



The Energy Challenge

A New Agenda for Corporate Real Estate



Rocky Mountain Institute
1215 Spruce Street, Suite 301
Boulder, CO 80302
303.449.5226 p
www.rmi.org



CoreNet Global
260 Peachtree St. NW, Suite 1500
Atlanta, GA 30303
404.589.3200 p
www.corenetglobal.org

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Foreword to “The Energy Challenge: A New Agenda for Corporate Real Estate”

AMORY B. LOVINS, CHAIRMAN AND CHIEF SCIENTIST, ROCKY MOUNTAIN INSTITUTE

Buildings use two-fifths of the world’s materials and energy, one-sixth of the world’s fresh water. More than 90 percent of our time is spent indoors. Of all U.S. fixed capital assets, 85 percent are structures. Yet much of the capital invested in buildings, and most in energy, is wasted. By 1990, for example, the United States had misallocated roughly \$1 trillion of capital just to 200 million tons of air-conditioning equipment, and 200 billion peak watts of electricity to run it, that wouldn’t have been needed if the buildings had been designed to provide the most comfort at the least cost.

My 1992 inquiry into the causes found that the twenty-odd parties in the real-estate value chain have limited communications and perfectly perverse incentives—each systematically rewarded for inefficiency and penalized for efficiency. We could hardly have devised a better system for ensuring that buildings use an order of magnitude more energy than they should, cost more to build than they should, and are less pleasant, healthful, and productive to be in than they should be.

Modern energy efficiency’s low-hanging fruit is mashing up around our ankles and spilling in over the tops of our waders, while the innovation tree pelts our head with still more fruit. Buildings that are operated between -47 and $+115^{\circ}\text{F}$ (-44 and $+46^{\circ}\text{C}$)—which can be comfortable without space conditioning and save about 90-plus percent of energy use—have been created at reduced capital cost, chiefly by downsizing costly mechanical systems. Some need no fans or chillers. The most advanced are not climate-excluding and elaborately controlled but climate-adaptive and self-regulating, their elegant frugality inspired by vernacular architecture and nature’s 3.8 billion years of design experience.

In any climate, artful whole-system design can yield Class A offices with unprecedented thermal, visual, and acoustic comfort, unrivaled air quality and individual control, tiny churn cost, more rentable space per gross area and per unit height, and 80–90 percent

energy savings—all buildable cheaper and faster. The secret sauce is integrated design: optimizing whole buildings for multiple benefits, not isolated components for single benefits. Now proven in some \$30 billion of projects in twenty-nine sectors, integrated design can “tunnel through the cost barrier,” making very large energy savings cost less than small or no savings.

Competition is starting to bring such expanding returns from the fringe to the core of successful real estate practice. In some U.S. markets, a new office that isn’t at least LEED Silver may not get a bank loan, because the financiers fear it won’t lease. Smart capitalists are sifting winners from losers. Achieving these gamechanging outcomes requires strong and informed leaders; vision across boundaries; careful, prudent, persistent, fearless design by a strong trans-disciplinary team in an inclusive charrette process; specifying component and system performance and enforcing it by measurement; overseeing design, construction, and commissioning with unflagging and meticulous attention to detail; and performance-based fees that reward design professionals for what they save, not for what they spend. It’s not easy, but the rewards are great: buildings that make us healthier, happier, higher-performing; create delight when entered, well-being when occupied, regret when departed; take nothing, waste nothing, do no harm; produce net energy, clean water, beauty, perhaps food, and offer lessons; cost less to build and to run; are designed for their last day of occupancy as much as their first day; and are flexible for unknowable future needs. We know how; we just need to pay attention. Early adopters will thrive. Laggards will fail.

I applaud CoreNet Global’s commitment to turning pervasive obstacles into business opportunities. This collaborative report’s survey data and case studies offer insights and tools for that alchemy of stumbling-blocks into stepping-stones. The dedicated practitioners who apply this report’s lessons can create stunning competitive advantage—and a richer, fairer, safer, cooler world.

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Credits:

Rocky Mountain Institute

Research:

Report Review: Amory Lovins
Principal-in-Charge: Greg Franta
Project Manager: Aalok Deshmukh
Analyst: Caroline Fluhrer
Fellow: Eric Maurer

Communications:

Staff Editor: Cameron Burns
Art Director: Robin L. Strelow
Proof Reader: Cindy Cash
Graphics: Susan Rich
Graphics: Rob Irwin

CoreNet Global

Director of Global Research: Eric Bowles

Director, Europe Learning: Ron Adam

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- Nick Axford, Head of EMEA Research & Consulting, CB Richard Ellis
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- Patricia Crumley, Chief Services Officer, Staubach
- Bill Frain, Principal, Staubach
- Tim Frank, Field Operations Manager, Toyota
- Gerry Gurtler, Services Manager, Global Workplace Strategies, Microsoft Corporation
- Brad Hancock, Department of Defense
- Mike Harris, Vice President, Energy Services, Johnson Controls
- Mukesh Khattar, Energy Director, Oracle
- Mary Ann Lazarus, Senior Vice President, Hellmuth, Obata + Kassabaum, Inc. (HOK)
- James Maddock, Director of Global Corporate Services, DTZ
- Scott Muldavin, Executive Director, Green Building Finance Consortium
- Kevin Oakes, Senior Manager of Strategic Sourcing, Motorola
- Mia Ranta-Aho, Environmental Solutions Manager, Nokia
- Timo Salonen, Electrical and IT Solutions Manager, Nokia
- John Schinter, Vice President, Energy, Jones Lang LaSalle
- David Simms, Land and Planning Director, Lafarge Cement
- William Sisson, Sustainability Director, United Technologies
- Stephen Smith, Global Head of Facilities Management & Sustainability, ABN AMRO
- Kelly Speakes, Sustainable Strategies Leader, UTC Power
- Richard Spray, Corporate Real Estate Executive, Lafarge Cement
- Joe Valente, Director and Head of Research, DTZ
- Brenna Walraven, Executive Director, USAAA Realty Company
- Joe Wick, Managing Director, Cushman & Wakefield
- Theddi Wright Chappell, Managing Director of Advisory Services, Pacific Security Capital

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Table of Contents

Preface	2
Acknowledgments	3
Executive Summary	6
Introduction and Background	8
Energy Use Trends in Corporate Real Estate	12
Strategic Importance of Energy Efficiency	14
Drivers of Energy Efficiency	14
Shareholder Pressure	15
Government Incentives	15
Government Regulations	16
Reputational Value	17
Aging Infrastructure	18
Sustainability Concerns	18
Energy Costs	18
Will Drivers Go Away?	19
State of Facilities Energy Management	19
Internal Support for Energy Efficiency	19
Elements of Successful Energy Management Programs	19
Tracking Energy Data	21
Utilizing Energy Data	22
Energy Efficiency Throughout the Real Estate Life Cycle	23
Programming/Requirements	23
Design/Engineering	23
Acquisitions/Leasing	24
Operations/Facilities Management	25
Retrofits	26
Valuation	27
Barriers to Incorporating Energy Efficiency	28
Enablers to Incorporating Energy Efficiency	29
Success Stories: Real Stories, Real People, Real Buildings	30
Corporate Leadership and Data Management Key to Energy and Carbon Reduction Strategy at ABN AMRO	32
Developer-Tenant Collaboration Leads to Lean, Green Facility (Herman Miller)	34
Adobe: Outsource Energy Efficiency Upgrades and Reap the Benefits	35
Bank of America's NYC Skyscraper Aims for LEED Platinum	38
Peak Demand is Also Important (Credit Suisse)	38
LEED Platinum on a Government Budget (Lewis and Clark State Office Building)	39
Carbon-Neutrality in Reality (Hawaii Gateway Energy Center)	39
JohnsonDiversey: Institutionalizing Energy Efficiency for Continuous Improvement	40
Energy Efficiency Reaches Wall Street (Goldman Sachs)	43
New Building Leads to New Business (Alberici)	44
Integrated Design Key to Cost-Effective Energy Savings	45
Rocky Mountain Institute "Walks the Talk"	45
Toyota: Efficient Operations Translates into Efficient Buildings	46
Corporate Social Responsibility at Microsoft	49
Relocation Prompts Investment in Sustainability at Lafarge Cement UK	49
Century Prosper Center: Developers Seek Market Advantage with Energy-Efficient Buildings	50
Nokia: Introduction of Energy Management Program at Nokia China	52
Oracle: No-Cost Measures for Energy Savings	56
Key Conclusions	57
Recommendations	60
Corporate Agenda	63
Service Provider Agenda	65
References	68
Tables and Figures	69
Photo Credits	71

Executive Summary

“Buildings are rarely built to use energy efficiently, despite the sizeable costs that inefficient designs impose on building owners, occupants, and the utility companies that serve them. The reasons for this massive market failure have to do with the institutional framework within which buildings are financed, designed, constructed, and operated: many of the roughly two dozen actors who play a role in this process have perverse incen-

tives that reward inefficient practice. Fragmented and commoditized design, false price signals, and substitution of obsolete rules-of-thumb for true engineering optimization have yielded buildings that cost more to build, are less comfortable, and use more energy than they should.”

– Amory Lovins, “Energy-Efficient Buildings: Institutional Barriers and Opportunities” (1992)

On the whole, Lovins’s 1992 assessment of the building industry is not much different from how one might describe it today. On average, design is still fragmented, rules-of-thumb are still common, and buildings still cost more to build, are less comfortable, and use more energy than they should. Yet, fifteen years ago, green power purchasing was not available, the U.S. Green Building Council did not exist, and “energy efficiency” was still interchangeable with “conservation”. A closer look reveals that substantial changes have taken place and progress has been made, albeit with limited impact. Progressive architects, engineers, developers, government agencies, lenders, appraisers, landlords, facility managers, and corporate real estate groups all approach building performance differently than they did fifteen years ago.

Today, building energy costs are ramping up, greenhouse-gas emissions regulation is on the horizon, and climate change is accepted as an alarming reality. New trends have emerged that are unlikely to be reversed. While building energy costs are usually a relatively small portion of total operating costs, they are also one of the

most controllable compared to taxes or insurance. The variability of energy intensity and cost also positions energy as a prime area for cost reductions. While top quartile buildings may have annual energy costs of less than US\$1 per square foot (US\$11 per square meter), poor performers can have energy costs exceeding US\$6 per square foot (US\$64 per square meter). It is evident that corporate sustainability, and more specifically, energy efficiency, is no longer an optional business strategy. To examine new trends regarding energy use and management in corporate real estate, CoreNet Global partnered with Rocky Mountain Institute (RMI).

From June of 2006 to April of 2007, the Rocky Mountain Institute (RMI) and CoreNet Global team carried out research focused on identifying barriers, documenting successes, and outlining recommendations for the increased incorporation of energy efficiency in corporate real estate. The research included an online survey administered to over 240 real estate professionals as well as analysis of more than 15 corporations successfully incorporating energy efficiency measures and programs. Key con-

clusions as well as recommendations for the greater incorporation of energy efficiency in corporate real estate are presented next.

Key Conclusions

Corporations are thinking about energy efficiency and believe it is growing in importance, yet they don’t have the management structures in place to realize improvements effectively. Typically, the responsibility for energy efficiency is given to facility managers. Facility managers manage buildings; adding the responsibilities of designing goals, implementing tracking methodologies, reporting to upper management, and making the case for funding exceeds their bandwidth. Furthermore, too few corporations (fewer than half) have energy policies or consumption targets in place. Even fewer have active energy management systems that track data, identify problem areas, and help managers react to needs. Lastly, while most corporate players recognize the importance of energy efficiency, they do not recognize the risk of inaction nor the ease with which effective energy management programs can be enacted. Most barriers are just perceived barriers that can be easily and profitably overcome with

smart design, integrated solutions, the right management structure, and the appropriate implementation strategy.

Recommendations

This report describes and recommends two action plans—one for corporate real estate and one for service providers. Recommendations vary by their strategic nature and by their duration and immediacy (helpful schematics can be found on pages 61–62). A key recommendation for both the corporate stakeholders and service providers is to sign on to and promote The 2030 °Challenge, using the 2010 threshold (a 60 percent energy reduction compared to a 2006 baseline) as an immediate goal.

The key theme within the Corporate Action Plan is organization and leadership. There are few technical or economic barriers preventing an organization from setting goals and creating a com-

prehensive energy management program. Leadership is required to set aggressive goals, appoint sustainability champions, generate a framework to document investments and results, and in the long-term, to integrate sustainability into core business operations. On a logistics level, recommendations include creating a corporate energy baseline, seeking integrated solutions during any retrofit or new development, developing an internal emissions cap-and-trade program, tracking energy use and cost data, commissioning the building stock to identify opportunities, and training and retraining operations and maintenance staff.

For service providers, most recommendations rest on the premise that further data are required to quantify accurately the costs and benefits of energy efficiency. For the appraisal/lending industries, energy-efficient features need to be consistently accounted for and tracked. Developers need to

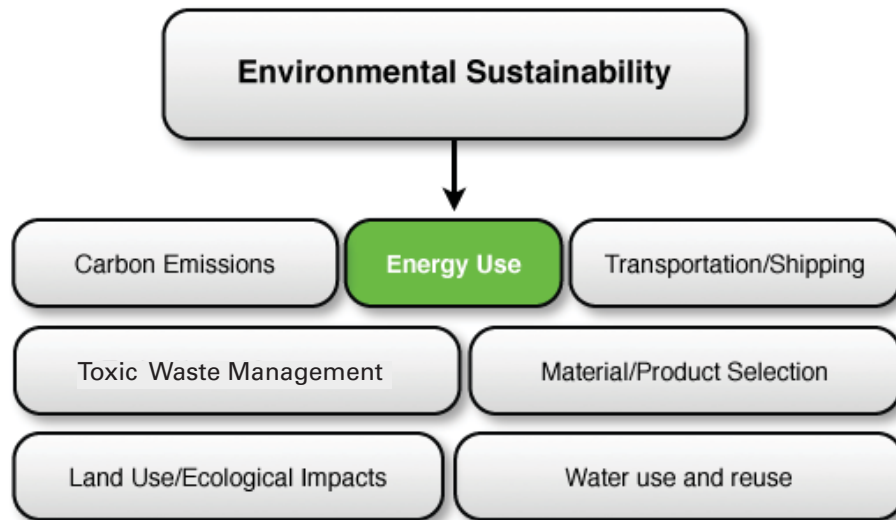
respond to growing demand for energy-efficient buildings and set internal policies to reach the 2010 goals. Landlords and owners need to explore shared-cost opportunities with clients and to upgrade equipment as it expires in existing buildings. Real estate service providers need to create demand by adding energy and sustainability requirements to all requests for proposals and by demanding and completing energy-related pre-lease due diligence activities. The architecture and engineering professions are often ahead of the curve and can help other industries as well as corporations catch up by effectively communicating success stories and by sharing energy and carbon analysis tools. Integrated solutions, created by experienced professionals, that truly achieve high performance and meet other program requirements at the same time can be challenging to achieve, but typically offer the highest performance and return on investment.

Introduction and Background

Increasing efficiency of procurement processes, controlling economic risk, and retaining talent are long considered top priorities in corporate real estate. Yet a new priority has emerged, and is rapidly gaining in importance—sustainability. Corporate sustainability is a concept often associated with the triple bottom line, which entails a focus on a company’s social, environmental, and economic performance and is a key component of overall corporate responsibility. This report focuses on describing how corporate real estate can affect the environmental performance component of corporate sustain-

ability. In the corporate real estate context, items affecting environmental performance will often include materials, waste, water, and energy transactions associated with the corporate building stock. Currently, energy use and the associated carbon dioxide emissions assume center stage in this regard. It is foreseeable that carbon will soon be a new corporate currency that must be accounted for and fully disclosed. This report addresses how companies can improve the energy efficiency of their building stock and reduce company-wide carbon dioxide emissions.

Figure 1: Energy use in the context of environmental sustainability



Why Focus on Energy Use?

Addressing energy use is motivated by five main factors. First, rising energy costs—in 1992, the average price of electricity in the United States was US\$0.0682 per kWh; in 2006, electricity peaked at US\$0.0953 per kWh¹. Oil prices on the global market have increased from US\$18.91 per barrel in 1990 to US\$57.83 per barrel as of March 2007². Commercial

natural gas prices in the United States have jumped from US\$4.92 per thousand cubic feet in 1990 to US\$11.57 in 2006³. Upward pressures may persist and price volatility is rising.

Second, energy use can be controlled, unlike taxes, insurance, or labor costs. Energy use can also be carefully tracked and monitored—even though it is not a

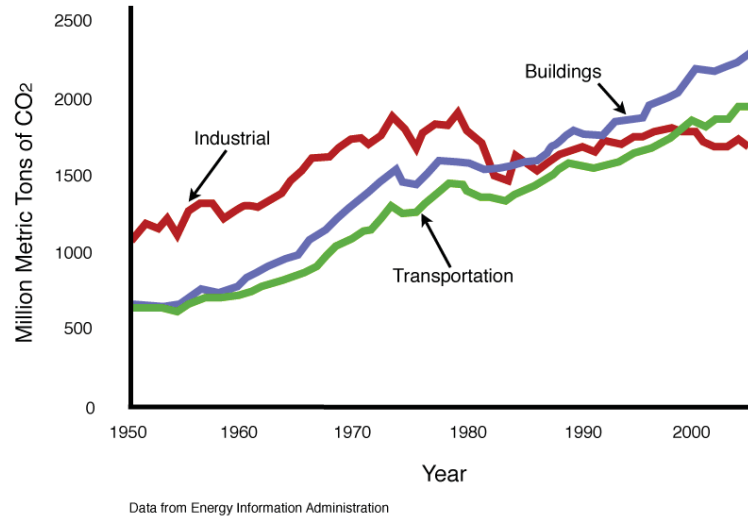
fixed cost. It is also important to recognize the distinction between energy conservation and energy efficiency. To some, conservation implies sacrifice or suffering. In practice, efficiency means operating buildings to provide a desired level of comfort and performance with a minimal amount of energy. In existing buildings this is accomplished through proper equipment scheduling,

better controls, and equipment upgrades. In new buildings, efficiency is achieved through proper orientation, improved building envelopes and daylighting, and optimized system design.

Third, there is currently a wide energy performance gap between top quartile and bottom quartile buildings. While annual energy use in poor-performing buildings may exceed US\$6 per square foot (US\$64 per square meter), top-performing buildings can use less than US\$1 per square foot (US\$11 per square meter). There are significant opportunities to upgrade the global corporate real estate portfolio. The key strategy for cost-effective efficiency measures is integrated design or retrofit that optimizes whole-building performance.

Fourth, energy consumption translates to carbon dioxide emissions (unless renewable energy is used), and the regulation of emissions is imminent. There is substantial risk for a large building owner or occupier to ignore this impending “carbon risk.” More corporations are recognizing the signs that carbon regulation is imminent and are taking steps to avoid the risks of inaction. In early 2007, corporations including GE, DuPont, Alcoa, Duke Energy, Lehman Brothers, and BP joined forces with environmental organizations to form the United States Climate Action Partnership (USCAP). USCAP is focused on urging U.S. lawmakers to pass legislation to introduce a mandatory carbon cap-and-trade program. Corporations are also responding to demands to

Figure 2: U.S. Carbon Emissions by End-Use Sector: 1980-2003



Buildings are responsible for 38 percent of U.S. fossil-fuel carbon emissions, excluding the energy required to transport and manufacture building materials. Buildings use 69 percent of U.S. electricity, 36 percent of direct natural gas, and 40 percent of total energy (2005).

disclose carbon data. In 2007, the fifth information request from the Carbon Disclosure Project was issued to 2,400 companies. More than 280 institutional investors with assets of more than \$41 trillion signed the request. Shareholders are also beginning to move on carbon regulation: 32 shareholder resolutions related to climate change were filed in the first half of 2006. Carbon reduction and disclosure are no longer optional operational objectives; rather, they are essential components of any corporate real estate strategy.

And, fifth, energy performance is part of a corporation’s increasingly scrutinized sustainability profile. Risks of corporate inaction regarding sustainability include reputational damage, loss of talent, loss of shareholder support, and increased costs. Taking action now not only reduces future risks but also has significant benefits, including reduced energy costs,

improved workplace environments (if energy efficiency strategies such as daylighting, thermal comfort control, and quality lighting are employed), and improved employee productivity and public relations. Increasingly, there are reputable platforms that recognize outstanding environmental performance:

- Dow Jones Sustainability Indexes are the first global indexes tracking the financial performance of the leading sustainability-driven companies worldwide.
- Standard & Poor’s and the United Nations Environment Programme’s (UNEP) “Sustainability” benchmark lists the 100 global leaders in corporate sustainability reporting, transparency, and disclosure.
- Innovent Strategic Value Advisors officially launched the third Global 100 list of the most sustainable corporations in the world at the World Economic Forum in Davos in January 2007.

Energy Efficiency in Practice

In the United States, buildings are responsible for more carbon dioxide emissions than industry and transportation (Figure 2). Purchasing green power from a utility, self-generating clean power, or reducing energy use can all reduce carbon emissions in buildings. Currently, reducing energy use through integrated solutions is the most cost-effective method to reduce carbon emissions. However, reducing energy use does not mean halting growth or turning off the heat. It means operating buildings more efficiently with the right technology. Energy efficiency is, and will always be, key to operating a carbon-lean building portfolio.

Factors influencing energy demand vary in importance depending upon climate and building type. Building orientation, envelope characteristics, and mechanical and lighting systems are generally most influential. For existing buildings, mechanical and lighting systems are easiest to address. Window replacements and daylighting can also prove economical. The most common energy use metrics include kBtu per square foot (or MJ per square meter) and kWh per square foot (or square meter) per year. The U.S. Energy Information Administration reports the average annual energy intensity (includes all fuel and electricity) for office buildings in 2003 was 92.9 kBtu per square foot (293 kWh per square meter⁴). A first step for any corporate entity would be determining how specific buildings stack up against national and regional averages as well as competitors.

Partnerships in Energy Use Reduction

In addition to corporate action, many non-profit, private, and government organizations are offering useful tools and frameworks to aid significant reductions of carbon emissions in the real estate sector. The U.S. Green Building Council is attempting to increase energy reduction requirements in its Leadership in Energy and Environmental Design (LEED) rating systems. The 2030 °Challenge, an initiative of Architecture 2030, challenges the global architecture and building community to reduce building energy consumption by 50 percent now and by 100 percent by 2030 (with incremental reductions between now and then). The Clinton Climate Initiative has partnered with the Large Cities Climate Leadership Group (now “C40”) to focus on reducing carbon emissions in large cities around the world. Other groups including the Building Owners and Managers Association (BOMA), the Green Building Finance Consortium, and the World Business Council for Sustainable Development all support energy-efficient real estate practices through a variety of programs and research products.

Motivation for RMI/CoreNet Global Research

The accelerated growth of interest regarding energy efficiency and sustainable development over the past two years is unprecedented and shows no sign of slowing. Yet interest and action are quite distinct. Despite growing interest in energy efficiency, many corporations have yet to

take action. Action may include defining an energy strategy, forming an energy leadership group, developing an energy baseline, or advocating a strong business case for energy efficiency. Barriers to achieving greater levels of energy efficiency in corporate real estate exist today, but it is unclear as to what they are, what supply-chain participants experience them, and how they can be overcome.

To answer these questions, CoreNet Global collaborated with Rocky Mountain Institute to identify barriers, document successes, and outline recommendations for the increased incorporation of energy efficiency in corporate real estate. This research is intended to update specific portions as a sequel to a 1992 paper by Amory Lovins, titled “Energy-Efficient Buildings: Institutional Barriers and Opportunities.” In this work, Lovins identified simple solutions to overcome common barriers to improving energy efficiency in buildings. At that time, the drivers of energy efficiency were much weaker and the barriers were much more legitimate. The current corporate real estate environment is clearly more favorable to ideas once considered impractical. However, many of the same opportunities that existed then still exist today and many have expanded.

As part of the research process, the RMI/CoreNet Global team engaged an advisory team composed of various supply-chain entities to provide an industry perspective. An online survey along with detailed case studies comprised the majority of

the research effort. All research focused on energy efficiency in corporate real estate (as opposed to general sustainability). The survey solicited input from corporate real estate professionals on energy use, management, and trends. The case studies focus on

leaders in the execution of effective energy-efficiency strategies and measures ranging from low-cost no-cost tune-ups to comprehensive, company-wide energy management policies that include aggressive targets and programs. The case studies were carefully

selected to represent a broad range of building and ownership types and diverse geographic locations. The findings of the RMI/CoreNet Global research are presented in this report.



Energy Trends in Corporate Real Estate



Table 1: Respondent Profile by Real Estate Function

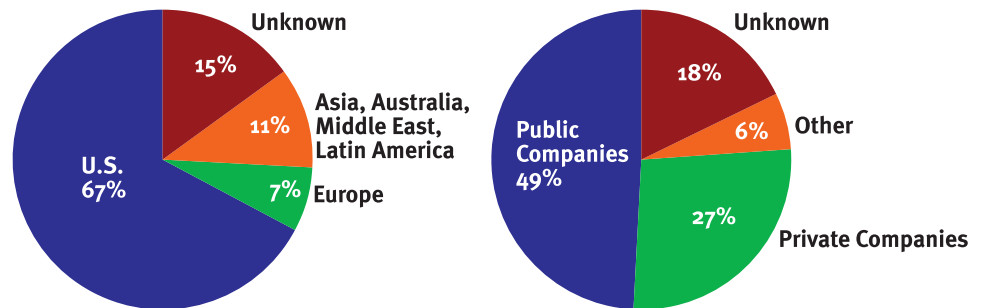
CRE Exec.	CRE Mgmt.	Facilities Mgmt.	Design/ Architect/ Engineer	Contractor	Real Estate Service Provider	Developer/ Landlord/ Investor/ Owner (non-occupant)
48 responses	27 responses	64 responses	32 responses	8 responses	39 responses	26 responses
20%	11%	26%	13%	3%	16%	11%

The conclusions drawn about energy use trends in corporate real estate are based on the results of an online survey administered by Rocky Mountain Institute and CoreNet Global. The survey, comprising of six different versions aimed at six different groups within the real estate supply chain, was administered over a three-month period during 2006 and focused on building-specific and corporate-wide energy-related issues. The results of this research, presented below, do not represent the corporate sector or real estate supply chain as a whole; rather, they reflect only the range of current practices and opinions received. Suggestions of where the balance of opinion lay within the respondent group are provided solely for information and to stimulate debate; they should not be interpreted as definitive findings or as in any way representative of a wider body of opinion.

Table 1 shows the number of responses as well as the percentage of total responses received from each group. In total, 244 corporate real estate professionals completed the survey.

As displayed in Figure 3, most of the respondents were from the United States and, at the time of the survey, were employed by public companies. Eighteen per-

Figure 3: Respondent Profile by Geographic Location and Organization Type



cent of respondents were outside the United States and 27 percent of respondents worked for private companies. The “unknown” category represents the group of respondents that did not supply information about their organizations or their phone numbers.

The discussion about energy use trends in corporate real estate is divided into the following sections:

Strategic Importance of Energy Efficiency

This section describes the importance that corporate real estate executives are attaching to sustainability and energy efficiency over the next ten years.

Drivers of Energy Efficiency

This section describes what respondents believe the current and future drivers of energy ef-

iciency are. Developments in the United States and globally that affect each driver are discussed in the context of their effects on corporate real estate.

State of Facilities Energy Management

In this section, respondents provided opinions on which energy management elements they believe are most important and which elements their companies currently employ.

Energy Efficiency throughout the Real Estate Life Cycle

This section describes how respondents are approaching energy efficiency in each segment of the life cycle: programming/requirements; design/engineering; acquisitions/leasing; operations/facilities management; retrofits; and valuation.

Barriers to Incorporating Energy Efficiency

Common barriers exist that limit the incorporation of energy efficiency. This section elaborates on the barriers that respondents believe are most significant in limiting the incorporation of energy efficiency.

Enablers to Incorporating Energy Efficiency

Many strategies exist to overcome barriers to energy efficiency. This section will outline effective enablers identified by respondents.

Strategic Importance of Energy Efficiency

Over the next ten years, corporate real estate professionals will see the emergence of a suite of new high-priority issues. CoreNet Global has attempted to define what these issues may be and how corporate real estate professionals can respond to them in its series of CoRE 2010 research reports. One of the emerging issues covered under the CoRE

2010 research agenda focuses on the topic of sustainability. As part of the RMI/CoreNet Global survey focused on sustainability, corporate real estate executives were asked to rate the importance of energy efficiency and sustainability relative to other initiatives affecting corporate real estate. Approximately 83 percent of executives ranked sustainability as “important” to “most important,” and 94 percent of executives ranked energy efficiency as important to most important, *relative to* other issues impacting real estate over the next ten years. Moreover, 75 percent of executives said they believed that, over the next five years, money allocated to energy efficiency in capital budgets would increase, and 66 percent of executives said they believed that money allocated to energy efficiency in operating budgets would increase. These results indicate that sustainability and energy efficiency are at or near the top of corporate real estate executives’ agendas.

Despite the stated interest of corporate real estate executives,

additional survey results indicated that many companies have taken little action to pursue energy savings. Significant, profitable opportunities to reduce energy use are often overlooked, even by those who believe the issue is important. The survey results discussed below begin to address some of these opportunities, and the case studies included in this report provide examples of how leaders in energy-efficient building design and operation are exploiting these opportunities.

Drivers of Energy Efficiency

Respondents were asked about the current importance of a series of drivers of energy efficiency and about the importance of these same drivers in the future (the year 2015). As Figure 4 demonstrates, on average, no driver is currently considered unimportant, and the importance of all drivers became more significant by 2015. Respondents generally agreed that energy costs and sustainability concerns are the primary driv-

Figure 4. Average Importance of Drivers of Energy Efficiency

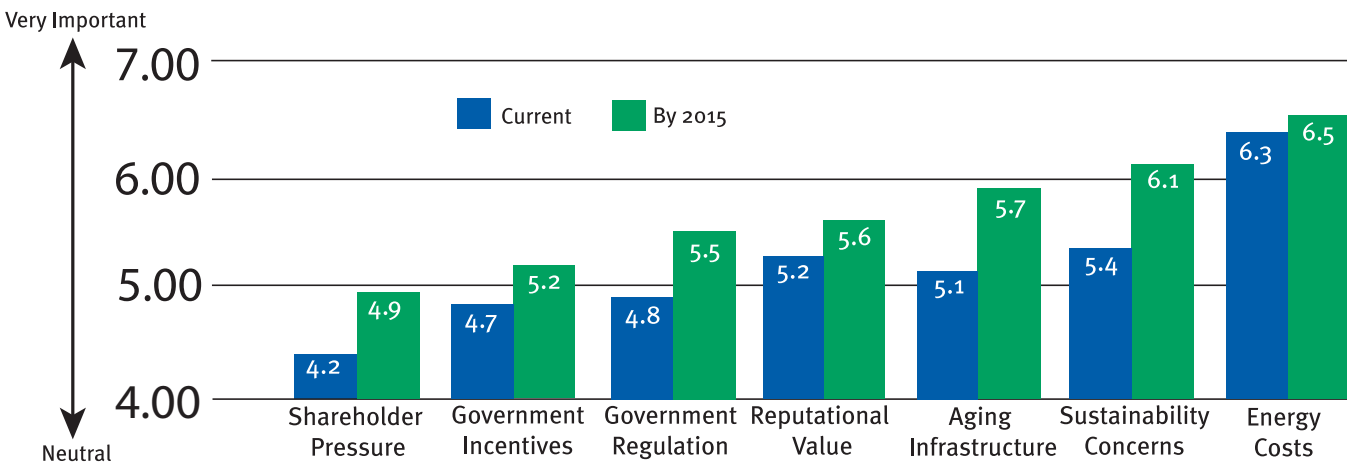


Figure 4 shows the average rank of importance that respondents attached to each driver of energy efficiency. Respondents were asked to rank each driver’s current importance and its importance in 2015 from 1 (very unimportant) to 7 (very important).

ers of energy efficiency within their companies. Sustainability concerns, government regulation, and shareholder pressure showed the greatest gains in importance between the present and 2015.

Shareholder Pressure

Respondents reported that shareholder pressure is not currently a major driver of energy efficiency. While it is believed that the importance of shareholder pressure will grow significantly, it is still believed that it will be the least important driver of energy efficiency in the future. This result is not surprising because shareholders have not historically targeted the energy efficiency of a company's office space as an important corporate issue; however, as shareholders become more active on climate change issues, this may change.

In the first half of the 2006 proxy season, shareholders submitted 32 resolutions to U.S. companies concerning climate change⁵. Most of these resolutions demanded action by oil and gas, energy, and home building companies; however, several resolutions asked

retail companies to report on energy efficiency performance⁶. In addition to submitting shareholder resolutions, investors are working together to increase corporate disclosure on climate change⁷. In 2000, a group of large institutional investors formed the Carbon Disclosure Project (CDP) to understand better the business implications of climate change. The CDP sends an annual survey to the world's largest companies to collect information on their carbon-equivalent emissions and the actions they are taking to address their exposure to climate change. The 2006 survey, sent to more than 2,400 of the world's largest public companies, was endorsed by 225 institutional investors with assets of more than \$31 trillion. More than 900 companies responded to the survey. As shareholders demand better disclosure of carbon emissions and climate change risk, the energy a company's owned and leased building stock uses may come under scrutiny for its contribution to greenhouse-gas emissions, and as a competitive metric.

To address the need for comparable and consistent corporate reporting on sustainability issues, including energy use and climate change, the Global Reporting Initiative (GRI) was formed in 1998. The GRI is an organization that creates guidelines for corporations reporting on economic, social, and environmental performance. The most recent set of guidelines released by the GRI, the G3 Guidelines, include no fewer than four indicators that relate to energy use in a company's building stock. These indicators include indirect energy consumption (e.g., quantity of purchased electricity), energy saved as a result of conservation and efficiency efforts, total direct and indirect greenhouse-gas emissions by weight, and initiatives to reduce greenhouse-gas emissions and the reductions achieved. More than 2,000 organizations have used the GRI guidelines to help guide their sustainability reporting⁸.

Government Incentives

Respondents placed little relative importance on government incentives as a driver of energy

Federal Incentive: Energy-Efficient Commercial Buildings Tax Deduction

The Energy Policy Act of 2005 established a tax deduction for energy-efficient commercial buildings applicable to qualifying systems and buildings placed in service from 1 January 2006 through 31 December 2008.

A tax deduction of \$1.80 per square foot is available to owners of new or existing buildings who install (1) interior lighting; (2) building envelope; or (3) heating, cooling, ventilation, or hot water systems that reduce the building's total energy and power cost by 50 percent or more.

Deductions of \$0.60 per square foot are available to owners of buildings in which individual lighting, building envelope, or heating and cooling systems meet target levels that would reasonably contribute to an overall building savings of 50 percent if additional systems were installed.

The deductions are available primarily to building owners, although tenants may be eligible if they spend money on construction.

efficiency. In the United States, financial incentives (e.g., rebates, grants, and low-interest loans) exist at the state and federal levels and are also offered by local utilities. This patchwork of incentives leads many to assume the time involved in finding applicable incentives, implementing projects, and applying for incentives overrides the financial benefits derived from receiving the incentives. However, there are tools that simplify the process. In the United States, all federal, state, and local utility financial incentive programs can be found on the website of the Database for State Incentives for Renewable Energy (DSIRE), www.dsireusa.org.

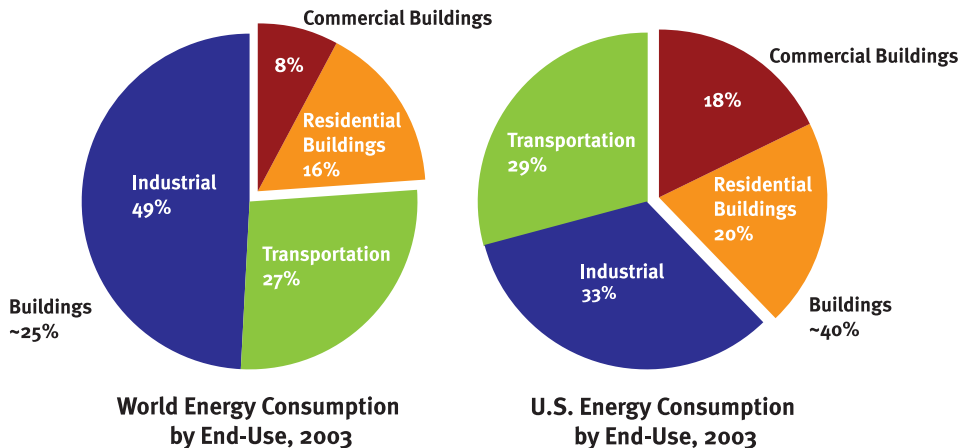
There are substantial benefits to be had from using these incentives and rebates as part of a company’s energy efficiency investments. For instance, Adobe Systems carried out energy efficiency improvements to its San Jose properties that produced \$1 million in annual savings and reaped \$349,000 in rebates (see case study for more details).

Government Regulations

Respondents placed “moderate” importance on government regulation as a current driver of energy efficiency. Also, while they recognized that the importance of regulation will grow in the future, they still attached relatively little importance to regulation, even in 2015.

Unfortunately, waiting to take action on climate change may not be consistent with the current and future political reality. National, regional, and local governments around the world are taking steps

Figure 5: World and U.S. Energy Consumption by Sector



Buildings are responsible for 38 percent of U.S. fossil-fuel carbon emissions. If one includes the energy required to transport and manufacture building materials, the building sector would be responsible for more carbon emissions than either industrial operations or transportation.

to mitigate climate change. Buildings use a significant amount of energy responsible for a large portion of total U.S. carbon dioxide emissions. Figure 5 shows that according to data from the U.S. Energy Information Administration (U.S. EIA), commercial and residential buildings consume more energy through their construction and operation, than either industrial operations or transportation⁹.

In Europe and the rest of the world, governments are working to comply with the Kyoto Protocol, which mandates emissions reduction targets of between 5 and 8 percent below 1990 emissions levels. The European community is also considering more aggressive targets for the period after that covered by the Kyoto Protocol.

In the United States, a bill that would have created a carbon emissions cap, the McCain-Lieberman Climate Stewardship Act, failed to garner the majority required for passage in the Senate. However,

with a new Democratic majority in Congress and uncertainty over who will win the 2008 Presidency, greenhouse-gas emissions regulation may not be far away.

At the local level, the city of London is leading a collective charge to fight climate change. In 2005, the Mayor of London organized C20: The World Cities Leadership Climate Change Summit¹⁰, which brought together mayors from twenty of the world’s largest cities to discuss best practices and to set an agenda for future collaboration on climate change mitigation. The summit prompted the formation of the Large Cities Climate Leadership Group (LCCLG) to further collaboration between large cities. The LCCLG has also partnered with former U.S. President William Jefferson Clinton’s Clinton Climate Initiative.

London, along with a number of cities, has set ambitious targets to reduce its carbon footprint (see Table 2 – City Emissions Targets). London’s energy strategy calls for a 20 percent reduction in

Table 2: City Emissions Targets¹¹

City	Reduction In	%	Target Date	Baseline Levels
San Francisco, USA	GHG	20%	2012	<1990
Seattle, USA	GHG	7%	2010	1990
Mexico City, Mexico	emissions	4%	2006	1998-2001
Chicago, USA	emissions	4%	2006	1998-2001
Toronto, Canada	GHG	20%	2005	1990
New York City, USA	CO2	20%	2010	1995
London, England	CO2	20%	2010	1990
Barcelona, Spain	GHG	20%	2002-2012	-
Berlin, Germany	GHG	25%	2010	1990
Cape Town, South Africa	CO2	10%	2010	-
Beijing, China	Coal Consumption	<15.2 million tonnes	2007	2001 (26.4 mil tonnes)
Tokyo, Japan	GHG	-	2010	1992
Melbourne, Australia	Corporate GHG	20%	2010	1996

carbon dioxide emissions by 2010 from a 1990 baseline, and a 60 percent reduction by 2050¹². The majority of the city's emissions, approximately 70 percent, are attributable to heating, cooling, and electrical loads. Consequently, London is focusing its strategy on energy efficiency improvements in buildings while also developing a cleaner, more efficient, decentralized utility grid. Regulation may play a role in ensuring that carbon reduction goals are met in the future. Many First World cities that attempt to reduce their carbon footprint are also focusing on buildings as more economies are shifting from an industrial base to a service base.

Reputational Value

Respondents viewed reputational value as a moderately important driver of energy efficiency, and saw relatively little growth in its importance by 2015.

Reputational value is important to the overall success of an organization. Dr. Arlo Brady, a researcher at Cambridge University's Judge Business School, articulates the value of corporate reputation, "...reputation is a resource, albeit intangible, leading to competitive advantage¹³." Dr. Brady believes reputational value is composed of seven different elements, in which companies will compete: (1) knowledge and skills; (2) emotional connections; (3) leadership, vision, and desire; (4) quality; (5) financial credibility; (6) social credibility; and (7) environmental credibility¹⁴. Of course, these attributes are also critical for recruiting, retaining, and motivating the best people.

Charles Fombrun, the Executive Director of Reputation Institute and Professor Emeritus at New York University's Stern School of Business, holds sentiments similar to Brady's. Fombrun notes,

"Company survival and profitability depend on the ability to attract support from four holders of resources: employees, customers, investors, and communities. Having a good reputation among these resource providers is therefore crucial if a company is to build and sustain a competitive advantage." Fombrun discusses five principles of reputation management, one of which is company identity¹⁵. A company's building stock is an important physical symbol of the values that a company represents and it can affect corporate identity.

Martha O'Mara, author of *Strategy and Place: Managing Corporate Real Estate and Facilities for Competitive Advantage*, elaborates on the link between real estate and corporate identity, "...real estate and facilities are not just simple logistical tools, although that remains a critical role. They also greatly affect behavior and attitudes both within

and outside the organization's boundaries."¹⁶ Consequently, incorporating energy efficiency within a company's building stock may play an important role in establishing the "environmental credibility" that Brady refers to and legitimizing an environmentally friendly identity—thus creating more value than just operating cost savings.

Aging Infrastructure

Aging infrastructure is ranked as a moderately important driver of energy efficiency. Respondents believe that its importance will grow in the future; however, it is still not considered to be a "very important" driver of energy efficiency.

Aging infrastructure affords an opportunity to incorporate more energy-efficient equipment. Moreover, by taking advantage of integrated design solutions, the coordination of equipment replacement can create significant cost savings (e.g., replacing the HVAC system and upgrading lighting at the same time). Developing corporate policies that require consideration of energy efficiency in purchasing decisions can stimulate ongoing efficiency improvements and help merge sustainability into regular business practices. Using life cycle, as opposed to first cost analyses, plays a huge role in making the case for investments in energy-efficient equipment.

JohnsonDiversey addresses aging infrastructure from two directions. First, JohnsonDiversey utilizes preventative maintenance programs to extend the useful life and efficiency of equipment. This practice creates a roadmap for replacement decisions and

upgrades. Second, the company reviews the available incentives from the State of Wisconsin and works with the local utility and the company's energy consultants to change the way it looks at what have historically been considered simple replacements so that energy efficiency upgrades are considered for replacement.

Sustainability Concerns

Survey respondents said that sustainability is a moderately important driver of energy efficiency. Respondents also said that by 2015 sustainability will be elevated to the status of "very important" in terms of driving energy efficiency. Of all the drivers the respondents were asked about, sustainability, on average, saw the largest rise in importance between the time of the survey and 2015.

Although defined in a variety of ways, in a corporate context, sustainability most commonly refers to the triple bottom line—social, environmental, and economic performance. As corporate stakeholders continue to push companies on their social and environmental performance, sustainability is becoming an issue that must be dealt with at all levels within a company.

A company's building stock is one of its most visible assets, and the failure to incorporate sustainability into the design and operation of a company's buildings may form a clear signal to stakeholders that sustainability is not a corporate value. Additionally, stakeholders are demanding increased transparency on sustainability issues, and this may include reporting on policies, strategies, and metrics associated with man-

aging a company's building stock. For a more thorough discussion on the impact of sustainability on Corporate Real Estate, see the CoreNet Global report, *Corporate Real Estate 2010 – Sustainability and Corporate Social Responsibility*.¹⁷

Energy Costs

Survey respondents cited energy costs as the most important driver of energy efficiency, both currently and in the future.

The U.S. Energy Information Administration (EIA) projects that total commercial energy demand in Organization for Economic Co-operation and Development (OECD) countries will grow by 1.1 percent per year from 2003 to 2030 and electricity demand is expected to grow by 1.8 percent per year. In non-OECD countries, total energy consumption is projected to double by 2030, growing at an annual rate of 3.2 percent, and electricity demand is estimated to grow by 4.3 percent annually. In order to meet increasing service demand without incorporating significant demand-side efficiency measures, increases in generating capacity would be required.

Increased energy use combined with climate change regulations are commonly expected to lead to higher energy prices across the board. In an analysis performed by the U.S. EIA in 2003, commercial electricity expenditures in the U.S. were projected to be 25 percent higher, or \$46 billion more, by 2025 if the McCain-Lieberman Climate Stewardship Act were passed into law.¹⁸ In January 2007, the EIA forecast that under an even less stringent climate change law that would only attempt to reduce carbon

intensity, not absolute emissions, U.S. commercial sector electricity users would be spending \$6 billion more on energy by 2020.¹⁹

Will Drivers Go Away?

The drivers presented to survey respondents, although not an exhaustive list, represent many of the reasons companies are beginning to act to mitigate climate change and improve energy efficiency in their buildings. From a strategic perspective, a company must ask itself if the evidence suggests that any or all of these drivers will disappear or abate in the future. The answer to this question may shape a company's approach to energy management and the urgency with which actions to address climate change and energy use within a company's building stock are taken.

State of Facilities Energy Management

Internal Support for Energy Efficiency

Prior to embarking on the development of an effective energy management program or the implementation of major energy efficiency measures, it is important to assess the internal support for such measures within a company. As Figure 6 shows, respondents, including corporate real estate managers and facility managers, indicated that most entities within their companies are supportive of energy efficiency. Although real estate and facilities management personnel tended to be ranked most supportive, finance and C-Level (i.e., CEO, CFO, COO, etc.) entities are not far behind. The business-unit leadership and board of directors were most often considered “neutral” or “unsupportive” of energy efficiency efforts.

These results indicate a significant amount of support in many companies for increased energy efficiency. Additionally, between 14 and 38 percent of respondents for each internal entity estimated support for energy efficiency as moderate or neutral (rating of 4 or 5). This suggests that in many companies there is a significant opportunity for corporate real estate professionals who are knowledgeable about energy issues to shift internal support so that it is more favorable toward energy efficiency. Yet regardless of how effective corporate real estate gets at addressing these issues, the impact of leadership from the top cannot be underestimated. Change can occur without it, but with much less urgency.

Elements of Successful Energy Management Programs

As is evident in the case studies section of this report, successful energy efficiency programs

Figure 6: Internal Functions Supporting Energy Efficiency

	%6 or 7 (very supportive)	%1–4 (neutral or unsupportive)
Facilities Management Leadership	83%	5%
Corporate Real Estate Leadership	74%	6%
Finance Leadership	59%	12%
C-Level Officers	58%	12%
Business-Unit Leadership	48%	22%
Board of Directors	40%	27%

For each internal function, Figure 6 compares the percentage of respondents that ranked the level of support for energy efficiency within their companies as very supportive (6 or 7) to the percentage that ranked it as neutral or unsupportive (1 – 4). Respondents were asked to rank the level of support from each internal function from 1 (very unsupportive) to 7 (very supportive).

typically start with the adoption of effective energy management policies, systems, and leadership. Corporate real estate executives were asked the importance of a number of energy management elements to driving successful energy management. Figure 7 shows the average importance that executives assigned to each management element. Although, on average, no single management element was ranked as very important, four out of five elements were perceived as moderately important. This may be a reflection of the interdependence of each management element—effective energy management is dependent on all management elements working together.

Executives tended to believe energy policies and targets were most important while assigning

senior responsibility to energy management was slightly less important. Additionally, it is interesting to note respondents were indifferent (neutral) to linking employee compensation to energy targets—but this may actually be an effective means of achieving widespread action and progress. Determining the link between energy efficiency and expenses and/or profitability will be the key to a successful incentive compensation program.

A wider audience, including corporate real estate managers and executives, facility managers, and real estate service providers, were asked which elements their companies currently utilize; these results are shown in the right-hand column in Figure 7. Approximately half of the surveyed companies had qualitative energy

targets, while about 40 percent of companies had an energy policy and quantitative energy targets. Only about a quarter of companies had a senior-level executive responsible for energy management or quantitative financial targets. As suggested by the importance (or lack thereof) of linking employee compensation to energy targets, only 5 percent of companies utilized incentives.

Interestingly, there is a fundamental difference between the 5 percent of companies with employee compensation linked to energy targets and the rest of the companies. The 5 percent are much farther along the path to developing comprehensive energy management systems. Most of these companies have already incorporated all of the other management elements included in Figure 7 (i.e.,

Figure 7: Importance and Adoption of Energy Management



Figure 7 shows the average importance that corporate real estate executives attached to a list of energy management elements. Executives were asked to rank each element from 1 (very unimportant) to 7 (very important). A wider audience of respondents, including corporate real estate managers and executives, facilities managers, and real estate service providers, were asked if their company or the typical company they work for employs each of these management elements. The “% with Element” column shows the percentage of respondents that worked for or with a company/companies that employ each element.

energy and financial targets, energy policy, leadership, and compensation linked to targets). These companies said they believe that sustainability is the primary driver of energy efficiency, whereas the remaining companies said they see energy costs as the primary driver. Moreover, these companies said they attach a significant amount of importance to the linking of employee compensation to energy targets. In comparison, the rest of the companies, on average, rated this element of an energy management program as “neutral.” Lastly, the firms in this select group said they have much higher levels of internal support for energy efficiency than the rest of the respondents.

These differences may indicate a trend in the evolution of energy management in corporate real estate. First, respondents indicated that internal support for energy efficiency and energy management is growing stronger. Second, companies appear to be building comprehensive energy management systems that incorporate vision and strategy (policy and targets), leadership (senior executive), and performance-based compensation (employee compensation linked to targets). Third, as environmental, social, and economic concerns are woven into operations, sustainability is emerging as the primary driver of action on energy efficiency.

Tracking Energy Data

Together with the energy management elements discussed above, a successful energy management program also requires the capture and use of energy data. As the adage goes, you cannot manage what you do not measure.

Capturing both energy use and cost data allows flexibility in assessing energy performance and creating energy targets. Approximately 69 percent of companies surveyed track at least one type of energy use metric. Respondents identified kilowatt-hours (kWh) as the most popular metric for tracking energy use. Sixty percent of companies reported tracking energy cost data.

Tracking energy use and cost data is an important component of an energy management program. In order to assess the quality and usability of the data being tracked, four important questions should be considered:

- Which data are being tracked?
- How complete are the data?
- How timely are the data?
- How accessible are the data?

Toyota’s Facility Integrated Resource Management System

- Which data are being tracked?

The company utilizes utility pivot tables that track energy use, cost, and emissions data.

- How complete are the data? Does it at least cover large owned and leased properties?

Data are tracked for all significant energy use at all owned and leased properties.

- How timely are the data?

Data are within five minutes of real-time.

- How accessible are the data?

Data are searchable by facility type. Additionally, the energy data management system is linked with the Building Automation and Control Networks-compatible (BACnet) building automation systems.

Figure 8: Percent of Companies Tracking Energy Data

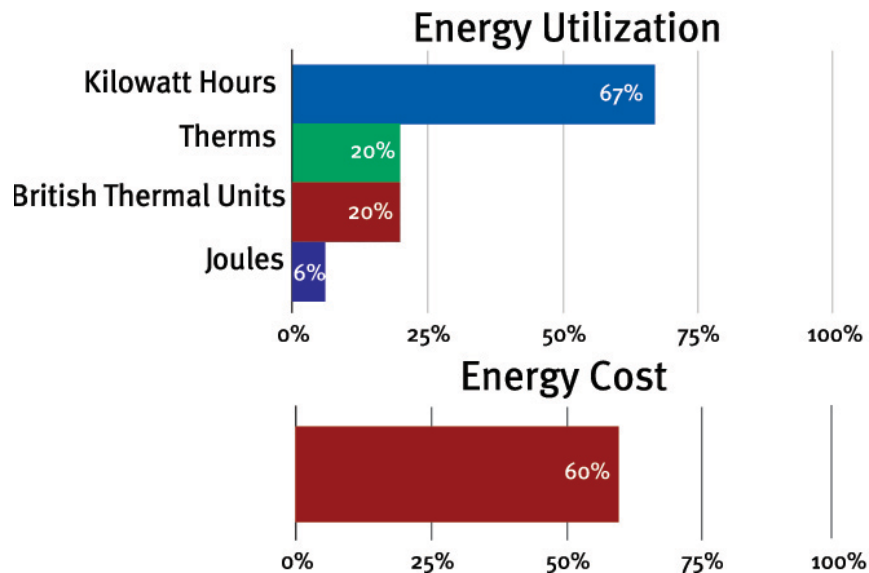


Figure 8 shows the percentage of respondents whose companies track each type of energy data.

Although the survey does not directly address each of these questions, case study data suggest that the leaders in energy management have only recently adopted tracking methodologies that allow them to remotely access a range of real-time, dependable data. Most companies, including some that have made significant progress on energy efficiency, have yet to develop a comprehensive energy data monitoring system combined with a portfolio-wide management program.

JohnsonDiversey, which built a highly efficient headquarters building and routinely incorporates energy efficiency throughout the real estate life cycle, collects and analyzes data centrally on only a small number of its buildings. This year the company is

attempting to gain a better picture of how it can track company-wide energy data, assess completeness of the data, and analyze the data with regard to set targets. This initiative is part of a wider effort to establish a company-wide carbon emissions baseline.

Utilizing Energy Data

Comprehensive and accessible energy data are rare, yet many companies are using the data they do have, however limited or incomplete it might be. Respondents identified several common uses for energy data, including creating operating budgets, diagnosing which facilities need energy efficiency improvements, and performing internal benchmarking. No more than approximately two-thirds of the companies surveyed are using any one

of the potential uses for energy data. This is not surprising given the state of energy tracking in most companies. Without understanding the answers to the data tracking questions presented in the previous section, it is difficult to utilize data effectively.

It is also informative to look at who is using energy data within an organization. Figure 9 presents the percentage of corporate real estate managers and facility managers who are using data to develop energy goals and establish energy use baselines. In both instances, the facility managers are more commonly using available energy data. Given traditional job descriptions, it is not surprising that facility managers more commonly use these data. Moreover, the patchwork nature of the data means that facility managers are most likely using these data on a facility-by-facility basis to develop energy baselines and goals.

Given increasing energy costs and the importance of sustainability initiatives, energy usage is becoming a strategic issue that corporate real estate managers need to be aware of. The nature of the corporate real estate professional's job, which includes evaluating a company's entire building stock and making strategic decisions on real estate that facilitate corporate competitiveness, typically puts that person in the best position to influence company-wide energy management.

In this role, the corporate real estate manager will become a more frequent user of energy data—utilizing these data to make informed decisions on appropriate

Figure 9: Percent of Companies Using Energy Data for Strategic Energy Assessments

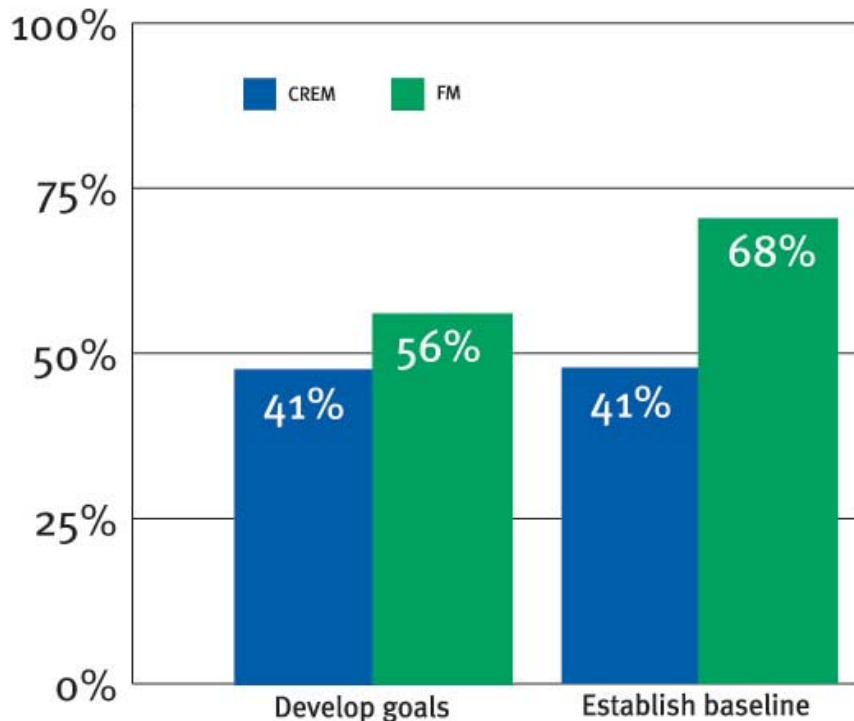


Figure 9 compares the percentage of corporate real estate managers who use energy data to develop energy goals and establish energy baselines to the percentage of facilities managers who use energy data for these purposes.

energy goals, which will inform future real estate decisions. Given the expertise of facilities management with analyzing energy data, a close partnership between facilities management and real estate management could facilitate the establishment of company-wide targets and policies.

Energy Efficiency Throughout the Real Estate Life Cycle

Programming/Requirements

Incorporating energy efficiency into planning and property selection requirements sets the tone for altering the nature of a company’s building stock. However, incorporating energy efficiency at this stage in the life cycle is uncommon. Only 30 percent of respondents in corporate real estate management and facilities management claimed to have included energy efficiency requirements into requests for proposals (RFPs).

Although relatively few companies include energy efficiency in the programming/requirements stage of the life cycle, this practice will probably become more common in the future. More than a quarter of survey respondents—real estate service providers, corporate real estate managers, and facility managers—said they believe that moving into energy-efficient buildings is a “very important” strategy to reduce energy costs in the short term. Forty-two percent of respondents said they believe that, in the long term, moving into energy-efficient buildings is a very important strategy.

Members of the development and investment communities had similar responses, confirming the growing demand for energy-efficient properties. If, as suggested, approximately 40 percent of companies surveyed purchased or leased properties with energy-efficient design, developers and landlords building and/or managing properties that failed to incorporate energy efficiency would experience considerable market pressure.

Design/Engineering

When a company decides to build new office space, smart building design and engineering can optimize energy efficiency within a specified budget. Figure 10 shows the distribution of respondents’ answers for required “payback” periods from energy efficiency investments

Toyota Puts Green Lease Provisions into Practice

When Toyota searched for 25,000 square feet of office space in Washington DC, the company included an environmental impact qualification attached to its RFP. The qualification, based on the LEED for Commercial Interiors rating system, placed emphasis on indoor air quality and energy efficiency. Additionally, Toyota included provisions within the lease for the right to sub-meter the space, purchase green power, use low-VOC-emitting materials during tenant improvement (TI) buildout, and implement a recycling program.

financed through a new facility capital budget. Of the respon-

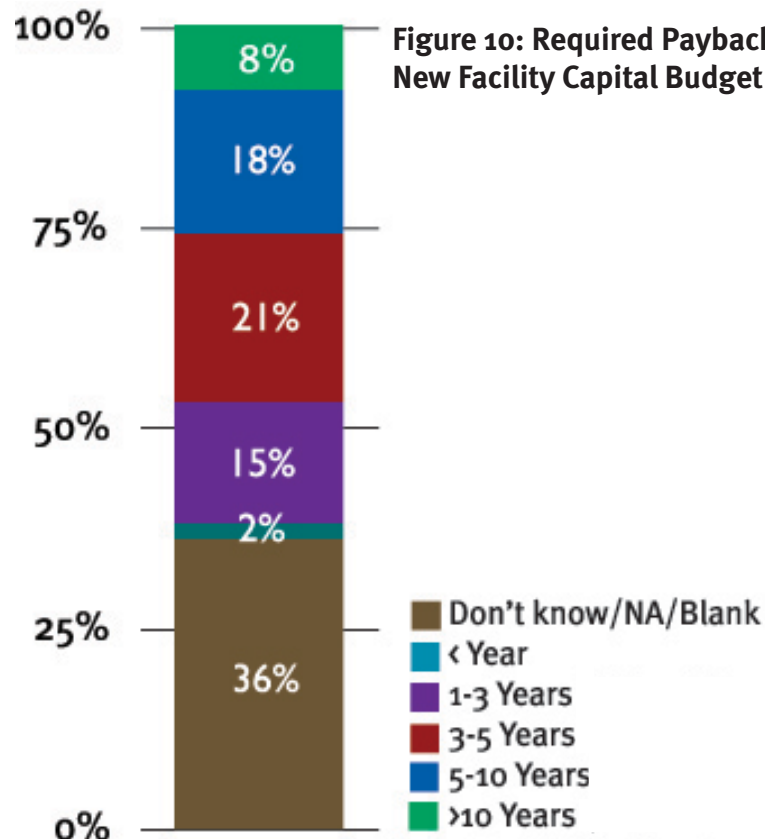


Figure 10 shows the percentage of respondents who selected a payback period for energy efficiency investments funded through a new facility capital budget.

dents who provided a payback period, most respondents noted a payback of greater than three years was acceptable. While longer payback periods may imply that greater levels of energy efficiency can be incorporated in new construction projects, it is important to consider the types of analyses a company is using to assess energy efficiency investments in new facilities. Typically, energy efficiency investments are evaluated during a “value engineering” process, which is, in most cases, a misnomer for simple cost-cutting. Individual investments that do not make the payback cutoff are typically “value engineered” out of the process. However, evaluating energy efficiency measures in isolation fails to recognize the integrated nature of these investments. When a design team considers eliminating a light shelf from a building design, the team should also consider the increased need for electrical lighting, as well

as the increase in lighting energy use over the life of the building. This will, in turn, necessitate an increase in the cooling capacity of the HVAC equipment on account of the increased internal heat gain. The net effect of all of these considerations will, in most cases, justify keeping the original light shelf.

Acquisitions/Leasing

Acting on the energy efficiency policies and requirements established during the programming/requirements stage occurs by carrying out pre-purchase/lease due diligence. Typical forms of pre-purchase/lease due diligence include analysis of utility bills, benchmarking energy costs, performing an energy audit, talking to prior users about the energy performance of a facility, identifying and testing energy-efficient equipment, and reviewing previous energy modeling analyses. Figure 11 provides a list of

these due diligence practices and the percentage of corporate real estate managers, real estate service providers, and facility managers that utilize these practices.

A significant percentage of respondents verified that their companies were not incorporating any of these due diligence strategies or they were unsure if these practices were being used. The most common due diligence practices involved identifying and verifying the working condition of energy-efficient features and benchmarking energy costs. However, all due diligence strategies have low adoption rates, and corporate real estate managers and facility managers seem to be less aware of energy efficiency due diligence than real estate service providers.

It is also interesting to note that facility managers are least likely to perform any of these due diligence activities. In most

Financing Energy-Efficient Buildings

Commercial lenders’ aversion to the novelty of energy-efficient design is often cited as a barrier to incorporating energy efficiency in new construction. But when corporate real estate managers, real estate service providers, and developers were asked about how borrowing costs for new construction that incorporated energy efficiency compared to borrowing costs for conventional new construction, the survey results painted a different picture. On average, 30 percent of respondents had experienced no difference in borrowing cost, 26 percent had experienced higher costs for energy-efficient designs, and 18 percent had experienced lower costs for energy-efficient designs (the remainder of respondents, 26 percent, answered “don’t know” or did not provide an answer).

Scott Muldavin, President of the Muldavin Group and Executive Director of the Green Building Finance Consortium²⁰, elaborates on current and future trends in commercial lending for energy-efficient building:

“Volatile and increasing energy costs have reduced lender aversion to energy-efficient design in recent years, but as the number and complexity of energy saving techniques/products has increased, the modeling of forecasted benefits, and ability of money sources to interpret such forecasts, has lagged. At the Consortium, we are working to improve the ability of lenders/investors to assess the reliability/accuracy of energy performance forecasts to ensure the lowest cost financing possible. If lenders are unsure of the benefits, or can’t reasonably assess the reliability of estimates, cost can increase, but more often the amount of loan will be reduced, or the reserve requirements increased, or other lender terms will be negatively adjusted. As forecasting models and the procedures to evaluate them improve, and borrowers learn to incorporate the growing availability of grants, rebates, and subsidies available to energy-efficient design, the 18 percent figure for respondents who experienced lower costs should increase dramatically.”

Figure 11: Percentage of Respondents Performing Pre-Lease Energy Efficiency Due Diligence

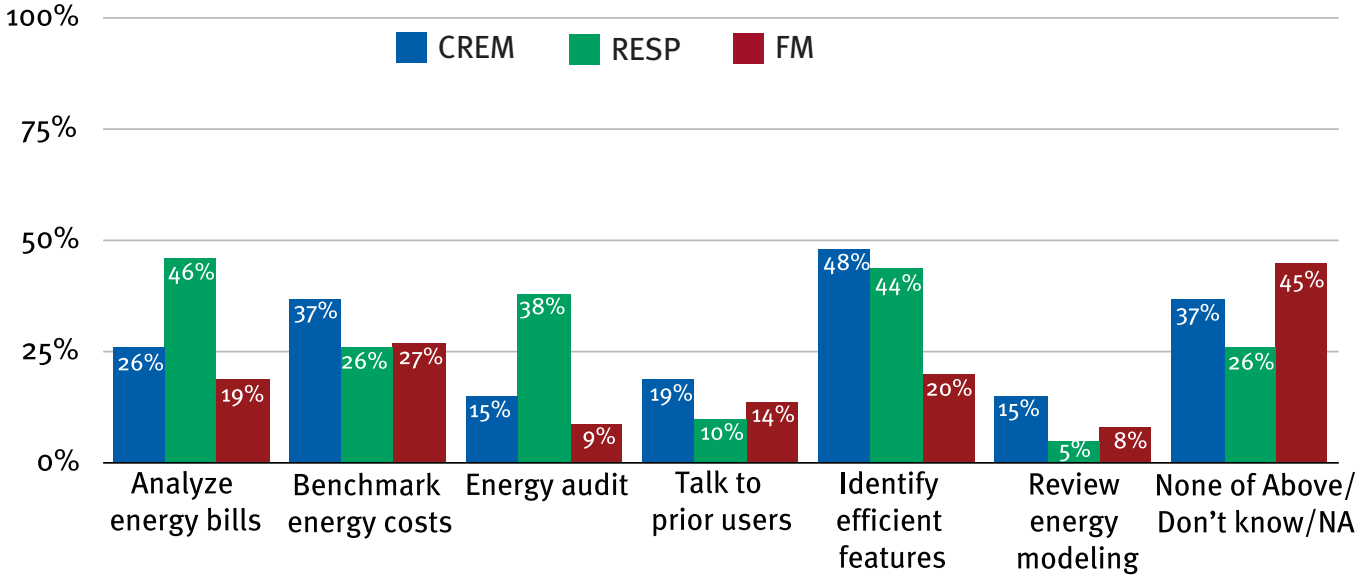


Figure 11 compares the percentage of corporate real estate managers, real estate service providers, and facilities managers who perform each type of action listed before leasing a property for their company or typical corporate client.

companies, facility managers have a wealth of knowledge concerning energy efficiency and building operation. These due diligence activities provide an opportunity for real estate managers to apply a facility manager’s knowledge and experience in energy efficiency to a prospective transaction.

Operations/Facilities Management

Optimizing building systems and equipment for energy efficiency

can result in significant operational savings. Respondents believe that strategies to improve energy efficiency through operations and facilities management offer the greatest opportunities for reduced energy costs when compared to a number of other cost reduction strategies.

Figure 12 shows that approximately two-thirds of respondents believe the tune-up of control systems and equipment repre-

sents a very important short- and long-term strategy for energy cost reductions. Similarly, improved housekeeping measures were also seen as very important by a large percentage of respondents.

Working with facilities management or real estate service providers can often produce a laundry list of low-cost/no-cost measures that result in significant improvements in building operation and energy cost savings. For some years now, Oracle has been focusing on finding low-cost/no-cost measures that can be implemented in its facilities. The result has been buildings that operate much more efficiently and produce significant cost savings with little or no capital investment.

Figure 12: Percentage Rating Facilities Management as Very Important to Achieve Reduced Energy Costs

	Short Term	Long Term
Tune-up of control systems/equipment (e.g., simple tweaks in bldg. management systems)	67%	72%
Improve housekeeping measures (e.g., switch off lights after hours)	62%	70%

Figure 12 compares the percentage of respondents who ranked each facilities management strategy as very important (6 or 7) for reducing energy costs in the short-term to the percentage ranking each strategy as very important for reducing energy costs in the long-term. Respondents were asked to rank each strategy from 1 (very unimportant) to 7 (very important).

At Oracle’s Reston 1900 facility in Virginia, an employee spent just a few hours studying energy use data and identifying the following opportunities for improved operation:

- Morning startup/evening shut-down optimization—eliminate

outside air during warm up;

- HVAC schedule fix—building was operating on a 24/7 schedule; and
- Lighting adjustments through de-lamping, schedule fix, and adjustment to motion sensors.

With no capital investment, the implementation of these practices led to \$51,000 in energy savings—in just the first eight months of 2006.

Typically, funding for finding and implementing low-cost/no-cost energy efficiency measures will come out of an operating budget. Respondents noted that these types of measures needed to have fairly short payback periods, with 25 percent of respondents requiring paybacks of one year or less and 42 percent of respondents requiring a payback of between one and three years. However, as the Oracle example demonstrates, there is no dearth of high-return energy efficiency measures that can be financed within an operating budget.

Although low-cost/no-cost opportunities may exist and many respondents noted the importance of finding these opportunities, budgeting structures may not allow these opportunities to be fully embraced. When respondents were asked what percentage of their company's energy cost budget was allocated to identifying and implementing low-cost/no-cost energy efficiency measures, more than a quarter of the respondents did not know. As Figure 13 shows, of the remaining respondents who did know, most said their companies allocated a relatively small amount of the budget to identify and implement low-cost/no-cost energy efficiency measures. In-

Figure 13: Percentage of Energy Cost Budget Allotted to Identifying/Implementing Low-Cost/No-Cost Energy Efficiency Measures

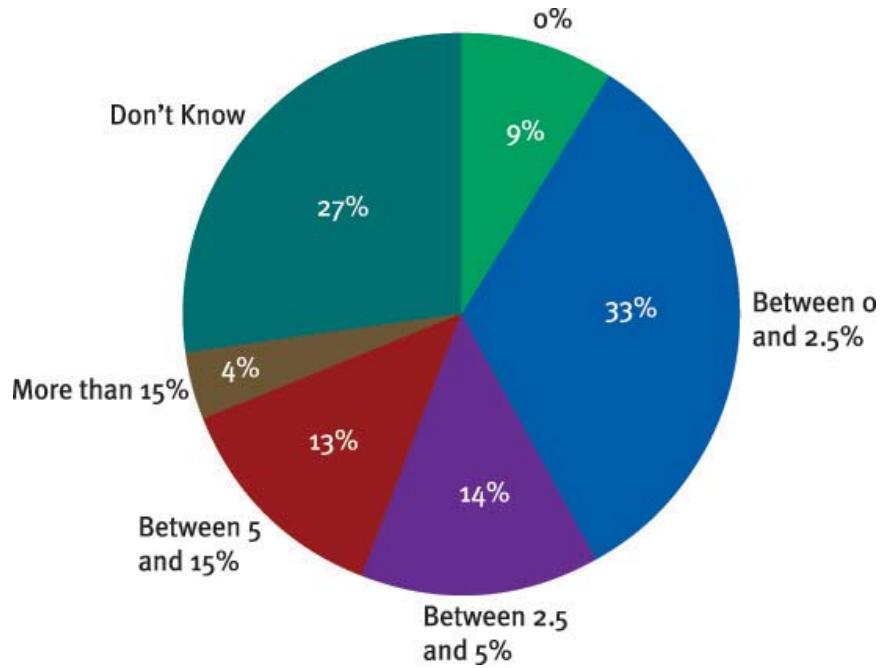


Figure 13 shows the percentage of respondents that selected the percentage range of energy costs that is devoted to identifying and implementing low cost/no cost energy efficiency measures.

ing the amount of time that can be spent finding these opportunities through budget allocations offers a significant opportunity.

Retrofits

Incorporating energy efficiency into renovations, upgrades, and

equipment replacement can result in ongoing improvements across the building stock. Although only about a third of respondents believed that retrofits represented a very important short-term strategy for energy cost reduction, 64 percent of respondents saw retro-

Figure 14: Change in Percentage Selecting Each Energy Efficiency Strategy as Very Important

	Long Term—Short Term %6 or 7 (very important)
Retrofit building systems	+28%
Move from high to lower energy use rated buildings	+16%
Improve housekeeping measures (e.g., switch off lights after hours)	+8%
Switch rate plans (short term) and locate facilities with lower electricity rates (long term)	+7%
Tune-up of control systems/equipment (e.g., simple tweaks in building management systems)	+5%

Respondents were asked to rank the importance of a series of strategies for reducing energy costs in the short-term and over the long-term, from 1 (very unimportant) to 7 (very important). Figure 14 highlights and compares how much greater the percentage of respondents ranking each strategy as very important (6 or 7) over the long-term is than the percentage ranking each strategy as very important in the short-term.

Table 3: Retrofits in Adobe Towers

Energy Efficiency Measure	Capital Cost	Annual Energy Savings	Payback Period	ROI
Motion Sensors for HVAC in all Conference Rooms	\$37,500	310,438 kBtu	8 months	140%
Reprogrammed Garage Lighting	\$55,267	76,713 kBtu	11 months	115%
Installed VFD on Chiller	\$65,000	87,265 kBtu	7 months	163%
Surge Protectors and Motion Sensors for each Office	\$104,750	148,498 kBtu	5 months	253%
Retrofitted Garage Lighting	\$157,775	312,254 kBtu	10 months	118%

Table 3 displays the characteristics of numerous energy efficiency retrofits that Adobe Systems carried out at Adobe Towers. Located in San Jose, California, Adobe Towers is the 989,358-square-foot (91,911-square-meter) headquarters of Adobe Systems.

fits as a very important long-term strategy. As Figure 14 shows, relative to other energy cost reduction strategies, retrofits are expected to grow the most, in importance, from short to long term.

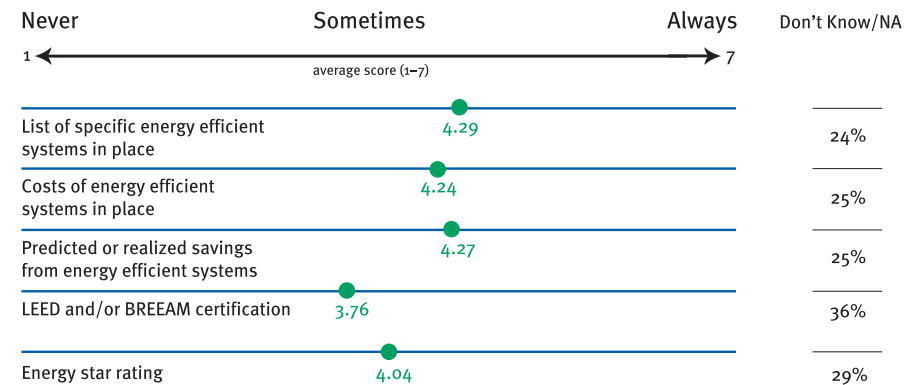
Respondents also noted that their companies accept longer average payback periods for retrofits than for energy efficiency measures financed through an operating budget. This provides more flexibility in selecting equipment that offers greater benefits in the future, but it may require a significant capital investment.

When Adobe Systems entered discussions with Cushman & Wakefield about improving energy efficiency at Adobe Towers, the discussion initially focused on finding low-cost/no-cost energy

efficiency measures. However, after earning the confidence of Adobe Systems through several highly successful efficiency measures, Cushman & Wakefield

turned its attention to finding profitable retrofit opportunities to maximize cost savings. Table 3 presents several of these retrofits.

Figure 15: Average Frequency that Energy Efficiency Information is Supplied to Appraisers



Respondents were asked to rank how frequently, from 1 (never) to 7 (always), they supplied an appraiser with each piece of information listed. Figure 15 displays the average ranking of the frequency that respondents supplied information on energy efficiency to their appraisers. The “don’t know”/N/A (not available) column shows the percentage of respondents that selected “don’t know” or N/A (not available) instead of providing a rank for this question.

Valuation

For proper valuation of energy-efficient buildings to occur, building owners must provide appraisers with the requisite information. Also appraisers need to be familiar with energy-efficient designs, the operational savings that can result from energy efficiency, and the demand for energy-efficient buildings.

Figure 15 indicates that energy efficiency information is sporadically supplied to appraisers. Additionally, a quarter of the

respondents didn't know if each piece of energy efficiency information described in Figure 15 was being supplied to appraisers. This suggests that respondents are often not involved in the appraisal process, and that few have thought about how the energy efficiency of a building might affect an appraisal.

When respondents were asked a follow-up question on the effectiveness of appraisers at including energy efficiency information, a

similar trend was found: no less than a third of the respondents answered “don't know” or were indifferent (answered “neutral”).

Barriers to Incorporating Energy Efficiency

Opportunities to incorporate energy efficiency into building design, operation, and retrofits have existed for decades. Scholars and practitioners alike have often been puzzled as to why these high-dol-

Incorporating Energy Efficiency into the Appraisal Process – From an Appraiser's Perspective

*By Theddi Wright Chappell, CRE, MAI, FRICS, AAPI, LEED AP
Managing Director of Advisory Services,
Pacific Security Capital*

Study results aptly reflect the overall state of the appraisal profession today relative to energy efficiency. While there is general recognition that energy efficiency practices and products are becoming more prevalent in the marketplace, there are limited empirical data on how these factors impact property value.

Research completed independently by the author and with the Green Building Finance Consortium indicates that owners and developers often do not provide appraisers with data sufficient to facilitate a thorough and objective assessment of both the costs and benefits of energy efficiency strategies. Too much reliance is placed upon “first costs” and payback periods, when the more relevant analyses that should be completed include lifecycle cost assessments and return-on-investment calculations.

Identifying the precise costs of energy-efficient components and the longer-term potential benefits is a major challenge for appraisers—again due to the limited amount of factual data readily available on this topic. Owners and developers need to take a much more proactive role in providing appraisers with in-depth descriptions of the overall goals and objectives of a building's energy plan. Appraisers need to educate themselves on the importance of early design and systems integration, “right-sizing,” building commissioning, and other issues unique to “high-performance” buildings.

At the recent Vancouver Valuation Summit in Vancouver, British Columbia, appraisers gathered from around the globe to discuss the challenges facing the valuation profes-

sion and its capabilities to appropriately assess and value sustainable properties. Leaders of the largest international valuation groups formally agreed to collaborate and share information on this topic to ensure their members are educated and brought quickly up to speed on the best approaches to incorporate environmental considerations into the appraisal process.

Presentations reflected a need to more appropriately incorporate objective assessments of the valuation implications of energy efficiency practices, particularly relevant to climate change issues. The case studies presented reflected the need to identify and evaluate the level of market recognition of, and demand for, strategies and building programs addressing various sustainability issues. A strong focus on risk mitigation was apparent—particularly regarding the potential for regulatory change and the perception of early obsolescence in buildings that are perceived as less efficient in systems and design.

Ultimately the discussion will revolve around the topic of risk and the role it plays in the valuation process. Risk being a primary determinant in the selection of discount and capitalization rates, the correlation between energy efficiency and risk mitigation will need to be established. If high-performance, energy-efficient buildings are perceived as “less risky” investments, this perception could manifest itself in a variety of ways—improved marketability, quicker absorption, better tenant retention, less rollover—all of which would typically enhance value.

Both the survey results and current market activity indicate the move toward high-performance energy-efficient buildings is no longer an “if.” It is now a “when?” and “how much?”

lar return opportunities have not been exploited by profit-driven entities. However, barriers often stand in the way of organizations attempting to incorporate energy efficiency. In 1992, Amory Lovins, cofounder of Rocky Mountain Institute, published a comprehensive account of some of the most important barriers to energy efficiency.²¹ This study, a follow-up to Lovins's 1992 account, utilized a focus group of corporate real estate professionals as well as a survey to update knowledge on barriers to energy efficiency. Many of the barriers initially identified in 1992 remain important today; however, new barriers have also emerged since the publication of the Lovins article. A comprehensive list of barriers was discussed by the focus group. The survey asked respondents about a subset of the most common barriers discussed by the focus group. Respondents confirmed that each barrier is moderately significant in blocking energy efficiency improvements. These barriers included:

- Difficulty of quantifying the value of energy efficiency investments;
- Lack of integrated design and whole-system thinking;
- No data to verify that building systems were sized appropriately;
- Inadequate commissioning, operating, and maintenance documentation;

- Lack of training and retraining of building operators;
- Appraisals that do not include energy efficiency;
- Split incentives between owner and tenant; and
- Short-term leases, discouraging energy efficiency investments.

It is worth noting that all barriers received an average score of “moderate importance” and no single barrier stood out as most or least important. This suggests that there are many small barriers that need to be overcome to achieve energy efficiency, but none of these barriers is insurmountable. The case studies section of this report provides examples of how companies are overcoming many of these barriers to make progress on energy efficiency.

Enablers to Incorporating Energy Efficiency

In the previous section, numerous barriers to incorporating energy efficiency were identified. When asked how effectively a subset of enablers would be at overcoming barriers to energy efficiency, respondents asserted that all enablers could be moderately effective. Similar to the barriers to incorporating energy efficiency, there doesn't appear to be one all-powerful enabler—rather, just a

variety of effective strategies that can be employed when needed. The enablers listed in the survey included:

- Involve entire company in mission-oriented energy program;
- Develop internal environmental metrics (e.g., energy use, carbon dioxide emissions, etc.);
- Insert energy efficiency demands into company's RFPs;
- Develop and employ user-friendly and inexpensive life-cycle cost tools;
- Identify keys to integrated design process early on (e.g., conduct goal-setting meeting with all participants);
- Monitor and verify building systems over time as building approaches full occupancy;
- Provide comprehensive operation and maintenance training for building staff;
- Specify energy efficiency in lease agreements;
- Require visibility for energy costs in lease agreements; and
- Create building energy ratings (e.g., AAA rating for highly energy-efficient buildings).

Although there is no single solution for overcoming barriers to energy efficiency, many different enablers exist to help your company achieve greater energy efficiency.



Success Stories: Real Stories, Real People, Real Buildings



The survey results give us insight into the current state of energy use and management in corporate real estate. The results also examine barriers that prevent greater energy efficiency in corporate real estate and discuss enablers that might help overcome these barriers. Currently, leading companies are already addressing these and other barriers and are moving aggressively to overcome them. Results from the survey suggest that the corporate real estate community is beginning to see what these leaders have already realized—there are solutions and technologies that exist today that could be implemented with minimum capital investment and with acceptable payback periods and rates of return to reduce energy consumption in corporate real estate.

This section presents a series of case studies that demonstrate leadership in the field of energy management in corporate real estate. The studies highlight effective strategies and measures ranging from low-cost/no-cost tune-ups to comprehensive, company-wide energy management policies that include aggressive targets and programs. It is clear that with the right approach and resources, almost any barrier can be overcome. The case studies were carefully selected to represent a broad range of building and ownership types, as well as geographic locations.

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- [Corporate Leadership and Data Management Key to Energy and Carbon Reduction Strategy at ABN AMRO](#)
 - [Developer-Tenant Collaboration Leads to Lean, Green Facility \(Herman Miller\)](#)
 - [Adobe: Outsource Energy Efficiency Upgrades and Reap the Benefits](#)
 - [Bank of America's NYC Skyscraper Aims for LEED Platinum](#)
 - [Peak Demand is Also Important \(Credit Suisse\)](#)
 - [LEED Platinum on a Government Budget \(Lewis and Clark State Office Building\)](#)
 - [Carbon-Neutrality in Reality \(Hawaii Gateway Energy Center\)](#)
 - [JohnsonDiversey: Institutionalizing Energy Efficiency for Continuous Improvement](#)
 - [Energy Efficiency Reaches Wall Street \(Goldman Sachs\)](#)
 - [New Building Leads to New Business \(Alberici\)](#)
 - [Integrated Design Key to Cost-Effective Energy Savings](#)
 - [Rocky Mountain Institute "Walks the Talk"](#)
 - [Toyota: Efficient Operations Translates into Efficient Buildings](#)
 - [Corporate Social Responsibility at Microsoft](#)
 - [Relocation Prompts Investment in Sustainability at Lafarge Cement UK](#)
 - [Century Prosper Center: Developers Seek Market Advantage with Energy-Efficient Buildings](#)
 - [Nokia: Introduction of Energy Management Program at Nokia China](#)
 - [Oracle: No-Cost Measures for Energy Savings](#)

Corporate Leadership and Data Management Key to Energy and Carbon Reduction Strategy at ABN AMRO

Corporate sustainability, widely acknowledged for the first time in the 1990s, typically uses the triple bottom line framework of economic, social, and “natural” capital to define company performance. Spurred by the Global Reporting Initiative and efforts by the World Business Council for Sustainable Development, sustainability reporting metrics and indicators are becoming more uniform and better defined every year.

However, within companies, mechanisms to collect data and create the proper metrics are struggling to keep up—especially in

the real estate sector. And, as the adage goes, “You can’t manage what you can’t measure.” While essential to effective management, collecting data on a global scale is no small task. Using data to inform strategic real-estate decisions adds another layer of complexity, often considered icing on the cake.

Bolstered by significant corporate leadership, international bank ABN AMRO has surmounted both of these challenges in its quest to reduce company-wide energy consumption by 10 percent by the end of 2008 (compared to 2004 levels).

Project Overview

ABN AMRO employs approximately 106,000 full-time equivalents in more than 4,700 buildings in more than 50 countries worldwide. While the majority of the company’s environmental impacts occur indirectly through financial investments, ABN AMRO recognizes that significant opportunities exist to reduce the company’s direct environmental impacts through influencing suppliers and optimizing internal resource use. The major, and perhaps most significant component of internal resource consumption, is the fossil-fuel energy used in ABN AMRO’s leased and owned properties.

To address company-wide building energy consumption, a pilot study was undertaken on 31 of ABN AMRO’s buildings (representing some 60 percent of the total office portfolio by size) to quantify costs and opportunities associated with energy efficiency upgrades.

This study, which led to the 10 percent energy reduction mandate from ABN AMRO’s Managing Board, revealed that meeting the 2008 energy reduction target could save the company some €3.5 million (US\$4.6 million) in energy

costs, with a commensurate reduction in carbon dioxide emissions.

Project Specifics

A variety of technical and behavioral changes are being implemented portfolio-wide to achieve the targeted energy savings, including equipment scheduling, resource optimization, and employee education.

At the headquarters building in Amsterdam, ABN AMRO partnered with NUON Energy to launch a natural district-cooling system for building air-conditioning. The system uses the cooling effect of naturally chilled water (8–10 degrees Celsius/46–50 degrees Fahrenheit) taken from 25–30 meters (82–98 feet) below the surface of a nearby lake. Without using the water itself, this system virtually eliminates the need for mechanical cooling.

This innovative solution will reduce energy consumption by some 1,715 MWh (5,851,580 kBtu) per year and allow ABN AMRO to avoid emitting some 640 tons of carbon dioxide per year. This represents a 70 percent reduction in carbon dioxide emissions compared to the emissions released through using traditional mechanical cooling systems.

The driving force behind all of the energy improvements at ABN AMRO is the implementation of a Global Energy Management and Carbon Dioxide Tracking System, which has the backing of corporate leaders. Managed by the Global Property & Facilities Management Services Team (GP-FMS), this tool allows the team to monitor real-time energy use and carbon dioxide emissions.

Using the management tool simplifies the collection and dissemination of energy data for use by facilities staff. Real-time and aggregated energy data are not only used to identify buildings where reductions are possible, but also to measure the effectiveness of efficiency upgrades before and after projects are completed.

ABN AMRO partnered with Energy Management Advisory Services (EMAS), an energy management company based in Leeds, England, for the phased deployment of the “non-invasive” web-based Global Energy Management Tool, targeting 35 key buildings in the first phase.

The schematic below shows how the system works. ABN AMRO uses

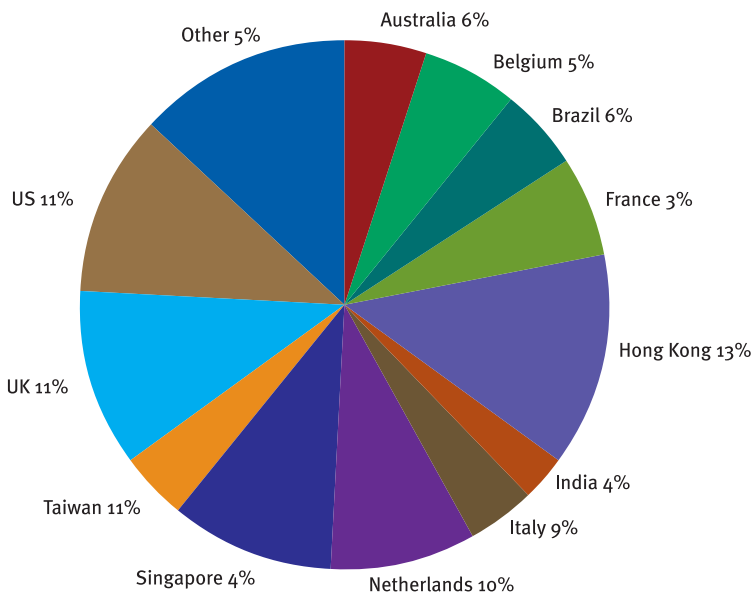
a “General Packet Radio Service” (GPRS) version of an iModem for remote sites where fixed connectivity is not an option, or where the buildings allow uninterrupted access for GPRS connectivity. Other connectivity options include telephone, broadband, and intranet. The system is capable of providing connectivity for up to ten electricity meters per iModem. The same interface types are used for meter connectivity as are used for the fixed network solution.

Using the tool, GPFMS is able to monitor and report on energy consumption for the global building portfolio and enable Regional Facilities Managers to monitor and target energy reductions across their regional building portfolios. Measuring actual energy use is vital in documenting progress toward the 2008 energy-reduction goal, and the energy-management system is crucial to providing these data.

Corporate leadership from senior management and a committed Global Property & Facilities Management Services Team is key to the success of ABN AMRO’s global energy-monitoring program.

Building on the success of current initiatives, ABN AMRO is continu-

Figure 16: Relative kWh Usage Per Seat



ABN AMRO Global Energy Profiles 2006

ing to roll out the global monitoring system in more and more of its buildings, and the bank is aiming to minimize the company’s energy consumption and carbon dioxide emissions as a response to climate change.

Barriers and Enablers

Barrier: Secure Commitment from Facility Managers

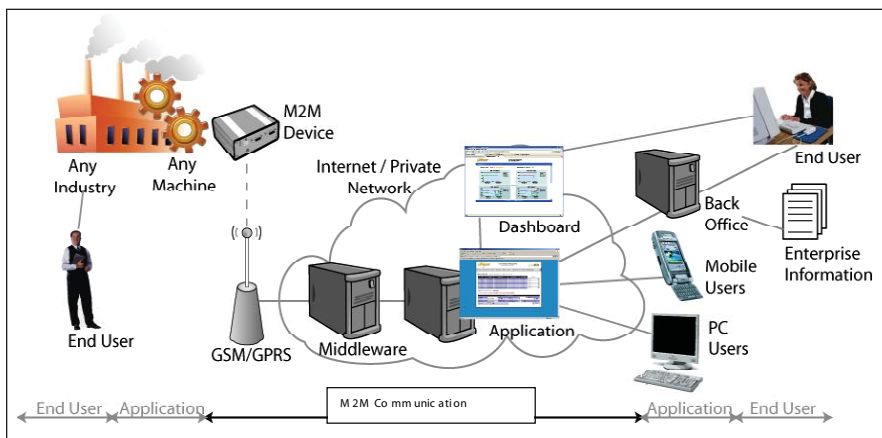
Enabler: When the energy target was first introduced in 2005, some facility managers were reluctant to volunteer their buildings for upgrades using the “there’s-no-room-for-improvement” or “we’re-already-performing-as-best-we-can”

arguments.

To overcome this barrier, ABN AMRO provided them with in-house energy efficiency “toolkits.” The main purpose of the toolkits—comprising of images, descriptions, and examples—was to stimulate facility managers to think innovatively and generate new ideas for how they could improve their buildings. The toolkit was complemented with openness and encouragement from the corporate building management group.

Building managers were encouraged to set their own energy targets above and beyond those set at the corporate level. This decentralized tactic of challenging each building manager to set his or her own standard is proving successful at ABN AMRO.

Figure 17: ABN AMRO Global Energy Management Tracking System Schematic



Barrier: Engage Employees in Behavioral Change Initiatives

Enabler: Employee behavior can have a considerable impact on building performance, yet engaging employees to make the behavioral changes can be challenging. ABN

AMRO is tackling this problem by including energy use reduction as part of employee engagement and awareness campaigns.

ABN AMRO has conducted a number of detailed pilot studies focused on increasing employee awareness and encouraging participation at a selection of its facilities in London, Paris, Amsterdam, and Istanbul.

The studies have shown that energy reduction initiatives incorporating employee behavioral change work best if they remain clearly focused. They need to be backed up by sound technical measurements—so staff can see clearly

the results of their actions—and they should preferably be tailored to individual buildings. As a result of these pilots, there have been several building specific and country-wide initiatives targeting energy reduction and other resource efficiency opportunities.

Barrier: Providing Sustainable Leadership and Vision

Enabler: A common barrier to energy efficiency in corporate real estate is a lack of leadership and vision. Whether it's employees, corporate facilities teams, or executive leaders, each sector must rise to the challenge and demonstrate a commitment and the capability to get everyone else on board.

At ABN AMRO, the Global Property & Facilities Management Team took on this role by establishing a clear, quantifiable, and achievable vision.

Not only did they create the vision, they also effectively communicated it to executive leadership to garner buy-in and company-wide support.

Furthermore, they empowered their team members with the proper tools and training to work toward the vision on a day-to-day basis.



Developer-Tenant Collaboration Leads to Lean, Green Facility

Completed in only six months for US\$89 per square foot (US\$958 per square meter), the Herman Miller Marketplace in Zeeland, Michigan demonstrates the effectiveness of informed stakeholders acting cooperatively and efficiently to build green. Working together with the Granger Group of Companies, Herman Miller was able to integrate its environmental agenda into building specifications from the start.



The building, which consumes 99.7 kBtu per square foot (314 kilowatt-hours per square meter) per year, will save Herman Miller US\$1million in operating, FF&E (furniture, fixtures, and equipment), tenant improvement, and churn costs over the life of the

seven-year lease. Open and airy, the building, praised for its flexibility and comfortable atmosphere, not only earned LEED Gold certification for new construction, but it was also named by the AIA as one of the world's top ten green projects for 2003.

Adobe: Outsource Energy Efficiency Upgrades and Reap the Benefits

Energy efficiency upgrades can produce high returns and need not tie up substantial amounts of upfront capital. By involving a building management company, many no- and low-cost investments can be identified and implemented, reaping large annual operating savings. After completing the no- and low-cost

projects, many companies, including Adobe, are motivated to continue upgrading facilities with more capital-intensive, longer life-cycle cost-saving measures. Positive results encourage corporate real estate and facility managers to make ever-greater investments in energy efficiency.

Project Overview

The energy efficiency upgrades at the Adobe headquarters in San Jose, California began in 2001 with the help of Cushman & Wakefield, a global commercial real estate brokerage and services company. During the subsequent five years, Adobe spent US\$1.2 million on 53 separate energy efficiency projects. Adobe is saving US\$1 million per year in reduced operating expenses and has to date received US\$349,000 in rebates as a result of the projects. These projects, prompted by high energy costs and the threat of forced power cuts during periods of peak electricity demand, have garnered attention from upper management, including Adobe CEO Bruce Chizen.

“Adobe is committed to continuing to employ the most advanced processes and the latest technologies to conserve energy and other resources, and to reducing Adobe’s total environmental footprint,” said Chizen. “Over the next several years, Adobe plans to implement the conservation practices that have worked for us so well at our headquarters buildings in Silicon Valley and in all of our facilities worldwide, and to achieve the Energy Star label and LEED green building certification for all of our buildings.”

Project Specifics

Worldwide, Adobe employs nearly 6,000 people who work in five owned and 66 leased properties—altogether totaling more than 2.5 million square feet (232,250 square meters). Clearly, these buildings represent significant opportunities for cost savings and reduced environmental impact. Currently, the portfolio of Adobe buildings uses 117 kBtu per square foot (369 kWh per square meter) per year on average. As the San Jose Adobe Towers demonstrate, reducing energy consumption is quite cost-effective. Before retrofits began, the 989,358-square-foot (91,911-square-meter) Adobe Towers used 167 kBtu per square foot (526 kWh per square meter) per year. Now, the buildings operate at 106 kBtu per square foot (334 kWh per square meter) per year. This translates to cost savings of more than US\$2 per square foot (US\$21 per square meter) per year. Today, the energy-intensive Adobe Towers, which include three data centers, 28 software labs, and chillers running 24-7 to cool them, operate with energy costs of US\$4.05 per square foot (US\$43.60 per square meter) per year. The reduction in energy consumption at Adobe



headquarters has not only resulted in cost savings; it has also reduced carbon dioxide output by 16 percent.

The projects completed at the Adobe Towers range from a US\$575 outlay for cooling tower staging to a US\$157,775 investment in energy-efficient garage lighting. Eleven of the 53 completed projects managed by Randy Knox III, Director of Real Estate Facilities and Security for Adobe worldwide, Tex Tyner, Facilities Manager for Adobe Towers, and George Denise, General Manager of Facilities for Cushman & Wakefield, are outlined in the table below.

Energy was not the only focus of the retrofit projects. In addition to energy-saving measures, many new water- and resource-saving features were incorporated into the Adobe Towers. Restroom

upgrades included the installation of waterless urinals and automatic flush toilets and the installation of automatic roll towel dispensers. The dispensers have microchips that write their own work order when towel supply is low. Outdoors, the landscape was redesigned to incorporate native vegetation requiring less water. All remaining watering systems were replaced with sub-surface drip irrigation systems with evapotranspiration controllers wirelessly linked to local weather stations. Indoors, employees were provided with “side-saddle” wastebaskets at workstations, allowing them to easily separate out organic waste (which can be composted).



Barriers and Enablers

Barrier: Competition for Capital

Enabler: Any project has to compete for capital. To date at Adobe, US\$1.2 million has been spent on 53 separate energy efficiency and related projects.

These projects are saving US\$1 million per year in energy costs and have received US\$349,000 in rebates. This translates to an 11-month payback and 115 percent average return on investment. Even to Adobe, with a 23 percent

Table 4: Energy Efficiency Projects at Adobe

Energy Efficiency Measure	Capital Cost (US\$)	Annual Cost Savings (US\$)	Annual Energy Savings (kBtu)	Annual Energy Savings (kWh)	Payback Period	Return on Investment
Modified Cooling Tower Staging and Sequencing	\$575	\$12,272	322,092	94,400	Immediate	2134%
Modified Boiler Control Programming	\$600	\$41,779	94,162	27,597	Immediate	6,963%
Corrected Chilled-Water Pump Controls	\$1,200	\$43,000	96,915	28,404	Immediate	3583%
Changed Corridor Lighting Override to Control and Program	\$4,500	\$27,327	717,229	210,207	2 months	607%
Added Real-Time Electric Meters	\$19,969	\$39,938	90,013	26,381	6 months	200%
Retrofitted Indoor Lamps	\$21,088	\$52,530	118,393	34,700	5 months	249%
Provided Motion Sensors for HVAC in All Conference Rooms	\$37,500	\$40,357	310,438	90,984	8 months	140%
Reprogrammed Garage Lighting	\$55,267	\$34,037	76,713	22,483	11 months	115%
Installed VFD on Chiller	\$65,000	\$38,719	87,265	25,576	7 months	163%
Provided Surge Protectors and Motion Sensors for Every Office	\$104,750	\$65,887	148,498	43,522	5 months	253%
Retrofitted Garage Lighting	\$157,775	\$138,544	312,254	91,516	10 months	118%

profit margin, a 115 percent return is very enticing. However, had Cushman & Wakefield approached Adobe at the start and asked for US\$1.2 million for energy efficiency projects up front, they feel confident they would have been turned down. Instead, Cushman & Wakefield began with inexpensive projects, the so-called “low-hanging fruit,” which in many cases were carried out by Adobe’s in-house staff. Cushman & Wakefield presented each proposal one at a time and provided a description of the project, the goal of the project, its cost, rebates if any, projected annual savings, payback, and finally return on investment. Once they had won Adobe’s approval, the firm completed the project and presented the successful results. If there was a rebate, they presented Adobe with the check in person. Cushman & Wakefield also kept a summary of all cost-saving projects showing cumulative costs, rebates, and savings with payback and return on investment in its monthly management reports. The result was that as Cushman & Wakefield documented each success, Adobe was more inclined to provide the consultants with funding for the next project. The more projects Cushman & Wakefield completed, the larger the cumulative numbers. This helped them win approval when they requested larger and larger amounts of capital as some of the later projects required (e.g., US\$178,000 for variable frequency drives for the main supply fan motors).

Barrier: Risk-averse Building Operating Staff

Enabler: The job of the building staff is to maintain a comfortable work environment, provide uninterrupted service, and address occupants’ problems. They were reluctant to take risks, and there was little incentive for them to reduce costs. As part of Cushman & Wakefield’s standard reports, the company provides Adobe with a quarterly supplier business review (SBR), which measures the energy projects’ performance against eleven key performance indicators (KPIs). Working with Adobe’s management, Cushman & Wakefield changed one of the KPIs to: “reduce electricity by a minimum of 10 percent over the previous operating year.” That was later modified to “maintain an Energy Star Label for all three campus buildings.” In addition, when Cushman & Wakefield started working toward LEED green building certification, they designed a bonus system that gave each employee a 1 percent bonus if they achieved certification and a 2 percent bonus if they achieved Platinum-level certification. This incentive prompted Cushman & Wakefield’s building engineers to step outside the box. Also, Cushman & Wakefield involved the building engineers as much as possible by having them give building tours and participate in photo and interview opportunities to establish ownership of mutual goals.

Barrier: Change-resistant Building Janitorial Staff

Enabler: The janitorial staffers in most buildings generally do their jobs invisibly. They are provided minimal supervision, and given little motivation to strive for excellence. From the outset, Cushman & Wakefield worked with the janitorial staff and introduced them to the green building concept and the rationale for green cleaning practices: less labor-intensive work practices for them, the chance to be on the cutting edge of their industry, and a healthier work environment for everyone. Cushman & Wakefield introduced the janitorial staff to the new equipment and methods (e.g., Green Seal chemicals, re-usable micro-fiber dust wipes and dust mops, and lightweight, high-filtration, ergonomic backpack vacuum cleaners). Cushman & Wakefield asked for two volunteers to try the new methods for two weeks and see what they thought—which they did. At the end of two weeks, Cushman & Wakefield suggested they return to the old cleaning methods and let other janitors test the new methods; however, the guinea pig janitors didn’t want to go back to the old methods. At that point, Cushman & Wakefield asked how many would like to adopt the new methods immediately. It was unanimous—they all wanted to adopt the new methods. Cushman & Wakefield held more extensive training for all the janitors and then held a graduation for them, inviting their families to attend. They were presented with framed certificates and served refreshments afterward. Clearly, the program has been very successful.

Bank of America's NYC Skyscraper Aims for LEED Platinum

Bank of America Corporation is partnering with the Durst Organization to construct a 945-foot-tall (288-meter-tall), 55-story office building in midtown Manhattan that will be one of the world's most environmentally responsible buildings when it opens in 2008. Designed by Cook + Fox architects, the 2.1-million-square-foot (195,090-square-meter) Bank of America Tower at One Bryant Park will serve as headquarters for the bank's New York operations. The building, which will be the first high-rise submitted for the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) "Platinum" designation, will include features such as:

- Higher ceilings for improved daylight penetration and light distribution, high-performance glazing, daylight dimming, and LED lights that will reduce energy demand;
- A 5.1-megawatt cogeneration plant that will produce electricity during the day and ice at night;
- An underfloor air ventilation system combined with floor-by-floor air handling units that will allow occupants superior comfort control on each floor;
- An air filtration system that will remove ozone, volatile organic compounds (VOCs), and 95 percent of particulates, and carbon dioxide monitors that will automatically adjust the delivery of fresh air; and



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- A graywater system that will capture and re-use rainwater and wastewater, saving 10.3 million gallons (39 million liters) of water annually and eliminating all contributions of stormwater to the city's wastewater system.

"We have an ingrained appreciation for our impact on and responsibility toward the environment," says Mark Nicholls, Bank of America's Corporate Workplace Executive. "That responsibility literally is written into our corporate DNA, as 'doing the right thing' is one of our enunciated core values.

"An organizational commitment to sustainable design is a natural byproduct of that culture," Nicholls added. "It is our intention to continue to pursue the viability of sustainable design or LEED certification on all new projects we undertake as a company. Our real estate practices can positively influence our impact on the environment, and we are committed to making all of our facilities environmentally sound."

Peak Demand is Also Important

Credit Suisse's U.S. headquarters on Madison Avenue in New York City recently incorporated 64 neoprene ice storage tanks. The tanks store ice produced during the night to chill water for cooling purposes for the next day. Nighttime ice storage is primarily a cost-effective, load-smoothing measure, heavily encouraged by utilities. By creating "coolth" at night during off-peak hours, Credit Suisse is able to significantly shave its peak load during the day. Because utility bills often comprise two components, electric energy use plus peak demand charges, reducing peak demand can be as cost-effective as reducing overall

energy consumption. Load smoothing reduces the number of new power plants being built (as existing plants are simply operating at higher capacity factors) and reduces the operation of the dirtiest, most expensive plants (which are typically run only during periods of high demand). Load smoothing thus has a significant impact on reducing carbon emissions, just as reducing overall energy consumption does.

By incorporating the ice storage units, Credit Suisse lowered the building's peak energy usage by more than 900 kilowatts and reduced operating costs by more

than US\$1 million per year. As part of the overall ice storage project, Credit Suisse also changed out and upgraded the entire chiller plant which added a great deal of efficiency and allowed the system to take better advantage of the free cooling periods from October through April. Bill Beck, Global Head of Engineering Services, states, "I feel strongly that when done right, thermal ice storage offers multiple avenues of energy and operational savings that positively contribute to a company's sustainability program by combining both cost and environmental savings."

LEED Platinum on a Government Budget

The Leadership in Energy and Environmental Design (LEED) rating system, administered by the U.S. Green Building Council (USGBC), is quickly becoming the standard for green building verification in the United States. LEED Platinum is currently the highest level of certification (above Certified, Silver, and Gold) awarded by the USGBC. As of 2006, there were only 24 projects that had been awarded LEED Platinum status across all LEED rating systems.

The Lewis and Clark State Office Building, located in Jefferson City, Missouri, houses more than 400 state employees who work for the Missouri Department of Natural Resources. The 120,000-square-foot (11,150-

square-meter) project, designed by BNIM architects of Kansas City, was successfully designed and constructed to serve as an environmental and financial model for future state buildings.

Integrated design, saving US\$85,000 to US\$92,000 per year in energy costs, was key to the US\$17-million project. Energy use of around 42 kBtu per square foot (132 kWh per square meter) per year was accomplished through proper orientation, climate-responsive architecture, extensive daylighting and shading, electric lighting controls, high-performance glazing, and underfloor air distribution. While additional funding was required for these energy efficiency measures, their combined load-



reducing effect allowed for a smaller, less expensive—and less energy intensive—HVAC system. Integrated design helped keep the project's capital cost on budget while significantly reducing operating costs and greenhouse gas emissions for the life of the building.

Carbon-Neutrality in Reality

As concerns about energy costs, climate change, and global warming continue to grow, measures to decrease gradually the energy consumed by buildings have been put in place, with the goal of creating a carbon-neutral global building stock. A carbon-neutral building obtains all of its energy from renewable energy technologies such as solar photovoltaics or wind turbines. This “carbon-free” energy can either be produced on-site or be obtained by purchasing renewable energy credits.

The Hawaii Gateway Energy Center (HGEC) is a US\$3.5-million carbon-neutral visitor center, designed by Ferraro Choi Architects and located on the Big Island of Hawaii. At 3,500 square feet (325 square meters), the center, which consumes only 8.5 kBtu per square foot (26.8 kWh per square meter) per year, produces more energy than it uses, via photovoltaic and fuel cell energy production. Optimal performance was achieved through efficient architecture, which took advantage of passive design strategies appropriate for the hot, humid, sunny climate.

The key design feature is a thermal chimney comprising copper roofing and void space, which exhausts hot air to draw in replacement air (12 to 15 air changes per hour) from the occupied space. The cool, fresh air is drawn into the occupied space via an underfloor plenum linked to a deep seawater cooling system. This unconventional system eliminates the need for mechanical HVAC equipment (except a small circulating water pump). The building also takes advantage of proper orientation to maximize daylighting, minimize heat gain, and achieve zero net energy use.



JohnsonDiversey: Institutionalizing Energy Efficiency for Continuous Improvement

The quest for energy efficiency does not end after designing a highly efficient building. JohnsonDiversey is continually devising and implementing efficiency improvements in the company's headquarters building, a facility designed to utilize 60 percent less energy than a similar building—

proving that cost effective energy efficiency opportunities exist in even the most efficient buildings. More importantly, JohnsonDiversey is working to institutionalize energy efficiency into the daily operations of its real estate and facilities staff.

Project Overview

In June 1995, JohnsonDiversey completed the programming phase for a new global headquarters building in Racine, Wisconsin. Within two years, the building, a combination of office and laboratory space, became a reality as staff moved into the building in August 1997. The final design and construction costs for the facility were 10 to 15 percent below the average for similar U.S. office and lab buildings. The building incorporates a variety of energy efficiency measures including underfloor air distribution, personal ventilation and temperature controls, an energy-efficient building envelope, building automation systems, and heat recovery systems. These features produced a building that uses approximately 73 kBtu per square foot (230 kWh per square meter) per year, 60 percent less than the energy use for similar code-compliant buildings.

Despite these successes, Stuart Carron, JohnsonDiversey's Director of Global Facilities and Real Estate, believed that more could be done to improve the performance of the headquarters building and further reduce operating costs. In 2003 and 2004 this belief led JohnsonDiversey to pursue LEED certification for Existing Buildings (LEED-EB).



The requirements for achieving LEED-EB provided Carron and his staff with a framework to structure a continuous improvement program. In Carron's words, "LEED-EB provides all the components we need to address building efficiency, indoor air quality (IAQ), procurement practices, and environmental performance that contribute to a healthy and productive workplace, as well as benefiting the environment in alignment with our corporate values and strategic objectives."

Rather than approach the demands of LEED certification as a one-time exercise, Carron institutionalized the LEED requirements so that they became a part of the staff's daily routines. In 2004, JohnsonDiversey successfully achieved LEED-EB Gold status, but the staff continues to utilize the LEED framework to find new and innovative ways to improve the energy efficiency of the building. Coupled with the LEED-EB framework, JohnsonDiversey's energy management program

incorporates feedback from external consultants and the company's local utility on energy reduction strategies.

Project Specifics

Technology improvements, efficient building management, and building usage changes create opportunities, even in highly efficient buildings, for reductions in energy use. JohnsonDiversey's energy management program started out as just a brainstorming session on energy reduction ideas, but it eventually evolved into a three-pronged program:

1. *Institutionalize LEED-EB into building operation.*

As outlined in the LEED-EB framework, JohnsonDiversey requires **continuous commissioning** of its building systems, which connects the three pillars of fundamental building maintenance: 1) the building operating plan documents how each building system is to operate, what schedule it should be on, and

what environmental condition it intends to produce; 2) the building automation system monitors equipment and environmental conditions, trends the data, and alerts the staff when items deviate from the desired conditions; and 3) the preventive maintenance program requires staff to regularly touch each piece of equipment and check its operation. Utilizing continuous commissioning preserves the useful life of the company's assets, ensures that the desired energy efficiency is achieved, and eventually provides a road- map for capital replacements and upgrades. It has become second nature for the facilities managers to consider energy efficiency and LEED requirements when replacements or upgrades are needed. For example, the headquarters building was having problems with its bag

filtration system on the outdoor air intake ducts—they tended to collect water and humidity, leading to system alarms and occasional shutdowns. The facilities management crew, with an understanding of LEED requirements, felt that a higher level of filtration efficiency (MERV 13) could be used in place of the older filtration system. After testing a new filter system, they found a surprising quadruple win for JohnsonDiversey and the environment. The new structured filter system: 1) met LEED requirements and improved indoor air quality (IAQ) with greater filtration efficiency; 2) eliminated the operational problems that the old bag system experienced; 3) actually reduced the fan energy consumption by providing greater surface area; and 4) reduced the solid waste stream since the new filters will last

two to four times as long. The filter system upgrade produced savings of US\$7,333 per year and had a payback period of 2.03 years. The retrofit, spurred by operational problems yet guided by LEED, resulted in less energy use and waste, smoother operations, and improved IAQ.

2. *Collaborate with the local utility.*

The local utility provides energy analysis free of charge, and it offers high-level ideas for efficiency improvements and the incentive programs for funding them. The utility incentive programs motivate building owners and operators to look at energy efficiency as a primary goal of any retrofit. One-for-one replacements in kind become unacceptable practices unless the energy analysis proves it to be the best choice. The 2006 review by local utility WE Energies

Table 5: Energy Efficiency Measures at Johnson Diversey

Energy Efficiency Measure	Annual Cost Savings (\$)	Annual Electricity Savings (kWh)	Annual Gas Savings (therms)	Total Annual Energy Savings (kBtu)	Demand Savings (kW)	Simple Payback
RCx Summer Gas Use	\$18,742	0	16,000	1,600,000	0	4 months
Supply Air Temperature Reset	\$17,088	(59,944)	16,915	1,486,970	0	1 month
Finer Zone Lighting Control & Schedule	\$12,321	270,974	0	924,563	0	3.2 years
Increase Office Light Dimming Capability	\$7,555	73,485	0	250,731	30	8.4 years
Static Pressure Reset	\$4,737	104,188	0	355,489	0	5 months
Dim or Eliminate Architectural Shelf Lighting	\$3,680	36,982	0	126,183	14	2.7 years
Occupancy-based VAV Controls	\$3,294	17,777	2,122	272,854	0	1.5 years
Daylight Controls in Stairwells	\$744	12,864	0	43,892	1	3.5 years
Additional Occupancy Sensors	\$466	10,257	0	34,997	0	17.9 years

produced a 60-page detailed report with 32 cost-saving ideas. Twenty of the ideas included possible incentives from the various utility and State energy efficiency programs. The ideas ran the gamut, from lighting retrofits to demand-controlled ventilation (DCV) to electric tariff structure changes. About half of the recommended ideas were selected by JohnsonDiversey for additional evaluation.

3. *Utilize external energy consultants to provide energy efficiency analysis and ideas.*

Based on the energy assessment report provided by the local utility, JohnsonDiversey hired energy consultants to produce a detailed review of energy usage, propose specific projects, and complete the financial analysis to support them. The consultants confirmed that “The facility is equipped with very efficient energy systems... T8 lamps and electronic ballasts, an automatic daylight harvesting system dims lights in areas with large amounts of glazing... design includes a number of the best practices promoted by the Labs 21 (program), including variable flow exhaust and heat recovery....” Despite this finding, the consultants were able to build on the local utility idea list with detailed analysis and several recommendations for energy efficiency projects which could pay back in three years or less (see table on previous page). JohnsonDiversey is now considering the range of options presented by the consultants to improve further its already efficient facility.



Additional ideas and programs that have come out of the ongoing energy management program include: 1) team cleaning, which allows one floor of the facility to go dark six hours before the rest; 2) opportunities for energy savings through water use reduction, recommissioning, and operating schedule changes; and 3) staff education about LEED and smart building technology that leads staffers to ask questions and demand answers on equipment issues. For JohnsonDiversey, its energy management program, with a continuous improvement approach that considers both operating and technology advancements, results in lower energy bills and lower exposure to volatile energy markets.

Barriers and Enablers

Barrier: Resistance to Change Among Facilities Management Personnel

Enabler: Facility engineers and building operators are generally risk averse and good at what they do. Occasionally, this combination of characteristics leads facilities managers to approach significant change with a healthy dose of skepticism. Facilities managers perceived JohnsonDiversey’s LEED-inspired energy management program as a significant change. The program asked facilities managers to change

the way some things were being done *and* document their activities. Resistance to change has been overcome by embedding the LEED-EB requirements into the facility management program in such a way that it is now viewed as the company’s continuous improvement program for facility management.

Embedding the requirements was a challenge, since many viewed the achievement of LEED-EB certification as a one-time project or event that, once completed, didn’t have to be followed or improved upon. To change the facility management team’s mindset from a one-time effort to an ongoing program, JohnsonDiversey used a mix of continuous training and collaboration. At JohnsonDiversey, training on LEED and energy efficiency programs using webcasts is popular and cost-effective. The webcasts also help connect the workforce with common objectives and provide a forum for sharing ideas.

The company reminds everyone that within five years it must seek LEED re-certification, and it is the company’s plan to achieve re-certification within three years. So JohnsonDiversey adopted a program of quarterly reviews with reports, where the key players

(facility manager, maintenance manager, and housekeeping manager) sit down and collect the documentation necessary for the re-certification process. This affords the opportunity for idea and best practice sharing, and keeping score provides camaraderie around the idea that improvements can always be made. Recognition of contributions is also used to motivate employees. For instance, when JohnsonDiversey received its LEED certificates from the U.S. Green Building Council (USGBC), the company gave framed versions to each of the key staff involved.

Barrier: Lack of Clarity About Corporate Energy Efficiency and Green Building Goals

Enabler: JohnsonDiversey has a long history of sustainable business practices and achievement, but facility certification was never really on the radar screen as important to the business or integral to the company's leadership objectives. Even after recent efforts at the company's headquarters building to implement LEED-EB and improve

energy efficiency, the message about green building and energy efficiency largely hadn't left the confines of headquarters.

In 2006, when JohnsonDiversey decided to construct a large industrial facility in the United States, the supply chain personnel were unaware of the corporate goals surrounding LEED or how to define a "green" building. Speaking about "green" building was like speaking a foreign language. Thus, education was needed to align the corporate objectives to the project team's goals. Stuart Carron's team at headquarters recognized that one of the project team's goals was to create a facility that achieved "higher performance" in its distribution operations, and the project team established specific metrics around this idea. Carron's team started talking about "green" building design and construction in terms of higher performance, dropping the word "green" from the conversation. Carron and the project team discussed opportunities to lower energy cost, reduce water usage, create a better

work environment, and set up systems that would maintain these efficiencies over time.

The group set a target of being 30 percent better than a standard code-compliant building, which translated into annual savings of more than US\$50,000 and one-time incentives from the State utility program of more than US\$75,000. Setting metrics in these areas resonated with the operations people since they are accustomed to measuring results. Only after receiving buy-in for these performance metrics did the team start to discuss using LEED as the framework for achieving results. Subsequently, the project team has fully embraced the "green" building approach, and is excited about achieving third-party recognition of sustainable design, expected in late 2007. The key enabler for overcoming the lack of understanding about what "green" is and does was to talk about it in terms of "high-performance," using metrics aligned to operations goals for reducing costs and improving productivity.

Energy Efficiency Reaches Wall Street

Energy efficiency is showing up on Wall Street's radar screen. Investment banking giant Goldman Sachs made a commitment to invest up to US\$1 billion in renewable energy and energy efficiency projects. Goldman Sachs is also pursuing opportunities to green its own facilities. Its 1.5-million-square-foot (139,350-square-meter) Jersey City, New Jersey facility was LEED certified, and its new downtown Manhattan headquarters is being designed to use 25 percent less

energy than a building of similar size and type. "Goldman Sachs recognizes that an effective environmental policy must first begin with a focus on minimizing the impact of our own operations," said Michael DuVally of Goldman Sachs. "Accordingly, we will make efforts to ensure that our facilities and business practices adopt leading-edge environmental safeguards."

New Building Leads to New Business

In the design and construction of its LEED-NC Platinum corporate headquarters in St. Louis, Alberici Corporation, a Midwest-based global design, construction, and management company, also designed and constructed a

new business unit—Vertegy. Launched in 2005, Vertegy was created to provide Alberici's broad client base with the opportunity to reap increased value and reliability from the incorporation of sustainable design strategies.

Thomas Taylor, Vertegy founder, states, "True sustainability is the correct application of strategies which result in a higher value end product for the building owner." This is certainly true of Alberici's headquarters building, which cost \$137 per square foot (US\$1,474 per square meter) and has a total energy consumption of 31.1 kBtu per square foot per year (98 kWh per square meter). Situated on 13.6 acres (5.5 hectares), the partially re-used structure features energy-saving measures, including high-performance windows, solar hot water heating, a 65-kilowatt wind turbine, a rainwater harvesting system, operable windows, and an advanced building management system. Together these upgrades cost US\$540,000 and save US\$78,000 per year in operating costs for a 7.7 year payback and 14 percent return on investment (based on 2004 US dollars).

The project was prompted by a decision to create a new space in lieu of expanding Alberici's existing facility to accommodate company growth. Project goals were both financial and strategic. Alberici sought to stay within the pre-set budget while transforming a circa-1950 office building and large metal fabrication plant into class-A office space. Alberici also strove to incorporate long-term thinking and to avoid saying "I wish we would have thought about that" twenty years down the line. Lastly, a desire to convey innovation, collaboration,

and corporate responsibility drove project decisions.

While the design and finances of the project were successful, the initial operation did not meet expectations. To reconcile the problem, the team integrated an advanced energy management system with a measurement and verification protocol into the design of the building. The term "design of the building" is often referred to as just that, the design. However, the team realized that the design of this building had to include a way to monitor the performance of the building and it had to allow for operational enhancements over time. In other words, the design included the operation of the building long after the delivery team had completed its task. The information collected through the advanced energy management system was used to formulate a plan to adjust operating parameters and to educate the building manager about how to improve the efficiency of the building. While it has taken almost two years to get the building to operate as intended, the building team has learned a lot in the process and can now inform others how they might improve the performance of their buildings.

Currently, the facility manager, along with other parties involved in the mechanical design and operation of the building, are constantly reviewing data from the building's measurement and

verification system. The team constantly strives to meet and surpass design efficiency goals.

As a byproduct of the Alberici Corporate Headquarters project, project manager Thomas Taylor won the support of project champion John Alberici to start a new sustainable consulting firm called Vertegy. The project not only stimulated the new consulting arm, but also influenced corporate environmental policy and employee behavior at Alberici. Waste reduction plans and company-wide recycling programs were instituted, while communal resources including common storage, a healthy cafeteria, and outdoor walking paths were provided. The building was not only cost-effective, but is well-used, well-operated, and has increased in valuation since its construction.

Alberici Redevelopment Company, the owner of the Alberici headquarters building has not had the building appraised since the time of completion, so data are not available on current commercial value. However, when the company was working with bank appraisers to establish a conversion rate from a construction to a fixed-asset loan, they found that the green attributes of the building increased the conversion rate from 82 to 90 percent. This increase in the conversion rate equated to a lower out-of-pocket expense for the construction of the project.

Integrated Design Key to Cost-Effective Energy Savings

Integrated building design considers relationships among building systems in order to optimize building performance. It recognizes that high levels of sustainability cannot be achieved by simply selecting options from a menu of energy efficiency strategies. To achieve optimum performance, energy efficiency strategies must be modeled and analyzed collectively, not independently. When strategies are analyzed as isolated projects, opportunities for synergistic relationships are often overlooked.

A project such as upgrading an inefficient chiller that may have a three-year payback when considered in isolation could have a five-month payback when coupled with load-reducing strategies such as high-efficiency lighting or high-performance glazing.

Combining a lighting retrofit and high-performance glazing with a new smaller chiller might have the same capital cost as a larger chiller sized for the original larger load (because the size, and thus cost, of the new chiller is greatly reduced as a result of the load-reducing strategies). However, the three-part project that combines the lighting and glazing with the chiller upgrade will achieve significantly greater energy savings and have a much shorter payback period—perhaps even a reduced capital cost.

Integrated design creates opportunities for significant energy and cost savings. Building components do not function independently and cannot be analyzed as though they did.

Rocky Mountain Institute “Walks the Talk”

Founded by Amory and Hunter Lovins in 1982, Rocky Mountain Institute (RMI) is an entrepreneurial nonprofit think-and-do-tank that works with corporations, design professionals, governments, communities, and citizens to help them solve problems, gain competitive advantage, increase profits, and create wealth through productive use of resources. Designing energy, resource, and economic efficiency into RMI’s new Boulder office aligned well with RMI’s mission and gave the company a chance to “walk the talk.” Motivated by the need for additional space, RMI strategically aligned with Morgan Creek Ventures, a local developer, to rehabilitate an existing building located only a block away from Pearl Street, a pedestrian mall in downtown Boulder. RMI’s Built Environment team worked with Morgan Creek on the interior design, daylighting strategies, and materials selection. In September 2006, the 2,700-square-foot (250-square-meter) space received the

first LEED-CI Platinum (v2.0) designation in history.

The energy-efficient office space boasts superior indoor air quality, excellent lighting quality, and reduced water usage. An open office floor plan, which allows light from south- and west-facing windows to illuminate 75 percent of regularly occupied space, along with the installation of T5 HO lamps, dimmable ballasts, and photocell and occupancy sensors, reduces energy consumption for lighting by 70 percent. All remaining energy use as well as employee travel is 100 percent offset through the purchase of renewable energy certificates. Water-pressure-assist technology in toilets and waterless urinals minimize wastewater volumes, while 0.5-gallon-per-minute (1.9-liters-per-minute) water faucets with solar-powered on-off sensors help reduce overall water use by 54 percent. An underfloor air system improves thermal comfort, giving each occupant control of his or her individual environment.



MICHAEL MYERS

Lastly, carefully chosen sustainable materials such as marmoleum, wheat board, sorghum and sunflower board emit very low levels of volatile organic compounds and other toxins. These materials offer improved indoor air quality and a healthier and more productive workspace. Future improvements will include the addition of interior light shelves, an acoustical system, and a rooftop photovoltaic system.

Toyota: Efficient Operations Translates into Efficient Buildings

Energy efficiency is not merely a function of good engineering and design. More frequently, energy efficiency is achieved through rigorous operations and maintenance. Toyota is a leader in both the automobile industry and the green building industry as a result of operational efficiency,

rigorous accountability, and, of course, cutting-edge technology. Toyota Motor Sales U.S.A., Inc.'s new LEED Gold Vehicle Distribution Center (VDC) is the latest example of its long-standing strategic commitment to enhanced environmental performance.

Project Overview

Started in 2003, the 98,000-square-foot (9,105-square-meter) Toyota Port of Portland Oregon Vehicle Distribution Center (VDC) was completed in January 2005. The project was motivated by the expiration of an existing lease, the need for a bigger facility, and the US\$300,000 annual (and growing) repair and maintenance bill for the existing building. The new building is located on an 86-acre (35-hectare) property alongside the Willamette River near downtown Portland, closer to dock and rail services than the old facility. The warehouse receives and coordinates delivery of vehicles to dealerships across North America. The new US\$40-million project, partially financed by the Port of Portland, reduced Toyota's energy costs from US\$221,845 to US\$189,125 per year, even though the new facility processes more vehicles per year and is 100 percent powered by wind. This translates to a 26.3 percent reduction in



energy consumption from 127 kBtu per square foot (401 kWh per square meter) per year at the old facility to 93.8 kBtu per square foot (296 kWh per square meter) per year during the first year of operation at the new building.

Toyota's company-wide Global Earth Charter along with the Real Estate & Facilities Department's (RE&F) Process Green Initiative guided the project, providing clear top-level support for capital investments

Healthy working environment

in energy efficiency. The Earth Charter, developed in 1992, outlines policies documenting Toyota's environmental attitude and actions. The Charter is supported by a number of five-year Environmental Action Plans, which provide specific environmental goals and targets. The "Process Green" initiative, developed by the RE&F Department, requires the development of an environmental strategy before any new facilities project is undertaken. At the Portland VDC project, the three principles of Process Green—"Procure," "Participate," and "Pay it Forward"—were incorporated early on, providing the greatest opportunities for energy efficiency.

Project Specifics

At the new Toyota Motor Sales VDC building, energy consumption has been reduced by 33 percent and water consumption

The three principles of "Process Green" are:

PROCURE and use resources in the most environmentally intelligent, cost-effective, and reliable manner possible;

PARTICIPATE in public, private, and professional organizations to share knowledge and accomplishments; and

PAY IT FORWARD to affect a similar shift in the organization and culture of our business partners.



Water efficient landscaping

by 75 percent compared to a typical building of the same size and function. Energy savings were accomplished through the use of efficient HVAC systems, occupancy sensors, skylights, and energy-efficient fluorescent lighting along with high-performance glazing and insulation. A heat-recovery system captures waste heat exhausted from the process shop to heat incoming fresh air.

Also, quick-closing process doors and demand-control ventilation were used to help reduce energy use. Lastly, a busway power utility distribution system was introduced to minimize redundancy while providing processing flexibility for electrical power usage. The dramatic reduction in water use was achieved through the use of rainwater harvesting, low-flow faucets, and the elimination of a permanent irrigation system.

The project encountered numerous design barriers along the way. On the energy side, modeling energy reductions proved challenging given the high energy intensity of a vehicle-processing environment. In spite of the fact that the design case building had significantly higher than typical operating requirements

for lighting, ventilation, and power utility requirements, the building still achieved a 33 percent reduction in annual energy costs as compared to the base case, code-compliant building. The waterfront location of the industrial site encouraged collaboration with the Port of Portland, the Army Corps of Engineers, and local environmental groups. A bioswale was established along the river, which provided water quality treatment, yet further stressed the long, narrow shape of the site. Managing construction-waste diversion and the incorporation of local, low-VOC-emitting, yet highly durable, materials also proved challenging.

The real value of Toyota's new energy-efficient LEED Gold building is in its continuously

Example Portion of Natural Resource Treasure Hunt Report

Original Situation	Proposed Fix	Annual Energy Savings (kBtu)	Annual Energy Savings (kWh)	Cost Savings (US\$)	ROI
Manual On/Off Office Lighting	Provide Occupancy Sensors	46,062	13,500	\$1,700	31%
Inefficient Elevator Cab Lighting	Replace 30 R20 Lamps with LedTronics MR-11 LED	14,794	4,336	\$540	21%
Inefficient Exterior Door Lighting	Replace Downlights with Fluorescents	5,677	1,664	\$207	207%
Overlit Task Areas	Remove Two Lighting Fixtures	3,944	1,156	\$144	144%
Canopy Lighting Excessive for Task	Remove One Lamp from Eight Fixtures	3,824	1,121	\$140	140%
Ineffective Architectural Lighting	Disable Uplighting Fixtures in Phone Booths	1,521	446	\$55	55%

The purpose of Natural Resource Treasure Hunts are to use all of Toyota Real Estate & Facilities' and Roy Jorgensen & Associates' natural resource experience to identify energy cost saving ideas and increase awareness of natural resource preservation.

improved operation. Toyota has rigorous operations and maintenance teams constantly seeking energy-saving opportunities. Through Toyota's unique Facility Integrated Resource Management (FIRM) program, operations and maintenance teams track and evaluate energy use through real-time utility meter monitoring, building automation systems, utility pivot tables, project justification forms, measurement and verification reports, and treasure hunts.

Barriers and Enablers

Barrier: Vague Project Goals and Unclear Communication

Enabler: Toyota tackled this barrier from the outset, kicking off the project with an eco-charrette. The charrette brought together all of the key project players to outline goals, devise strategies, and identify potential blockades. Following the charrette, each team member was armed with the appropriate knowledge and tools to carry out his or her project responsibilities. This transparent process proved successful for both project managers and team members, and also permeated communications with Toyota employees, the local community, and the government. Early on, Toyota not only acknowledged Portland's commitment to social responsibility and environmental quality, but also sought to contribute to the City's mission. In restoring 4,500 feet (1,371 meters) of waterfront along the Willamette River, Toyota planted more than 10,000 native shrubs and 500 native trees, converted 7.6 acres (3 hectares) of pavement into permeable landscape, and shielded the surrounding neighborhood and river from industrial activities.

By incorporating more than energy efficiency into the project, Toyota reduced local opposition and was recognized as a local environmental leader.

Barrier: Insufficient Energy Management Systems

Enabler: All too often, building managers are presented with a building to manage, operate, and improve without the necessary tools or training. At Toyota, the Facility Integrated Resource Management (FIRM) program provides building managers with the intellectual capital to make informed decisions about energy management and upgrades. The FIRM program has several components, including real-time utility meter monitoring, building automation systems, utility pivot tables, project justification forms, measurement and verification reports, and treasure hunts. This integrated program provides web-based real-time monitoring of utility meters, allowing building managers to "view" energy usage within five minutes of the real time. The Energy 1st software used relays information that includes peak demand and hour-by-hour natural gas consumption for any connected meter. It also allows the user to set "energy alarms," alerting building managers to excessive energy demand or consumption. The FIRM program also includes Building Automation and Control Networks-compatible (BACnet) building automation systems, which allow building operators to manage properties in the most energy-



Energy Star roof

efficient manner while still meeting the user's operational requirements. Another component of the program are the utility pivot tables, which track energy usage, costs, and emissions. These portfolio-wide tables, easily searchable by facility type, form Toyota's database for all energy-related information. Also, before any new project is initiated, an Energy Efficiency Project Justification Form, which constitutes a financial evaluation, must be completed. After the project is completed, an Energy Project Measurement & Verification Report is done to confirm the project's performance against the original energy efficiency projections. Lastly, treasure hunts provide an opportunity for a team of operations and maintenance professionals to visit a particular facility and over the course of 3–4 days evaluate energy savings opportunities and recommendations. Combined, these efforts provide Toyota facility personnel with the information and resources to improve energy efficiency in a proven and cost-effective manner.

Corporate Social Responsibility at Microsoft

Worldwide, Microsoft Corporation owns 86 properties and leases another 429 to house more than 71,000 employees plus a fluctuating population of consultants and vendors. Totalling nearly 22 million square feet (2,043,800 square meters) and growing, opportunities for energy savings in existing and new buildings are continually evaluated.

As part of Microsoft's Corporate Energy Policy, the Real Estate & Facilities Department (RE&F) focuses primarily on lighting and HVAC opportunities in existing buildings. At the Redmond, Washington headquarters, the department is facilitating the construction and acquisition of 3.1 million new square feet (287,990 square meters) by 2009. The new buildings are targeted to use 30 percent less energy than the new strict Washington State Energy Code requires; Microsoft will achieve this through daylighting, lighting controls, and higher efficiency HVAC systems including underfloor air distribution.

At Microsoft, energy policy is administered through RE&F and is motivated by a desire to increase efficiency, lower energy consumption, and provide

improved shareholder value. As a focus area for cost reductions, Microsoft has an internal goal to reduce energy consumption in its existing portfolio by 3 percent each year over the previous year's energy consumption reduction. The reductions would be normalized against headcount and square-footage growth.

Microsoft RE&F continually reviews building efficiency improvements, and as they are proven to work, they are utilized in both new construction and retrofit applications.

Microsoft also seeks to reduce environmental impact through 100 percent subsidies for employee use of public transit, vanpools, and carpools, and its environmental principles, which are focused on resource efficiency, business relationships, and product development. Supporting employee volunteer activities and matching charitable donations help Microsoft foster an atmosphere of global responsibility and environmental awareness.

Relocation Prompts Investment in Sustainability at Lafarge Cement UK

In mid-2005, Lafarge Cement UK decided it needed a better-located and significantly larger head office building as its existing premises were better-suited to the operational requirements of Blue Circle prior to its acquisition by Lafarge in 2001.

A site—extremely close to Birmingham International Station and Birmingham International Airport and offering high-quality public transportation links for employees and visitors—was identified for the new head office. After selecting the site, Lafarge approached Stoford, a local

developer, with the development opportunity. Stoford had already prepared a conventional speculative building scheme for the site, which incorporated a steel frame with light external cladding.

Lafarge Cement was, however, not satisfied with the speculative building design and environmental performance. Lafarge wanted to use this opportunity to create an energy-efficient building, which would not only celebrate the use of cementitious materials in a sustainable way, but also demonstrate the company's commitment to sustainable

operations. A revised design was prepared. It incorporated a concrete frame, concrete barrel vaulted ceilings, concrete floors, and exposed soffits to increase thermal mass and overall energy performance, for which Lafarge will pay around £2million (US\$4 million) towards the environmental/sustainability upgrading. The £23-million (US\$46-million) office investment, due for completion around July/August 2007, is likely to earn a "Very Good" rating under the BREEAM green certification system.

Century Prosper Center: Developers Seek Market Advantage with Energy-Efficient Buildings

The benefits of an energy-efficient building extend far beyond utility-bill savings and emissions reductions. Yet only recently are these benefits, including quicker leasability, longer-lease terms, and government cooperation, being acknowledged as valuable by developers. Recognition of green building benefits is catching

on, especially in China where forward-thinking developers are seeking to differentiate themselves. This is certainly true for Fountainwood Real Estate Company, Ltd., which is designing and constructing the Century Prosper Center in Beijing's central business district.

Project Overview:

Planning for the Century Prosper Center project began in 2002 with Fountainwood Real Estate Company, Ltd. recruiting RTKL as the prime architect along with Environmental Market Solutions, Inc. (EMSI) and ENSAR group as sustainability consultants. Fountainwood was initially motivated to create a green building to attract international tenants, save operating costs, and provide healthy working environments. However, as the project developed, it gathered more steam as it became apparent this was not just another project, but a template for green building in China.

The 1.6 million-square-foot (148,640-square-meter) building is currently under construction and is scheduled for completion in mid-2007. Expected to house 10,000 occupants, the US\$250-million-dollar project, housing retail and commercial office tenants, will cost approximately US\$156 per square foot (US\$1,679 per square meter) and is expected to use 40.2 kBtu per square foot (127 kWh per square meter) per year.

Project Specifics:

The Prosper Center project features impressive leadership from Fountainwood CEO Mr. Wei Ping. Several company-wide organizational changes were made

following the decision to create a green building in China. First, the company joined the U.S. Green Building Council, making it the first Chinese entity to become a member and to participate in the Council's annual Greenbuild meetings. During USGBC's Green Expo in Atlanta 2005, the CEO/President was one of nine Chinese real estate developers to receive a special award from the President of USGBC in recognition of their pioneering efforts in China's green building movement. Realizing the importance of the energy saving and green building program, Fountainwood set up a green building task force, which included members from the Beijing Design Institute, the construction company, EMSI, and a supervisory firm. Mr. Ping also appointed the Secretary of the Board of Directors to oversee the "greening"

of the entire project, while a second green program manager was appointed to coordinate internal green initiatives. The company continuously promotes the green building process, the LEED rating system, and the U.S. Green Building Council's role in the region. Fountainwood has also included the green building message in sales packages and marketing brochures.

The building features a high-performance curtain wall constructed of two layers of toughened glass with layers of metallic coating including silver, titanium, and tin. Between the two layers of the glass are purified gases to provide excellent performance in energy savings. Inside the building, the SWISS ABB intelligent lighting system has been installed to make full use of natural light. Additionally, air delivered to occupied spaces is automatically conditioned to meet temperature and humidity targets.

Barrier: Changing the Design Mentality

Enabler: "Introducing LEED to the project is a painful march," said Mr. Ping. "[LEED] is a totally new concept of developing and building a project. The designer not only needs to consider the aesthetics of the façade, he also needs to consider the environmental



features, be conscious of interior material selection, evaluate the energy efficiency and refrigerant of various cooling systems, the elevator, lighting, and water systems.” To overcome this design barrier, Mr. Ping started introducing an environmental consciousness into the project early on. Working with key partners at the Beijing Institute of Architecture and Research in the conceptual phase, the design team was able to realize significant resource savings. “We used steel structure to save internal space,” Mr. Ping explained. “Because of the reduced weight, size of columns, and the long-span columns grid, we were

able save 15 percent of the floor space to accommodate BAS and the HVAC equipment.” Through CEO leadership and project team education, the Prosper Center project was able to steer the typical design process in a new direction and create an energy-efficient building.

Barrier: Applying U.S. Standards to Chinese Projects

Enabler: The application of foreign standards makes it difficult to meet the minimum levels of performance required by LEED. Most Chinese buildings designed before the onset of the new Chinese Energy Code perform well

below ASHRAE 90.1 requirements, and thus much of Prosper Center’s challenge was in simply meeting the minimum energy performance baseline. To solve this required teamwork and patience (and understanding cultural differences). In addition to teamwork, expertise in green building and LEED certification were necessary to navigate a process and program that was initially foreign. EMSI and their team of experts, which included ENSAR Group, was instrumental in fulfilling this need and helping to meet the energy and environmental performance goals.

Table 7: Energy Efficiency Measures at Century Prosper Center

Energy Efficiency Measure	Capital Cost (US\$)	Annual Cost Savings (US\$)	Payback Period	Annual Energy Savings (kBtu)	Annual Energy Savings (KWh)
Automatic Light Controls and Dimming	\$190,031	\$598,243	7 months	12,569,556	3,683,926
High COP HVAC System with Heat Recovery	\$341,328	\$159,274	25 months	6,439,706	1,887,370
High-performance Window Glazing	\$844,173	\$445,316	22 months	14,628,725	4,287,434

Greening a Mobile Phone Giant: Implementing an Energy Management Program at Nokia China

Today, business leaders are beginning to recognize sustainability as an important component of economic progress. At Nokia, the global leader in the mobile communications industry, strong leadership provided the impetus for the development of an energy management program. President and CEO Olli-Pekka Kallasvuo spurred the program by setting clear

expectations regarding environmental performance: “Our continuous goal is to set the industry benchmark in environmental performance and seamlessly integrate environmental aspects into our strategic and operative activities. Caring for the environment is everybody’s business.”

Project Overview

As a result of setting clear corporate policy, environmental performance was included as a key performance indicator in Nokia’s facility management service contract with Cushman & Wakefield (C&W). Minimizing energy intensity is listed as one of the seven principles of eco-efficiency in Nokia’s environmental goals, thus reducing energy use was a core is-

sue to be addressed. The contract included services for its China facilities, including four manufacturing sites and more than 80 offices. In December 2004, C&W initiated an energy management program focused mainly on the four manufacturing sites.

The challenge of implementing energy-saving initiatives at Nokia sites was not only about economic achievement and environmental

stewardship but also about minimizing disruptions in production and workplace environments. The main components of the energy management program included:

- Establishing an energy management team;
- Conducting an energy audit;
- Developing energy conservation measures;
- Establishing a measurement and verification plan;

Table 8: Energy Management Team at Nokia China

Team Members	Roles and Responsibilities	
Steering Group	<div style="border: 1px solid black; border-radius: 15px; background-color: #00a651; color: white; padding: 10px; text-align: center; width: fit-content; margin: 0 auto;"> Nokia WR Senior Management C&W Account Director </div> <ul style="list-style-type: none"> Program Sponsor Approval of processes and saving results Approval of proposals and budget 	
Technical Supports	<div style="border: 1px solid black; border-radius: 15px; background-color: #fff9c4; padding: 10px; text-align: center; width: fit-content; margin: 0 auto;"> C&W Energy Specialist </div>	<div style="border: 1px solid black; border-radius: 15px; background-color: #fff9c4; padding: 10px; text-align: center; width: fit-content; margin: 0 auto;"> Nokia Global Technical Manager </div> <ul style="list-style-type: none"> Technical supports Introduction of advanced energy technologies
Working Group	<div style="border: 1px solid black; border-radius: 15px; background-color: #00a651; color: white; padding: 10px; text-align: center; width: fit-content; margin: 0 auto;"> Nokia WR Site Managers C&W Program Manager </div> <ul style="list-style-type: none"> Communication with senior management and end users Process development Proposals review Budgeting 	
Implementation Team	<div style="border: 1px solid black; border-radius: 15px; background-color: #00a651; color: white; padding: 10px; text-align: center; width: fit-content; margin: 0 auto;"> C&W Site Facilities Managers </div> <ul style="list-style-type: none"> Development of detailed proposals Implementation of the approved proposals Reporting 	

- Implementing the energy efficiency measures and risk management processes;
- Beginning with pilot projects, then rolling out successful initiatives to other sites; and
- Establishing a regular communication and review system.

More than 36 energy-saving measures were implemented in 2005 and 2006. As a result, energy use was reduced by 10 percent in 2005 and by another 10 percent in 2006 compared to 2004 energy use. Because approximately 70 percent of electricity in China is produced using coal, the energy reductions not only resulted in economic benefits, but also significantly reduced carbon dioxide emissions (by 7,000 tons). Additionally, there were no disruptions caused by

the implementation of the energy initiatives.

Project Specifics

Energy Management Team:

The Energy Management Team for the Nokia China project included personnel from Workplace Resources (WR) and C&W. The team was structured into four groups, which included the steering group, the technical support group, the working group, and the implementation team. The C&W program manager led the team with support from the other members. This project structure enabled close communication between Nokia and C&W and was recognized as a key success factor.

Energy Audit: The program began with an energy audit, which was proposed to assess building

energy use and to identify opportunities for savings. The C&W program manager along with technical specialists conducted the audit with the support of on-site service teams. The audit consisted of four steps, including information collection, site visits, report preparation, and a presentation.

During the information collection stage, data on equipment, energy consumption, energy costs, operations schedules, and equipment maintenance records were collected. The information was collected by the site service team under the supervision of the audit team and informed the creation of an energy baseline. Following the information collection phase, site visits were completed. The purpose of the site visits was to observe the

Table 9: Energy Conservation Measures at Nokia China

System	Energy Conservation Measures
Heating, Ventilation and Air Conditioning	<ul style="list-style-type: none"> • Tight control of the equipment operating time • Area temperature and air velocity optimization • Chilled water supply temperature optimization • Hot water supply temperature optimization • Improvement of chiller condenser clearance • Installation of free cool system • Installation of VSD • Installation of water supply spray system for air cooled chillers • Replacement of the low efficiency chiller compressors • Cooling tower system retrofits
Lighting	<ul style="list-style-type: none"> • Tight control of operating time • De-lamping • Installation of automatic switches • Improvements of zoning control • Electronics ballast application
Office Equipment	<ul style="list-style-type: none"> • Switch off during night time, weekend and holiday • Set to automatic OFF model

condition of the facilities, verify the collected information, and identify opportunities for savings. Approximately two days were spent at each site. Following the site visits, the audit team and on-site technical team participated in a brainstorming session to discuss opportunities and risks related to introducing new energy-saving ideas and technologies to the site. Based on the collected information and site visits, the audit team completed a detailed analysis that benchmarked the site energy usage, evaluated the energy-saving opportunities, and developed energy-saving measures. An audit report was generated and sent to all program management members for review and discussion. The final piece of the audit process included a face-to-face presentation by the audit team to key program management members. In addition to discussing the baseline energy definition, energy efficiency improvements were proposed for approval by the steering group.

Energy Conservation

Measures (ECMs): Today, it is well recognized that efficiency and the application of renewables are the major solutions for reducing carbon intensity. As renewable technologies are still relatively new in China and the economic payback time is considered too long (usually more than 5 years), the program team gave priority to efficiency measures in 2005 and 2006. Except for production equipment, HVAC and lighting systems were the major energy consumers at Nokia sites. To achieve an immediate saving result, the program team gave priority to no- and low-cost energy conservation measures (ECMs). Larger investments,

restricted by the long-term budget approval process, were considered as next steps. All ECMs implemented in 2005 and 2006 had a simple payback of less than two years. The major ECMs have been developed and implemented in the past two years (Table 9).

In addition to the implementation of no- and low-cost ECMs, the program team recognized that a well-established operations and maintenance plan would have a significant impact on the energy consumption of equipment. As a result, an improved facilities operation and maintenance plan was developed as part of the whole energy management program.

Measurement and Verification:

Measurement and verification is a challenge for any building, but more so for manufacturing sites where there are many factors directly and indirectly affecting energy consumption (e.g., production volume, outdoor temperature and humidity, headcount, overtime work, etc.). Moreover, few manufacturing sites have adequate metering devices to precisely measure and monitor energy consumption. To improve measurement and verification, Nokia's energy management program team decided to adopt options A and B of the International Performance Measurement and Verification Protocol. In addition to developing a measurement and verification plan for each ECM, the team also decided to benchmark energy consumption on a product unit basis.

Implementation and Risk Management:

To minimize interruptions to equipment operation or workplace environment, the program team developed a comprehensive risk management system. The proposal for each ECM was required to include a risk analysis and mitigation plan. As a result of the requirement, some proposed ECMs were rejected during the review even though they could achieve significant energy savings. All proposals were required to follow the plan, review, and approval process below.

In creating the risk analysis program, the program team fully engaged on-site facility operation teams to exploit their knowledge of building equipment and operations. On-site facility operation teams were also required to participate in each project's kick-off meeting and in commissioning and testing, as well as training for new installations and retrofits before they were brought into operation.

In addition to developing a risk management plan for each specific ECM, C&W on-site teams also developed and implemented facility monitoring and contingency plans. These plans included close monitoring of equipment and indoor air conditions of production facilities and office areas (e.g., temperature, humidity, etc.). This not only reduced the risk of interruptions, but also helped to maintain a high productivity workplace.

Pilot project: The largest manufacturing site at Nokia China (in Beijing) was selected as the pilot site. The implementation of

approved ECMs first began at this facility. During implementation, the site service team closely monitored energy savings and summarized lessons learned, which were then shared with the service teams at other sites. Sharing immediate results from the pilot helped other service teams recognize challenges and understand opportunities prior to implementing similar ECMs.

Regular communication and review:

Regular communication and review are essential components of any energy management program. For Nokia, these included, for each ECM; a kick-off meeting, bi-weekly technical discussions, and monthly performance review meetings. At the outset, Nokia

global technical managers were involved in the review process so that they could provide technical advice on proposed ECMs. The monthly performance review meetings focused on reviewing implementation progress and risk management plans. Nokia WR management took responsibility for communicating with Nokia senior management and business end users, while C&W communicated closely with on-site service teams.

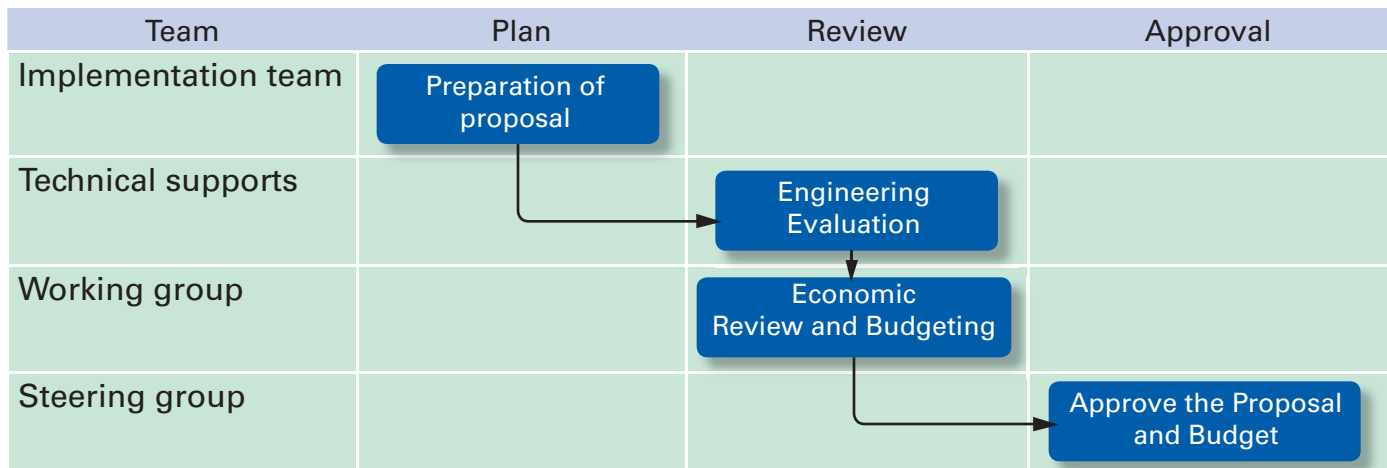
Conclusions: The success of the energy management program relied heavily on the effective collaboration between Nokia and C&W. The program will continue, although realizing further significant savings could be more difficult in future phases.

The next step will focus on larger investments that may contribute more to environmental stewardship than to economic rewards.

In the 21st century, the role of facility management has pushed beyond “just keep it functional.”

“Is green a new level for facility management?” asks Mr. David J. Brady, President and CEO of the International Facility Management Association. “We think so. With energy costs on the rise and as the environmental impact of buildings continues to be closely examined by corporations, the bottom-line impact of how facilities are built and managed has become critical.”

Table 10: Implementation and Risk Management at Nokia China



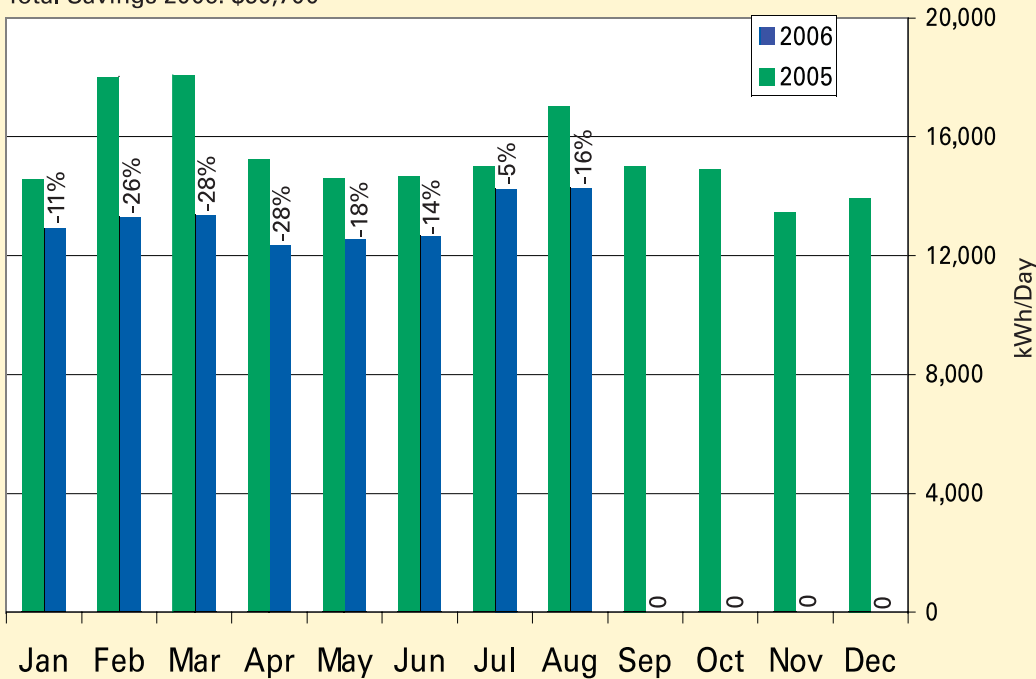
Implementation of No-Cost Measures at Oracle

In 2006, Oracle recommissioned buildings in Reston, Virginia. No-cost and low-cost energy upgrades resulted in savings of more than \$50,000 at one facility (shown in diagram). Savings came from fixing HVAC schedules, optimizing morning startup and shutdown processes (outside air is not needed during warm-up), and lighting upgrades (de-lamping and mo-

tion sensors). While the savings are significant, most of the implementation required only a few hours of an employee's time to dig through operating data and identify corrective measures. Oracle will now be following up with a second wave of efficiency measures that will have more significant costs and will produce similar savings.

Figure 18: Savings from No-Cost Measures at Oracle Reston 1900 Facility

Total Savings 2006: \$50,700





Key Conclusions

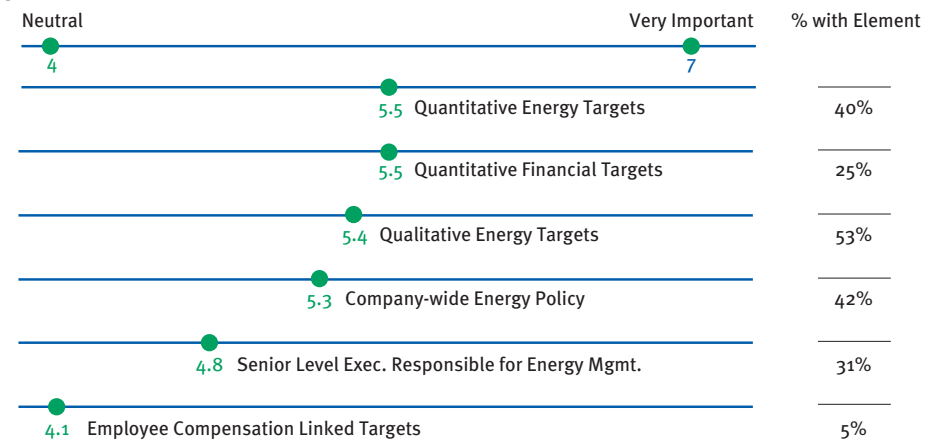


While many drivers, barriers, and enablers for energy efficiency in corporate real estate are identified in the survey study and case studies, several key conclusions emerge:

Too few corporations (fewer than half) have energy policies or energy use reduction targets in place. Without goals (especially ones tied to carbon reduction) along with incentives and/or mandates, it is difficult to motivate change. Despite recognition of the growing importance of energy efficiency, few companies have implemented management systems or are tracking the data necessary for effective energy management. Figure 19 shows how executives who responded to the survey rank the importance of particular energy management elements and the corresponding percentage of responding companies that currently employ each element.

Low-hanging fruit is still overlooked in the majority of corporations. Most corporations believe that replacing building systems is most important to reducing energy use when retro-commissioning, schedule adjustments/night-setbacks, and employee/facility staff education would probably reduce energy use faster and at considerably less expense. Spurred on by escalating energy costs in the Silicon Valley, Adobe Systems approached its real estate service provider, Cushman & Wakefield, about improving energy efficiency. Cushman & Wakefield started off with small steps at first, focusing on low-cost/no-cost efficiency improvements. After gaining the confidence of Adobe, the program evolved into a more substantial commitment

Figure 19: Importance & Adoption of Energy Management Elements



with total capital investment of \$1.2 million on 53 projects producing annual energy savings of \$1 million. Major building overhauls are not necessary to reap big savings. In fact, some grizzled facility managers have remarked, "A bad building well run and maintained will usually outperform a good building badly run and maintained."

The task of reducing energy use falls too heavily on the shoulders of facility managers. Setting goals, motivating other business units, tracking data, creating strategies, and prioritizing investments, in addition to actually making physical changes, should not all be the responsibility of the facility manager. A more integrated personnel group (CEO, corporate real estate executive, sustainability director, business unit managers, and facility managers), perhaps led by a sustainability captain, needs to take on responsibility. The sustainability "head" would then simply need to facilitate these efforts when needed and to help with the coordination and an integrated presentation of the results of everyone's efforts. Such a strategy could address the issue whereby many business units

and functions simply consider sustainability to be someone else's job—and while they will cooperate they are not proactive and will not quite be champions of the cause.

New corporate and industry players will need to step up.

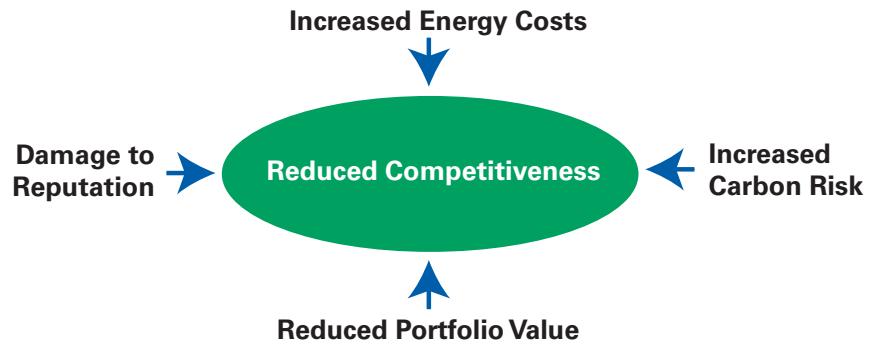
Within the corporation, business unit leaders and boards will need to provide more support. In industry, the architecture and engineering professions are leading the way on energy efficiency in corporate real estate. The lending and appraisal industries are lagging, as quantifying the benefits of energy efficiency continues to be challenging. As such issues as carbon disclosure and climate change gain more traction among shareholders and the general public, it will be imperative for high level corporate players as well as certain industry players to become more proactive in this regard.

There is growing recognition of the importance of energy efficiency in corporate real estate. More than 57 percent of corporate real estate executives ranked energy efficiency as a "very important" issue impacting real estate over the next ten years.

Surveyed executives also believe that funding for energy-related capital expenditures and operating budgets will increase in the next five years. Also, nearly 70 percent of corporations now track energy consumption while 60 percent track energy cost—though fewer corporations actually use these data.

Most barriers are just *perceived* barriers that can be overcome with minimal effort. The survey respondents ranked most of the barriers included in the survey study as moderately significant. While some of these barriers do need to be addressed at a global level in terms of formulating broadly acceptable methodologies, there are barriers that can be overcome by putting in place a clear, stated policy that requires actionable and measurable strategies to be adopted as standard practice. Companies also need to start asking the right questions for some of these issues to gain traction. For example, widespread pre-lease and programming stage due diligence on energy

Figure 20: Consequences to Failing to Address the Energy Challenge



efficiency measures (e.g., including energy efficiency criteria in RFPs and verifying performance) will encourage the inclusion of energy efficiency measures in the appraisal process as well as accurate quantification of the value of energy efficiency investments.

There is very little acknowledgment of the risk of inaction. As the experiences of companies featured in the report illustrate, energy efficiency can be incorporated into corporate real estate at many different levels. Ultimately, the corporate real estate function must ask itself if it is ready to proactively take action

on energy efficiency to enhance its company's competitiveness or, by inaction, risk detracting from it. The combination of sustainability concerns and impending government regulations on carbon emissions along with rising energy costs and concerns over aging infrastructure will probably result in increased shareholder pressure and a higher threat to reputational value and competitiveness than has been projected by survey respondents. Inaction is not going to be an option. There is a pressing case for corporate real estate and all of the stakeholders across the supply chain to embrace energy efficiency as a strategic opportunity.



Recommendations



This RMI/CoreNet Global research forms a basis to develop a framework and implement an action plan for future work that needs to be done to facilitate the widespread incorporation of energy efficiency as a strategic issue in corporate real estate.

Rocky Mountain Institute and CoreNet Global, together with the Advisory Team, have developed two action plans to further the incorporation of energy efficiency in corporate real estate. The first action plan is focused on the corporation and its internal stakeholders. Tasks are not assigned to specific players, as many tasks may be performed by a variety of players or groups. The second action plan is for service providers who interact with the corporation.

Figure 21: The Energy Challenge: Corporate Agenda

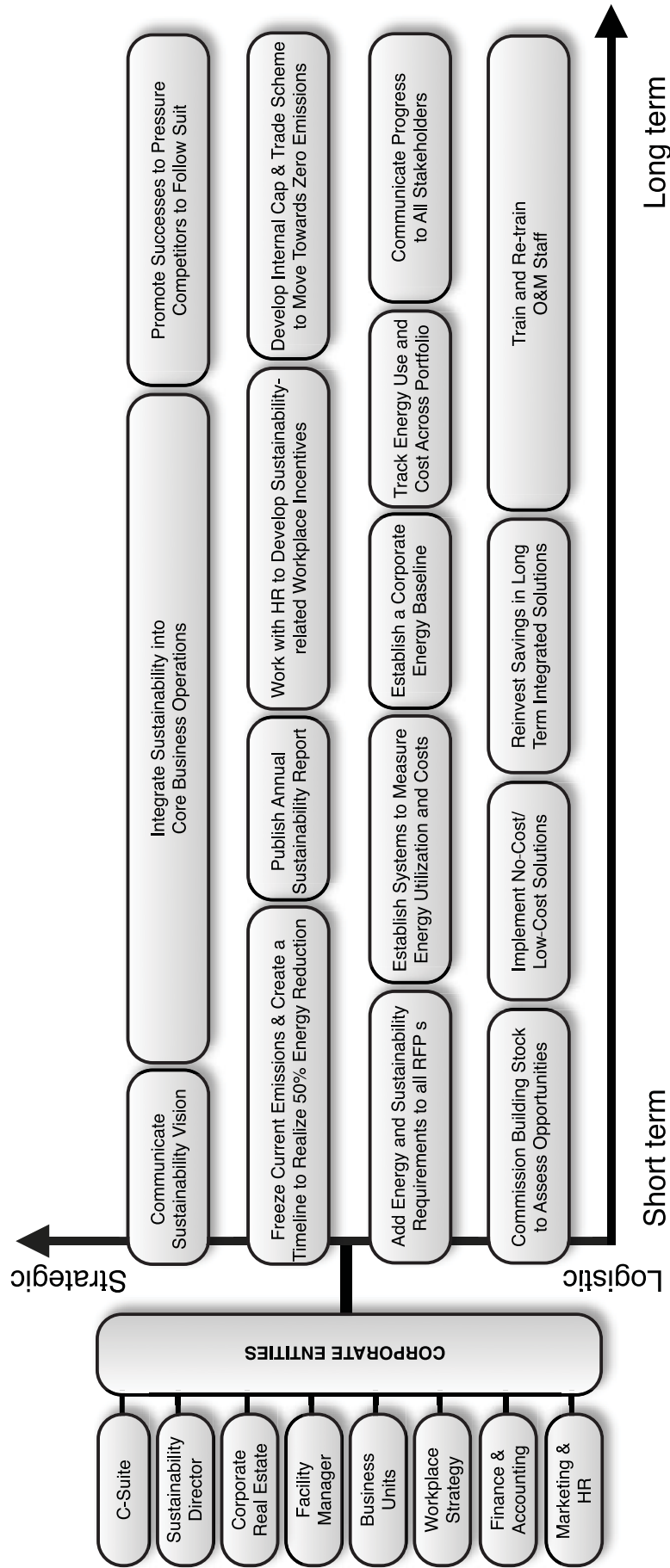
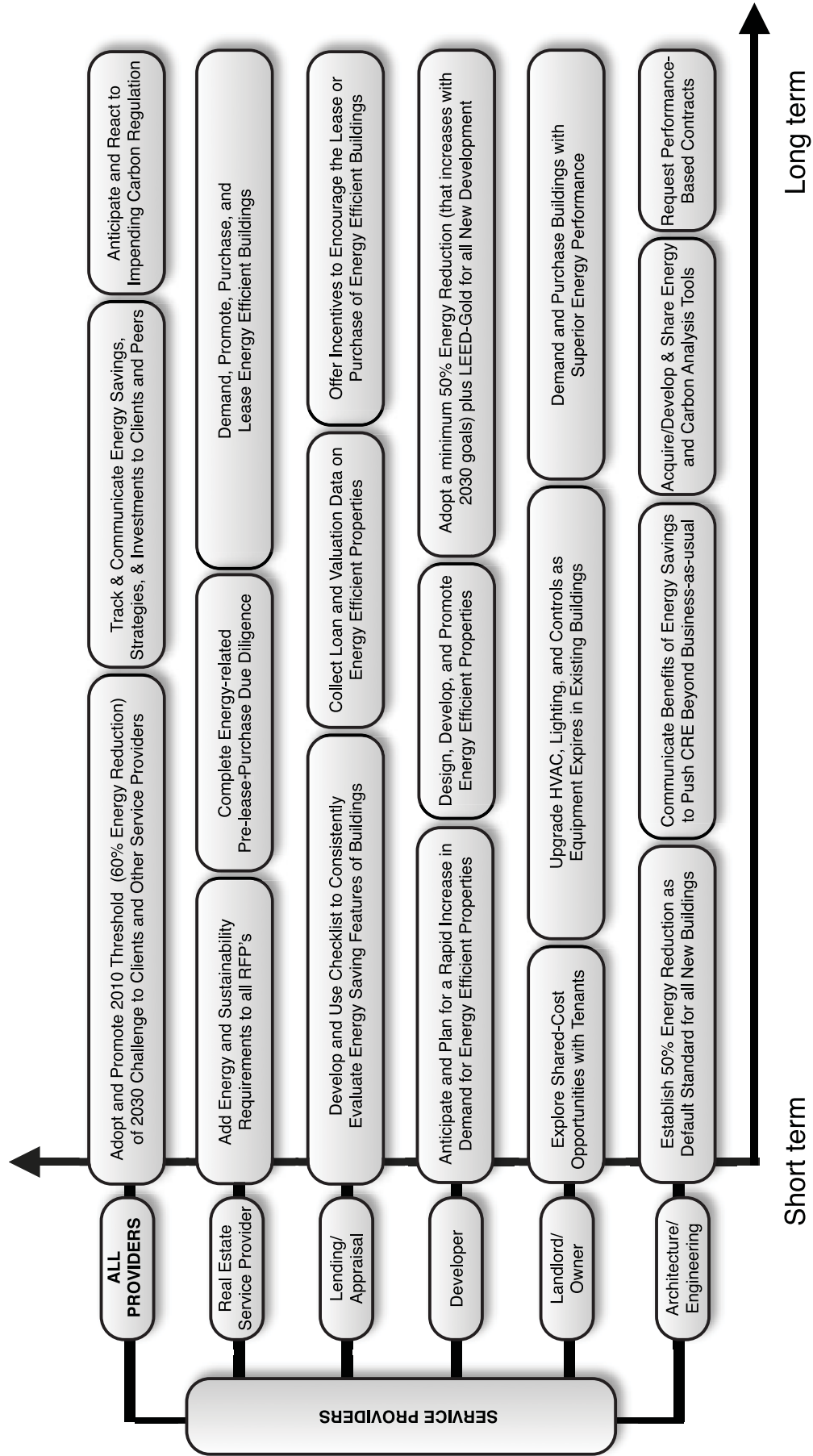


Figure 22: The Energy Challenge: Service Provider Agenda



Corporate Agenda

Tasks in the Corporate Agenda are filtered by their strategic nature as well as by their immediacy. It is assumed that C-suite personnel, corporate real estate executives, and sustainability directors will champion the more strategic tasks, while

finance/accounting, human resources, and/or facility managers will collaborate to execute the more logistical, day-to-day tasks.

Communicate Sustainability

Vision: The most important strategic task to execute immediately is to communicate sustainability and energy-related goals to the entire corporation. While individual, ongoing initiatives to accomplish those goals will come from internal champions, the sustainability vision will be most successful if communicated from the C-suite level. The vision should contain goals as well as preliminary strategies to reach

those goals (e.g., appointing a sustainability director, creating an energy task force, or developing employee incentives).

Integrate Sustainability into

Core Business Operations: Energy efficiency is not the only way to reduce environmental impact and corporate real estate is not the only entity that can take action. Any energy efficiency efforts will greatly benefit from a corporate culture and business mentality

that values economic, social, and environmental resources. Steps should be taken to integrate sustainability into not only corporate real estate, but also corporate investments, business partnerships, and manufacturing processes.

Promote Successes to Pressure Competitors to Follow Suit:

Challenge and pressure competitors to improve the performance of their building stock. When one corporation profitably reduces

The 2030 °Challenge (From www.architecture2030.org)

Credible scientists give us ten years to be well on our way toward global greenhouse-gas (GHG) emissions reductions in order to avoid catastrophic climate change. Yet there are hundreds of coal-fired power plants currently on the drawing boards in the United States. Seventy-six percent of the energy produced by these plants will go to operate buildings. As Architecture 2030 has shown, buildings are responsible for almost half (48 percent) of all energy consumption and GHG emissions annually; globally the percentage is even greater. Immediate action in the building sector, and a concerted global effort, are essential if we are to avoid hazardous climate change. Stabilizing emissions in the building sector, and then reversing them to acceptable levels over the next ten years, is key to keeping global warming to approximately one celcius (C°) above today's level. To accomplish this, Architecture 2030 has issued The 2030 °Challenge, asking the global architecture and building community to adopt the following targets:

- That all new buildings, developments, and major renovations be designed to meet a fossil-fuel, GHG-emitting, energy-consumption performance standard of 50 percent of the regional (or country) average for that building type.
- That at a minimum, an equal amount of existing building area be renovated annually to meet a fossil-fuel, GHG-emitting, energy-consumption performance standard of 50 percent of the regional (or country) aver-

age for that building type (50 percent of the regional average through innovative design strategies, the application of renewable technologies and/or the purchase—20 percent maximum—of renewable energy).

- That the fossil-fuel reduction standard for all new buildings be increased to:
 - 60 percent in 2010;
 - 70 percent in 2015;
 - 80 percent in 2020;
 - 90 percent in 2025; and
 - Carbon-neutral by 2030 (using no fossil-fuel GHG-emitting energy to operate).

We know these targets are readily achievable and that most developments and buildings can be designed to use only a small amount of energy at little or no additional cost through proper planning, siting, building form, glass properties and location, proper materials selection, and by incorporating natural heating, cooling, ventilation, and daylighting strategies. The additional energy a development or building would then need to maintain comfort and operate equipment can be supplied by renewable sources such as solar (photovoltaics, hot water heating, etc.), wind, biomass, and other viable carbon-free sources.

To meet The 2030 °Challenge, we must not only design high-performance and carbon-neutral buildings and developments, but also advocate for incentives and actions that will ensure that all buildings and developments meet these targets as well.

carbon emissions, there is no reason others in the industry should lag behind in this regard. Publicizing the efforts and achievements in this regard (through the Carbon Disclosure Project, Global Reporting Initiative, or other means) will mean that peers in the industry will have to catch up to remain competitive.

Freeze Current Emissions and Create a Timeline to Realize 50 Percent Emissions Reduction:

Freezing current emissions implies that future emissions levels will never exceed current levels. This means that new energy use at a new property must be accompanied by reductions in energy use at existing properties. In addition to freezing current emissions, the appropriate players should create a realistic timeline to reduce current building emissions levels by 50 percent through either energy efficiency or through the generation or purchase of renewable energy. An example of a timeline that the corporate real estate function could consider adopting as a target for energy use for all existing and new buildings portfolio-wide is described in the sidebar “The 2030 °Challenge.”

Publish Annual Sustainability Report: Tracking and reporting building energy use data are the most important steps to reducing energy use. Comparing energy use data to competitors as well as to other building types and top performers helps guide energy reduction plans. Use resources including the Carbon Disclosure Project and the Global Reporting Initiative as guidelines to develop an annual sustainability report. Sharing progress with sharehold-

ers and consumers is also a valuable marketing opportunity.

Work with Human Resources to Develop Sustainability-related Workplace Incentives:

Linking economic incentives to behavior often proves successful. Incentives may apply to facility managers (e.g., bonuses according to percent reductions), to employees (e.g., personnel with top three energy tasks that get implemented get bonuses), or to C-suite entities (e.g., the board approves bonuses if certain energy reduction thresholds are reached).

Develop Internal Cap-and-Trade Scheme to Move towards Net-Zero Emissions:

Corporations should begin to recognize carbon as currency. Once all energy consumption and carbon emissions are accounted for, corporations should develop an internal cap-and-trade scheme amongst all company operations (not just buildings) to allow for some operations (e.g., manufacturing) to operate above net-zero while others (e.g., corporate real estate) operate below. This will hold each company entity accountable for its use while providing incentives for it to reduce energy use.

Establish Systems to Measure Energy Utilization and Costs:

To track progress towards goals as well as to understand the source of energy loads, an energy management/metering system should be put in place. Ideally this system links all buildings with the corporate portfolio and provides real-time energy use data to a central manager. As part of this energy management program, systems to track investments in energy

efficiency, predicted payback, and actual payback should be implemented. Proving the success of energy efficiency measures is essential to the survival of an energy management program.

Establish a Corporate Energy Baseline:

Without a baseline, it is impossible to set goals, identify opportunities for improvement, or track progress. Recognizing the amount of energy different buildings and end-uses need (e.g., HVAC versus lighting) will inform energy use reduction strategies.

Track Energy Use and Cost across Portfolio:

Tracking energy use and cost on a daily, monthly, and yearly basis is essential to any successful energy or sustainability program. Incorporating additional variables—like the number of users, load distribution, etc.—into a tracking system will make the energy data even more valuable and useful.

Communicate Progress to Key Decision Makers:

All outcomes of any energy management or sustainability program should be summarized and presented quarterly to upper management or key decision makers.

Add Energy and Sustainability Requirements to all RFPs:

All new real estate should adhere to minimum levels of energy performance as determined by corporate real estate and facilities departments. Investigation into the prior energy performance of a property should always be completed before purchasing or leasing. Opportunities to partner with landlords to upgrade building systems should be explored.

Evaluate Building Stock to Assess Opportunities: Opportunities for building energy efficiency tune-ups and upgrades should be assessed through a series of building energy audits and retro-commissioning exercises. Most buildings constructed prior to 1990 have never been fully commissioned.

Implement No-Cost/Low-Cost Solutions: Initial no-cost/low-cost opportunities will probably occur in the areas of scheduling, controls, and lighting. These opportunities will be identified during energy audits and retro-commissioning.

Reinvest Savings in Long-Term Integrated Solutions: Cost savings from implementing the no-

cost/low-cost solutions should be reinvested in long-term solutions. When equipment is scheduled to be replaced, analyze opportunities to simultaneously upgrade efficiency. Never replace equipment without exploring efficiency opportunities. This includes all building systems (e.g., HVAC, electrical, lighting, plumbing, as well as office and kitchen equipment, etc.). Incorporating energy efficient upgrades in the replacement cycle will yield better returns. In addition, do not upgrade HVAC equipment without first analyzing the potential for simultaneous upgrade of windows, daylighting, electric lighting, controls, or other opportunities to cut loads. Frequently, a new HVAC

system with the same capacity as before costs the same as a right-sized HVAC system with much improved efficiency.

Train and Re-train Operations & Maintenance (O&M) Staff:

Even the best-designed, most efficient, innovative systems are likely to perform below par gradually, especially if O&M staff aren't trained to operate the specific systems they manage and maintain. The field of sustainability is growing rapidly, and new building technology and energy management techniques are emerging rapidly; hence it is of paramount importance that the education be of a continuous nature.

Service Provider Agenda

Tasks in the Service Provider Agenda are filtered by the service provider as well as by their immediacy. For all providers, the first action item is to adopt and promote the 2010 threshold (60 percent energy reduction over average) of the 2030 °Challenge to all clients as well as to other service providers. The 2030 °Challenge is a clear, concise statement for any real estate professional to adopt and promote. The second action item for all providers is to track and communicate energy sav-

ings, strategies, and investments to clients and peers. Tracking energy data and communicating the implications of these data is a recurring theme that cannot be overemphasized. It will also be important for corporate entities and service providers to focus on the appropriate metrics so that fair comparisons can be made. The third action item for all providers is to anticipate and react to impending carbon regulation. This implies that energy efficiency should not be avoided or delayed.

Real Estate Service Providers

Provide and Demand Energy Performance and Sustainability Information: Include energy performance information based on historical data (kBtu per square foot of kWh per square foot) on all responses to RFPs - even when it hasn't been requested. Demand this information of all owners and developers. Doing so will effectively reduce the demand for outdated buildings and will send strong signals to owners and developers that energy performance must be addressed to stay competitive.

Complete Energy-Related Pre-lease/Purchase Due Diligence:

Corporate real estate groups and providers must demand the completion of a pre-lease energy audit. This exercise would uncover underperforming mechanical and lighting systems and give tenants a better understanding of overall building performance. Following the energy audit, the tenant should work with the landlord to share the cost of upgrades during tenant build-out or remodeling.

Demand, Promote, Purchase, and Lease Energy-Efficient Buildings:

Real estate service providers, whether representing the tenant or landlord, should become educated on the benefits of energy efficient buildings and be prepared to communicate these facts to their clients. If a client does not include energy efficiency in an RFP, real estate service providers can suggest this requirement be added. Similarly, real estate service providers can help market energy efficient properties for landlords who have upgraded buildings.

Lending/Appraisal Service Providers

Develop and Use Checklist to Consistently Evaluate Energy-Saving Features of Buildings:

Appraisers should develop an industry-wide checklist or menu of energy efficiency options typically installed in commercial buildings. Building owners can help appraisers by collecting accurate data for each feature to prove the value of each individual feature or group of features.

Collect Loan and Valuation Data on Energy-Efficient Properties:

Lenders should begin collecting data on loans granted towards the acquisition of high-performing buildings.

Offer Incentives to Encourage the Lease or Purchase of Energy-Efficient Buildings:

To encourage the lease or purchase of energy-efficient buildings that cost less to operate, lenders should offer preferential interest rates or comparable incentives.

Developers

Anticipate and Plan for a Rapid Increase in Demand for Energy-Efficient Buildings:

As the survey results demonstrate, the demand for energy-efficient buildings is going to grow rapidly in the coming years on account of the combination of all the factors mentioned earlier in this report. Developers who plan for this increase and stay ahead of the curve in this regard will stand to benefit greatly in the coming years.

Design, Develop, and Promote Energy-Efficient Properties:

Visibility and recognition of being early adopters and promoters of energy-efficient practices in current property development will ensure positioning for success in the years to come. This will also help build capacity to meet the anticipated growth in demand for energy-efficient properties.

Adopt a Minimum 50 Percent Energy Reduction over Average (that increases with The 2030 °Challenge goals) plus LEED Gold for all New Development:

The technology exists today to cost-effectively achieve 50 percent energy reduction over the average energy use for various building types. Numerous studies document that LEED Gold buildings can be achieved without an increase in cost.

Landlords and Owners

Explore Shared-Cost Opportunities with Clients:

Tenants are often willing to consider shared-cost and shared-savings programs so as to achieve enhanced levels of energy performance in buildings. With all of the anticipated risks mentioned earlier in this report (e.g., carbon, energy, reputation, retention of talent, etc.), it is foreseeable that the opportunities for collaboration in this regard will only increase.

Incorporate Energy Efficiency Upgrades as Part of Equipment Replacement Cycle for Existing Buildings:

The incremental cost of energy efficiency upgrades when old

equipment in buildings is at the end of its planned life and is due for scheduled replacement is small compared to energy efficiency upgrades for equipment that still has a useful life associated with it. Do not replace equipment that is due for end-of-life replacement with anything less than the most efficient options available.

Demand and Purchase Buildings with Superior Energy Performance:

Including requirements for minimum energy performance (kBtu per square foot or kWh per square foot) based on historic data (or including these targets for new construction) will ensure outdated buildings are not acquired or built. This will also help protect the company against impending carbon risk and increased energy costs.

Architecture/Engineering (A/E) Service Providers

Establish 50 Percent Energy Reduction over Average as Default Standard for all New Buildings:

Adopt the Architecture 2030 °Challenge and establish the 2030 goals as standard practice. With the anticipated growth in demand for energy-efficient properties, A/E service providers that are able to effectively design with integrated solutions and deliver energy-efficient properties can expect to see a continuous increase in demand for their services.

Communicate Benefits of Energy Savings to Push Corporate Real Estate beyond Business-as-Usual:

The A+E community has been

amongst the most proactive with regards to acknowledging the benefits of energy efficiency in particular and sustainability in general and has effectively been ahead of other supply-chain participants in acquiring the knowledge and developing methods of delivering more energy-efficient and sustainable buildings. However, the quantifiable benefits of these cost-effective best practices are often left undocumented and there is very little information that

is passed on to client organizations that would encourage them to move towards increased levels of performance.

Acquire or Develop and Share Energy and Carbon Analysis Tools:

As the “carbon-as-currency” concept gains more traction, it will be critical to develop energy and carbon analysis tools that not only provide predictions but also track operational reductions once

buildings are occupied.

Request Performance-Based Contracts:

Encourage client organizations to establish A/E contracts that are performance-based. This will help provide differentiation in the marketplace, and these contracts could also potentially be structured to provide incentives over time for meeting or exceeding the high-performance goals of a project.

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20. For more information on the GBFC, see www.greenbuildingfc.com. The Green Building Finance Consortium (GBFC) is a group of leading corporations, real estate companies, and trade groups that have joined together to address the need for independent research and analysis of investment in green or energy-efficient buildings. GBFC will develop the underwriting practices, tools, and methodologies required to assess, from a fiduciary perspective, investment or lending on green buildings, and widely communicate the results of its work.
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Tables and Figures

List of Figures

- Figure 1: Energy Use in the Context of Environmental Sustainability.
- Figure 2: U.S. Carbon Emissions by End-Use Sector: 1980-2005.
- Figure 3: Respondent Profile by Geographic Location and Organization Type.
- Figure 4: Average Importance of Drivers of Energy Efficiency.
- Figure 5: World and U.S. Energy Consumption by Sector.
- Figure 6: Internal Functions Supporting Energy Efficiency.
- Figure 7: Importance and Adoption of Energy Management Elements.
- Figure 8: Percentage of Companies Tracking Energy Data.
- Figure 9: Percentage of Companies Using Energy Data for Strategic Energy Assessments.
- Figure 10: Required Payback Period—New Facility Capital Budget.
- Figure 11: Percentage of Respondents Performing Pre-lease Energy Efficiency Due Diligence.
- Figure 12: Percentage Rating Facilities Management as Very Important to Achieve Reduced Energy Costs.
- Figure 13: Percentage of Energy Cost Budget Allotted to Identifying/Implementing Low-Cost/No-Cost Energy Efficiency Measures.
- Figure 14: Change in Percentage Selecting Each Energy Efficiency Strategy as Very Important.
- Figure 15: Average Frequency that Energy Efficiency Information is Supplied to Appraisers.
- Figure 16: ABN AMRO Global Energy Profiles 2006: Relative kWh Usage Per Seat.
- Figure 17: ABN AMRO Global Energy Management Tracking System Schematic.
- Figure 18: Savings from No-Cost Measures at Oracle Reston 1900 Facility.
- Figure 19: Importance and Adoption of Energy Management Elements.
- Figure 20: Consequences of Failing to Address the Energy Challenge.
- Figure 21: The Energy Challenge: Corporate Agenda.
- Figure 22: The Energy Challenge: Service Provider Agenda.

List of Tables

- Table 1: Respondent Profile by Real Estate Function.
- Table 2: City Emissions Targets.
- Table 3: Retrofits in Adobe Towers.
- Table 4: Energy Efficiency Projects at Adobe.
- Table 5: Energy Efficiency Measures at JohnsonDiversey.
- Table 6: Example Portion of Natural Resource Treasure Hunt Report.
- Table 7: Energy Efficiency Measures at Century Prosper Center.
- Table 8: Energy Management Team at Nokia China.
- Table 9: Energy Conservation Measures at Nokia China.
- Table 10: Implementation and Risk Management at Nokia China.

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Page 47:

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Page 48:

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