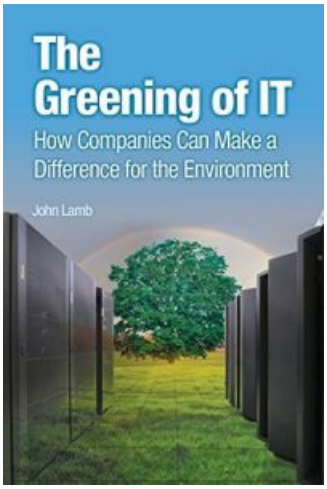

Book The Greening of IT

How Companies Can Make a Difference for the Environment

John Lamb
IBM Press, 2009

Recommendation

As conventional energy sources dry up, the cost of electricity increases. Expanding energy usage is wreaking havoc on the environment, so businesses must find ways to become more energy efficient. Organizations of any size that spend heavily to power and cool their information technology (IT) operations can save money and help the planet by going green in IT. John Lamb, an IT architect, explains how to get that done in this informative, comprehensive and eminently practical book. He offers many helpful case studies of a wide variety of companies and nonprofits that have successfully made the transition to green IT. He presents a strong business case for environmentally sound IT, describes best practices and touches on some primary technical issues. *BooksInShort* suggests Lamb's thoughtful guide to CEOs, chief information officers and other IT professionals. Executives of all kinds will be able to understand this book, though Lamb includes enough technical data to provide extra utility to IT experts who want to make their operations less costly and more sustainable.

Take-Aways

- Information technology (IT) operations are hugely expensive to power and cool.
- Because IT consumes vast amounts of energy, it contributes heavily to greenhouse gas emissions and, therefore, to global warming.
- Even companies with a strong interest in IT energy efficiency often fail to act.
- Most firms give IT managers little incentive for reducing energy expenses.
- This is shortsighted. You can cut your IT energy cost in half with green practices.
- Optimizing your IT operation's energy use will require strong leadership, as well as collaboration with other departments and with external stakeholders.
- To make your IT department green, first consolidate and virtualize its infrastructure.
- Pay attention to the energy-use impact of every detail, from ensuring that software works proficiently to turning off computers when they are not in use.
- Your electricity provider may offer rebates and incentives for green practices.
- Sharing resources via cloud computing can reduce your IT energy use.

Summary

Information Technology Is an Energy Hog

Corporate information technology (IT) includes more than data centers. It encompasses all your company's electronics, from handheld devices to laptops, and it consumes vast amounts of energy. In the U.S., data centers used five billion watts of electricity from 2000 to 2005, and that usage is growing. Information technology contributes substantially to greenhouse gases, which exacerbate global warming. In fact, "about 2% of global carbon emissions are due to the direct effects of IT usage, especially data centers." So, in line with both corporate social responsibility and cost effectiveness, companies must focus on making their operations energy efficient, including IT.

> "Green computing promises an enormous win for IT: a chance to save money – and the environment." (*ComputerWorld)*

Energy solutions, like using fluid cooling instead of air conditioning, and opting for "virtual servers, blade servers and virtual data storage," can reduce IT energy usage by 50%. IBM estimates that a 25,000-square-foot data center costs $2.5 million annually to power and cool, based on 12 cents per kilowatt-hour.

"Data centers consume more energy per square foot than any other part of an office building."

Fortunately, making your IT department greener is not as hard as you may think. For example, most companies replace their computer equipment, from PCs to servers, every few years. They can use this routine upgrade to implement new technology that is more energy efficient. However, a survey found that only one out of four businesses now incorporates "green criteria" in its IT purchasing. Advances in virtual computing also enable firms to reduce their data center costs. Large organizations are starting to take the lead in moving to power-saving "IT virtualization, cloud computing, and so on."

"In Europe, for several years, consumers and businesses have earned more favorable rates if they use less energy during peak hours."

Strategizing about green IT can uncover some pivotal organizational considerations. In most companies, the chief information officer is not responsible for IT's electrical expenses. Many firms allocate data-center power costs on the basis of departmental square footage, not usage. Thus, IT professionals often are not concerned – and their organizations don't ask them to be concerned – with the cost of powering and cooling their equipment. This is a mistake. IT departments can achieve tremendous energy efficiencies if that goal becomes part of their leaders' priorities and portfolios. Achieving green IT requires having a well-placed executive to champion the initiative, and to shepherd a strong collaborative effort with other departments and with external entities, like vendors, utility companies, government agencies, and so on.

Financial Incentives

Utility companies and governments frequently offer businesses financial incentives for increasing their energy optimization and emphasizing green IT operations. This makes solid economic sense for utilities, which face enormous capital expenditures for power plant construction or expansion. They benefit greatly when their clients consume less electricity. Utilities that offer financial inducements for IT energy-efficiency upgrades include Xcel Energy, which operates in eight states. Con Edison, another utility firm, works with the New York State Energy Research and Development Authority to offer financial incentives to data centers that reduce their electricity use by 20 kilowatts or more.

"The flat world of the 21st century has enabled global corporations to optimize their IT anywhere on the planet it makes business sense."

Pacific Gas and Electric (PG&E), a leader in promoting green energy, will pay client companies up to $4 million in incentives for instituting certain power-saving projects in their data centers, such as adopting virtual servers. This California utility was the first to provide financial rebates to customers for energy-efficiency initiatives. It recently expanded the program to include rebates for "data center disk-storage equipment." PG&E sponsors the Utility Information Technology Energy-Efficiency Coalition. More than 24 U.S. utilities participate in the coalition's efforts to help organizations reduce their IT power requirements. Many utilities now partner with the U.S. government, developing and offering educational resources that promote energy savings and enhance environmentally sound business operations.

The Green Solution

Making a data center greener can involve the following steps: reducing the building's carbon footprints, using low-emission building materials, planting sustainable landscaping, recycling waste products, adding catalytic converters to backup generators, incorporating alternative-energy technologies and using more efficient equipment, like fans, heat pumps and cooling technology. Server consolidation is a primary way of reducing data center energy consumption. Among other benefits, it helps cut data center space requirements. Pay attention to these areas to make your IT operations greener:

- **Audits** – Hire an expert to examine your IT energy consumption and assess the proficiency of your data center. This consultant may use IBM's "Mobile Measurement Technology" to uncover data center "hot spots." This crucial audit can identify equipment you need to retire and replace.
- **Communication** – The effort to attain IT energy optimization requires superior coordination and collaboration. Communicate your goals to everyone concerned, but make one person responsible for leading the effort. Be ambitious, visionary and holistic. Avoid piecemeal solutions. Create an IT power-saving program that will perpetuate itself. Start now.
- **Measurement** – New metrics and devices will enable firms to assess their equipment's energy efficiency more precisely than is now possible. Meanwhile, numerous good energy-analysis tools are already available, including the online Carbon Footprint tool and the U.S. Department of Energy's Data Center Profile tool, also online. This resource helps you diagnose how your data center uses energy. IBM's "Active Energy Manager" (AEM) measures the energy your IT appliances consume. You also can use AEM software to limit the power your IT unit expends for "servers, storage and networking."
- **Consolidation** – Consolidate and "virtualize" your IT apparatus to reduce your carbon footprint and energy requirements. To maximize your IT savings, set up an integrated plan for consolidating your servers. IBM employed an "Enterprise Computing Model" to shrink from thousands of servers to approximately 30 oversize servers installed in a central location. Large servers enable you to reduce your wattage demands greatly. Consolidation also will ease your IT unit's conversion to cost-efficient direct current (DC). Meanwhile, use only the latest versions of IT equipment. New machines are much more energy sparing than older iterations. Replace your oldest, least efficient IT gear before upgrading to newer models. Use tiered storage. Eliminate redundancies. You don't need expensive, space-hogging servers sitting around to address "what if" scenarios, but you do need to retain the capabilities for crisis control and for high demand periods.
- **Virtualization** – This process enables you to attain more flexibility while cutting back on the number of servers you operate. Impressive new technology enables you to make IT increasingly virtual, so you can extract the highest possible utility from your IT equipment. Considering, for instance, that the typical Wintel server is active less than 15% of the time, vast efficiency improvements clearly are possible. You can cut more than 50% of your IT energy use through "virtualization and management of workloads." Companies are moving to full virtualization. Indeed, consolidation and virtualization are the two primary energy-saving steps most large firms, including Hewlett-Packard, IBM and Advanced Micro Devices, are now taking in their IT operations.
- **Servers** – Replace rack-mounted servers with blade servers, which enable the machines to share resources, including electricity, "fans, networking and storage." Blade units deliver the same computing capacity for 10% to 25% less electricity and cooling than older units need. Use the "power save" features on your servers and turn off "dead" servers.
- **Cooling** – In-row or supplemental cooling units are more energy efficient than large air conditioners located on the perimeters of computer rooms. To ensure that cold air does not mix with hot air sooner than needed, add "blanking panels" to server racks with empty slots. Consider installing chillers with variable frequency drives to adjust air conditioning motors "when cooling needs to dip." Savvy organizations use "free cooling" – that is, chilly "outside air" – whenever possible. Many firms situate their data centers in cold-weather areas, like Colorado, that offer the maximum free cooling potential.

- **Applications** – Streamline your software programs work as effectively as possible. To illustrate, one firm cut the time needed to create a warehouse data report "from eight hours to eight minutes" simply by altering its software's search procedures. More resourceful applications use less server time and, hence, less energy. Reduce "bloatware" whenever possible. Compress data so it consumes less storage space. And use tape, which requires less energy than other storage media.
- **Building** – Of course, the ideal way to go green with IT is to build a state-of-the-art data center from the ground up. If you get that opportunity, make it modular. Design it with "data center modeling and thermal assessment tools and software." Install only the latest, most cost effective equipment and the most modern cooling solutions.
- **Individual computers** – Ubiquitous laptop and desktop units consume large amounts of energy in the aggregate. Employ the sleep mode whenever possible and turn computers off when they are not being used. Turning computers on and off a few times a day does not in any way harm them, but don't use screen savers, which waste energy.
- **Power supplies** – Use equipment that delivers efficiency of more than 80%. Newer Uninterruptible Power Supply (UPS) units can attain up to 95% efficiency.
- **Voltage** – High-voltage power cords (208 volts, 230 volts) are more proficient than conventional 120-volt cords. Use high voltage for IT equipment whenever possible.
- **Cogeneration** – Modern technology offers many alternative ways to generate your own electricity, including, "fuel cells, gas turbines, wind turbines [and] solar arrays."
- **Disposal** – Maintain sustainable IT operations. Dispose of old gear in an environmentally sound way.
- **Negotiation** – Negotiate with your utility company for economic inducements to take your data centers "off grid" during peak-demand periods. Utilities want to reduce the chance of "brownout or blackout" power cuts during high-use periods. If need be, use generators.
- **Equipment** – Treat energy as a valuable commodity. Turn unused IT equipment off.
- **Additional tips** – Consolidate switches to increase energy efficiency (and get rid of terminals that are no longer necessary). If feasible, provide 100 Mbps (megabit per second) at each workstation, instead of 1Gbps (gigabit per second); the power-use savings can be significant at sites where many machines are in simultaneous operation. Consider using Power over Ethernet (PoE) for "IP phones, wireless access points and security cameras." Place all your information technology apparatus so that it pulls in cool air and blows out warmed air.

Cloud Computing

Sharing computing resources, for instance, with cloud computing, lets users tap into Internet-accessible computing capacities that "hover" like clouds. The many benefits of cloud computing include enabling companies to locate their infrastructures in areas with reduced power and cheaper space costs, and permitting them to share "peak-load capacity," which can result in significant cost savings. Shared or distributed computing is not new in IT, but grid and cloud computing are meaningful advancements because they employ "open source middleware to virtualize resources across domains." With cloud computing, organizations can reduce their needs for local servers.

Valuable Resources

Several online information services are available to help you make the transition to an optimally green IT environment. The Green Grid helps promote forward-thinking green initiatives for data centers. The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) publishes useful information on the best ways to cool data centers. The Uptime Institute discusses data center serviceability. The U.S. Environmental Protection Agency is standardizing energy metrics, and the U.S. Department of Energy is working to develop best practices for green information technology.

About the Author

John Lamb, Ph.D., a member of the Institute of Electrical and Electronics Engineers and of the American Society of Mechanical Engineers, is the author of four books. He earned his Ph.D. from Engineering Science from the University of California at Berkeley.
