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Demystifying Green IT *Seeding Advantage*

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EXECUTIVE SUMMARY

As public and private organizations around the world seek to limit their greenhouse gas (GHG) emissions and other environmental impacts, information technology (IT) stands to make a significant contribution. Addressing the direct environmental by-products of IT use is one way that green IT solutions can help organizations reduce these emissions and address sustainability concerns. But an even bigger opportunity lies in helping other industries in their response to climate change. IT solutions can eliminate or otherwise redirect business activities that generate emissions.

The need for increased efficiency and automation is spurring demand for IT equipment and services. As IT procurement officials and other IT practitioners seek to fill this demand,

employing green IT strategies will help move their organizations that much farther down the path to realizing their objectives for environmental responsibility and sustainability.

KEY HIGHLIGHTS

- The IT function can play a vital role in helping governments and corporations use IT more responsibly by leveraging energy-efficient technologies in both capital and operational projects and activities, as well as enforcing practices that promote smarter energy use.
- Organizations can adopt leading green IT policies and practices on two fronts: greening IT, i.e., reducing the environmental footprint of IT equipment needed to conduct business; and going green through IT, i.e., applying green IT solutions to make other aspects of their day-to-day activities more environmentally friendly.
- In particular, data center consolidation, advanced cooling systems, and server virtualization are effective measures of greening IT.
- Going green through IT has the greater potential for yielding environmental and cost savings: Measures may include reducing unnecessary travel with telecommuting technologies, using more-efficient transportation planning systems, and reducing the number of bricks-and-mortar business establishments by replacing them with online stores.

WHAT IS GREEN IT?

Around the world, governments and corporations are under increasing pressure to implement policies and business practices that support what environmentalists call “the sustainability agenda.” This pressure is coming from a number of sources. New evidence of climate change is prompting strategies to cut GHG emissions such as carbon dioxide (CO₂). Population growth and urbanization are placing a premium on the conservation of natural resources. And technological advances are paving the way for consumers and businesses to recycle more commonly used products.

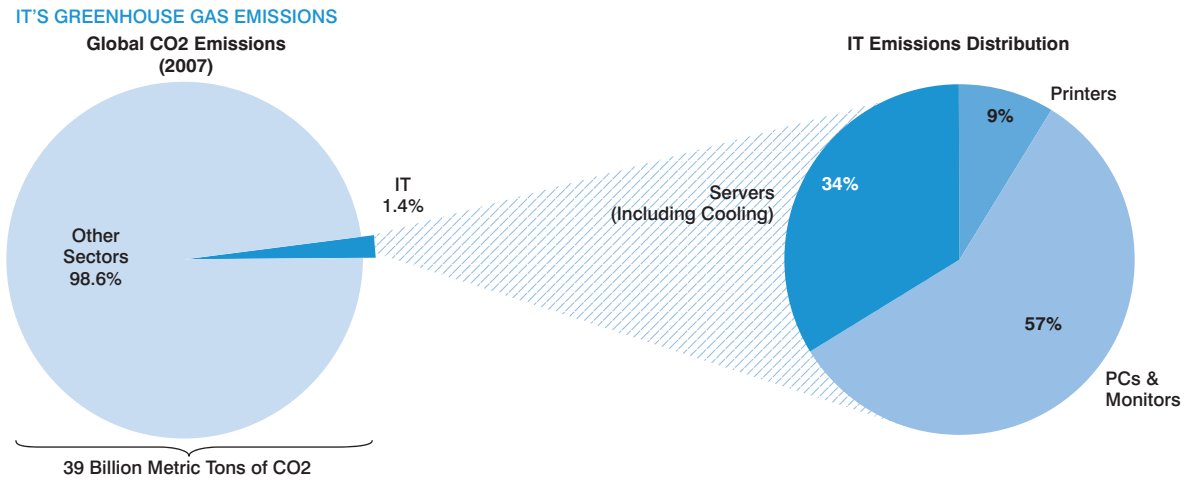
In recent years, policymakers and corporate leaders have helped to further the sustainability agenda by seizing on the economic or business case for investments in green technologies that use less energy and, therefore, generate fewer harmful emissions. Policymakers are increasingly pointing to job creation and economic competitiveness as rationale for their

support; corporations are trumpeting cost efficiencies and new revenue streams.

In this near-universal push to consider the environmental ramifications of our everyday lives, IT has a central role to play. Global economic transformation has triggered the rapid diffusion and usage of IT across all sectors. Today, these technologies account for approximately 1.4 percent of global CO₂ emissions¹ (see *Exhibit 1*). At the current pace of growth and technology usage, that contribution is set to more than double by 2020.²

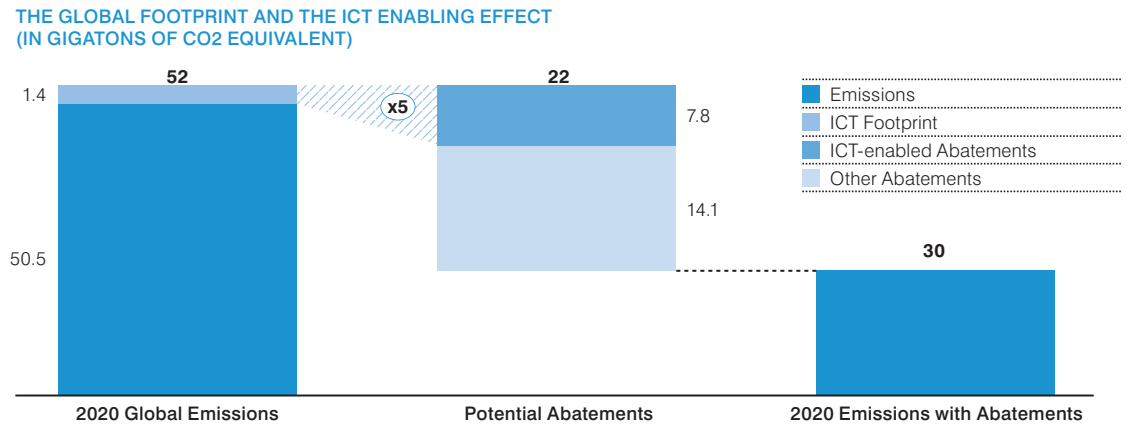
As important as curbing the environmental impact of their own activities, IT service providers and manufacturers are recognizing the opportunities that exist—in both the business and the environmental sense—in developing technology solutions to help the other 98.6 percent of GHG emitters clean up their act, too. Estimates indicate that by 2020, energy efficiencies in other industries that are enabled by information and communications technology (ICT) could yield carbon savings five times greater than the emissions of the entire ICT sector³ (see *Exhibit 2*).

Exhibit 1
Greenhouse Gas Emissions from IT Are on the Rise



Source: Gartner, Booz & Company analysis

Exhibit 2
The ICT Sector Can Reduce Overall Global Emissions



Source: The Climate Group for GeSI, "SMART 2020: Enabling the Low Carbon Economy in the Information Age"; Booz & Company analysis

Both of these drivers have hastened the evolution of what many now call the green IT industry. Green IT is loosely defined as the collective representation of IT products and practices that reduce environmental impacts either by leading to lower net emissions or by reducing waste by-products. Green IT encompasses a wide variety of activities: for instance, substituting thin clients for PCs, using motion-detection technologies in public lighting, and simply employing underused power-management features currently available on existing computers.

Spending on green IT services has picked up in recent years and is expected to rise significantly and quickly. For instance, the market for green IT consulting services is expected to surge from just \$500 million in 2008 to \$4.8 billion in 2013.⁴ Yet, with a few exceptions, green IT is not being put to use in most organizations, although IT spending is accelerating steadily: In the Middle East, for example, annual IT spending is expected to grow at a 7.3 percent annual rate from the end of 2008 to the end of 2013, compared to an annual 2.6 percent rise in real GDP.⁵

Therefore, green IT's relative lack of penetration is less a story of a missed opportunity than it is of an opportunity at hand. In anticipation of this coming wave of IT investment, public and private organizations can adopt leading green IT policies and practices on two fronts: greening IT and going green through IT. The former seeks to reduce the environmental footprint of IT equipment needed to conduct business and the latter applies green IT solutions to organizations to make other aspects of their day-to-day activities more environmentally friendly.

GREENING IT

The IT function plays a vital role in helping governments and corporations use IT more responsibly by insisting on energy-efficient technologies in procurement or by adopting practices that promote smarter energy use. In either case, the business opportunity lies in two major areas: data centers and distributed IT.

Data Center Consolidation

Data centers soak up huge amounts of power; in 2006 they accounted for 1.5 percent of total U.S. energy consumption. Moreover, data centers are requiring more energy every year. Energy usage at U.S. data centers doubled between 2000 and 2006 and it is expected to double again by 2011.

Virtualization is the process that takes applications and operating systems from multiple and often underutilized servers and packages them into virtual machines housed on a single server. It allows IT administrators to match computing needs to remotely stored hardware, enabling data centers to be consolidated and thus reducing energy consumption. For instance, using virtualization, Hewlett-Packard was able to consolidate its 85 data centers down to six, thus reducing its data centers' energy consumption by 25 percent.⁶ Another application of virtualization technologies is cloud computing, in which customers typically lease the physical IT infrastructure from a third-party service provider and use it on demand, which reduces energy consumption.

Advanced Cooling Systems

The power required to run cooling equipment represents roughly 40 percent of energy consumed in data centers, and that figure is rapidly rising, elevating the urgency of improving cooling efficiency. IT functions are using a number of techniques to reduce energy consumption and the environmental impact of data center cooling systems:

- *Optimizing airflow* in the data center to reduce its mean gradient temperature, reducing the amount of cooling required
- *Employing a hot/cold aisle configuration* in which equipment racks are arranged in alternating rows of hot and cold aisles
- *Using air handlers* to better control air flow within the data center and enable more efficient cooling
- *Deploying smart cooling energy-management systems* to reduce energy consumption by as much as 40 percent through the use of heat sensors⁷
- *Increasing cooling temperature targets* to slightly above the data center baseline temperature, with every degree of upward change resulting in an estimated 4 percent reduction in energy consumption by cooling units⁸
- *Installing renewable cooling sources* such as outside air during the winter—where practicable—to minimize usage of internal cooling systems

Thin Clients

A thin client is a computer that primarily depends on a server to fulfill

traditional computing functions, such as processing office applications. This contrasts with the original “fat” client (or PC), a computer designed to take on these functions by itself. In this context, thin client technology provides a greener alternative to traditional PCs, with a significantly reduced ecological footprint. With an average thin client consuming between 6 watts and 40 watts of power, compared to the 150 watts to 350 watts consumed by a PC, the energy conservation argument is compelling. For example, Sun Microsystems Inc. offers thin clients called Sun Rays, which are significantly cheaper than traditional PCs, last up to seven years longer, and use less power. Screwfix, a leading supplier of tools and accessories in the U.K., recently deployed 350 of these thin clients, leading to a 75 percent reduction in energy consumption per device.⁹

Power Management Software

The vast majority of computers run 24 hours a day, 7 days a week, with 94 percent never going to sleep no matter how long they remain unused. It is estimated that the annual PC energy consumption in the U.S. could be cut by about 14 billion kilowatt-hours simply by enabling power-management features and powering down PCs at night and on weekends.¹⁰

Power management software monitors PC users' activity and reduces energy consumption by switching to low-power mode when activity is low and by shutting down PCs when they are left idle for a certain period of time. Power-management software installed in desktop machines at HSBC's Asia-Pacific operations resulted in a 90-ton reduction in the bank's CO₂ emissions.¹¹

GOING GREEN THROUGH IT

The practices listed above can lead to meaningful reductions in energy use and environmental impacts when employed alone or in conjunction with one another. But the value inherent in green IT extends far beyond the direct implications of IT's use. A whole host of activities not related to IT can benefit when green IT applications are put into play in areas such as buildings, logistics, energy, motors, teleconferencing, and e-services. These solutions can provide a number of options that not only reduce the environmental impact of user activities but also increase overall productivity.

Buildings

Leveraging IT solutions to automate internal building operations results in more effective management of energy needs. Examples of "smart" building features include:

- *Motion Detection and Control:* Detects personnel presence in rooms and switches lights on or off

- *HVAC Management and Control:* Monitors temperature in building rooms and adjusts climate control
- *Light Detection and Control:* Measures lighting intensity in rooms and switches lights on or off
- *Control Panel:* Receives user input for building automation settings, such as non-working hours and air-conditioning target temperature

Logistics

IT systems can help reduce inefficiencies tied to travel, decreasing travel times and thereby lowering vehicle emissions in companies that rely at least in part on transportation to conduct day-to-day business activities. Such systems also indirectly increase the productivity, efficiency, and effectiveness of the transportation sector. Examples of technologies to be implemented in smart logistics include:

- *Fleet Management Systems:* Global positioning system or other software that is patched into the vehicle's onboard computer to gather required data, manage the fleet, and perform tasks such as instantaneous vehicle tracking, driver and vehicle profiling, trip profiling, and

monitoring of vehicle efficiency. For instance, UPS uses real-time information on available routes and traffic congestion to automatically determine best routes from source to destination, thereby reducing its fleet's carbon emissions.

- *Traffic Management Systems:* Helps government transportation officials manage recurring traffic congestion and identify and respond to traffic incidents by employing IT sources such as cameras, traffic signals, and speed radar services. Such systems contribute to optimizing and reducing traffic, which subsequently curbs carbon emissions.

Energy

IT can play a significant role in revamping traditional energy distribution networks. These networks often consist of inefficient grids that lose power in transmission, lack efficient power-routing mechanisms to cope with unexpected surges in energy use, and allow for only one-way communication from provider to customer. Building IT capabilities into these networks to create so-called smart grids could curb global power sector emissions by more than 14 percent.¹²

Smart grids consist of software and hardware tools that allow for efficient routing of electricity, data capture across the power generation and transmission networks, and two-way real-time information exchange with customers. This results in reduced need for excess capacity across the grid, reduced inefficiencies, and effective energy demand management.¹³ Going green through the IT practices used in smart grids includes but is not limited to:

- *Smart Metering:* Helps consumers track how much electricity is being used, when, and at what price
- *Smart Billing:* Helps providers set rates for consumption according to current energy usage across the grid
- *Resource Pooling:* Allows renewable and distributed energy distributors—including individual households—to be integrated in the grid and be compensated for doing so

Smart grid solutions are increasingly being promoted and deployed globally. In 2007, the U.S. government passed the “Energy Independence and Security Act, Title XIII,” which pushes for grid modernization and seeks to

deliver an R&D program for smart grid technologies. In 2000, Enel, Italy’s largest power company, deployed a smart grid which by 2006 encompassed some 28 million smart meters.

Motors

Motor systems—electrical devices that convert electricity into mechanical motion—are a fundamental contributor to industrial activity, and its resulting emissions. Industrial activity uses nearly half of all global electrical power generated, with industrial motors contributing to 65 percent of that figure. Moreover, motors are inefficient as they run at full capacity regardless of required output. Therefore, there is opportunity for IT systems to reduce resulting emissions by increasing the efficiency of motor systems. Potential emissions savings for motor systems generated by going green through IT could reach 15 percent by 2020.¹⁴

Teleconferencing

Teleconferencing can obviate the need to travel by allowing people in disparate physical locations to meet virtually. Companies are also increasingly using telecommuting, allowing employees to work part-time or full-time from home, which cuts down on employees’ daily

travel and its corresponding environmental impacts.

E-Services

Online services that help conduct transactions between organizations and customers result in greater efficiency and transform user behavior to reduce the environmental impact of the associated service. IT forms the foundation of initiatives such as e-commerce, e-banking, and e-government, which significantly reduce paper consumption and the need for additional physical branches. Such e-services offer more convenient interactions between organizations and customers, help generate new business opportunities, and help raise user satisfaction levels. In most cases, the financial savings alone merit the up-front investments. In tandem with all these benefits, e-services also significantly reduce the environmental footprint of the organization by bringing many physical activities online.

These efforts to go green through IT put the IT function in prime position to deliver on an organization’s goals for cost efficiencies and carbon reduction, and are but a few of the ways companies can leverage IT to benefit the environment, across non-IT sectors.

CONCLUSION

The IT function in public and private organizations is under renewed pressure to deliver higher returns on IT investments, reduce costs, and help drive higher performance throughout the organization. Concurrently, these same organizations are expanding their efforts to operate in more environmentally friendly ways and reduce the environmental impact of their day-to-day activities.

Technology is at the heart of green activities whether it is applied to its own sector or used to create opportunities in other industries. From that perspective, green IT is quickly emerging as a lever for the IT func-

tion to help organizations meet demands for change. Whether by greening IT or going green through IT, organizations are reducing their carbon footprints. Greening IT opportunities abound for meaningful energy and environmental savings simply by addressing the power consumption required by data centers, computers, and other IT infrastructure. Going green through IT has the potential to yield much greater environmental and cost savings to create a competitive advantage and help organizations rise to the fore of environmental stewardship. The green IT agenda is, therefore, fundamental to the road ahead.

Endnotes

¹ Gartner, "What Does Green IT Mean for Government?" prerecorded teleconference, November 13, 2007.

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⁵ "IT Spending to touch \$36b in region," Gulf News, October 18, 2009 (http://www.menafn.com/qn_news_story_s.asp?StoryId=1093158740).

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¹⁰ Reliant Energy (http://www.reliant.com/en_US/Page/Shop/Public/esc_oma_computer_power_management_bus_shp.jsp).

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¹² "Smart 2020: Enabling the Low Carbon Economy in the Information Age."

¹³ Ibid.

¹⁴ Ibid.

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