrone has been the driving force behind much of this program. Montana is one of the windiest places in the country. One developer has described the winds in Montana as "screamers." Locals can tell you stories of strong winds knocking down power lines, trees and even Lady Justice from the top of the Courthouse. The memory of the small wind turbines knocked over in the 1980s had stuck in the minds of Montanans. But in 2001 Commissioner Beltrone, visiting a wind farm in

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Alberta, Canada, realized that wind technology had grown and matured. The big turbines she saw there were ready for Montana's big wind. Wind technology had reached a scale where it was able to turn the strong winds blowing through Montana into energy and profit.

Today's turbines range in size from small home or farm-scale operations which produce about 1 kilowatt (kW) to commercial turbines that can range from 50 kW to 3 megawatts (MW). In the U.S. the 2MW size is popular for most commercial operations. Technology is no longer the limiting factor in size; instead it is the ability to transport the pre-fabricated pieces of



the turbines along the interstate highway system. A complete 2 MW turbine is as tall as a 30 story building and costs about \$3.5 million. With a good wind source it can produce 6 million kW hours each year. Enough to power 600 average American households.

The question for Commissioner Beltrone then became how to bring developers into her small county in Montana. Cascade County put its wind information into a format that added more information for developers than existing national maps, with the ability to distribute them in a variety of ways to catch developers' interest. An

executive from FPL Energy, the nation's largest wind developer, commented that the GIS tool provided in one place the normally scattered information that would have taken his company weeks to gather. "We gave ourselves an edge by being able to send this map to anyone in the world," Commissioner Beltrone said.

But the county role has not been limited to only the GIS tool. The county is aggressive on a policy front, answering questions about and streamlining the permitting process, providing information about avian issues, working with national experts on different barriers to wind energy development and recently launching a

new website to answer questions from landowners and developers. "We are trying to send the message 'You will have advocates in Cascade County for your project,'" Commissioner Beltrone stated.

The first commercial scale wind project in the county came online in 2006 with six turbines that can produce up to 9 MW of power in an area known as Horseshoe Bend. The turbines are owned by a local construction company. Part of the power is used to in its gravel operation, the remainder sold to a third party. The county played a large role in getting this project on its feet by supplying a 40 meter

anemometer tower to test the site, an expensive development step.

This June, Cascade County's own turbine went online. The county purchased a turbine to power its new \$6.4 million county shop complex. The 50 kW Entegry Wind Systems turbine towers 100 feet over the shop, adjacent to the interstate highway. "We wanted to show that Cascade County is walking the talk on wind energy," Beltrone said. It also served as a learning experience for the county in dealing with the local utility to bring the turbine online and to set up a net-metering system. A proposal is in the works to add a low-frequency radio station to tell the County's wind story to motorists. The county-owned project has also attracted attention from a national company to use the site to test new wind energy-related technology which could bring additional jobs into the community.

The Cascade County Commission continues to be aggressive in addressing barriers to wind energy, including transmission issues, the major factor limiting the growth of wind in rural communities across the country. The county has been very supportive of the Montana Alberta Tie Ltd., a proposed 600 MW merchant line between Great Falls in Cascade County and Alberta, Canada. Beltrone was part of a group to address property owners concerns for the company. The line is expected to get all of its permits within the next three months and be constructed over the next year.

So far, all that work seems to be paying off. Currently at least 13 sites in the county are being tested by well-financed developers. Commissioner Beltrone says she knows of at least three major companies that are testing for investments in wind energy totaling \$4 billion. The interest in Cascade County's wind is clear. It's clear that this interest is because of the supportive role of the local government. ■

For additional information go to www.cascadecountywind.com.



The Sunshine State Keeps IT Green

By Joshua Yaffin
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Green Florida

On July 13, 2007, Florida Governor Charlie Crist signed Executive Order 07-126, committing Florida to lead in the reduction of greenhouse gas (GHG) emissions. This historic move established GHG emission reduction targets of 10% by 2012, 25% by 2017, and 40% by 2025, and called for the use of environmentally sustainable business practices. The Florida Department of Management Services, in partnership with the Florida Department of Environmental Protection, coordinated activities across state agencies to conduct an immediate baseline of GHG emissions

during the 2006-07 fiscal year.

Florida's first comprehensive GHG emissions assessment, Florida State Government Greenhouse Gas Reduction Scorecard, is a baseline to identify and track GHG emissions within state government. Findings show that state agencies produced almost 899,107 metric tons of carbon dioxide during the 2006-07 fiscal year, the equivalent of emissions from 194,612 passenger cars or 115,418 homes. The study reports emissions data for each individual state agency building, as well as vehicle emissions. The data identifies areas to reduce and track reductions.

Target Areas

Facilities, purchasing and vehicles are key target areas. The state government is the largest employer in Florida with about 115,000 employees and 16.8 million square feet of office space. "As the state's landlord we have a huge opportunity to take this data and see what incremental improvements we should make to improve the efficiency of our real estate," said Department of Management Services Secretary Linda H. South.

Common types of improvements to reduce GHG emissions include:

Fleets:

- Educate drivers to increase efficiency (avoid quick starts, excessive speed, idling, reduce weight, etc.)
- Ensure vehicles are maintained (tire inflation, oil changes, air filters, tune ups)
- Train drivers on availability of alternative fuel across state

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- Rent hybrids or small compact cars
- Share vehicles when traveling to conferences.

Facilities:

- Use products that lower / eliminate volatile organic compounds (e.g., cleaners, carpeting, paints) and use integrated pest management to minimize pesticide application
- Follow U.S. Green Building Council Leadership in Energy and Environmental Design standards
- Purchase energy efficient appliances, lighting, etc.
- Purchase Environmentally Preferred Products (EPP)
- Establish a recycling program.

Florida purchases more than \$1 billion in commodities annually. Governor Crist's executive order required the Department of Management Services State Purchasing Division to develop the Florida Climate Friendly Preferred Products List to encourage the use of green purchasing standards and products. More than 9,000 products from 56 state term contracts on the list meet one or more of the 19 labels / standards approved by the Florida Department of Environmental Protection, like Energy Star and the Electronic Product Environmental Assessment Tool.

To encourage users to access the list, the state integrated the environmentally preferred products list into existing business practices. By working with its partner, Accenture LLP, to enhance Florida's statewide electronic procurement system, MyFloridaMarketPlace, or MFMP, it flagged qualifying products as "green." State purchasers now search, compare and track environmentally-preferred products in the system. As the program evolves and agencies continue to purchase available green products, the state can report by green product, contract, agency or purchasing group. This information provides significant value to the state and leads to new ways to



measure the state's performance as a green organization.

Next Steps

Statewide participation in reducing GHG emissions from facilities and vehicles is working to meet the target reductions. To help state agencies develop action plans to reduce their GHG emissions, the Department of Management Services produced a template outlining opportunities for agencies to reduce facility and vehicle GHG emissions. Potential opportunities include:

Vehicles

- Perform scheduled maintenance for all vehicles to maximize fuel efficiency
- Increase use of biofuels or other alternative fuels when available
- Increase telecommunications and video conferencing to reduce travel
- Investigate replacing older, larger vehicles with fuel efficient vehicles
- Replace older, larger vehicles with smaller, fuel efficient vehicles, including hybrids.

Facilities

- Consult energy conservation guides to identify steps to improve building energy efficiency
- Consolidate facilities to reduce total square footage
- Replace state- owned or leased space with energy efficient space that meets the green standards
- Use Building Council's LEED standards where viable
- Investigate telecommuting to reduce overall office space needed.

Serve to Preserve

Governor Crist convened the second Serve to Preserve Summit on Global Climate Change in June 2008 with more than 700 national and international environmental leaders. The summit focused on stimulating economic development in clean technologies as well as greening Florida's business community. The inaugural summit last year was the catalyst for Florida's "green" portal, the Serve to Preserve Web site at <http://www.myfloridaclimate.com/env/home/>. This inclusive site includes announcements, energy tips, summit Web casts, resources and much more.

The governor and state government encourage innovation in this area. The state continues to look for opportunities to leverage tools such as online catalogs that highlight green commodities and identify ways of automating the collection of utility data to ensure the success of these initiatives. Florida's commitment to stimulating investment through green, climate-friendly energy sources, purchasing technologies and building relationships with alternative resources strengthens its future and protects its natural environment for generations to come. ■

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Green IT Approaches Span the Globe

By Dr. Thomas Skirbunt
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The United States and four other large English-speaking nations are taking similar steps to increase the energy efficiency of government computers and data centers and to reduce their impact on the environment. The Chief Information Officers of the United States, the United Kingdom, Canada, Australia and New Zealand compared their respective approaches during a videoconference hosted by the GSA Center for Intergovernmental Solutions in late February.

Each of the five nations has looked into ways to reduce the carbon footprint of information technology at every point in the life-cycle of their government systems, from purchase and production through usage and ultimate disposal. The five nations have all taken steps to be environmentally friendly in the following areas:

Moving from CRTs to LCDs

All five nations have concluded that replacing employees' Cathod ray Tube (CRT) computer monitors with Liquid Crystal Display (LCD) monitors will reduce both energy consumption and costs of the IT systems. LCD computer monitors use considerably less office desk space than traditional CRT monitors, and the energy savings from a shift to LCDs is considerable. Because CRTs use up to 50% more energy to operate, replacing CRTs with LCDs can reduce energy consumption by 123 Kilowatt hours per monitor over the course of a single year. In addition, LCDs emit less heat than CRTs

which reduces energy consumption to cool LCD equipped offices.

Ensuring that new IT purchases conform to sustainability standards

In 1992 the US Environmental Protection Agency (EPA) introduced ENERGY STAR as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Today all five countries have in place similar standards to guide procurement officers toward those IT hardware products that conserve energy. The New Zealand Energy Efficiency and Conservation Authority has its own Energy Star Rating system. Canada's Ecologo program, dating from 1988, is the second oldest environmental standard and certification program in the world. Australia has implemented its environmental check list, which is outlined elsewhere in this news letter. The United Kingdom and the United States have both implemented the Electronic Product Environmental Assessment Tool (EPEAT) as a core requirement for PC and laptop purchases. The desire for similar sustainability standards for IT purchases by all five of these nations is expected to promote improvements in the energy efficiency of IT hardware over time.

Reducing the energy consumption of the public-sector server estate

All five nations are strong advocates

of sharing IT services across government departments and agencies to reduce the numbers of IT servers needed by government. In addition, there is growing awareness that significant energy savings can be obtained by using Green Building concepts in the design and construction of data storage facilities in which to house IT servers and related hardware.

The US EPA National Computer Center in Research Triangle Park, NC is operating with a 70% savings on electricity because it employs green lighting features including motion sensors and daylight dimming sensors as well as heating and cooling systems designed to meet actual energy demand. Integrated into this facility is one of the largest photovoltaic installations in the US which has generated as much as 110,000 kilowatt hours of electricity in a given year.

Government Australia policy on Energy Efficiency in Government Operations commits to reduce energy consumption by government-operated computer centers by 20% over the next five years.

Converting Physical Servers to Virtual Servers

Servers are computers that provide other computers with assistance. Usually, servers are designed to run a specific operation for use by many desktop computers at the same time. Virtual servers are based on the concept of partitions on mainframe computer servers that allow each partitioned division to function as a stand-alone or "virtual" server dedicated to a single customer. The use of virtual servers allows fewer servers to operate any mix of computer applications, thereby reducing the amount of space and energy needed to maintain them.

All five nations are committed to the conversion of physical servers to virtual servers and are in the process

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Disposing of IT equipment that is at the end of its life-cycle

of developing specific goals and benchmarks for the future. Australia has established its current benchmark ratio of virtual servers to physical servers at 5:1.

Reducing the use of desktop printers and the amount of material that is printed

The New Zealand government goal is to reduce the amount of paper that is generated by the use of IT systems. Their focus is on moving transactions, not paper, and always being aware that IT is the enabler through which public goals are

optimized, and not a goal in itself.

All five nations encourage a replacement of desktop printers with shared multi-function systems as a first step toward reducing the energy use associated with printed material. The CIOs all seek to reduce the government's reliance on printed material through the use of new media for collaboration (wikis, blogs, videoconferencing, etc.) and enhancing the transaction capabilities of government departments and agencies. The Australian Department of the Environment, Water, Heritage and the Arts has already configured all of its

printers to produce two-sided copies by default.

Disposing with IT equipment that is at the end of its life-cycle

Computer monitors, towers and laptops contain lead, chromium, cadmium, mercury, beryllium, nickel, and other chemicals that can present serious environmental hazards if they are not disposed of properly or recycled. A recent study by the US EPA found that 59,000 computers donated for disposal contained 13,000 pounds of toxic material.

All five nations are either developing standards for the disposal of hazardous IT material, or like Australia, have issued guidance on its management. The Australian Guidance is contained in Electronic Scrap – A Hazardous Waste (www.environment.gov.au/settlements/publications/chemicals/hazardous-waste/electronic-scrap-fs.html).

Next Steps

All five nations are building on their existing Green IT initiatives. The United States will introduce next year a 5 year planning process to optimize the IT infrastructure of every government agency for cost, performance and energy efficiency. The Australian government is conducting a pilot study of five government agencies (Securities and Investments Commission, Department of the Environment, Water, Heritage and the Arts, Department of Defense, Centrelink and IP Australia) to validate their goal for a 20% reduction in IT energy usage in five years. In the United Kingdom the Transformational Government team in the Cabinet Office is working with industry on proposals for improving the sustainability of IT used by the government. New Zealand is implementing its Sustainable Procurement Guidelines, and Canada has initiated a mandatory three year reporting cycle on IT sustainable development strategies for all of its departments. All five

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nations are developing specific Green IT targets and performance measures.

The 5-Nations CIO Council consists of the senior IT officials of five major English-speaking nations: the United States, the United Kingdom, Canada, Australia and New Zealand. They have come together regularly since May, 2006 to discuss issues of common concern in quarterly videoconferences and annual face-to-face meetings. The meetings have enabled these national CIO's to share ideas, information and insights in a trusted environment with their peers around the world. Topics for discussion ranged from Web 2.0 to shared services, building a central government CIO function, and controlling costs of IT infrastructure.

The principal participants in this meeting were:

Australia:

Ann Steward, CIO, Australia;
Peter Woods, CIO, Department of the Environment, Water Resources, Heritage and the Arts

Canada:

Ken Cochrane, CIO,
Government of Canada;
Jeff Braybrook, Deputy CTO,
Government of Canada

New Zealand:

Edwin Bruce, Manager, E-government Projects, State Services Commission;
Clifton Chan, Senior Analyst, State Services Commission

United Kingdom:

Andrew Stott, Deputy CIO, United Kingdom;
William Perrin, Director, Strategy and Policy, E-Governance Unit

United States:

Karen Evans, Administrator, E-Government and IT, Office of Management and Budget;
Molly O'Neill, Assistant Administrator, Office of Environmental Information, and CIO, Environmental Protection Agency ■



Australia's ICT Environmental Impact Checklist

The Australian Government issued the Environmental Impact Better Practice Checklist in December 2007 to help agencies reduce the impact of their information and communication technology activities on the environment.

The rapid growth in the use of ICT has prompted the Australian government to consider how to better manage and reduce the potential environmental impacts resulting from using ICT products and services. The Checklist was developed to assist agencies in managing the environmental impact of ICT products and services. The checklist is intended raise awareness of the

impact that government ICT resources have on the environment. It provides information and acts as a guide to agency staff responsible for managing ICT products and services.

Agencies should consider the following when completing the Checklist.

Procurement of ICT Products and Services

1. Have you included the environmental impact of ICT products and services in procurement plans?
 - Under the Commonwealth Procurement Guidelines, agencies must make a whole-of-

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life assessment of the costs of alternative procurement processes or solutions.

- Agencies need to be methodical and analytical about the way they assess, select and manage their ICT sourcing requirements - this requires much more than a series of one-off purchasing decisions.
- *Refer to The Environmental Purchasing Checklist - Personal Computers and Monitors and the Green Office Guide*
- Look for the Energy Star label when purchasing ICT equipment
- Ensure that environmental issues are included in all procurement documentation such as the Request for Tender, Contract, and Tender Evaluation Plan.

2. Have you considered the environmental impact of the ICT products and services being procured?

- It may be more energy efficient to replace old equipment rather than maintaining it.
- Consider the use of notebook computers where appropriate. Notebooks use 90 per cent less energy than desktop personal computers.
- Before purchasing new products such as printers and scanners, determine whether it is possible to network existing or new devices.
- Consider what types of batteries (nickel-cadmium, nickel hybrids or lithium ion) will be supplied with the ICT products.
- Check that new ICT equipment can operate with recycled paper and that cartridges can be recycled.
- Consider purchasing LCD monitors which use less energy than CRT monitors.
- If you are procuring for a data centre consider taking steps to

ensure it is a green data centre, one in which the computer systems and the building have all been designed for maximum energy efficiency and minimum negative environmental impact.

- Consider purchasing multifunctional devices such as devices that can print, copy, fax and scan.
 - Consider how packaging for ICT products and services can be minimized and how will it be recycled? For example, cluster packaging of bulk supply of computers is recommended.
- 3. Have you allocated key resources for management of the environmental impacts of ICT products and services?**
- Identify an asset manager to track the ICT products and services across their full life cycle (from the design of the tender process, the tender selection itself, operational phase, and the disposal phase at the end of initial life).
 - Set up an ICT asset monitoring system, including an ICT asset register.

Use and Operation of ICT Products and Services

- 4. Have you implemented policies and practices that encourage good environmental awareness and practice in the use of ICT? The following points will assist in the development of policies and guidance within agencies.**
- Follow *The Green Office Guide*
 - Using ICT equipment efficiently may lengthen the lifetime of the equipment.
 - Consider using ICT for teleconferencing rather than face to face meetings to reduce the environmental impact associated with commuting.
 - Consider instituting education and training to increase

awareness, knowledge, skills and attitudes leading to environmentally responsible practices and behavior.

- Switch off ICT equipment outside of work hours
- Switch off computers when not in use during the day. If a computer is not in use for 30 minutes it should be switched off.
- If ICT equipment cannot be switched off, activate standby or sleep mode.
- Switch off the monitor of a computer acting as a network server which must remain on.
- Consider making double sided printing the default setting in printers.
- Only use color printing when necessary, and minimize use of color when formatting documents.
- Think twice before printing documents that can be reviewed electronically, particularly drafts and emails.
- Encourage staff to change computer monitor view options (font size, text/background color etc) to enhance on-screen readability and reduce the need to print.
- Consider replacing paper based material and information, including letters and forms, with online information where possible.
- Implement electronic document record management systems in accordance with policies and guidance from the National Archives of Australia.
- Consider teleworking and online collaboration as a way to reduce environmental impacts of commuting.
- Communicate with staff about ways to reduce printing and use of storage space.

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Better Practice Checklist

Managing the environmental impact of ICT

Procurement of ICT products and services

- Have you considered the environmental impact of ICT products and services in business plans and procurement plans?
- Have you considered the environmental impact of the ICT products and services being procured?
- Have you allocated key resources for the management of the environmental impacts of ICT products and services?

Use and operation of ICT products and services

- Have you implemented policies and practices that encourage good environmental awareness and practice in the use of ICT?
- Have you considered implementing environmental monitoring and management systems?

Re-use, recycling and disposal of ICT products and services

- Have you prepared an environmentally sound disposal plan for any ICT products and services no longer required?
- Have you identified methods or means by which ICT products and services can be re-used or recycled?
- Have you identified hazardous materials in your ICT products and services and the means by which they will be disposed of?

Environment Reporting Requirements

- Have you met the Australian Government's environmental reporting requirements?

5. Have you considered implementing environmental monitoring and management systems?

Re-use, Recycling, and Disposal of ICT Products and Service

6. Have you prepared an environmentally sound disposal plan for ICT products and services no longer required? The following issues should be considered when documenting and managing the disposal of ICT resources.
- Identify whether the ICT products can be re-used or recycled.
 - Update asset management records to reflect disposal, re-use or recycling of ICT products.
 - Scan ICT products to determine

if discovery data should be removed from the product prior to disposal, re-use or recycling.

7. Have you identified methods or means by which ICT products and services can be re-used or recycled?
- Make recycling decisions taking into consideration the National Government Waste Reduction and Purchasing Guidelines.
 - Consider programs that provide free or subsidized computers to the community. The Department of Broadband, Communications, and the Digital Economy maintains a list of these programs.
 - Consider recycling toner cartridges and using recycled

toner cartridges, rather than purchasing new cartridges.

- Recycle ICT equipment packaging.
 - Monitor contract performance in relation to re-use and recycling clauses in contracts for ICT products and services.
8. Have you identified the hazardous material in your ICT products and services and the means by which they will be disposed?
- Put in place a strategy to communicate what is hazardous waste in ICT products and how it should be disposed of.
 - Dispose of waste in accordance with the guidance in *Electronic Scrap - A Hazardous Waste*
 - Ensure that any hazardous waste produced by your agency is disposed of appropriately, and does not contravene the Hazardous Waste (Regulations of Exports and Imports) Act 1989 which regulates the export, import and transit of hazardous waste to ensure it is managed in an environmentally sound manner

Environmental Reporting Requirements

9. Have you met the Australian Government's mandatory environmental reporting requirements?
- *Financial Management and Accountability (FMA) Act 1997*
 - *Environment Protection and Biodiversity Act of 1999*
 - *National Packaging Covenant*
 - *2006 Energy Efficiency in Government Operations* ■

For a comprehensive look at the requirements for each checklist question refer to <http://www.finance.gov.au/e-government/better-practice-and-collaboration/better-practice-checklists/environmental-impact.html>



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