

Creating a green data center to help reduce energy costs and gain a competitive advantage.





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The data center is often the engine that drives the growth of the enterprise, and energy efficiency is the key.

After an intensive study of server and data center energy efficiency for Congress, the U.S. Environmental Protection Agency (EPA) reported that the U.S. data center industry is in the midst of a major expansion period spurred by increased demand for IT capacity to support business growth. The Agency listed several trends that are stimulating this demand, including:

- Increased use of online banking and electronic stock trading
- Adoption of Internet-based communications and entertainment
- A shift to using electronic medical records for healthcare
- Globalization of competition
- Government regulations requiring digital records retention.¹

IT management is responding by building more data centers. In recent surveys, 73 percent of U.S. senior decision makers surveyed said they were planning expansion in the next 24 months,² while 67 percent of senior decision makers in European markets said they were planning to do so.³

IT capacity growth meets increasing energy costs

To satisfy this robust demand for computing capacity, IT executives are increasing both the numbers and the density of their servers and storage devices. IBM and consultant studies project that the server installed base will increase by a factor of six between 2000 and 2010, while storage is expected to grow by a factor of 69.⁴



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Business demands, IT capacity growth, increased power consumption and rising energy costs are defining a new field of competition—data center energy efficiency.



One result of this IT capacity growth is that data centers have become major consumers of electrical energy to power and cool the equipment. In a recent study, Gartner reported, “The average power consumption per server quadrupled from 2001 to 2006, while the average number of servers doubled and is expected to grow another 50% by 2010. This rapid growth has resulted in data centers typically consuming up to 100 times more energy per square foot than a typical office building.”⁵

As data center energy use increases, the cost of that energy is increasing as well. According to Energy Insights, an IDC Company, a recent survey for Johnson Controls revealed that “[s]eventy-nine percent of businesses expect their energy costs to increase [over the next year]. More than half believe prices will increase 6-20%.”⁶

And rising energy costs affect businesses of all sizes. IBM surveyed more than 1,100 executives from small and midsize businesses across ten markets in Europe, Asia and the Americas. Nearly half said energy represented one of their largest cost increases over the past two years.⁷

A new field of competition

Increased demand for IT capacity to support business growth, increased energy use by the data center, rising energy costs and environmental concerns are coming together to define a new field of competition for the enterprise—data center energy efficiency. The more energy efficient your data center, the more able your company is to compete in a business environment where energy is becoming more and more expensive.



And this shift in the competitive landscape is being noticed by high-level organizational management. Top executives perceive several benefits of energy efficiency—including the fact that it is possible to double the size of a data center in the same energy footprint and reduce data center energy costs by close to 45 percent⁸—which should help reduce your company’s environmental impact. The pursuit of these overlapping IT, financial and environmental goals creates a situation where your company’s top management—CIO, CFO and CEO—can all benefit by acting as an integrated team.

CIO: gaining flexibility while doubling IT capacity

IT management often does not feel the pain of rising energy costs—the bills are paid by facilities managers. But energy-efficient solutions can directly benefit the CIO. Increased energy efficiency can not only help reduce a company’s current energy costs but can also make energy previously used by the physical infrastructure available to power new server, storage and communications equipment as it becomes needed to support business growth.

Energy efficiency therefore gives the CIO more flexibility in increasing IT capacity within current facilities to support the company’s business growth. This tactical fix buys time for you to grow and time for you to plan a longer-term strategy. Demonstrating leadership in continually increasing IT capacity to support business growth while containing operating costs is one of the most important ways for the CIO to contribute to the successful growth of the company—and be valued as a member of the executive team.

Management teams see several benefits from working together to achieve data center energy efficiency, beginning with cost cutting and more productive energy use.



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CFO: finding the truth about energy costs

In a recent global study done in cooperation with The Wharton School and Economist Intelligence Unit, IBM identified successful CFOs as those who can provide hard data “about the business that reflects the reality of the enterprise’s performance.”

As the report continues, “With data turned into information then turned into insight, Finance moves beyond ‘taillights’—historical reporting—to a keener sense of ‘headlights’ with which to illuminate the future direction of the enterprise. As truth owner, the CFO can help shape operational decisions and strategic directions.”⁹

Start by finding out the truth about energy consumption in the data center—and whether your allocated costs really match usage.



The first place you should turn your headlights toward is the allocation of energy costs. For example, within IBM, data centers account for 6 percent of our total floor space but are responsible for 30 percent of our energy cost, and this cost grew at 18 percent last year. However, at many companies, energy expense is treated as an allocated cost based on occupied square footage of floor space rather than as a charge to users for the actual energy they consume.

A recent study conducted by Bernstein Research found that 50 percent of CFOs surveyed were already actively exploring how to reduce data center power consumption and data center energy costs.¹⁰ The growing importance of accounting for, properly allocating and managing data center energy costs creates one of the most important emerging areas of opportunity for CFOs to exercise corporate leadership.



CEO: building positive environmental brand stewardship

CEOs are increasingly concerned about environmental issues. Many want to demonstrate that they lead environmentally friendly organizations in an era when responses to global warming have become dominant measures of how corporations are viewed by important stakeholder groups such as stockholders, customers and government regulators.

In a recent survey of 1,150 CEOs in 50 countries, PricewaterhouseCoopers found that many of these executives were concerned about energy costs and other environmental issues. "Sixty-four percent are 'somewhat' or 'extremely concerned' about rising energy costs ... while 49% are nervous about increasing costs in areas such as compliance and insurance," the report said.¹¹

Further, more than a quarter of the CEOs surveyed believe that climate change will benefit their business economically (in revenues, operational efficiencies, etc.) or intangibly (in brand or reputation, access to talent, etc.).¹² Achieving data center energy efficiency may therefore produce a long-term positive impact on your company's operating performance as well as people's willingness to do business with you.

IT managers can take action today to get ahead of the competition

In recent interviews with 1,000 global senior business and IT managers, Enterprise Strategy Group found that nearly half said professional services to assess, design and implement technologies to support green initiatives were most important in selecting IT vendors.¹³

CEOs are growing concerned about both energy costs and their organizations' environmental image.



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Five building blocks can help companies start gaining competitive advantage through energy efficiency.



IBM has a decade of experience in owning and managing eight million square feet of data centers around the world. And we've been working closely with our clients the past year in implementing energy-efficiency solutions. Based on our firsthand experience implementing energy-efficiency projects, IBM has identified five strategic building blocks companies can use to take action today to begin to achieve energy efficiency and gain an edge over their competition.

Diagnose—get the facts to really understand your energy consumption

According to *InformationWeek*, more than half of 472 business technology professionals surveyed said the facilities team at their companies gets the electric bill and IT never sees it. Another 21 percent said that IT is aware of the electric bill but isn't responsible for managing it.¹⁴ Yet "cost reductions from reduced energy consumption" is the most closely tracked metric being used by senior business executives to gauge the success of their green initiatives.¹⁵ Data center energy-efficiency assessments can help you close that accountability gap and start to get a handle on your energy consumption—and the results can be startling.

According to Gartner, "Traditionally, the power required for non-IT equipment in the data center (such as that for cooling, fans, pumps and UPS systems) represented on average about 60% of total annual energy consumption."¹⁶ IBM has learned from the data center energy-efficiency assessments that we do for our clients around the world that we can implement solutions to cut that consumption by 15 percent to 40 percent annually. This means that the payback on your investment can be achieved in as little as two years, thereby covering the cost of the assessment in the first year.

Assessments help determine the true state of your energy consumption and provide a benchmark to what is possible.



The data center energy challenge affects both the physical data center and the IT infrastructure. IBM assessments provide insights into not only the data center's energy efficiency but also the potential for gaining efficiencies through server and storage consolidation. These assessments of the current state of your data center can be compared to industry benchmarks and provide a fact-based business case for making improvements.



For example, a major IT company needed to support its growth in computing capacity with its existing 5,000-square-foot data center while improving its energy efficiency and reducing costs. It asked IBM to conduct a comprehensive, fact-based analysis of its physical infrastructure. The IBM analysis evaluated cooling system components, electrical systems and other building systems. IBM provided an industry-standard metric that established a baseline for the client's data center energy efficiency. We found that only 28 percent of every dollar spent on energy was actually used by the IT equipment. The rest was spent on air-conditioning and other infrastructure—not generating productive use of IT for the business.

However, when the client reaches its objective of 53 percent annual energy savings, it will save US\$125,000 to US\$170,000 in energy costs every year. To get there, we recommended reducing recirculation and bypass of cooling air, increasing computer room air conditioner air discharge temperatures, adjusting indoor temperature and relative humidity, and improving the efficiency of the uninterruptible power supply (UPS). Most of the recommendations are designed to have a payback of less than a year.

Build—explore options to upgrade your data center or build a new one

Compounding the environmental and financial challenges that occur when the rising demand for IT capacity meets the rising cost of energy, data centers themselves are often out of sync with the information technologies they support. A study by Gartner found that “36 percent of respondents indicated that their organizations’ *newest* data centers are seven or more years old.”¹⁷ By contrast, IBM’s client experience has shown that the IT equipment in those data centers is typically turned over every two to four years. As a result, the older data centers may not be able to power and cool the newer IT equipment—especially blade servers—in an energy-efficient manner.

Older data centers have trouble powering and cooling newer IT equipment—especially blade servers.



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With rapid IT growth, companies often are looking to consolidate data center operations to achieve space savings and other benefits such as increased manageability. Building or upgrading a new data center provides the perfect opportunity to rationalize the data center strategy as a way for you to gain major capital and operational savings, including energy-efficiency savings.

Bryant University in Rhode Island needed to reduce costs and grow the capacity of its IT infrastructure to meet rising student enrollments—and their expectations for IT services. The university’s previous decentralized IT infrastructure was costly, inefficient and increasingly unable to scale to meet these growing demands.

Rationalizing your IT infrastructure through a new build provides flexibility as well as saves energy costs.



The university worked with IBM to consolidate and upgrade its IT operations. IBM helped Bryant design and build a centralized, 500-square-foot data center. The new data center was implemented in half the total space required by the previous three. This smaller footprint, coupled with energy-efficient components, significantly reduced the university’s energy costs—contributing to a 40 percent reduction in overhead costs. The project consolidated 75 servers in three data centers down to three IBM BladeCenter® platforms holding a total of 40 IBM System x™ and IBM System p™ servers.¹⁸

It also gave them flexibility. Rich Siedzik, director of computer and telecommunications services at Bryant, told *InformationWeek*, “Before we did this data center, it was the thing that kept me up at night. . . . Now, we have more time to be innovative.” According to the article in *InformationWeek*, “The university needed to move from an operational focus to a strategic one.” And, Siedzik said, “the data center allowed us to do that.”¹⁹



Virtualize and simplify—increase the efficiency of your existing servers and storage devices

Virtualizing servers and storage devices can increase processing loads and boost individual utilization rates. A happy by-product of increasing operating efficiency through virtualization is that energy efficiency can be increased as well. Virtualization can increase your available storage space and reduce the overallocation of resources. Bernstein Research found that technology priorities are generally consistent between CFOs and CIOs and that “[v]irtualization is widely viewed as having compelling ROI.”²⁰

An example of that comes from the University of Pittsburgh Medical Center (UPMC), which is seeking to become a truly integrated, self-regulating healthcare system using evidence-based medicine to produce superb clinical outcomes and lower costs. To support this goal, UPMC has been undergoing an IT service transformation program with help from IBM.

Health Industry Insights, an IDC Company, has been tracking the project and reports that, “UPMC is facing multiple challenges that translate into doing more with less.”²¹ Health Industry Insights noted such challenges as pressures “to improve customer service, patient safety, and service quality while reducing care delivery costs.”²²

“In order to deliver highly integrated, efficient care in the face of this rapid growth and industry pressures, UPMC recognized that enterprisewide IT systems, data integration, and platform standardization were crucial for its quality and business integration goals and to achieve the economies of scale expected to accrue from these acquisitions,” Health Industry Insights said.²³

Virtualizing your IT infrastructure can let you do more with less and save on energy consumption.



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UPMC worked with IBM in virtualizing its Wintel and UNIX® systems and consolidating 1,000 physical servers down to 300 IBM servers. Storage also was reduced from 40 databases down to two centralized storage area network (SAN) arrays. Health Industry Insights reports, “Our initial estimate that UPMC would avoid almost \$20 million in server costs has grown to \$30 million and is likely to exceed \$40 million by the conclusion of the project in 2008.”²⁴

“Considering that IBM and UPMC are only midway through this transformation project, the results have been impressive. We have already proven that standardization, along with aggressive implementation of virtualization, yields unprecedented productivity and efficiency,” said Paul Sikora, vice president of IT Transformation at UPMC.²⁵

Innovative cooling technologies are available to handle high-density computing and keep capacity growing.



Cool—use innovative cooling techniques to beat the heat

Cooling has become a major problem in many data centers. According to Gartner, “High-density equipment, such as blade servers, demand enormous equipment power and air conditioning power. Rack enclosures can accommodate 60 to 70 (1U) units equating to 20,000 watts to 25,000 watts of power per rack. In addition, for every watt of equipment power, there is a need for another 50% to 60% for air conditioning equipment.”²⁶ But innovative cooling technologies can help you beat the heat in high-density computing facilities. They can enable and accelerate the growth of IT capacity by making it possible for the data center to increase its use of blade servers.

Georgia Institute of Technology’s Center for the Study of Systems Biology required supercomputing capabilities for protein structure simulations and other techniques supporting research into new drugs. Its supercomputer demanded the highest possible computational performance while



generating significant heat output from its ultradense blade servers. By implementing a mix of advanced IBM cooling technologies—including an innovative rear door heat exchanger—the university was able to maintain computing performance while reducing air-conditioning requirements by 55 percent. The resulting energy savings helped cut operational costs 10 percent to 15 percent and helped save an estimated US\$780,000 in data center costs.²⁷

Manage, measure and enhance—take control to automate energy consumption

If you can't measure it, you can't manage it. But with innovative energy management software, it's possible for you to have the energy billing metrics necessary to help control your data center's energy consumption.

Tracking energy usage history and service levels can be valuable tools in allocating or capping power to enhance energy use. Taking the process to the next level, an organization can automate energy management to preset energy usage levels to support service level and energy optimization objectives.

InformationWeek reported that Bryant University is working with IBM to deploy software that automatically manages server clock speed to lower power consumption. In addition, software helps monitor and control fan speed, power level used at each outlet, cooling capacity, temperature and humidity, and it distributes power to server blades as needed.²⁸

Automation helps you put data center energy consumption on cruise control to meet service level agreements and other objectives.



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Act now—cut costs and gain competitive advantage today

Those companies that start now in implementing energy-efficient data centers can begin to achieve payback earlier than those that wait another year or two. First-mover advantage is critical in a world where nearly every company now faces energy constraints that can undermine business growth.

The range of energy-efficiency services available from IBM Global Technology Services has already delivered value to other clients.

IBM IT Facilities Assessment, Design and Construction Services helps you make optimal investments in energy efficient data centers. IBM Data Center and Facilities Strategy Services – data center energy-efficiency assessment helps quantify potential energy savings. Options to improve energy efficiency include a turnkey, scalable modular data center that can be deployed quickly to help you consolidate your IT assets and cut costs.



IBM Server Optimization and Integration Services – server consolidation efficiency study helps lay out a high-level strategy, roadmap and business case for designing, planning and implementing a consolidated server environment. IBM Server Optimization and Integration Services – server consolidation helps you make the transition to higher utilization rates, greater energy efficiency and reduced operating costs.

IBM Storage Optimization and Integration Services – storage consolidation assessment provides an evaluation of the power and environmental benefits of moving to a new storage platform. IBM Data Mobility Services enables you to more safely migrate your data to new, more energy-efficient storage platforms.

For more information

Energy-efficiency services from IBM can help you double your IT capacity using the same amount of energy, gain tactical flexibility, cut operating costs, build a positive environmental brand—and gain sustainable competitive advantage.

To learn more about one of the broadest data center energy-efficiency solution portfolios in the industry, please contact your IBM representative or visit:

ibm.com/systems/greendatacenter

ibm.com/services/siteandfacilities

ibm.com/services/server

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Gain sustainable competitive advantage by doubling your IT capacity in the same energy footprint.





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