

# Strategies for a Sustainable

Organizations need ways to use fewer resources, optimize processes, and invest in energy-saving products and services. The good news is that they have more practical options than ever.



The green movement is evident in everything from eco-friendly coffee cups and grocery bags to energy-efficient windows. The popular slogan “green is the new black” recognizes that going green makes sense not only ecologically but also economically. Eco-awareness has been on the rise for several years, but President Obama’s administration is renewing focus on energy and the environment and coupling that with economic stimulus. On April 17, 2009, the Environmental Protection Agency (EPA) signed a proposed finding indicating that six greenhouse gases (GHGs) pose a threat to the health and welfare of Americans. This signing is further evidence of the serious commitment at the government level. Perhaps this renewal is the final incentive for organizations to go green. Going green is an opportunity to transform business and government with novel solutions that will profoundly affect energy consumption and costs. As they do their part to address life-threatening problems like global warming, they can achieve real innovation and immediately realize gains from more efficient resource use.

But these high-level notions are often difficult to translate into practical and affordable implementation strategies. Implementing energy solutions on a large scale requires significant capital investment. In a recent interview, the president’s energy secretary, Steven Chu, announced “We need a breakthrough of a factor of five” in overall system cost for advancements in solar technology and next-generation photovoltaics.<sup>1</sup>

Organizations may find the idea of retrofitting controls prohibitively expensive, but the reduction in life-cycle energy and operating costs is significant. As technology progresses, the costs of these solutions will continue to go down. The \$400 million in the stimulus package designated for Advanced Research Projects Agency—Energy is ready to fund “game-changing” solutions that will drive such innovation.<sup>1</sup> Clearly, saving energy and money is the key to a sustainable green enterprise.

But even if organizations understand this, what are some practical first steps? What green policies and investments will save the most energy, offer a good return on investment, and

# Green Enterprise

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reduce carbon emissions? With technology advancements and an increasing focus on sustainable solutions, organizations have more opportunities and practical methods for building a sustainable green enterprise.

## Why go green?

Going green is more than a trend. When they consider the environmental, regulatory, and business drivers, organizations clearly have a mandate to change their operational model.

### Global warming

Climate change is a complex issue that nations worldwide must immediately address. Over the past 50 years, the average global temperature has increased at the fastest rate recorded in history.<sup>2</sup> Global warming is continuing to accelerate and unless enterprises reduce their emissions and shift their energy patterns, temperatures could rise to an unprecedented level. It is difficult to ignore the warnings of experts that global warming will cause a rise in sea level and sea surface temperature, disrupt natural habitats, and result in early snow melt. Neither business nor government can afford to overlook environmental issues.

### Regulatory conformance

Under Executive Order 13423,<sup>3</sup> federal agencies are required to

- incorporate sustainable practices at 15 percent of agency buildings by 2015;
- ensure that at least 50 percent of required renewable energy consumed comes from new renewable sources;
- reduce the petroleum consumption of the agency's motor vehicle fleet by two percent per year through 2015; and
- increase non-petroleum-based fuel consumption by 10 percent per year.

The order defines sustainable practices as<sup>3</sup>

“...actions contributing to sustainability such as but not limited to environmental purchasing, resource conservation, pollution prevention, toxics reduction, practices to reduce or control emissions of greenhouse gases, electronic and other product stewardship, sustainable construction and buildings, water and energy conservation, renewable energy and resources, and recycling.”

This legislation motivates the need for a wide range of sustainability solutions to help our nation realize significant savings in cost, energy, GHG emissions, toxic materials, and hazardous waste.

President Obama has declared energy the most important issue facing the future economy. The president's goals are to reduce GHG emissions 80 percent by 2050, create millions of new green jobs, reduce U.S. dependency on fossil fuel, and cut fuel costs for American families. With this ambitious agenda, the green wave could rapidly become the green tsunami.

## Inside Track

- Organizations impacted by changes in environmental policy will require more comprehensive solutions to effectively manage energy use, greenhouse gas (GHG) emissions, and rising energy costs.
- By developing GHG inventories and understanding reporting protocols now, organizations will have the tools necessary to adapt to climate-change policy.
- Sustainable solutions can be anything from implementing renewable energy sources to procuring the right mix of information technology for green modernization.
- Cloud computing, virtualization technology, and e-cycling for end-of-life equipment disposal will evolve as common green computing practices.

On February 17, 2009, the president signed into law the American Recovery and Reinvestment Act of 2009 aimed at providing billions for green building, retrofitting, energy efficiency, and renewable energy projects. The projects include those in federal facilities; state, local, and tribal areas; schools; and housing. Figure 1 highlights the funding allocation for one of the legislation's primary objectives—to stimulate our economy with clean, efficient American energy.

Additionally, the EPA announced on March 10, 2009, that it plans to establish a national GHG emissions-reporting system. Although, the plan would apply only to industrial sources that emit 25,000 metric tons or more a year, it sets the stage for a federal cap on carbon and other GHGs. The registry plan is estimated to cover about 13,000 facilities, which account for 85 to 90 percent of the nation's GHG emissions. The commitment at the government level to address these economic and environmental issues will rapidly transform the future green enterprise.

Local governments are also setting steep environmental goals. Virginia Governor Timothy Kaine has proposed a 19 percent reduction in electricity consumption in Virginia by 2025, the top recommendation of the Governor's Commission on Climate Change.<sup>4</sup> Tax incentives included as part of his Renew Virginia initiative are part of a proposal to stimulate the economy and turn the environmental challenges of this region into economic opportunity by attracting renewable energy companies and promoting green jobs.

### Business opportunities

All enterprises—not just heavy manufacturing companies or government agencies—must do their part to reduce environmental impact. With the Internet and Web 2.0 technologies enabling

instant communication worldwide, it makes business sense to have an environmentally responsible reputation. Not only can sustainability reduce costs, it can also improve brand and corporate image. For example, Frito-Lay recently inserted a "Solutions for a Better World" supplement in the April 2009 issue of *National Geographic*. In addition to general interest articles on solar power and biofuels, the company included brief descriptions of its energy-efficient and eco-responsible industrial practices, finishing with the slogan, "The biggest impact we can have is not to have one."

Although clearly advertorial, this campaign demonstrates the power of linking business to environmental issues and the possibilities for consumer goodwill. Another aspect of that link is the satisfaction of working for an enterprise with sound environmental credentials—from its products and services to its telecommuting policies and green building practices.

## First steps toward sustainable green

It is one thing to define goals and quite another to set an implementation plan in motion. This is the stage at which many enterprises give up, but with such compelling drivers to go green, inertia is no longer an option.

### Establish a monitoring program

A good monitoring program is at the foundation of any meaningful effort to decrease energy use and carbon emissions. Tracking monthly consumption and costs at the facility and enterprise level helps organizations measure energy and emissions, identify opportunities for savings, and justify green investment decisions. Regulatory and stakeholder requirements must be considered when establishing a monitoring program to ensure that key per-

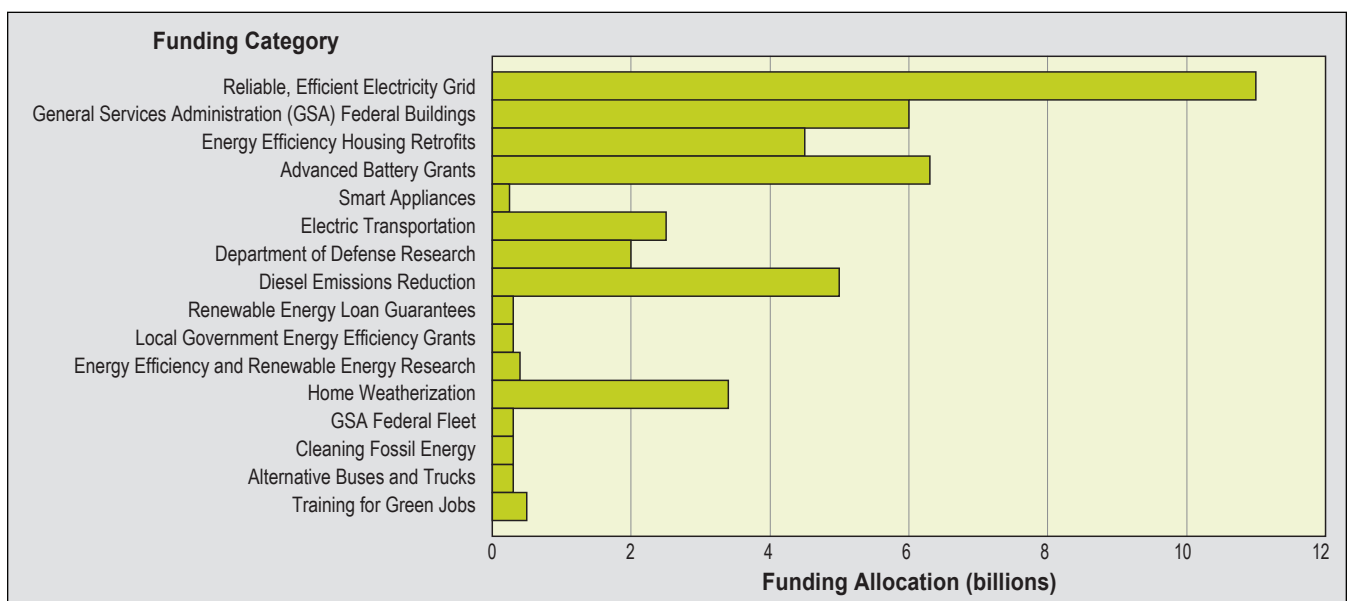


Figure 1. Funding allocations for clean, efficient American energy. Figure based on statistics from "Summary: American Recovery and Reinvestment," Committee on Appropriations press summary, Feb. 13, 2009; <http://appropriations.house.gov/pdf/PressSummary02-13-09.pdf>.

formance measures are tracked. Organizations should conduct energy audits to collect detailed information about their facility operations. Audits assess the efficiency of mechanical systems, such as heating, air conditioning, thermostats, and ventilation. They also evaluate energy efficiency measures in place.

### Create a baseline

An emissions or energy-use baseline is the organization's current energy-use level and environmental impact. Guidelines and standards are already in place for measuring emissions, notably the *Greenhouse Gas (GHG) Protocol*, developed by the World Resources Institute and the World Business Council for Sustainable Development. The *GHG Protocol*, easily the most widely used de facto international standard, provides standards for preparing a GHG inventory, including the accounting and reporting of all six Kyoto Protocol gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>6</sub>).

The International Organization for Standardization (ISO) also provides standards that support the *GHG Protocol* accounting framework, along with validation and verification of GHG assertions for certifying bodies. These standards help any organization prepare inventories that it can then use as part of an effective strategy to manage and reduce emissions.

### Set reduction targets

Reduction goals tailored to the organization's operations should be outlined in an enterprise reduction strategy and action plan. To determine the best alternatives for their targets, organizations are turning to green analytics—a suite of tools that monitor energy and GHG emissions to support green decision making. Green analytics allow organizations to forecast how changes in policy, processes, and green investments will affect their carbon footprint, overall energy consumption, and bottom line.

### Implement sustainable solutions

Once effective reduction strategies have been developed, organizations can start implementing best-fit solutions, including shifting inefficient energy patterns and modifying individual behavior to conserve energy. Most organizations start with the inexpensive solutions, or low-hanging fruit, such as replacing legacy incandescent lighting with compact fluorescent bulbs or implementing employee policies such as telecommuting and alternate work schedules.

### Reevaluate the enterprise

The rapid evolution of green technology and the ever-changing nature of the enterprise environment require that organizations constantly reevaluate implemented solutions for cost-effectiveness and efficiency. New areas for efficiency improvements will surface, requiring further analysis and evaluation of the solutions in place. Depending on the industry and business, organizations

will need to assess their energy portfolio at least annually to ensure that solutions are providing maximum energy efficiencies.

## Technology and eco-innovation

Technology clearly plays an important role in the move toward sustainable green. The past decade has seen advancements in renewable energy sources, smart grid technology, energy consumption monitoring, green building, and software to measure and manage energy and GHG emissions. All these will be essential components of the framework to manage and continually improve sustainable practices. If the history of innovation is any indication, the world is likely to see a rapid exchange of ideas that will accumulate to push innovation to new heights. As businesses continue to compete in showing their green side, eco-innovation is poised to become even more economically attractive.

### Sustainable technology initiatives

Most experts agree that a clean energy future will demand both renewable energy and energy efficiency at a lower cost. Advancements in photovoltaic systems could significantly lower the cost of solar power. In one project, General Electric scientists demonstrated a silicon nanowire solar cell with higher efficiency and lower production costs that could achieve up to 18 percent efficiency.<sup>5</sup>

Additionally, scientists researching plastic solar cells as an alternative to silicon cell technology have demonstrated a 30-percent improvement in working models. The team from the University of Alberta and the National Research Council's National Institute for Nanotechnology predicts that mass-produced plastic solar cells made by ink-jet-like printers can be made cheaply in just five to seven years.<sup>6</sup> Sustainable technology initiatives must consider enabling solutions that will make greening more affordable and viable for everyone.

### Smart grid advances

When the Energy Independence and Security Act of 2007 made the smart grid a national U.S. policy, it set the stage for modernizing the nation's electricity grid. The past few years have seen the creation of more sophisticated sensors, meters, and digital controllers, as well as software to automate and control energy flow.

President Obama allocated \$11 billion as part of the economic stimulus package to build a high-tech smart grid system to monitor and manage the nation's energy consumption, including 40 million installed smart meters in American homes. Smart meters will provide detailed data on electricity, gas, and water use, which will help in managing energy consumption and costs. The timely delivery of such data will allow government, industry, and consumers to better monitor the implementation of efficiency projects, evaluate progress, and make adjustments more quickly.

## Green technology modernization

Advanced metering solutions also extend to monitoring a data center's energy consumption at both the server and enterprise levels. According to the EPA, national energy consumption by servers and data centers could nearly double again by 2011 to more than 100 billion kilowatt-hours (kWh), representing a \$7.4 billion annual electricity cost.<sup>7</sup>

Figure 2 depicts several scenarios, showing an annual savings of approximately 23 to 74 billion kWh over current efficiency trends. The corresponding reduction in annual electricity costs is from \$1.6 to \$5.1 billion, and the reduction in CO<sub>2</sub> gas is 15 to 57 million metric tons in 2011.

The energy-efficient scenarios in the figure are

- **Improved operation.** Energy-efficient improvements requiring little or no capital investment.
- **Best practice.** Efficiency gains from adopting practices and technologies used in the most energy-efficient facilities now operating.
- **State-of-the-art.** Maximum energy-efficiency savings from using available technologies, assuming that U.S. servers and data centers are operated at maximum possible energy efficiency and under the best management practices available.

Data center improvements—advanced cooling, metering, server consolidation, virtualization, built-in management of server power, high-efficiency equipment, and the use of direct current (DC) power—are becoming commonplace. But although electronic

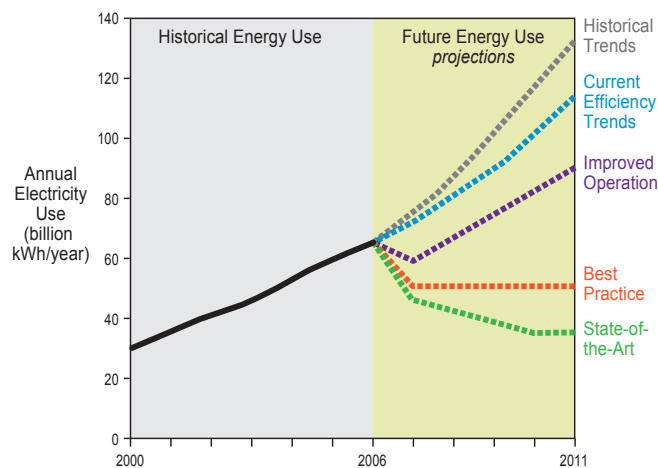


Figure 2. Comparison of projected electricity use scenarios from 2007 to 2011. Even small efficiency measures can yield noticeable reductions in energy use. The improved operation scenario, for example, requires little or no capital investment. The best practice scenario requires adopting practices and technologies used in the most energy-efficient organizations. The state-of-the-art scenario is the maximum energy efficiency possible. Figure from *Report to Congress on Server and Data Center Energy Efficiency*, Public Law 109-431, U.S. EPA, Aug. 2, 2007.

improvements and upgrades make data centers more energy efficient, they can also increase the amount of electronic waste. Organizations must consider what happens to an electronic product at the end of its life, ensuring that electronics, particularly those with hazardous material, are reused or recycled.

One green solution rapidly gaining popularity is cloud computing. Software tools to acquire, analyze, and manage energy and emissions can be offered as software-as-a-service, which can further reduce costs when establishing a sustainable enterprise. Software hosted over the Internet reduces the need for individual organizations to install and configure hardware, manage licenses, and conduct maintenance. Other cloud-delivered resources, such as storage, data, platforms, infrastructure, processes, and applications, can also reduce energy and emissions if employed under the right conditions. Cloud offerings from companies like Amazon provide resizable computing capacity through web services, and companies like Rackspace provide on-demand Linux servers. With these resources, more organizations are finding it economical to look outside their walls for information technology (IT) assets and infrastructure.

## Green building

Green building practices must balance cost benefits with environmental objectives. New construction projects and major renovations for the General Services Administration (GSA) require certification through the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. To promote green modernization, LEED offers credits for exemplary performance related to existing LEED criteria and innovative performance. These credits are helping to drive the market, providing incentive for green vendors to offer low-cost energy-efficient solutions to their customers.

Building owners are also implementing energy-efficient solutions by finding new ways to retrofit existing buildings. This will become a high-growth area in the green building market now that organizations have less credit to fund large construction projects.

## In this issue

This issue of *Sigma* offers strategies that include greening building and data center operations; developing GHG inventories; and implementing information technology to help reduce emissions, energy, and cost. Taken collectively these strategies become a blueprint for a sustainable green enterprise.

Critical to any strategizing is an overview of the motivations and choices that an organization must face. As a companion to this introduction, *Sigma* offers two excerpts from *The Necessary Revolution* by Peter Senge et al. and from *Strategies for the Green Economy* by Joel Makower. Both excerpts describe what it takes to transform a business into a sustainable green enterprise.

In "The Climate Is Right for Green," Robert Wassmann provides an overview of how the political climate, regulatory driv-

ers, methodology, funding, and technical resources for capacity building are changing enough to make now an optimal time to build green. He looks at what it means to be a “high-performance green building” and explores some of the requirements that the U.S. Green Building Council has established as part of its LEED rating system. He concludes by looking at allocations from the American Recovery and Reinvestment Act of 2009 that promise to yield aggressive advances in green practices.

“Green Analytics to Improve Operations” offers practical suggestions about how organizations can best apply tools and techniques that make emission-reduction and energy-consumption efforts more efficient. With green analytical tools, organizations can identify the areas that consume the most energy and forecast efficiency measures and policy changes to improve operations, reduce energy, and save money. Robert Wassmann and I describe one such tool: Noblis’ Total Emissions Analyzer (TEAL), a web-based application that enables decision makers to identify where greening can most impact their organization’s bottom line. TEAL supports predictive modeling, visualization, and benchmarking so that organizations can make clear sustainable business decisions.

In 2006, data centers accounted for 1.5 percent of all U.S. electricity consumption for a total electricity cost of about \$4.5 billion, making them a natural target for energy-use reduction.<sup>6</sup> In “Green Data Center Management,” David Garbin and Elizabeth Chang examine recent trends in data consumption and its affect on the demand for data centers. The authors present the current state of data center power management, data-gathering processes, and best practices for green data center management, including measures that will break the current trend in power use, such as server virtualization, consolidation, more sophisticated cooling methods, and software and hardware to track energy use. The authors also describe how organizations can make more responsible choices in equipment disposal when upgrading a data center.

Green initiatives need not be costly, as H. Gilbert Miller, Kim Jackson, and Moseeta Whitaker describe in “Modern Telecommuting’s Contribution to Green.” The authors offer checklists and lessons from nine years of Noblis’ popular and cost-neutral telecommuting program, which emphasizes the close coordination of telecommuters and managers and attention to enabling technologies. With no additional expense to the company, as of 2008, the program had prevented the release of 962 additional tons of CO<sub>2</sub>.

Any move toward sustainable green requires conforming to emissions standards and measurement principles. In “A Future in Counting Carbon,” Michael Barba discusses regional and international regulation and policy and explains the key requirements for quantifying and reporting GHG emissions to GHG registries. He then looks in depth at how organizations can set up a GHG emissions inventory and begin establishing a baseline of emissions production. Because carbon trading markets will allow

businesses to earn money by investing in GHG management and reduction, organizations have a monetary as well as an environmental incentive to demonstrate to reduce their GHG emissions.

Military installations have the unique opportunity to produce as much energy on site as they consume. In “Toward Net-Zero Energy Installations,” Paul Reinke and Benjamin Hough look at four key strategies that will allow military bases to be islands of sustained power in the face of energy-security threats: reduce energy consumption and demand, implement sustainable business practices, install renewable energy and other onsite energy-generation systems, and develop a smart grid to manage onsite generation.

Findings from case studies at Marine Corps Air Station Miramar, Fort Irwin, and Nellis Air Force Base suggest that by implementing net-zero energy solutions along the four strategies, military bases can significantly reduce dependency on the commercial power grid, ensure continuity of operations and the fulfillment of critical missions, cut GHG emissions, and become more energy efficient.

Rodney Lay debuts Noblis’ Ongoing department with “Revisiting Energy Security,” an update of Noblis’ work in energy security reported in the December 2007 edition of *Sigma*. Lay reexamines key findings from the 2007 articles, commenting on the often contradictory and paradoxical interactions of energy, environment, economy, and equity.

Organizations have considerable opportunity to save money and drive innovation when developing a sustainable green enterprise. Coordination of sustainable practices is essential to combat global warming, manage the world’s power demands, decrease energy expenditures, and transform business policies. With considerable support for green initiatives, there is no better time to be proactive in meeting these challenges. ■

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