Greening Existing Buildings with LEED-EB!

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Master of Science in Real Estate Development

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Abstract

The market of existing office buildings is going green. While early adopters of green buildings were owner-occupiers, there is a current wave of nonowner-occupied office buildings seeking Leadership in Energy and Environmental Design (LEED) for Existing Buildings certification.

This thesis examines the current context in which this dramatic change is transpiring as well as answers the following questions as they relate to this green transformation of existing multi-tenanted office buildings:

- Who is participating?
- Why are they participating?
- What is the process?
- What are the costs?
- How is it being financed?

Research conducted included literature review and interviews with building owners, property managers, building engineers and brokers in several major metropolitan office markets in the United States.

This thesis examines green building rating systems from around the world. We focus on the LEED rating system, the most widely used in the United States, as it provides a good framework for owners and managers to evaluate and benchmark the environmental performance of their building.

Our research indicates that a much higher percentage of Class A office building owners and managers are pursuing LEED for Existing Building (LEED-EB) certification, while Class B owners and managers are not. Class B owners face less incentives and greater obstacles when pursuing LEED-EB certification. In chapter four of this thesis, we explore two creative ways that Class B owners and managers may be able to overcome some of these hurdles – Energy Savings Performance Contracts (ESPCs) and Power Purchase Agreements (PPA).

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Chapter 1: The Green Scene

1.0 Overview

Public awareness and media coverage of climate change has intensified rapidly over the past few years. This fact, coupled with political actions to fight climate change, has pushed many businesses and organizations to look at their carbon footprint. Carbon dioxide and other greenhouse gases trap heat in the atmosphere, and scientists say that an increasing concentration of greenhouse gases will change the planet's climate.[1] A carbon footprint is the "representation of the effect that human activities have on the planet's climate in terms of the total amount of greenhouse gases produced (measured in units of carbon dioxide)."[2] With global warming emerging as a mainstream concern, corporate accountability, social responsibility, and sustainability are materializing as critical topics for businesses in the United States and abroad. Many companies, anxious to show their dedication to fight climate change, have made noteworthy public commitments. Google, for example, promised to become carbon neutral by the beginning of 2008.[3] When News Corporation, including its notoriously conservative Fox News network, announced its goal of carbon neutrality by 2010, founder and CEO Rupert Murdoch stated, "Climate change poses clear, catastrophic threats. We may not agree on the extent, but we certainly can't afford the risk of inaction."[4]

In 2007, the Carbon Disclosure Project[5] issued its fifth report, which provides a unique analysis of how the world's largest companies (FT Global 500) are responding to climate change. It found that 76% of the responding companies[6] implemented a greenhouse gas (GHG) emissions reduction initiative compared to only 48% of the respondents in 2006.[7] Clearly a significant shift in corporate awareness and actions has taken place. Corporate sustainability and joining the fight

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[1] "Climate Change : Basic Information." U.S. Environmental Protection Agency. Accessed 21 July 2008. <http://www.epa.gov/climatechange/basicinfo.html>.

[2] "Glossary of Terms; Ecological and Carbon Footprints." Royal Geographical Society with IBG. Accessed 12 July 2008 <http://www.esd.rgs.org/glossarypopup.html>.

[3] "Carbon Neutrality by End of 2007." The Official Google Blog. 19 June 2007. Accessed 17 July 2008. <http://googleblog.blogspot.com/2007/06/carbon-neutrality-by-end-of-2007.html>.

[4] Lincoln Archer. "News Corp to be carbon neutral by 2010." News.com.au. 10 May 2007. Accessed 21 May 2008. <http://www.news.com.au/story/0,23599,21704218-2,00.html>

[5] The Carbon Disclosure Project is a not-for-profit organization that seeks to identify business risks and opportunities presented by climate change for its 385 signatory investors who combined have $57 trillion of assets under management.

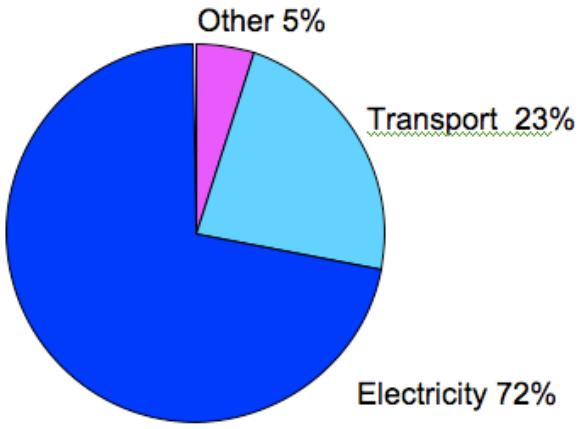
[6] The Carbon Disclosure Project (CDP5) questionnaire had a response rate of 77% or 383 of the FT Global 500 companies.

[7] "Global FT500." Carbon Disclosure Project. 2007. 1-92. Accessed 11 July 2008. <http://www.cdproject.net/currentreports.asp>.

against climate change appear to be prominent topics of conversation in a majority of the corporate boardrooms around the world.

As these corporations calculate their environmental footprint on the path to carbon neutrality, they have begun to recognize the necessity of "greening" their buildings. As Dan Probst, Chairman of Energy and Sustainability Services at Jones Lang LaSalle, commented, "The path to sustainability often starts with real estate and facility strategies."[8] When News Corp partnered with ICF International to analyze their carbon footprint, they found that 72% of News Corp's GHG emissions was attributable to the electricity used to run their buildings, computers, and other production equipment (Figure 1). Consequently, News Corp's strategies to achieve carbon neutrality are: to reduce energy use through energy efficiency in its buildings and production; to utilize renewable energy; and, at last resort, to purchase offsets.[9]

Figure 1: News Corps' Greenhouse Gas Emissions by Source



Source: News Corp's Global Energy Initiative Report

Obviously, each company has a different breakdown of its GHG emitting sources; nevertheless, buildings are consistently a significant contributor to one's carbon footprint.

In response to this corporate demand and other factors that we will discuss in this thesis, the real estate industry has begun to green existing office buildings. The thesis will draw on extensive literature review, case studies, and interviews with building owners, property managers, building

[8] "Lights are on but no one is home when it comes to energy efficiency." Real Estate Weekly. Feb 20, 2008. FindArticles.com. Accessed 29 May 2008. <http://findarticles.com/p/articles/mi_m3601/is_25_54/ai_n24359103>.

[9] "Global Energy Initiative." News Corporation. 2007. 1-34. Accessed 15 July 2008. <http://www.newscorp.com/energy/index.html>.

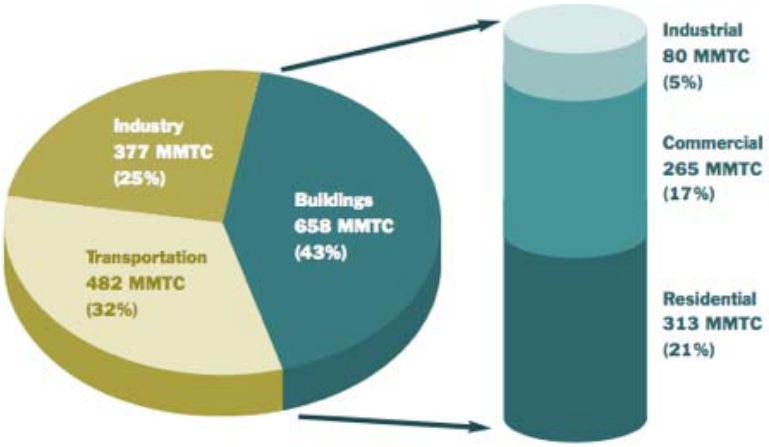
engineers, and brokers. The goal of our research is to:

- Describe and provide insight on several current green building rating systems from around the world with emphasis on the LEED Rating System and its LEED for Existing Buildings program
- Identify what motivates firms to pursue LEED-EB certification
- Document the process and steps necessary to achieve a LEED-EB rating
- Understand the costs and financing of LEED-EB, including innovative financial methods such as Energy Savings Performance Contracts and Power Purchase Agreements.

1.1 Climate Change and Buildings

According to the U.S. Green Building Council, buildings are among the heaviest consumers of natural resources and energy, thereby creating a significant portion of the greenhouse gas emissions that affect climate change.[10] While industrial and transportation sectors produce 25% and 32%, respectively, of the U.S. CO_2 emissions from fossil fuel consumption, buildings, at 43%, account for the largest share of U.S. CO_2 emissions as illustrated in Figure 2.

Figure 2: Carbon Dioxide Emissions From Fossil Fuel Combustion



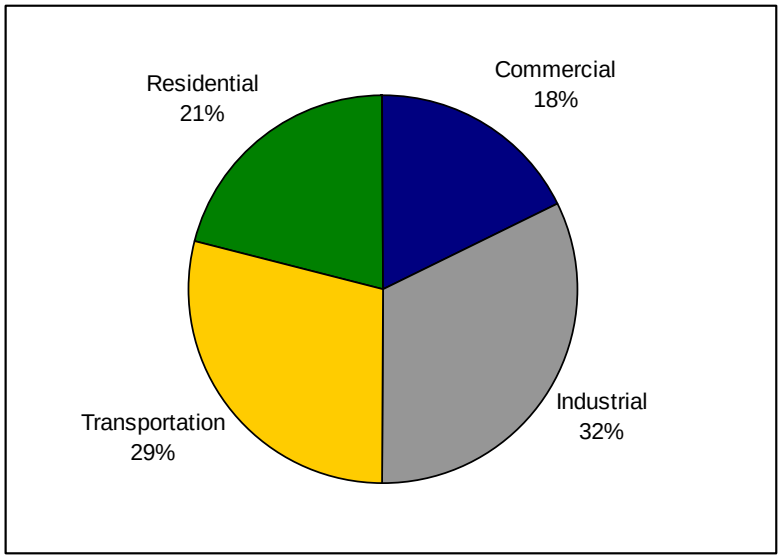
Source: *Towards a Climate Friendly Built Environment*. Pew Center on Global Climate Change. June 2005. (MMTC = Million Metric Tons of Carbon)

Consequently, there are many opportunities to fight climate change within the building sector. We have chosen to focus on the opportunities within the office market and the actions their owners and managers are currently implementing for several reasons. *One*: Although residential buildings as a whole consume more energy than commercial buildings (Figure 3) and nearly nine

[10] "Green Building by the Numbers." U.S. Green Building Council. June 2008. Accessed 19 June 2008. <www.usgbc.org/ShowFile.aspx?DocumentID=3340>.

times as much as office buildings (Figure 4), office buildings consume nearly twice as much energy per square foot than residential buildings (Figure 4). This high-energy consumption per square foot led us to believe that perhaps there were more efficient ways of operating and maintaining office buildings. *Two*: Office buildings amount to 12.2 billion total square feet, second only to residential buildings at 211 billion square feet (Figure 4). *Three*: More than any other nonowner-occupied building type, multi-tenanted office buildings are being upgraded to green building standards (specifically LEED-EB). Currently, there is a push to green other existing building types, from residences to factories, but few of these are nonowner-occupied properties.

Figure 3: U.S. Energy Consumption 2007



Source: US Energy Information Administration,
Annual Energy Review 2007

Figure 4: Table of Energy Consumption (BTU) per Sq. Ft.

Principal Building Activity	Consumption per Sq Ft. (BTU)	Number of Buildings (Thousand)	Total Sq Ft	Total Energy Consumption (Btu)
Residential[11]	46,683	107,000	211,325,000,000	9,865,400,000,000,000
Commercial				
Education	83,046	386	9,874,000,000	820,000,000,000,000
Food Sales	200,000	226	1,255,000,000	251,000,000,000,000
Food Service	258,162	297	1,654,000,000	427,000,000,000,000
Health Care	187,796	129	3,163,000,000	594,000,000,000,000
- Inpatient	249,343	8	1,905,000,000	475,000,000,000,000
- Outpatient	94,594	121	1,258,000,000	119,000,000,000,000
Lodging	100,078	142	5,096,000,000	510,000,000,000,000
Retail (Non-Mall)	73,893	443	4,317,000,000	319,000,000,000,000
Office	92,889	824	12,208,000,000	1,134,000,000,000,000
Public Assembly	93,932	277	3,939,000,000	370,000,000,000,000
Public Order & Safety	115,596	71	1,090,000,000	126,000,000,000,000
Religious Worship	43,420	370	3,754,000,000	163,000,000,000,000
Service	77,037	622	4,050,000,000	312,000,000,000,000
Warehouse & Storage	45,247	597	10,078,000,000	456,000,000,000,000
Other	164,556	79	1,738,000,000	286,000,000,000,000

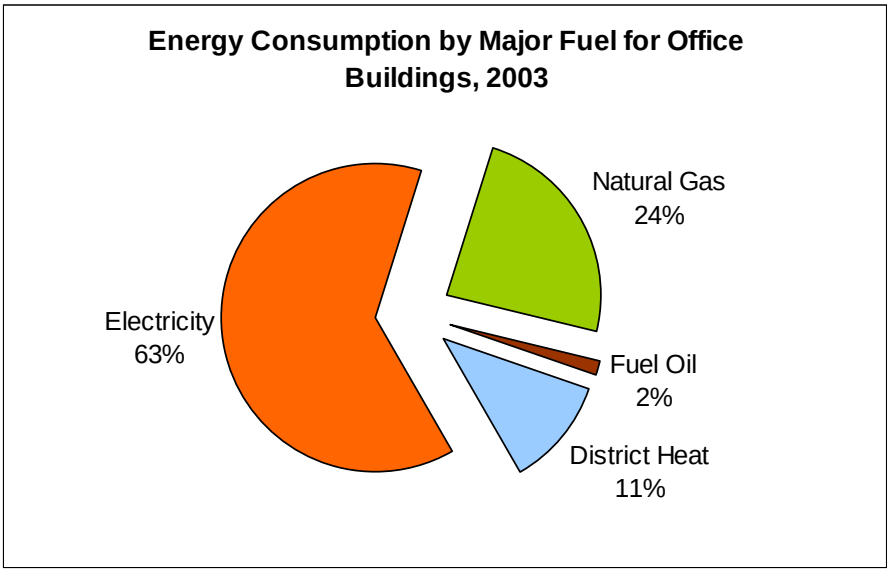
Source: US Energy Information Administration

The environmental impacts of buildings can be measured, monitored, and improved. From improving the efficiency of building systems, to reducing water consumption, to choosing indoor materials that are healthier, buildings can be prime candidates to showcase one's commitment to sustainability. The conversation about what qualifies as a "green" building or what it means to green a building and would be valuable but is not the focus of this thesis, so for our purposes, the LEED rating system will be utilized as the benchmark for green building. We chose this benchmark not only for its focus on energy efficiency, which has a direct impact on greenhouse gas emissions and climate change, but for its inclusiveness of other sustainable initiatives such as material and resource efficiency and selection, site impacts, water efficiency and indoor air quality. We will discuss the LEED rating system in more detail in Chapter 2.

The energy consumed by office buildings consists of four major fuel types: electricity, natural gas, fuel oil, and district heat[12] as represented in Figure 5. Electricity is by far the dominant fuel consumed by office buildings.

[11] Data from "Total Energy Consumption in U.S. Households, 2001, Square Feet and Household Demographics." Energy Information Administration. Accessed 18 June 2008. <http://www.eia.doe.gov/emeu/recs/recs2001/detailcetbls.html>.

Figure 5: Energy Consumption by Major Fuel for Office Buildings, 2003



Source: Energy Information Administration

Buildings can be responsible for the production of greenhouse gases in two ways – on-site or indirectly. On-site, buildings may burn natural gas or fuel oil to produce power for heat and electricity, which in turn emit greenhouse gases as a by-product.[13] More often, buildings produce greenhouse gases indirectly, through the purchase of electricity or steam generated off-site by a third party. Electricity, purchased from utilities, can be generated through natural gas, coal, hydropower, wind, solar, biomass, and so on. Each of these fuel sources emits different levels of greenhouse gases. As shown in Figure 5, electricity is the predominant energy source used by office buildings to light, cool, heat, ventilate, and power their space. Within the commercial building sector, consumption of electricity accounts for 78% of the sector's total carbon dioxide emissions.[14] Hence, reducing a building's electricity and overall energy consumption can lessen the environmental impact and reduce greenhouse gas emissions.

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[12] District Heat is steam or hot water produced outside of a building in a central plant and piped into the building as an energy source for space heating or another end use.

[13] "Understanding Source and Site Energy." Energy Star. Accessed 25 June 2008. <http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_benchmark_comm_bldgs>

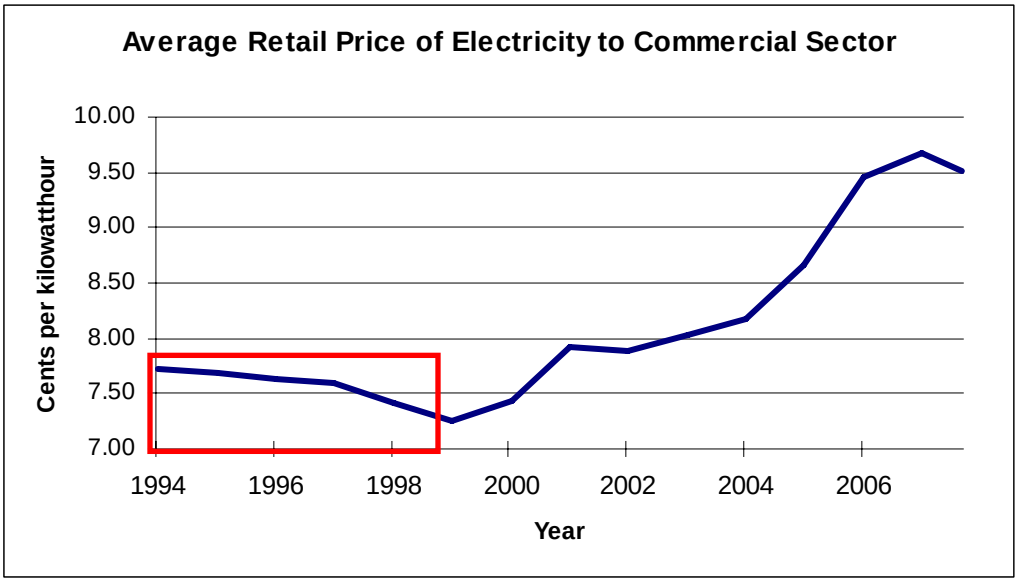
[14] "U.S. Carbon Dioxide Emissions From Energy Sources 2007 Flash Estimate." Energy Information Administration. May 2008. Accessed 18 June 2008. <http://www.eia.doe.gov/oiaf/1605/flash/flash.html>.

1.2 Rising Energy Prices and Energy Efficiency Investments

With the recent run-up in energy and electricity costs, coupled with the increased demand for energy-efficient and green space, building owners have examined energy efficiency projects more closely. Economists suggest that the current increase in energy prices is not an anomaly and that the "era of cheap energy is over."[15] Figure 6 shows the increase in the average retail price of electricity to the commercial sector across the U.S. since 2000. This is an approximately 25% increase over the past 7 years.

This is a noticeable departure from what the price of electricity did in the previous six years from 1994 to 2000. The price of electricity actually decreased until the year 2000, but has increased ever since. This has real consequences for virtually every business and impacts cost structure, and hence, profitability.

Figure 6: Average Retail Price of Electricity to Commercial Sector, 1994-2008

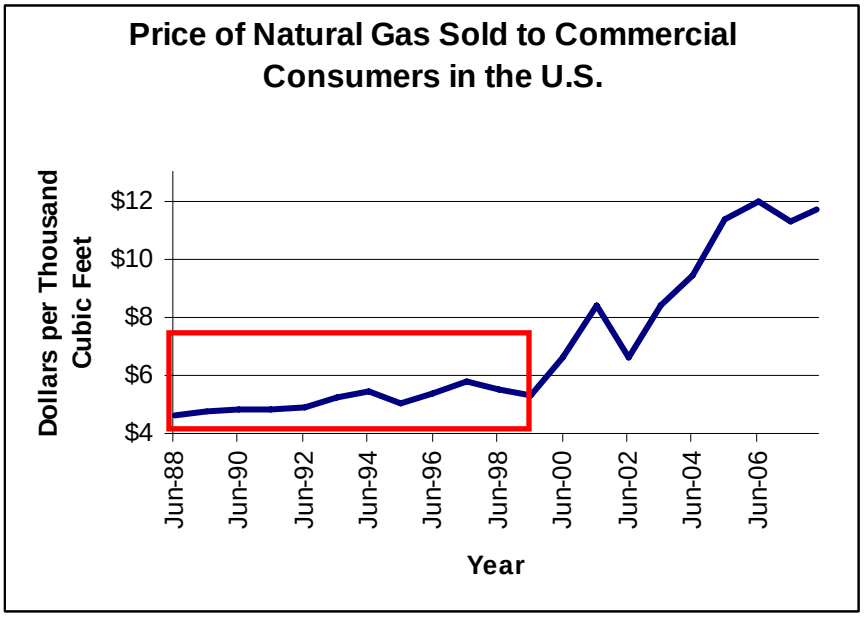


Source: Energy Information Administration, data through February 2008

[15] Lave, Lester B. "The era of cheap energy is over." Pittsburgh Post-Gazette. 4 May 2008. Accessed 2 June 2008. < http://www.post-gazette.com/pg/08125/878667-35.stm>.

A similar trend can be observed in Figure 7 for the price of natural gas, which over the past 8 years, has increased from $6.59 in 2000 to $11.66 in 2008. The price jumped dramatically from 2000 to 2008, increasing by 77%. As with electricity this is a marked departure from the historical activity (1988 to 2000) of the commodity.

Figure 7: Price of Natural Gas Sold to Commercial Consumers, 1988 - 4/2008



Source: Energy Information Administration, data through April 2008

This price activity is important -- a fact that the New England region, for one, already generating 42% of its electricity by power plants burning natural gas, has recognized.[16] Given these national energy trends real estate companies have an opportunity to engage in energy efficiency projects that not only make environmental sense but also economic sense.

1.3 Advantages of Green Buildings

As real estate is a major user of natural resources, businesses are looking to green the spaces they occupy as a way to enhance their public image and fulfill their sustainability initiatives. Additionally, there are also significant advantages of green buildings that have been reported by their early adopters and occupiers:[17]

[16] "New England's Wholesale Electricity Markets Performed Competitively in 2007." ISO New England Press Release. ISO New England. 6 June 2008. Accessed 22 July 2008. <http://www.iso-ne.com/nwsiss/pr/2008/amr_press_release_06.09.08.pdf>.

[17] Note: some of these green building advantages are not always applicable to existing buildings that only pursue LEED-EB.

- Green building's have healthier indoor environments with fewer toxins and more daylighting, which can increase employee productivity. For example, the "West Bend Mutual Insurance Co. documented a 16 percent productivity gain in the early 1990s following a move into a new 150,000-square-foot green building. Its annual payroll at the time was $13 million; the increased productivity amounted to more than $2 million a year. Design strategies included daylighting, individually controlled workstation environments, connectivity to nature and improved lighting. Energy costs were reduced by an estimated 40 percent."[18]
- Similarly, healthy indoor environmental quality leads to lower absenteeism and turnover among employees, according to the U.S. Environmental Protection Agency and the American College of Allergy, Asthma & Immunology. Pennsylvania Power & Light's upgrade of their lighting system in a drafting facility produced not only energy savings of 69% but also an increase in productivity by 13%, with a 25% decrease in absenteeism. [19]
- Good indoor air quality can reduce the risk of lawsuits and insurance claims. In Bloomquist v. Wapello County, Iowa 1993, workers successfully sued their employers for providing inadequate ventilation and failing to provide a safe workplace.[20]
- With green buildings perceived as higher quality products that have lower risk, insurance companies, such as the Fireman's Fund, are offering discounts. The Fireman's Fund is currently offering a 5% discount for both commercial and residential buildings that were constructed or renovated with green principles.[21]

[18] "An Introduction to the U.S. Green Building Council and the LEED Green Building Rating System." PowerPoint. 18 March 2004. Accessed 7 July 2008. <www.usgbc.org/Docs/About/usgbc_intro.ppt>.

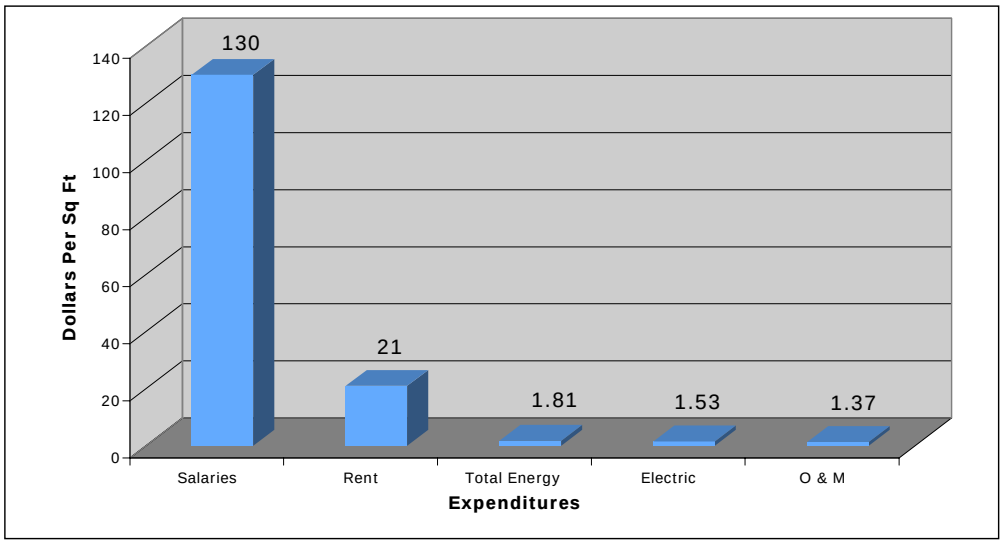
[19] Romm, Joesph J., and William D. Browning. Greening The Building and The Bottom Line. Rocky Mountain Institute. December, 1994.

[20] Witkin, James B. Environmental Aspects of Real Estate and Commercial Transactions. Chicago: Section of Environment, Energy, and Resources Real Property, Probate and Trust Section, American Bar Association, 2004. 656-657.

[21] "Fireman's Fund Offers Green Insurance for Homeowners." Greener Buildings. 8 July 2008. 16 July 2008 <http://www.greenerbuildings.com/news/2008/07/08/firemans-fund-green-insurance>.

Carnegie Mellon University conducted research for the General Services Administration (GSA) in 1999 that found labor costs to be 78% of total operations costs. While costs related to real estate, such as rent, operations and maintenance, and office moves, made up only 9%.[22] Clearly, any measure that improves worker health, productivity, and retention can have a tremendous impact. The question, then, is this: 'how do we make it easier and more appealing for companies to invest in more green, or sustainable, buildings?' The answer will come through a balance of public sector guidelines and private sector incentives.

Figure 8: Average Annual Commercial Expenditures in Dollars Per Square Foot



Source: Data from Building Owners and Managers Association; Electric Power Research Institute; Statistical Abstract of the United States, 1991

1.4 Government Role in Greening Buildings

Significant policy and regulatory shifts toward "greener" government buildings are also evident today. The Energy Independence and Security Act of 2007 mandates that all federal buildings reduce energy use 30 percent by 2015, compared with their 2005 levels. The measure goes on to mandate that all federal agencies occupy space only in Energy Star[23] (a prerequisite of the LEED for Existing Buildings rating system discussed in Chapter 2) certified buildings beginning in 2010. California and Michigan have executive orders requiring that state facilities or state funded projects meet some level of LEED.

[22] Morton, Steve. "Business case for green design." Building Operating Management. November 2002. Accessed 15 July 2008. <http://findarticles.com/p/articles/mi_qa3922/is_200211/ai_n9164101/pg_2>.

[23] Energy Star is a U.S. Department of Energy and U.S Environmental Protection Agency backed program established to promote energy efficiency. Buildings can earn an Energy Star if it can be demonstrated they meet a specified level of energy performance.

A growing number of jurisdictions, including the state of Connecticut; and cities and counties such as Babylon, New York; Boston, Massachusetts; Montgomery County, Maryland; Washington D.C; and San Francisco, California, have begun to impose green building requirements for private construction. Seventeen states, including California, and 80 localities require public buildings to meet green standards, but so far, only one state and 14 cities are applying those rules to private construction. Figure 9 shows a sampling of local government green mandates and incentives. The trend to date with governments has been to offer quicker permitting time for projects that are LEED registered while some municipalities are beginning to require that projects attain LEED certification in order to obtain a building permit. In general, major cities on the West Coast of the United States, such as Portland, San Francisco, and Seattle, have been more proactive about LEED buildings than cities on the East Coast. However, the East Coast is making efforts to catch up, with Boston currently leading its counterparts in Washington D.C. and New York City.

Figure 9: Sampling of Local Government Green Mandates and Incentives

Sampling of Local Government Green Mandates and Incentives

Jurisdiction	Date	Regulation
Boston, MA	2007	Zoning Code is revised to require LEED-NC certification for all public and private development projects over 50,000 SF.
Chicago, IL	2007	The Department of Construction and Permits expedites permitting for projects that incorporate innovative green building strategies, including LEED certification.
Los Angeles, CA	Jul-07	Private-sector green initiative requires all projects greater than 50,000 SF, or 50 units, meet LEED standards. In addition, the city is planning an expedited process for projects that meet or exceed LEED Silver.
Portland, OR	Jun-05	Resolution adopts LEED-NC Silver standards for all private-sector projects over 10,000 SF that receive public funds totaling over $200,000 or 10% of the total project costs.
San Francisco, CA	Sep-06	Planning Department Director's Bulletin gives priority permit review to all new and renovated buildings that achieve LEED Gold certification.
Santa Monica, CA	Aug-05	Ordinance expedites permitting for LEED-registered projects.
Seattle, WA	Apr-06	Zoning update provides a height or density bonus to commercial or residential projects that achieve at least LEED Silver certification and contribute to affordable housing.
Sunnyvale, CA	Jan-04	Ordinance updated the city's building codes in areas zoned for industrial use to allow a density bonus of 5% FAR for buildings that achieve a minimum of LEED-Certified.
Town of Babylon, NY	Nov-06	Local law that requires LEED certification for any new construction of commercial buildings, office buildings, industrial buildings, or multiple residence over 4,000 SF.
Washington, DC	Dec-06	Beginning in 2008, tenants of District-owned commercial buildings that improve a space of at least 30,000 SF must achieve LEED-CI certification. Starting In 2009, all new construction or major renovations to private, non-residential buildings 50,000 SF or more must outlining green features that will be pursued. After 2012, non-residential and post-secondary educational facilities shall achieve LEED-NC or LEED-CS certification.

Source: "The Greening of U.S. Investment Real Estate - Market Fundamentals, Prospects and Opportunities" RREEF Research. Number 57 November 2007.

In Boston, private developers proposing any type of project over 50,000 square feet have to prove that their building is "LEED certifiable"[24] in their submissions to the city. The work necessary to prove a project is certifiable is often enough to convince the developer to officially apply for the rating through the United States Green Building Council.[25] Boston is the only large U.S. city that currently has imposed strict environmental standards for private construction, but its mandate is not as far-reaching as San Francisco's current proposal.

On March 19th, 2008, the San Francisco Building Inspection Commission passed what are probably the toughest environmental construction standards in the country, and these standards are expected to be endorsed by senior officials in the next few months and put into operation by next year. The proposal requires Leadership in Energy and Environmental Design (LEED) silver certification for any public construction over 5,000 square feet. New residential high-rises taller than 75 feet, new commercial buildings larger than 5,000 square feet, and renovations on buildings larger than 25,000 square feet will also have to comply with LEED standards. Meanwhile, all new residential construction would have to be GreenPoint Rated,[26] another environmentally friendly building standard for residential buildings.

Under New York City Local Law 86, New York has also begun to mandate that private development meet LEED green building guidelines. However, Local Law 86, which took effect in January 2007, requires this only of persons who seek capital funds from New York City valued at either $10 million or 50% of the cost of the project cost. In addition, new buildings and additions constructed by the City that cost more than $2 million must also be energy efficient and adhere to the LEED green building guidelines. The City owns approximately 1,300 buildings and leases over 12.8 million square feet of office space. While not having as big of an influence on private development as Boston's or San Francisco's legislation, this law should significantly reduce New York City's electricity consumption, air pollution, and water usage while also

[24] "LEED Certifiable", a structure that is planned, designed and constructed to achieve the level "certified" using the LEED building rating system most appropriate for the Proposed Project, as defined in Article 37 of the Boston Zoning Code.
[25] The United States Green Building Council is a non-profit organization with 15,000 members that promotes sustainability as it relates to real estate and is responsible for the LEED rating system.
[26] According to the Build It Green website, GreenPoint Rated is a program that grades a home in five categories: Energy Efficiency; Resource Conservation; Indoor Air Quality; Water Conservation and Community.

encouraging the building construction towards green guidelines.[27] As highlighted, state and local municipalities are playing a more prominent role in pushing for green buildings beyond the properties they control.

1.5 Greening Private Real Estate

In recent years, numerous large companies and organizations have made commitments to improve their environmental footprint as it specifically relates to their real estate and Leadership in Energy and Environmental Design (LEED)[28]. Citigroup, which owns and leases 14,500 properties, totaling more than 87 million sq. ft. of space, in over 100 countries, has established a LEED Silver rating as the target for all of its new office space and operation centers worldwide, (among many other corporate sustainable measures). At the GreenBuild conference in 2007, GE Real Estate launched a program to green its entire real estate investment business, using the LEED rating system and international equivalents to benchmark performance of its portfolio. As we have described over the course of this chapter, corporations and other businesses have seen numerous benefits in efforts to green their existing offices or seek new green office space. These include lessening their environmental footprint and helping fight climate change; lowering energy dependency and achieving high returns of energy efficiency projects; lowering operating expenses; increasing employee productivity; lowering employee absenteeism or turnover; recruiting inducement for prospective employee talent; and not least mitigating risk of impending government regulations on building standards or greenhouse gas emissions.

1.6 Green Demand Outstrips Supply

To gauge corporate awareness and understand the key issues driving sustainability in real estate, Jones Lang LaSalle and CoreNet Gobal[29] conducted a survey in 2007 called *Sustainability*

[27] Percio, Stephen D. "LEED Silver for Bronx Library Center & Local Law 86 Primer." GreenbuildingsNYC. 22 Jan. 2007. 05 June 2008 <http://www.greenbuildingsnyc.com/2007/01/22/leed-silver-for-bronx-library-center-local-law-86-primer/>.

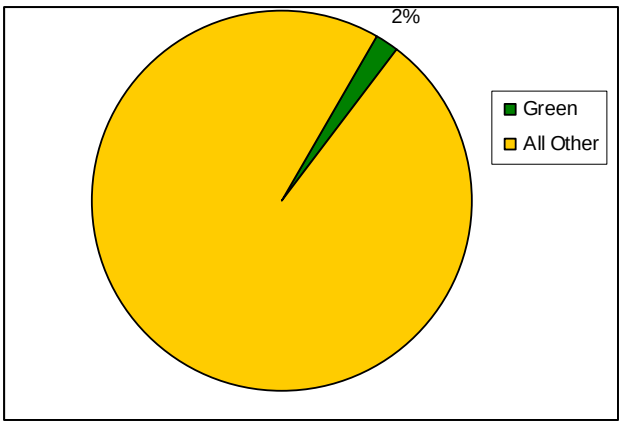
[28] The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a voluntary third party certification program, overseen by the USGBC that promotes a whole-building approach to sustainability (USGBC website).

[29] CoreNet Global members manage $1.2 trillion in worldwide corporate assets, totaling 700 billion square feet of owned and leased office, industrial and other space.

Perceptions and Trends in the Corporate Real Estate Industry.[30] The survey found that of the four hundred and fourteen corporate professionals who responded, 77% were willing to pay a premium for green space. Of this 77%, 55% were willing to pay a 1 to 5% premium, 22% willing to pay 5 to 10% premium, and 3% were even willing to pay a premium in excess of 10%. Nearly 80% of respondents said that sustainability would be critical to corporate real estate within two years. "Designing, building, and maintaining a green office building may require extra time and effort," the survey concluded, "but tenants are sending a clear message to the real estate industry – environmental sustainability is here to stay and of critical importance."[31]

With such corporate demand for green buildings, there does not appear to be sufficient supply. In the aforementioned Jones Lang LaSalle and CoreNet Global survey, only 17% of respondents stated that there was good, or widely available, sustainable real estate solutions in markets where their companies needed to locate offices. 42% of respondents reported patchiness and said the supply is good in some markets but not others. Another 41% of respondents viewed overall availability as limited or minimal. Overall, 83% of respondents described the national supply of green buildings as limited. Estimates from McGraw Hill using USGBC data in 2006 suggest that 2% of the US commercial real estate stock is currently LEED, so for tenants, sustainability is not always an easy choice (Figure 10).

Figure 10: Total US Non-Residential Construction in 2006



Source: McGraw-Hill and RREEF Research

[30] Breslau, Ben. "Sustainability in the Corporate Real Estate Industry: Perceptions and Trends." Jones Lang LaSalle, CoreNet Global. Jones Lang LaSalle, 2007. 1-4. 10 May 2008 <http://www.joneslanglasalle-boston.com/ma/corporate/research/download/BothIssues_Breslau_Sustainability_12-16-07.pdf>.

[31] Breslau, Ben. "Sustainability in the Corporate Real Estate Industry: Perceptions and Trends." Jones Lang LaSalle, CoreNet Global. Jones Lang LaSalle, 2007. 1-4. Accessed 10 May 2008 <http://www.joneslanglasalle-boston.com/ma/corporate/research/download/BothIssues_Breslau_Sustainability_12-16-07.pdf>.

A large percentage of the new construction going up in major cities across the U.S. is starting to show signs of "green". In New York and Atlanta, 80% of the new office developments will be LEED certified, while Boston and Chicago's new office pipeline is around 55% LEED.[32] Currently, there are 1,134 certified projects under the LEED for New Construction (LEED-NC) rating system while 7,562 projects are registered (meaning that the projects are pursuing certification but have yet to be certified by the USGBC) under LEED-NC. While this shift in new construction to meet LEED criteria will continue, driven by a combination of regulations, incentives, and tenant demand, new construction approximately accounts for a mere 1% of the building stock. The remaining 99 percent of the building stock are existing buildings -- the logical source to meet the demand for "green" space.

1.7 Thesis Objectives and Methodology

We are observing exponential growth year after year in the interest for green space, whether to build it, manage it, or work in it. However, until recently the greening of existing buildings hasn't captured the same interest as greening new construction. There are approximately 4.6 million commercial buildings in the U.S., of which nearly 824,000 are commercial office buildings.[33] Only 511 of these office buildings have been certified or registered as LEED for Existing Buildings projects,[34] constituting less than 0.1% of the office building stock. The LEED for Existing Buildings (LEED-EB) rating system is one of nine LEED rating systems and it provides a benchmark for building owners and managers to measure operations, improvements, and maintenance.

The remainder of the thesis is organized as follows:
In Chapter 2, we explain the Energy Star program, the National Australian Built Environment Rating System, the Building Research Establishment's Environmental Assessment Method, and Leadership in Energy and Environmental Design Rating Systems. We felt it was helpful to

[32] "Global Trends in Sustainable Real Estate: an Occupier's Perspective." Jones Lang LaSalle & CoreNet Global. February 2008. 1-7. Accessed 10 May 2008. <http://www.building.co.uk/Journals/Builder_Group/Building/Think_Digital_Supplement/attachments/Report%20-%20Global%20Trends%20in%20Sustainable%20Real%20Estate%20-%20An%20Occupier's%20Perspective.pdf>.

[33] "2003 Commercial Buildings Energy Consumption Survey: Number of Buildings and Floorspace by Principal Building Activity; Table 1". Energy Information Administration. Washington DC. December 2006.

[34] Data for the USGBC as of June 4, 2008.

analyze several international and domestic green building rating programs in order to provide a frame of reference on how to identify and address building performance.

In Chapter 3, we discuss the main findings of our research relating to the motivations, costs, financing, and execution of LEED-EB. Our initial observation of the users of the LEED-EB rating system was that the owner-occupiers and single building tenants dominated them. However, through extensive literature review, case studies and interviews with building owners, property managers, building engineers, and brokers, we have observed a market shift. Owners of commercial Class A multi-tenanted office buildings are suddenly starting to participate in LEED-EB by registering and subsequently certifying their projects. While LEED-EB certification seems to be rather straightforward and painless process for up-to-date and well managed Class A office buildings, LEED-EB is a much more arduous task for a Class B and C building owners.

In Chapter 4, our interest in on-site power generation and creative ways to finance energy efficiency upgrades, (both sections in LEED-EB in which applicants can earn points), led us to talk with professionals in these areas. Those interviewed were professionals involved in solar energy, green building finance, Energy Service companies, on-site combined heat and power (co-generation plants), and energy policy. We organized Chapter 4 into two sections to convey the results of our interviews. The first section will examine Energy Savings Performance Contracts (ESPCs). The second section examines Power Purchase Agreements (PPAs).

Chapter 2: Benchmarking Building Performance

2.0 Overview

The real estate industry's effort to combat climate change and reduce greenhouse gases requires measurement and a concrete understanding of environmental impact. For better or worse there is the tendency of building owners to declare their property "green" or as having certain sustainable features with little more than their word and experience to document their assertions. This presents a challenge to an observer looking to understand a particular building's green design or operational features or compare one building to another. The presence of an objective third-party can provide an opportunity to assess and certify a building's performance. Globally, there are many third-party rating systems by which a building can benchmark its design, construction and operations. This chapter will identify and summarize some of the major green building rating systems with a focus on the LEED Green Building rating system and, more specifically, LEED for Existing Buildings. The following sections provide a brief summary of four rating systems and the issues they seek to address.

2.1 Energy Star

In the U.S., the Environmental Protection Agency released the Energy Star program for Office Buildings in 1999, allowing a building owner to measure the energy efficiency of a building and compare it to other buildings across the U.S. Under the program, the energy performance of a building is scored on a 1-100, scale and the buildings that achieve a score of 75 or above are eligible for the Energy Star.[35] For example, a building that has a score of 80 means the building is in the top 20% of facilities in the country for energy performance. The score is calculated by estimating how much energy the building would use if it were the best- or worst-performing building of its type (and every level in between) in terms of its size, location, and number of occupants. The rating system then compares the actual energy data entered to the estimate to determine where the building ranks relative to similar buildings.[36] For existing buildings, applicants use the Portfolio Manager tool on the Energy Star website to organize, evaluate and track energy (and, more recently, water) consumption. The steps for using the Portfolio Manager tool can be seen in Appendix B. While the move to include water consumption has broadened the

[35] "The ENERGY STAR for Buildings & Manufacturing Plants." Energy Star. Accessed 10 June 2008. <http://www.energystar.gov/index.cfm?c=business.bus_bldgs>.

[36] "How the Rating System Works." Energy Star. Accessed 10 June 2008. <http://www.energystar.gov/index.cfm?c=evaluate_performance.pt_neprs_learn>.

scope of Energy Star it still does not address or rate many sustainable or green aspects surrounding a given building and isn't considered a comprehensive green building rating system.

2.2 NABERS (National Australian Built Environment Rating System)

The NABERS is a performance based rating system for existing buildings that measures their overall environmental performance during operation. The rating system is managed by the New South Wales Department of Environment and Climate Change and incorporates the Australian Building Greenhouse Rating that was launched in 2001 to assess of the greenhouse intensity of office buildings. Currently NABERS provides ratings for existing office buildings, office tenants, residential homes and hotels while ratings for hospitals, schools and retail centers are still under development. The system looks at three key categories; the impact of the building on its occupants, on its local environment, and on the broader environment. The measurement categories are dependant on the type of property being rated and include indoor air quality, water, energy use and greenhouse gas emissions, stormwater runoff and pollution, sewage, landscape diversity, transport, waste, toxic materials and refrigerants.[37]

2.3 BREEAM (Building Research Establishment's Environmental Assessment Method)

BREEAM, developed in the United Kingdom in 1990 by the Building Research Establishment,[38] claims to be the most widely used environmental assessment (rating) method for buildings in the world.[39] It covers many product types including office, retail, healthcare, industrial, residential, prisons, and courts. BREEAM also has a customizable tool that is meant for buildings fallings outside the standard categories such as hotels, resorts, laboratories and university buildings. As of October 2007, approximately 100,000 buildings were certified and nearly 700,000 homes and buildings were registered for assessment under BREEAM. The assessment criteria are divided

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[37] "NABERS – Frequently Asked Questions." National Australian Built Environment Rating System (NABERS). 2008. Accessed 14 June 2008. <http://www.nabers.com.au/nabers/faq.aspx?site=1>.

[38] "Using BREEAM to Assess the Environmental Performance of Buildings." PowerPoint. 2003. Accessed 7 July 2008. <http://www.heepi.org.uk/HEEPI%20presentations/Newcastle%20Sus%20Build%2025_03_04/Higher%20education%20HEEPI%20event%20-%20NewcastleTB.ppt>.

[39] "BREEAM *Frequently Asked Questions*." BREEAM (Building Research Establishment's Environmental Assessment Method). 2008. Accessed 14 June 2008. <http://www.breeam.org/page.jsp?id=27>.

into 9 categories: Management, Energy Use, Health and Well-being, Pollution, Transport, Land Use, Ecology, Materials and Water.

Three other rating systems and assessment methods worth noting are reviewed and summarized in the "Sustainable Building Rating Systems" report[40]; the CASBEE (Comprehensive Assessment System for Building Environmental Efficiency), developed in Japan in 2001; the GBTool, developed by the International Framework Committee for the Green Building Challenge; and the Green Globes™ US adapted from the Green Globes Canada rating system in 2004. "Sustainable Building Rating Systems," a report completed in July 2006 for the U.S. General Services Administration, made a comprehensive evaluation of 5 green building rating systems,[41] two of which are reviewed in this chapter. While the report did not provide a recommendation for a given rating system, it is a good resource that assessed and evaluated the 5 systems using a defined set of review criteria identified in the beginning of the report.

2.4 LEED® (Leadership in Energy and Environmental Design)

It is clear that third party green building rating systems provide an opportunity to benchmark building performance and to make objective comparison. According to the GSA, the most widely used rating system in the U.S. is LEED.[42]

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a third-party certification program, overseen by a non-profit organization, the United States Green Building Council (USGBC). LEED promotes a whole-building approach to sustainability by recognizing performance in five categories of human and environmental health: sustainable site development, water efficiency, energy efficiency, materials selection and indoor

[40] Fowler, K.M and Rauch, E.M.. "Sustainable Building Rating Systems Summary." Pacific Northwest National Laboratory. July 2006. Accessed 15 June 2008. <http://www.pnl.gov/main/publications/external/technical_reports/PNNL-15858.pdf>.

[41] 1) BREEAM (Building Research Establishment's Environmental Assessment Method); 2)CASBEE (Comprehensive Assessment System for Building Environmental Efficiency); 3)GBTool; 4)Green Globes™ US; 5)LEED® (Leadership in Energy and Environmental Design)

[42] Doan, Lurita. "Letter to The Honorable Christopher Bond, Committee on Appropriations, U.S. Senate." GSA Letter to Oversight Committee. 15 Sept. 2006. Accessed 15 June 2008. <https://www.usgbc.org/ShowFile.aspx?DocumentID=1916>.

environmental quality.[43] New and creative strategies and solutions that exceed credit requirements or are not recognized in other categories receive points in the Innovation section.

In each of the five categories, there are requirements and performance criteria. The USGBC calls these requirements prerequisites that stipulate the minimum requirements for achieving certification under a certain rating system. The performance criteria are called credits, and there are numerous credits within the categories that have points assigned to them; the better you perform (and document) the more points you achieve. In order to achieve a point, the applicant has to demonstrate compliance with the credit to the USGBC. For example, in the Energy & Atmosphere section of the LEED for New Construction rating system, one of the three prerequisites in this category calls for a minimum level of energy efficiency. The prerequisite sets forth specific sections of ASHRAE/IESNA Standard 90.1-2004[44] with which the project must comply with in order to get certified. A subsequent *credit* in the Energy & Atmosphere section encourages increased levels of energy performance, and, depending on the demonstrated level of performance, a project can earn additional points.

LEED has 9 separate rating systems: LEED for New Construction and Major Renovations, Existing Buildings: Operations & Maintenance, Commercial Interiors, Core & Shell, Schools, Retail, Healthcare, Homes, and Neighborhood Development. Figure 11 shows the year the rating system was adopted and made available for the general public (or its current status), as well as the most applicable development type for the given rating system.

[43] "LEED Rating Systems." U.S. Green Building Council. Accessed 19 July 2008 <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222>.

[44] According to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers/ Illuminating Engineering Society of North America Standard 90.1 User Manual, Standard 90.1 provides minimum requirements for the energy-efficient design of buildings and building systems. It applies to all buildings except low-rise residential buildings (low-rise means three habitable floors or less). The Standard is written in building code language and is intended for adoption by national, state/province, and local code jurisdictions.

Figure 11: Table of LEED Rating Systems and Status

Rating System	Year Adopted/Drafted	Applicable Development
New Construction (NC)	2000	Built-to-suit or owner occupied
Existing Buildings (EB)	2004	Renovations or reposition
Commercial Interiors (CI)	2004	Tenant Improvements
Core & Shell (CS)	2006	Speculative development
Schools	2007	K - 12 schools
Homes	January 2008	Single family homes (multi-family possible)
Healthcare	[Draft] First comment period closed in Spring 2008	Healthcare facilities
Retail: New Construction	[Draft] Second comment period opened Spring 2008	Shopping Centers and retail spaces
Retail: Commercial Interiors	[Draft]First comment period slated for Summer 2008	Retail interiors
Neighborhood Development (ND)	Pilot program closed, public version expected in 2009	Planned developments

Source: USGBC and RREEF Research

Throughout the 9 rating systems, applicants can achieve 4 levels of certification; Certified, Silver, Gold and Platinum. The number of points needed to achieve the various levels differs for each rating system and does not correspond to the level of difficulty.

Figure 12: LEED Points Associated with Different Rating Systems

		Rating System			
		NC	EB	CI	CS
Certification Level	Certified	26-32	34-42	21-26	23-27
	Silver	33-38	43-50	27-31	28-33
	Gold	39-51	51-67	32-41	34-44
	Platinum	52-69	68-92	42-57	45-61

Source: USGBC

The point scales do not relate across rating systems, however the USGBC does hope to address this in the near future.[45]

[45] One of the fundamental changes in the proposed LEED 2009 Rating Systems will be to align the rating systems to a 110 point scale and to re-weigh the scaling of credit points.

A third-party green building rating system gives owners, managers and tenants, along with their professional team of engineers, architects and contractors, the ability to benchmark building design and performance. The purpose of assessing and benchmarking the performance of a design or operations of a building is largely to make measurement possible. Whether to comply with a government mandate or to differentiate a product, the more a developer or owner is able to measure green building performance, the better the a management team can do its job. This adoption of standards, along with compelling financial savings, brings clarity and organization to the greening of construction and building operation.

2.5.1 LEED for Existing Buildings

The LEED for Existing Buildings (LEED-EB) rating system provides the opportunity to fight climate change within the existing office building stock. LEED-EB was developed to measure the environmental performance existing buildings and presents a route for owners and managers of buildings to achieve LEED certification.

Additionally, an owner of a building previously certified under LEED for New Construction (LEED-NC) may want to prove that the building is currently maintained and operated in an efficient and sustainable manner and can do so through LEED-EB certification. While LEED-NC focuses on design expectations and construction practices, LEED-EB is based on actual building performance, and it addresses the operations and maintenance practices of the building and can help identify where operations and maintenance could be improved. Thus, LEED-EB attempts to reduce the environmental impact of the building during the course of its useful life.

LEED-EB is a whole-building certification program applicable to building operations, processes, and systems upgrades. The entire building must seek LEED-EB certification; therefore, individual tenant spaces or floors interested in LEED certification would instead seek LEED-Commercial Interiors. A building undergoing a complete gut renovation could seek certification under LEED-NC or LEED-CS depending on the occupancy. Projects with greater than 50% of the building’s tenant space occupied by a tenant/owner should utilize LEED-NC, if the

owner/tenant occupies 50% or less of the building's leasable space they should utilize LEED-CS.[46]

LEED-EB was first released in pilot version in January of 2002, and then formally as LEED-EB v2.0 in October of 2004. In November of 2007, the USGBC introduced an updated version entitled LEED for Existing Building: Operations & Maintenance (LEED-EB O&M). This new version, as its name suggests, focuses more on operations and maintenance. It also boasts of streamlined reporting, fewer prerequisites, and more emphasis on performance measurements, energy efficiency, water efficiency, and green cleaning. As of August 1, 2008, all projects registering for LEED for Existing Buildings must do so under the new LEED-EB O&M version.[47]

Some of the updates cited by the USGBC between LEED-EB v2.0 and LEED-EB O&M are as follows:

- 50% more points for energy efficiency in the Energy & Atmosphere (EA) Credit 1 and new credits for energy best practices, including auditing and building commissioning
- Doubling the number of points previously available for water efficiency and new credits for water metering and cooling tower efficiency
- Green cleaning has been consolidated into a single point category with emphasis on achieving a comprehensive green cleaning program and performance metrics for its effectiveness.
- New construction credits and prerequisites were removed from the system, making room for greater emphasis on operational best practices.
- Credits for bike racks and carpool signs have been converted into a performance-based system that rewards use.
- All credits in the Materials & Resources section have been sorted into groups, including consumable goods, durable goods, and facilities alterations and additions.
- References to third-party standards have been updated to include latest versions, notably ASHRAE 62 and 55, Uniform Plumbing Code, Green Seal, Environmental Choice, and CRI Green Label Plus.
- Prerequisites have been reduced from 13 to nine.[48]

[46] "LEED for Core & Shell." U.S. Green Building Council. Accessed 18 June 2008. Page 5. <http://www.usgbc.org/ShowFile.aspx?DocumentID=1728>

[47] "LEED for Existing Buildings." U.S. Green Building Council. Accessed 30 May 2008. <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>.

[48] "LEED for Existing Buildings." U.S. Green Building Council. Accessed 29 May 2008. <http://www.usgbc.org/ShowFile.aspx?DocumentID=3618>.

2.5.1 LEED-EB O&M Goals

To better understand LEED-EB O&M and its intentions, it helps to examine the goals addressed in the six LEED categories – Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation. It should be noted that one should refer to the USGBC's LEED-EB Reference Guide for father analysis of the LEED-EB's goals and its corresponding credits.

1) Sustainable Sites

Responsible, innovative, and proactive site management and maintenance techniques can ameliorate the negative consequences buildings have on their local and regional environment. The Sustainable Sites section identifies opportunities in improving exterior building management, encouraging alternate transportation, managing stormwater, minimizing light pollution, and reducing the heat island effect. There are eight credits in this section with twelve possible points.

2) Water Efficiency

In 2000, Americans use approximately 43.3 billion gallons per day of public supply water.[49] Only 14% of withdrawn water is consumed; the remainder is used, treated, and discharged back to the nation's water bodies. This returned water often contains contaminates such as bacteria, nitrogen, and toxic metals. Consequently, one-third of the nation's lake, streams, and rivers are unsafe for swimming and fishing, according to the U.S. Environmental Protection Agency. The Water Efficiency section endorses measures that curtail water consumption within the building and on the exterior landscaping through efficiency and wastewater strategies. In this section of LEED-EB O&M there is one prerequisite and four credits on a scale that awards up to ten points.

3) Energy & Atmosphere

In 2003, power plants in the United States generated 3,691 billion kilowatt hours (kWh) of electricity. Thirty-two percent of this power was used to heat, cool, light, and provide electricity needs to commercial buildings.[50] Coal-fired power plants generate approximately 53 percent of

[49] Hutson, Susan S., et al. "Estimated Use of Water in the United States in 2000." U.S. Geological Survey, Circular 1268, originally released March 2004, last revised February 2005. Accessed May 27, 2008. <http://water.usgs.gov/pubs/circ/2004/circ1268/htdocs/text-trends.html>.

[50] "Annual Energy Review 2007." Energy Information Administration. Accessed May 27, 2008. <http://www.eia.doe.gov/emeu/aer/>

this energy.[51] Producing electricity by burning fossil fuels emits harmful pollutants into the air and water. Additionally, utilities (electricity, water, natural gas, etc.) are the largest operational cost for commercial buildings, accounting for as much as 50% of overall operational costs on average. Coincidentally, it is the easiest place in the budget to realize savings, according to management experts.[52] The Energy & Atmosphere (EA) section rewards building commissioning, the efficient design of Heating, Ventilating, and Air Conditioning (HVAC) systems and performance-based measurements of the building's systems, as well as onsite renewable energy generation. There are three prerequisites and six credits for a total of thirty possible points, the most out of any sections. LEED-EB utilizes Energy Star in the EA section as an assessment tool for buildings to evaluate and benchmark their energy performance. Under EA Credit 1, two points are mandatory. To demonstrate achievement of those and any additional points the applicant has three options; 1) achieve an EPA rating of at least 69, using Energy Star's Portfolio Manager tool; 2) demonstrate energy efficiency at least 19% better than the average for buildings of a similar type; or 3) use an alternative method described in the LEED-EB O&M reference guide (not currently available to the public).[53]

4) Materials & Resources

Through their operation and use, buildings create a large amount of waste. The Material & Resource section aims to minimize waste, divert waste away from landfills and into recycling centers, and encourage the use of locally available materials with reductions in environmental impacts whenever possible. Thus, it rewards building policies that contain responsible procurement practices and effective waste management strategies. This section has two prerequisites and nine credits with a fourteen possible points.

5) Indoor Environmental Quality

Americans spend an average of 90 percent of their time indoors. Needless to say, the quality of a building's indoor environment is of great importance. Indoor Environmental Quality (IEQ) affects both an employee's health and productivity. The IEQ section encourages the use of low-emitting materials, daylighting and lighting quality, access to views, thermal comfort, and an Indoor Air Quality (IAQ) management plan, which addresses ventilation effectiveness, moisture

[51] "United States Country Analysis Brief." Energy Information Administration. January 2005. Accessed 27 May 2008. <http://www.eia.doe.gov/emeu/cabs/usa.pdf>.

[52] Johnson, Ben. "Tenants Go for the Green." National Real Estate Investor. 1 November 2007. Accessed 29 May 2008. <http://nreionline.com/property/office/tenants_green_building/>

[53] "LEED for Existing Buildings." U.S. Green Building Council. Accessed 30 May 2008. <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>.

management, and control of contaminants. Automatic sensors and individual controls are also rewarded. The IEQ section has three prerequisites and three credits for a total of nineteen possible points.

6) Innovation in Operations

Strategies for operating buildings more sustainably are constantly evolving and improving. The Innovation in Operations section provides an opportunity for applicants to earn four additional points by implementing innovative projects that are not recognized in any other category. This section has three credits with a total of 7 possible points. The remaining three points are achievable by having a LEED Accredited Professional on the team (1 point) and documenting sustainable building cost impacts (2 points). The Innovation credits are of great importance to the growth and development of the LEED rating system as a whole because they reward creative solutions to real problems.

2.5.2 Points for LEED-EB O&M

There are four levels of certification in the LEED-EB O&M rating system, as seen below in Figure 13. The levels are differentiated by a range of points that can be achieved by fulfilling a combination of credits in the 5 LEED categories. Below are the different levels and point categories:

Figure 13: LEED-EB O& M Certification levels

Certification Level	LEED-EB O&M Point Range
Certified	34-42
Silver	43-50
Gold	51-67
Platinum	68-92

Source: USGBC

Additionally the USGBC has a pilot Portfolio Program that was launched in November of 2006. The program involves 40 companies and institutions and includes 1700 buildings and approximately 135 million square feet of building space. The Portfolio Program's goal is to encourage "companies and building owners to integrate LEED into their new and existing building projects using a cost-effective, streamlined certification process."[54] The idea is to

[54] "Portfolio Program." U.S. Green Building Council. Accessed 9 June 2008 <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1729>.

persuade a company like Starbucks, which has an aggressive growth plan for new stores and a significant existing store portfolio, that there is a streamlined and efficient way for them to use the relevant LEED rating systems to approach their new construction as well as to green their existing space. Owners with a portfolio of existing buildings are another target constituency. The USGBC pilot program was scheduled to end in mid-2008 and officially launch in 2009. While it will most likely have some issues to work through, the program should be a beneficial tool for building owners looking to achieve LEED-EB O&M certification across their portfolio.

2.6 Conclusion

The green building rating systems discussed in this chapter have the common goal of minimizing the environmental impact of what goes into a building, what happens inside a building, and what leaves a building. The BREEAM system has certified more buildings than any other system in the world and is well positioned to be an effective tool for building owners, managers and developers throughout the world. The LEED rating system has been building momentum in the U.S. as well as internationally and offers a framework similar to BREEAM for analyzing a building's "green" performance.

Benchmarking building performance can have clear managerial benefits. The ability to measure the efficiency of building systems or have a working knowledge of indoor air quality presents the managers and owners with better tools in the effort to monitor and control costs and ensure tenant comfort and happiness. The global movement to fight climate change and reduce greenhouse gases is expanding exponentially, and real estate's role is only becoming more apparent. Using a third-party green building rating system provides owners and managers with the methodology and means to manage their environmental footprint and compare it to others in the industry. As government and industry move towards consensus in terms of regulations and incentives, one can expect an explosion in economic activity in this field.

Chapter 3: Who, Why, and How: LEED-EB

3.0 Overview

The LEED for Existing Buildings (LEED-EB) Rating System was created to assist owners and operators maximize their building's operating efficiency as well as minimize its environmental impact. Although the LEED-EB Rating System has been around since 2004, there are currently only 90 LEED-EB certified buildings. Compared with the success of the LEED for New Construction program, LEED-EB has had a slow start. However, today there appears to be a substantial shift in the market towards embracing LEED-EB, particularly in the nonowner-occupied Class A, urban, office buildings, as 1,503 total buildings are presently registered for LEED-EB.

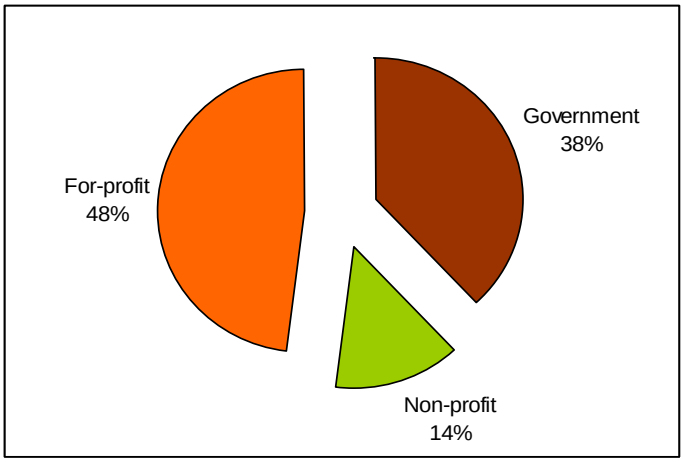
Given this apparent market shift towards LEED-EB, our focus was: *who* was participating; *why* were they participating; and *how* were they achieving or planning to achieve LEED-EB. Along with a thorough literature review and analysis of existing case studies (we compile and highlight main lessons from these case studies in Appendix A), we interviewed building owners, asset managers, property managers, engineers, and brokers about this market shift towards LEED-EB. We spoke with 15 real estate professionals who represented the owners of Class A, B, and C office buildings, with approximately two-thirds representing Class A office space and one-third representing Class B and C office space. We also interviewed representatives from two different Class A office building management teams. Interestingly, because of the nature of some vertically integrated real estate companies, which have ownership interests as well as management responsibilities, five of the professionals we interviewed were able to "wear several different hats" and provide multiple perspectives. Six office brokers representing tenants and owners in both Class A and Class B space provided additional perspective on green in the real estate market. This chapter synthesizes our findings into six sections: Participants; Motivations; Execution; Financing; Costs; and original Case Studies.

3.1 Participants

In 2005, 33 million square feet of building space were registered under LEED-EB, and 19 buildings had earned LEED-EB certification. Of this LEED-EB space in 2005, approximately 48

percent were owned and occupied by for-profit corporations, 38 percent by local, state, and federal government, and 14 percent by nonprofit organizations as illustrated in Figure 14.[55]

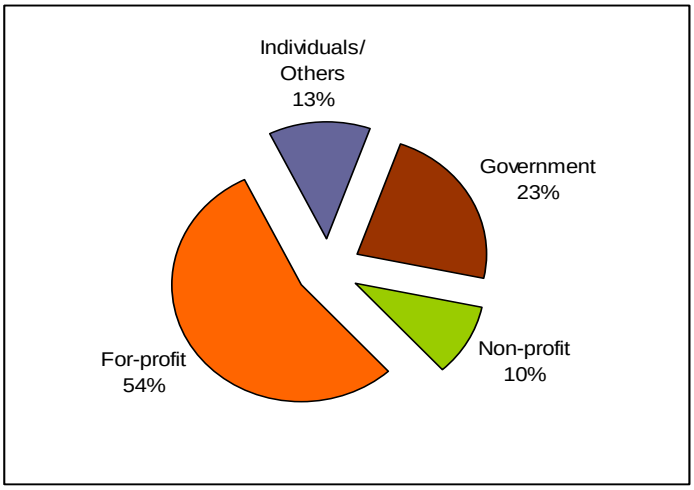
Figure 14: 2005 Percentage Breakdown of Types of Owners of LEED-EB Projects



Source: USGBC data from Tom Hicks' article, "LEED-EB: Effective Building Management." Environmental Design + Construction

Since 2005, the number of For-profit owners registering and certifying their buildings has increased 6% and now makes up a majority of the participants (Figure 15). This brings legitimacy to the LEED-EB rating system and indicates that companies sensitive to the bottom line are placing a value in LEED-EB certification.

Figure 15: 2008 Percentage Breakdown of Types of Owners of LEED-EB Projects



Source: USGBC (July 2008 data)

[55] Hicks, Tom. "LEED-EB: Effective Building Management." Environmental Design + Construction. 8 August 2005. Accessed 29 May 2008. <http://www.edcmag.com/Articles/Leed/63be0104cd697010VgnVCM100000f932a8c0>

Currently, there are a growing number of multi-tenant LEED-EB projects demonstrating an increasing awareness and acceptance of the LEED-EB rating system by those other than owner occupiers as seen in Figure 16.

Figure 16: Occupancy Type for LEED-EB Certified and Registered Projects

Occupant Type	Certified	Percentage	Registered	Percentage
Fed Gov't	3	3.3%	82	5.5%
State Gov't	13	14.4%	174	11.6%
Local Gov't	8	8.9%	68	4.5%
Non-profit	9	10.0%	148	9.8%
Profit	48	53.3%	472	31.4%
Mixed Occupancy	**10**	**11.1%**	**524**	**34.9%**
Individual	0	0.0%	55	3.7%
Total	**90**		**1503**	

Source: USGBC (July 2008 Data)

Major office owners in the U.S., such as Beacon Capital Partners, Boston Properties, Brookfield Properties, Equity Office, Hines Interests, Liberty Property Trust, Tishman Speyer, and Vornado Realty Trust, are currently registering and certifying their nonowner-occupied office buildings under the LEED-EB program. Typically these properties are Class A buildings[56] found in core urban markets, such as Boston, New York, Washington D.C., Chicago, and San Francisco. Brookfield Properties Corporation, which has one of the world's largest office portfolios, plans to retrofit at least one building in each U.S. market every year to LEED-EB certification.[57] Although other companies have not provided a timeline, they outlined plans to green their entire portfolio to specific levels of LEED. The growing awareness and interest in LEED-EB was evident in our interviews. In fact, utilizing our findings, we were able to calculate that 40% of the Class A building stock in the downtown Boston office market is in the planning stages for, registered for, or certified as LEED-EB. [58]

[56] The definition of Class A space can differ from market to market, but according to the Urban Land Institute Class A space can be characterized as buildings that have excellent location and access, attract high quality tenants, and are managed professionally. Building materials are high quality and rents are competitive with other new buildings.

[57] "Brookfield Properties Corp, 6-K, Report of a Foreign Private Issuer, EX-99.1." SEC Info. 27 March 2008. Accessed 27 June 2008. <http://www.secinfo.com/dRX7g.tBc.d.htm>.

[58] The percentage was calculated using Jones Lang LaSalle's Boston Class A office total square footage number of 32,772,776 as the denominator ("Greater Boston Market Statistics – 1st Quarter 2008") and data gathered through our interviews and research as the numerator. <http://www.joneslanglasalle-boston.com/ma/corporate/research/download/Q1_08_GreaterBoston OfficeMarketStatistics.pdf>.

Property managers like CB Richard Ellis and Transwestern are also beginning to register and certify buildings that they manage under the LEED-EB program. The knowledge and expertise working with LEED helps differentiate the management teams of these companies from those of other competitors while also attracting a lot of positive free press regarding their sustainable management practices. CB Richard Ellis and Transwestern have registered 100 and 51 U. S. office buildings, respectively, in the USGBC LEED-EB Pilot Portfolio Program.[59]

3.2 Motivations

Since April of 2008, nearly 483 more buildings have been registered under the LEED-EB rating system, second only to LEED-NC, which has had approximately 680 registrations since April. Many of these new applicants for LEED-EB are nonowner-occupied office buildings, while the majority of prior applicants of LEED-EB were owner-occupiers. Owner-occupiers were the early adopters of LEED-NC and LEED-EB, since they tend to have a more long-term outlook on their real estate, including a general awareness of the benefits inherent in green upgrades: higher employee productivity, retention, and recruitment; lower absenteeism; and lower operating costs. So, owner-occupiers have much more of a vested interest in greening their space, making their employees comfortable, happy, and productive.

Multi-tenanted owners have less of an incentive to green their facilities. They incur the initial costs for green upgrades – while only being able to recoup the energy or water savings if their lease allows them to pass through the upgrade costs along to the tenants. What's more, they have until recently received little or no additional monetary reward for green space from their tenants. What, then, are the reasons for the recent shift towards LEED-EB in nonowner-occupied buildings? The building owners of multi-tenanted space that we interviewed identified five motivating factors.

1) New Construction is Going Green

In the past decade, a growing majority of newly constructed buildings have been designed and built to green standards, such as LEED for New Construction. With the regulatory forces in cities like Boston requiring buildings over 50,000 square feet to be "certifiable," and markets such as San Francisco reporting nearly 100% of the commercial buildings (under construction, approved,

[59] Burr, Andrew. "The Big Skodowski." Co Star Group. 1 January 2008. Accessed 25 June 2008. <http://www.usgbc.org/News/USGBCInTheNewsDetails.aspx?ID=3577>

or in the planning stages) seeking LEED certification, there seems to be shift in the standards for new commercial buildings.[60] Building owners interviewed, especially owners of Class A space, told us that the new buildings were going to be green, and that to compete they needed to start upgrading their existing buildings to the LEED standards.

2) Green is a New Amenity

Owners feel that LEED certification is another amenity or seal of approval that sets their buildings apart from the rest. John Conley, Vice President of asset management, for Equity Office, who is planning on greening Equity's entire Boston portfolio to LEED-EB Silver certification level, explained that the rationale Equity Office is make this effort is for reasons of leasing and marketing. "Sustainability and LEED," says Conley, "is another amenity to offer, just like a fitness club, cafeteria, proximity to transportation, or parking."[61] Others owners echoed this sentiment, telling us that LEED would be a powerful marketing tool in attracting tenants, many of whom are increasingly aware of their environmental footprint. In the words of Andrew Hess, Transwestern Investment Company's representative for Milwaukee Center, a 28-story Class A office building in Milwaukee, WI.: "As a building owner, the LEED-EB certification provides a real opportunity to differentiate ourselves in the market. Making even the smallest operational changes yields not only financial rewards, but provides a better workplace where everyone benefits."[62]

3) Tenant Demand

Tenants are beginning to ask for green space, particularly LEED certified space. These tenants tend to be the good corporate citizens, government agencies, and technology companies that have public sustainability initiatives. Companies that place a very high value on the recruitment and retention of their employees, also see the importance of being able to point to a healthy and sustainable work environment. One broker who works with technology and biotech firms, confirmed this observation in her comment to us that, "companies that are competing for talent use their facilities as recruitment tools. If you are going to ask your employees to spend a lot of

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[60] Nelson, Andrew. "Financing and Investing in Green Buildings: Why Green? Why Now?" RREEF Research. PowerPoint. 8 January 2008. Accessed 18 May 2008. <http://www.ulisf.org/Content/10074/Financing_and_Investing_in_Green_Buildings_Presentations_and_Handouts.html>.

[61] Conley, John. Interview. 23 June 2008.

[62] "Milwaukee Center Office Tower Leads the Way." Green: Southeastern Wisconsin's Green Business Update. October 2007. Accessed 16 June 2008. <http://www.transwestern.net/EnergyStar/Green%2010_19_07.pdf>.

hours at work, you want to be able to point to good air quality and other measurable sustainable features...People are a firm's most expensive and import asset."

Such tenants, however, don't make up the entire market. In Boston, the average-size tenant occupies 20,000 square feet, and, while the brokerage community has noticed more tenants asking about LEED, tenants are not making decisions solely on whether the building is LEED certified or not.[63] Looking for office space tends not to be a regular occurrence for most businesses, as lease terms generally last between 5 and 10 years. According to the brokers interviewed, the selection criteria include LEED and sustainability but still focus primarily on location, access to public transportation, and building amenities. But it is worth noting a conversation that we had with a tenant in a Class A office building in downtown Boston, that is not currently upgraded to LEED-EB. He was describing how employees in his office were really starting to be pro-active about environmental issues, doing things like replacing disposable coffee cups with personal mugs and planting trees in local parks. He was interested to learn about LEED-EB and wasn't aware there was a rating system for existing office space. This piece of anecdotal evidence illustrates a potential for existing building owners to, at the very least, capture the interest of tenants by highlighting their sustainable building performance, possibly creating tenant loyalty and reducing tenant turnover, which can be costly to owners.

4) Investor Demand

Investors are beginning to ask about and for sustainability. A straw poll, conducted at a meeting of foreign and American investors for a major domestic and international developer (who asked to remain confidential), indicated that over half the investors said they would pay a premium for a green building – somewhere in the neighborhood of 5%.[64] Foreign investors, such as Europeans, seem to be leading the pack in sustainability; they seem to be more knowledgeable and experienced with sustainable assets and aware of the repercussions of impending green regulations. One building management team interviewed described its Canadian owner as highly receptive to LEED, since the owner compared it to the ISO certification[65] in Europe. There, if

[63] Blount, Kristen. Interview. June 19 2008.
[64] A telephone interview with a major domestic and international developer (who has requested to remain unidentified) whose investors are from around the world. 16 June 2008.
[65] ISO (International Organization for Standardization) 15392:2008 certification identifies and establishes general principles for sustainability in buiding construction. It is based on the concept of sustainable development as it applies to the life cycle of buildings and other construction works, from their inception to the end of life. (ISO website)

your building is not rated, you are not that likely to attract tenants or investors. Of course, not all investors are like-minded when it comes to sustainability. Some of the real estate managers we spoke with talked about the uphill battle they are fighting against their building owners in order to retrofit their buildings to green standards.

Numerous investors, it is clear, only care about the bottom line, or their return on their investment. But perhaps they are overlooking increasing evidence that green buildings can positively affect the bottom line. According to a CoStar Study released this March, for example, "demand in the marketplace for sustainability creates higher occupancy rates, stronger rents and sale prices in 'green' buildings."[66] Specifically, the CoStar Study stated that LEED buildings command rent premiums of $11.33 per square foot over non-LEED peers while also having a 4.1% higher occupancy than their non-LEED peers. Additionally, rental rates in Energy Star buildings represent a $2.40 per SF premium and have a 3.6 % higher occupancy than their non-Energy Star peers. Consequently, buildings are selling for an average of $61 per SF more than their peers, while "LEED buildings command a remarkable $171 per square foot" premium over their peers. In our interviews, building owners could not point to specific examples that would indicate whether green buildings were worth this much more than their non-LEED peers, but they did voice a "gut feeling" or intuition that their efforts are helping increase the value of the asset.

5) Fight Climate Change

Going green is just "the right thing to do," according to a Vice President at a real estate investment firm that specializes Class A properties. Anthony Campbell, Vice President of Energy Services for Vornado Realty Trust, said that he lived a frustrating life until the USGBC and Al Gore came along and brought national attention to sustainability issues and to the environmental impact of real estate and the human beings who develop, manage, and occupy it. Many of the professionals we interviewed believe real estate has a significant role to play in the fight against climate change and were motivated by the challenge to lessen the environmental impact of their professional activities. Since buildings produce 43% of carbon dioxide in the United States, real estate owners are beginning to recognize the need to green their space to play their part against climate change.

[66] Burr, Andrew. "CoStar Study Finds Energy Star, LEED Bldgs. Outperform Peers." CoStar Group. 26 March 2008. 5 April 2008. <http://www.costar.com/News/Article.aspx?id=D968F1E0DCF73712B03A099E0E99C679>.

3.3 Execution

The process and implementation of LEED-EB has been documented and summarized in a number of reports[67], articles and presentations[68]. Utilizing this literature and our interview findings, we have compiled a list of best practices for implementing LEED-EB.

3.3.1 Best Practices

After the decision has been made to rate a building's performance using LEED-EB, there are seven general steps, or best practices, that should be followed.

1) Select a Team

Choosing primary team members who are familiar with the building and how it operates and are knowledgeable of the LEED-EB rating system makes a positive first step. The team should have a clear leader who is focused on the goals of the LEED process. Data collection and documentation should be considered just as important as the knowledge of building systems and maintenance. Key members of the team can include Facility Managers, Property Managers, Plant Engineers, Operations and Maintenance Personnel, Commissioning Authorities, Engineers, Contractors and Vendors.

2) Conduct a Building Audit

The next step for the team is to sit down with the LEED-EB checklist (Appendix B) and review the building operations and practices using the LEED EB framework. The team should answer and identify the following:

- Are the prerequisites met?
- Identify the credits that can be met.
- Identify the credits that can be achieved with little or no cost.
- Identify the credits that will require capital.

The result of the building audit will give the team a sense of where they stand and the scope of what they will need to do to certify their building.

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[67] Iczkowski, Ed. "LEED-EB: How to Achieve Certification and Reduce Operating Costs." Texas A&M; Energy Systems Laboratory. 2005. 1-8. Accessed 29 May 2008. <http://repository.tamu.edu/handle/1969.1/5134>.

[68] "Understanding Operations & Maintenance for Existing Buildings." Green Building Services, Inc. 2006. Accessed 23 June 2008. <hawaii.gov/dbedt/info/energy/efficiency/state/leed06-2-eb.pdf>.

3) Register with USGBC

After the preliminary analysis of the building operations and practices, registration is encouraged. Registering initiates a relationship with the USGBC and opens up resources and orientation materials that can assist the team with technical support. Beginning July 1, 2008, all projects registering for LEED-EB must do so under the LEED-EB: Operations & Maintenance version. The fees associated with registering are identified in Figure 17.

Figure 17: Table of Fees for LEED-EB Registration.

USGBC Registration fees	
Members	$450.00
Non-Members	$600.00

Source: USGBC

4) Identify Incentives and Partners

As the team starts to evaluate their budget and capital needs, they should be aware of a number of state and local incentives for energy efficiency, renewable energy and LEED projects. These incentives take all forms – ranging from density bonuses to tax deductions, tax exemptions, and grants. Also available are rebates and loan and grant programs offered by utilities across the country. Awareness of such resources can help offset any initial capital investment. A good place to start research is the Database of State Incentives for Renewables & Efficiency (DSIRE). DSIRE is a comprehensive source of information on state, local, utility, and federal incentives that promote renewable energy and energy efficiency. [69]

5) Implement LEED-EB Plan

After identifying the prerequisites and LEED credits that the team is comfortable obtaining by documentation of current practices, the next step is to identify the "low or no cost" improvements and plan on how these are to be achieved. Some examples of "no cost" improvements are: sealing window and door frames, regularly changing filters, increasing the outdoor air quantity, replacing washers or cartridges in leaking faucets, replacing inefficient light bulbs with high efficiency bulbs, and reviewing the current building operating procedures. Examples of "low cost" improvements are: making equipment tune-ups, reviewing the sequence of operation, calibrating controls, and performing minor equipment upgrades such as variable frequency drives for motors, and installing occupancy sensors. Significant savings and efficiencies can be gained from

[69] http://www.dsireusa.org/

understanding a building's energy demand and usage and ensuring that the two match up.

Depending on the level of certification (Certified, Silver, Gold, or Platinum), there may be items and actions that require more significant capital investment. It will be important to identify these and determine how and when such items will be paid for and implemented. Some examples of "significant" improvements are: window replacement, faucet and toilet replacement, Photovoltaic installation, and new equipment installation.

After a draft checklist has been filled out, the team should use the content of their building audit to craft an implementation plan with a target certification level. A timeline is an important element to include in the implementation plan. There may be a number of items the team can carry out operationally as soon as their activities are under way. Any additional items on the newly created list that may require significant capital should have a time schedule associated with them. "No and low cost" initiatives can have an important psychological effect of orienting people to green building methods and can galvanize support for further investment in these type of strategies and practices.

6) Adopt Policies and Procedures

Another component of the LEED-EB process is establishing and adhering to sustainable policies and procedures. One prerequisite in the Materials & Resources section is to have in place a Sustainable Purchasing Policy (or Environmentally Preferable Purchasing policy) for items such as office paper and equipment, furniture and building materials. The second prerequisite is to develop and implement a Waste Management Policy that encourages recycling and reuse of materials destined for the landfill or incinerator. In the Indoor Environmental Quality section, there is a prerequisite for a Green Cleaning Policy, and credits can to be earned for indoor air quality best management practices. Policies and procedures can be a great way to document a firm's or owner's commitment to sustainability but if there isn't full involvement and support from the staff implementing the policies and procedures, the documents will be hollow.

7) Assemble and Submit documentation

LEED-EB imposes a specified period of time during which the functioning of the building is quantified. During this performance period, as it is called, a baseline of current system operations is established. The components that make up this baseline (HVAC, power consumption, heat loss, landscape management, etc.) are then compared against LEED-required performance levels. Just

as with LEED-NC, the ownership team has the opportunity to identify those aspects of performance that it wants to bring into compliance with LEED requirements.

LEED-EB is designed to be a tool to document, analyze, and improve building systems. The documentation lends discipline to the data collection with the intention to monitor and optimize building systems performance. The documentation is part of the overall application that is submitted to the USGBC. As illustrated in Figure 18, the fees associated with processing the application and certifying a building with the USGBC are based on square footage.

Figure 18: Table of Fees Associated with Certifying a Building Using LEED-EB

Initial Certification Review	Less than 50,000 Sq. Ft. (Fixed Rate)	50,000 to 500,000 Sq. Ft. (Proportional)	More than 500,000 Sq. Ft. (Fixed Rate)
Members	$1,250.00	$0.025/Square Foot	$12,500.00
Non-Members	$1,500.00	$0.03/ Square Foot	$15,000.00

Source USGBC

3.3.2 LEED-EB Consultant vs. In-house Staff

Of the ten property owners and managers interviewed who were currently engaged in the LEED-EB process, the majority have relied on in-house staff, while only two relied on the services of a LEED-EB consultant. The success achieved by in-house staff was credited to the motivation, involvement and knowledge of the team and their ability to pressure vendors and contactors to assist with the certification process. The USGBC has always assumed that owners and managers of a building would know their building best and could certify it without the need for outside assistance; however, consultants do offer process management, technical expertise, and experience that may be expedite the undertaking. Additionally, the size and availability of the in-house staff can vary from firm to firm. Class A office buildings usually have significantly larger and more experienced management teams than Class B or C office buildings. Thus, it is easier for Class A buildings to make the extra time commitment LEED-EB requires.

3.3.3 Major Obstacles

1) Minimum Energy Efficiency Performance

The greatest obstacle for owners to surmount, according to both the reports analyzed and our interviews, is LEED-EB's minimum energy efficiency performance prerequisite, currently an Energy Star rating of 69. If a building's energy efficiency performance is poor relative to this

energy efficiency prerequisite, the road to achieving LEED-EB is often long and expensive. While buildings often have various energy efficiency projects with paybacks less than five years, a building with poor prior energy efficiency performance usually needs more comprehensive and costly upgrades to achieve LEED-EB. These extensive upgrades usually have longer payback periods and lower returns, which can make them less attractive monetarily and less likely to be carried out. Therefore, a building's prior energy efficiency performance, or Energy Star rating, is generally used as the first indicator of whether or not the building owner should attempt LEED-EB certification.

2) Water Efficiency

One of the obstacles identified under water efficiency is compliance with potable water consumption. When a building has a large number of well-functioning toilets and urinals that consume too much potable water; the challenging question is does it make financial or ecological sense to dispose of them all, and purchase new ones? It rarely appears to make financial sense to replace well-functioning toilets and urinals with new water-efficient ones, as the monetary savings from reduced water consumption is minor compared to the cost of the new equipment. Nor does it seem to make ecological sense to replace the well-functioning equipment, when the new ones consume substantial raw material and energy to manufacture, transport, and install. In some drought-stricken locations and nations, such as Australia, the decision to change well-functioning toilets for new water-efficient ones may be wise; however, we feel that in most locations there are more financially and ecologically sound solutions for saving potable water on or off site, such as xeriscaping[70] or a condenser water loop (which we talk about in Case Study 1).

3) Education

LEED-EB may require the introduction of new procedures and policies that tenants and building staff are not used to. One building manager described this obstacle of tenant and staff education when discussing his new toner and battery-recycling program. If tenants and staff are accustomed to disposing of toner cartridges in the trash, the challenge becomes creating effective and creative ways to motivate them to break their habits while also not inconveniencing them. Additionally, the culture or modus operandi of the building's vendors and contractors must be changed. While more and more people are hearing about sustainability, the challenge is getting them to

[70] Xeriscaping refers to landscaping that does not require supplemental irrigation. It uses plants whose natural requirements are appropriate to the local climate thus eliminating or reducing water needs, and takes care to avoid losing water to evaporation and run-off.

incorporate it into the service or products that they provide, such as green cleaning or landscaping. This trend is growing as people perception of effective recycling is on the incline in modern industrial societies.

4) Verification

Another element of the process that is crucial to measuring the performance and operations of building is the isolation of the variables (the procedures, operations and equipment) that the team changes. For example, one owner we interviewed noted that the building manager changed paper products and the water flow of the toilets in restrooms at the same time, which caused them to have problems with the plumbing. So it was difficult to determine whether it was the switch to recycled content paper (which uses more glue to bind the paper than is required when using virgin paper) or the low-flow toilets that caused the plumbing to back up. In hindsight, the building manager realized that he should have implemented one change at a time, allowing the team to identify and understand the effects of each alteration.

5) The LEED-EB Paperwork and Documentation

One of the most frequently cited hurdles in undertaking the LEED-EB process is the amount of documentation required when submitting an application to the USGBC. The need to document Before and After operations is mentioned as particularly onerous. Recently, however, the USGBC has introduced a new streamlined and user friendly LEED-EB Rating System, called LEED-EB Operations and Maintenance. LEED-EB Operations and Maintenance (O&M) not only has fewer prerequisites, down from 13 to 9, but also has realigned the focus of the program more closely with the industry's concerns, such as energy and water efficiency. While this new streamlined LEED-EB O&M version has helped significantly, several owners have voiced a desire for more human interaction with the USGBC. One property manager said that while the amount of paperwork for LEED-EB O&M is now just above 2,000 pages (a decrease of 2,000 pages from version 2.0) the documentation is still a considerable task. In spite of the fact that much of LEED-EB's documentation is warranted as it forces building managers to create Stand Operating Procedures or building engineers to keep maintenance logs, owners claim that a site visit, or at least some telephone correspondence, would not only reduce a lot of the unnecessary paperwork. Furthermore, this additional interaction may increase the transparency and effectiveness of the program.

3.3.4 Time Considerations

According to Michael Arny, President of the Leonardo Academy, LEED-EB is not meant to be a race against time. (Mr. Arny was the Chair of the USGBC LEED for Existing Buildings Committee from 2001-2005, and guided LEED-EB through the development, pilot testing, refinement, and balloting process.) He notes that the rating system is a continual process, not an all-or-nothing event, like LEED-NC.[71] LEED-EB is ongoing, which allows owners and managers to improve the performance and operations of a building over time. Even after a building is LEED certified, the documentation, procedures, monitoring, and verification continue, since the building needs to reapply for certification every five years. "The biggest challenge is to get started," according to Mr. Arny. In our research, we found that the range of time needed to complete the LEED-EB certification process was 12 to 18 months.

3.4 Financing

The major cost of pursuing LEED-EB is the necessary energy and water efficiency projects. The building owners that we interviewed underwrite these costs in variety of ways. Some owners justify the costs by projecting higher tenant satisfaction and retention, while others expect value creation. Regardless of their rationale, building owners who spoke with us were interested in efficiency projects with short simple payback periods of one to three years. Others would only investigate projects with simple payback periods shorter than their hold period – that is, shorter than the length of time a real estate investor holds or intends to hold an asset before selling it. With the current influence of Internal Rate of Return (IRR)[72] funds, the average hold period is currently five to seven years. Most building owners told us that they would entertain efficiency projects with simple payback periods of five years or less and were extremely interested in efficiency projects with simple payback periods of less than three years.

Why would these sophisticated owners and investors use the simple payback method when this would allow them to miss positive Net Present Value (NPV) investments?[73] The building owners point to the fact that the management staff who analyze these investments rarely understand how

[71] Arny, Michael. Telephone interview. 11 June 2008.
[72] According to Innvestopedia.com, the Internal Rate of Return is the discount rate often used in capital budgeting that makes the net present value of all cash flows from a particular project equal to zero.
[73] Net Presenent Value (NPV) is used in capital budgeting to analyze the profitability of an investment project. It is the difference between the present value of cash inflows and the present value of cash outflows.

to calculate a NPV. Nevertheless, two owners whom we interviewed said that they compute the IRR of their energy and water efficiency upgrades and, if the efficiency projects have a higher IRR than their cost of capital, they will undertake the efficiency upgrade. This is another way of saying that they look at investment with positive returns. It is obviously a "home run" when the efficiency projects return close to the investment company's target returns, especially since efficiency projects are seen as seen as very low-risk investments.

While we started our research with the notion that the actual funding of these energy or water efficiency projects would be difficult, we found that most building owners funded the projects themselves. For upgrades with direct operational savings (savings that are captured by decreasing the cost of operations), owners usually pass through the capital costs of the upgrade to their tenants in yearly amounts equal to the direct operational savings. The real challenge is recouping the initial costs of the investment, which is dependent on the contractual terms agreed to between the owner and the tenant. Such terms are commonly specified in a lease, and the office lease can be generally categorized into three types, a Gross lease, Modified Gross lease, and Triple Net lease. The Gross lease states that the owner pays all of the operating costs for the building and the tenant pays an agreed upon rent. A Modified Gross lease has a base rent, usually dictated by the market, while the tenants paying a share of the operating costs generally proportional to the space they occupy. The Triple Net lease is commonly structured to have the tenants pay for operating costs in addition to rent. A majority of the owners we spoke with operated with Modified Gross leases. Thus, it is in their best interest to keep the operating costs as low as possible as owners with a Modified Gross lease earn the base rental (set by the market) minus the buildings' operating costs. Usually, there is an escalation clause stating that the owner can pass on "escalating" operating costs, usually at an amount near inflation.

It is important to note that each lease contact can be written differently to incorporate the terms important to the landlord and/or tenant. The ability to pass through initial energy or water efficiency improvement costs – amortized over time to be equal to the tenants' direct operational savings (what we will call amortized initial costs) – is an example of a lease term advantageous to the building owner; they are able to upgrade their buildings while passing through the costs to their tenants. Let's first examine a landlord with a Modified Gross lease who is contractually prohibited from passing through the amortized initial costs of energy or water efficiency projects to the tenants. In this case, if the landlord saves $1 a year in electricity costs due to an energy efficiency upgrade but other operating costs go up $1 in the same year, the landlord is unable to

realize any benefit as the escalating operating costs wipe out the energy savings. It is worth noting that even a landlord, who is unable to pass through amortized initial costs, would benefit from energy savings if a new tenant was signed after the efficiency upgrades were implemented; this new tenant would still pay the "market" dictated based rent but the operating cost portion of this base rent would be lower (market dictated base rent – lowered operating expenses = larger profit margin directly proportional to energy savings). One building owner remarked that lower expenses equals more money to landlord since tenants ultimately care about how much they spend in total (rents + expenses). Consequently, many landlords will only invest in their buildings when tenants are turning over but not when the building is stabilized. In contrast, if a landlord, who is allowed pass through the initial amortized costs (dictated by the lease contract to be equal to the calculated energy savings) to tenants, the landlord, in this example, would be able to increase operating expenses by $1 in respect to the amortized initial cost and would enjoy the full electricity savings.[74]

3.5 Costs

Many variables influence the cost of upgrading a building to LEED-EB's standards, but the most significant factors are two fold: the building's prior energy or water efficiency performance level and the building owner/management team's knowledge and time constraints. If a building's prior energy efficiency performance is poor relative to the LEED-EB's energy efficiency prerequisite (an Energy Star rating of 69), the road to achieving LEED-EB is often long and costly. This poor baseline performance leads to more comprehensive and costly upgrades. The knowledge of the owner and management staff varies widely and can impact LEED-EB costs in various ways. Some motivated management teams take it upon themselves to become experts in understanding the framework, process, and particulars of the LEED-EB rating system. This information allows them to navigate the process and achieve credits towards the rating with greater ease and less assistance or necessary capital investment. This is not to say that an educated team will not need any outside assistance; as nearly every team needs assistance with one process or another, such as analyzing outdoor light pollution levels, for instance, or measuring outdoor air delivery levels. Overall, the building's prior energy and water efficiency and the owner/management team's knowledge and experience with LEED are often used as a good determining factor to the feasibility and cost of pursuing LEED-EB.

[74] Emmett, Dan. Telephone Interview. 14 July 2008.

Leonardo Academy, a non-profit organization focused on advancing sustainability, released a White Paper in April 2008 sponsored by Johnson Controls. Entitled "The Economics of LEED for Existing Buildings for Individual Buildings," the study looked at the implementation costs for LEED-EB, Version 2.0 (not the new LEED-EB Operations and Maintenance version), and the operating costs of LEED-EB buildings compared to the operating costs in Building Owners and Managers Association International's 2007 Experience Exchange Report. A survey was sent to the owners or managers of 53 LEED-EB certified buildings, of which 23 responded. One aspect of the survey focused on the overall expense of the LEED-EB implementation and certification process, and only 14 of the 23 respondents provided such information. More specifically, the information gathered included the internal team's time commitment and expenses in achieving LEED-EB certification, LEED-EB consultant fees (if any), total soft costs of the process, and the total hard costs (for any building improvements made). The results of the survey found that the overall costs of the LEED-EB implementation and certification process ranged from $0.00 to $6.46 per square foot of floor space, with an average of $2.43 per square foot. The table in Figure 19 illustrates the four prerequisites that the respondents found to be a "significant cost."

Figure 19: Table Indicating Significant Cost Measures in LEED-EB v2.0.

LEED-EB Prerequisite	Percentage of respondents indicating this is a "significant cost" measure
Existing Building Commissioning	56.5%
Minimum Energy Performance	27.3%
Toxic Material Source Reduction: Reduced Mercury in Light Bulbs	22.7%
Outside Air Introduction and Exhaust Systems	31.8%

Source: Leonardo Academy

It is worth noting that the changes the USGBC made in the latest version of LEED-EB: both Existing Building Commissioning and Reduced Mercury in Light Bulbs are no longer prerequisites and are now credits for which applicants can earn points. The rest of the 13 prerequisites in LEED-EB v2.0 were categorized as "low or no cost" measures by the survey respondents. In conclusion, the range in costs reported to obtain LEED-EB was shown to have no correlation with the level of certification achieved. Leonardo Academy attributed the lack of correlation to the prior performance of the building's systems.

Of the 20 owners and managers we spoke with, five provided cost data on the LEED-EB process. These costs ranged from $100,000 to $938,613 or an average of $0.39 per square foot. However, these owners were already closely aligned with efficiency and sustainable principles and procedures; thus, there road to LEED-EB was relatively inexpensive. This is not to say that it was easy as all these owners described it as an onerous feat. Additionally, these costs did not account for many water or energy efficiency measures that would have been ordinarily conducted (because of their high returns) or for any in-house staff time – as staff is to maintain and improve the asset's value, the efforts to obtain LEED-EB certification should fall within that category. In contrast, a real estate investment company that plans to pursue LEED-EB has budgeted $4 per square foot for their Class A office buildings. Like Leonardo Academy, we have found a wide range of costs per square foot to implement LEED-EB. Nevertheless, the more knowledgeable the staff, the more effective they can be on enhancing the performance of the building.

3.6 Case Studies

As the cost and procedures to green an exiting building to LEED standards can vary greatly, it is beneficial to have a closer look at two specific case studies. Both buildings are Class A multi-tenanted office towers in major US cities. Per their request, we have kept their names and locations confidential. Nevertheless, their cost and return data as well as their overall experience provides a better understanding of what to expect when approaching LEED-EB, at least in the case for a Class A multi-tenanted office tower in an urban setting.

3.6.1 Case Study #1

One highly motivated management team in a metropolis of the United States took it upon themselves to seek LEED-EB certification for their Class A office building. Their specific motivations for pursuing LEED-EB were: to differentiate their building in the current marketplace while mitigate the risk of future "obsolescence" when all Class A building are green; to respond to an increasing tenant interest in LEED space; to increase tenant retention; to improve the building's operating efficiency and lower operating costs, thereby optimizing the asset's value; and to fight climate change (a momentous concern of the management team). In fact, they estimated that in 2007 approximately 1 in 20 tenants expressed interest in LEED rated space, while only a year later approximately half of their potential tenants asked about LEED.

Team

The management team in Case Study #1 consisted of three building management staff and seven engineers. An Operations Manager was instrumental to their efforts in pursuing LEED-EB certification. He took the initiative to educate himself about the LEED-EB rating system, champion the project through the process, and complete all 2,100 pages of their LEED-EB documentation. Other staff members were also extremely committed to the efforts, and this Spring spent one Friday evening digging through all of the building's garbage to learn that only 1/5 of the building's plastic, 1/3 of the building's metal, and 2/3 of the building's paper was being recycled. Using this information, the management team incentivized the cleaners to help sort the recyclable material from the trash, which dramatically reduced their total amount of trash and, consequently, their trash disposal expense. Their knowledge, experience, and commitment as a team significantly facilitated their ability to efficiently operate the building and pursue LEED-EB certification.

The Building

The building in Case Study #1 is a multi-tenanted Class A office tower in the Central Business District of a U.S. metropolis. This tower was constructed in the 1970s and is comprised of approximately 800,000 square feet.

Costs

The cost associated with upgrading the building to meet targeted performance levels for LEED-EB was relatively low at $179,359 compared to its annual operating budget of approximately $14 million dollars. This was the case partly because the building had been operated and maintained to high standards, resulting in relatively efficient baseline energy performance. Additionally, one substantial upgrade, a new $4M chiller plant, helped significantly with this above average performance level. This substantial system upgrade was not included in the budget for LEED-EB certification, as it was carried out well before the owner or management team had thought of pursuing LEED-EB. In addition, the new chiller plant was installed in order to replace an existing chiller that had come to the end of their useful lives. Therefore, the total LEED-EB related costs were $179,359 as described in Figure 20, 21 and 22. This does not include the registration cost of $450.00, certification cost of $12,500, or the cost of staff time.

Figure 20: Cost of Water Efficiency Upgrades

Water Efficiency	Cost	Payback	Difficulty to Implement	Overall Impact/Importance
3.5 GPF toilets upgraded to 1.6 GPF	$ 2,640	Combined Savings of $16,363.76 per year.	Moderate	24 toilets were replaced. Water cost savings were calculated using the LEED-EB Reference Guide.
2.5 GPM faucets fitted with 0.5 GPM aerators	$ 4,692		Low	204 aerators were installed. Water cost savings were calculated using the LEED-EB Reference Guide.
Women's lavatories fitted with dual-flush toilet handles	$ 6,630		Moderate	195 "green handles" were installed. Water cost savings were calculated using the LEED-EB Reference Guide.

Figure 21: Cost of Energy Efficiency Upgrades

Energy Efficiency	Cost	Payback	Difficulty to Implement	Overall Impact/Importance
Recommissioning[75]	$ 65,000	$20,000 from utility, plus anticipated savings from energy efficiency and extended equipment life	Moderate/High	The building's recommissioning was performed by an outside team, and the building engineering staff. The payback includes a $20,000 rebate from utility in addition to yet unknown cost savings as a result of increased energy efficiency.

Figure 22: Cost of Indoor Environmental Quality Upgrades

Indoor Environmental Quality	Cost	Payback	Difficulty to Implement	Overall Impact/Importance
Entryways equipped w/ mat system to reduce dirt infiltration	$20,397	Low/ Moderate	Low	In June 2007 the building installed matting in the main lobby at a cost of $19,164. In December 2007 the building installed matting in the loading dock at a cost of $1,233.
new 'data backbone' for the Energy Management System	$80,000	Low/ Moderate	High	In 1992 the building got a new Energy Management System and in pursuit of a point on Outside Air Delivery Monitoring reprogramming (and new computer equipment) was necessary to correct the amount of outside air intake.

The LEED-EB process had the benefit of a committed and determined building staff with respect to both management and engineering. The chief engineer was proud of the performance of the building before the LEED-EB process began and welcomed the challenge and opportunity to

[75] According to Rocky Mountain Power, "Commissioning" a new building helps to ensure correct operation of a facility's major systems when they are first installed. Over time, non-operational control strategies, faulty equipment, and deferred maintenance may result in system inefficiencies that are not readily noticeable. "Recommissioning" existing buildings helps to re-calibrate or restore a facility's operating systems.

document and improve it. The key element to success was the Operations Manager who took it upon himself to rate the performance of the building using the LEED-EB rating system and spearheaded the efforts to navigate the team through the process. He was the main facilitator for the necessary operational and physical changes, and he assumed responsibility for writing and modifying the policies and procedures required for certification.

Innovation

The team also sought an innovation point for a measure they implemented to recycle water. The team installed a Tenant Condenser Water Loop as part of a needed HVAC upgrade a few years earlier, which allows tenants to use recycled water to cool their data rooms rather than potable water. The water savings is approximately 15,000,000 gallons per year. There are substantial cost benefits to tenants, but the team noted that there has been difficulty communicating this benefit to tenants and getting them to agree to the change.

3.6.2 Case Study #2

This case study focuses on a reputable real estate investment firm that develops, owns, and manages properties through out the U.S. and Europe. They are committed to benchmarking and certifying 60% of their portfolio to a LEED Silver rating level and achieving LEED Certified for the remaining 40%. The firm's motivations include: an internal push at the firm to make LEED a part of their platform and lead the market by green their entire portfolio; an awareness of the high returns in energy and water efficiency investments; hedge risk against rising energy prices. The building is located in a U.S. metropolis and has recently received a LEED Silver certification.

Team

The owner championed the LEED-EB efforts for the reasons mentioned above, and worked closely with the building's management staff to seek certification. The owners also incentivized the building's engineers to achieve higher energy efficiency by offering a bonus based on increased energy performance. The owner elected to use a LEED-EB consultant for assistance in both the management of the process but also the documentation collection and completion.

The Building

The building is a multi-tenant Class A office tower in a Central Business District and is comprised of approximately 1,015,000 square feet.

Costs

The total cost of the project was $938,613. The cost associated with a LEED-EB consultant was approximately $60,000. The registration and certification costs were $450.00 and $12,500, respectively, however, it is important to note that there were no estimates of staff time used or the cost of this staff time. Other costs obtained by the authors from the real estate investment firm were related to energy conservation measures. These measures were taken to improve the energy efficiency of the building. Figure 23 below highlights some operational changes that incurred no substantial costs but produced savings.

Figure 23: Operational Changes that Produced Savings

Description	Cost $	Savings $/Yr	Electrical Savings kWh / year	Steam Savings Mlb / year	Actions
Decommission General Exhaust Fans	$0	$2,241	13,183		General Exhaust Fans turned off.
Decommission Cooling Towers for Winter Season	$0	$18,226		701	Draining cooling towers for winter season reduces steam consumption for freeze protection.
Temperature Control in Garage	$0	$19,500		750	Project involves installing temp control on garage heaters.

The Savings column for all of the figures in this case study was calculated by multiplying the kilowatt hour (kWh) per year savings by cost per kilowatt hour, which for this building was $0.17/kWh. The same methodology was used for steam, multiplying the thousand pound (Mlb) per year savings by the cost of steam per thousand pounds, which for this building was $26.00 per Mlb. In the event that a measure produced both electricity and steam savings then were simply added together.

Figure 24 below illustrates the costs and savings associated with reprogramming the Energy Management System (EMS) to heat and cool water more efficiently.

Figure 24: Costs and Savings Associated with Reprogramming the EMS

Description	Cost $	Savings $/Yr	Electrical Savings kWh / year	Steam Savings Mlb / year	Actions
Reset Chilled Water Supply Temp. Setpoint on Outdoor Air Temperature	$6,500	$44,590		1,715	By reprogramming the EMS system they can raise the set point of the Chilled Water Temp during optimal conditions depending on dewpoint.
Reset Secondary Hot Water Supply Temp. for Night Setback	$7,286	$51,454		1,979	By reprogramming the EMS system they can lower the set point of the hot water in the secondary loop.

The following energy conservation measures in Figure 25 were completed concurrently during a period of 6 months and the cost includes engineering fees and utility rebates. The owner stated that these energy efficiency projects would have been done regardless of LEED-EB because of their quick paybacks.

Figure 25: Concurrent Energy Conservation Measure Projects

Description	Cost $	Savings $/Yr	Electrical Savings kWh / year	Steam Savings Mlb / year	Comment
Convert Perimeter Fan Systems to Return Air	$359,827	$225,212		8,662	This will allow us to eliminate the heating & cooling of outside air for an extended period of time.
Reset Variable Air Volume (VAV) Supply Fan Static Pressure Setpoint on Outside Air Temp		$16,965	99,796		By reprogramming the EMS system we can slow down the supply fan motors to achieve power savings.
Parking Garage Temperature and Ventilation Control		$78,958	138,847	2,129	Install thermostats and VFDs to reduce power and steam.
Variable Frequency Drives (VFDs) for Secondary Water Pumps		$33,976	199,856		Installing VFDs will provide power savings by reducing the speed of the pumps.
CO_2 Sensors for Demand Ventilation Control		$51,116		1,966	Adding CO_2 Sensors to all return systems will allow for reduced outside air intake in the summer months
Install Variable Frequency Drives on Perimeter Supply Fans		$79,671	468,651		Installing VFDs will provide power savings by reducing the speed of the 4 Supply fans.
VFDs for Reheat/Radiation pumps on Service Level		$11,255	66,208		Installing VFDs will provide power savings by reducing the speed of the pumps.

The ECMs in Figure 26 have higher costs related to their associated savings and have paybacks in 3 years or less.

Figure 26: ECM Measures with Under a 3-Year Payback

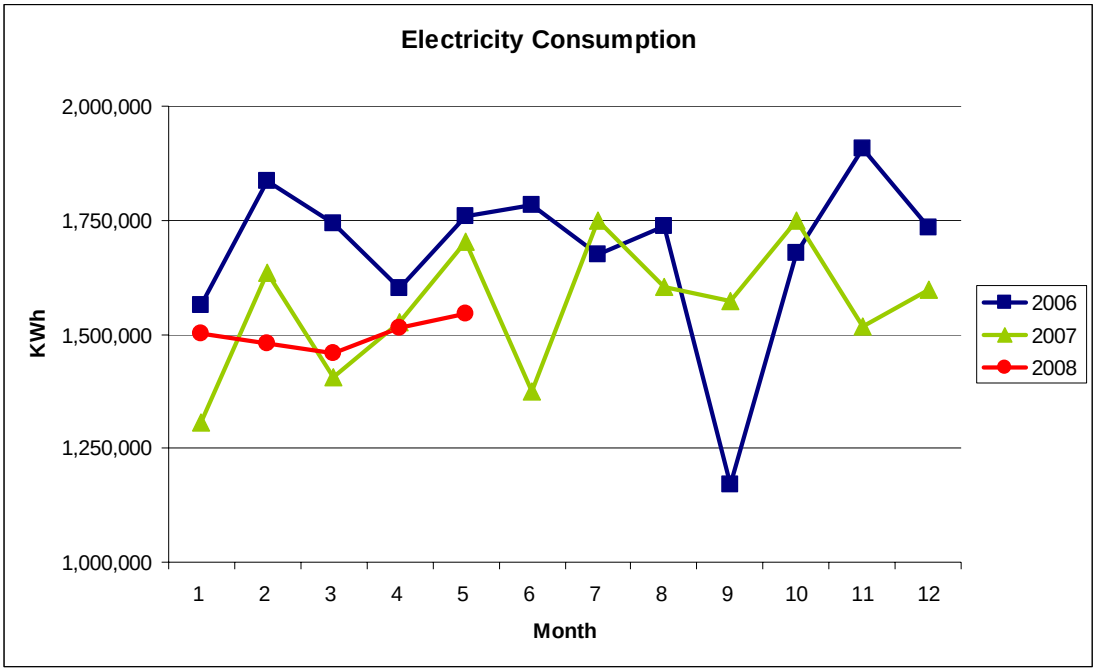
Description	Cost $	Savings $/Yr	Electrical Savings kWh / year	Steam Savings Mlb / year	Comment
Common Area Lighting Retrofit	$142,874	$70,152			Project involves replacing ballasts and fixtures with Super T-8 ballasts and lamps. (Tenant Space Excluded)
Variable Frequency Drives (VFDs) for Condenser Water Pumps	$69,460	$33,559			Installing VFDs will provide power savings by reducing the speed of the pump.
VFDs for Chilled Water Pumps with Freeze Protection Modification	$74,945	$35,046			Installing VFDs will provide power savings by reducing the speed of the pump.
VFDs for Cooling Tower Fans & CWS Temp. Setpoint Reset on OAT	$52,720	$22,005			Installing VFDs will provide power savings by reducing the speed of the cooling tower fans.
District Utility Steam Condensate Heat Recovery	$225,000	$74,982			Very rough estimate. Project includes recovering 180 degree condensate water and using it in parking garage and other applications.

The total LEED-EB related costs were $938,613 as described in Figure 23, 24, 25, and 26.

Energy Efficiency Upgrades' Impact on Energy Consumption and Costs

We were able to obtain monthly energy cost and consumption data for the building. In Figures 27, 28, and 29 below we graphed the electricity consumption, steam consumption and energy costs for years 2006, 2007, and up to May 2008.

Figure 27: Electricity Consumption for Case Study #2 Building



In Figure 27 the electricity consumption for the first 5 months of 2008 is showing signs of being less volatile compared to the two years prior. The kilowatt-hour consumption for 2008 nearly looks as if it can serve as a trend line for the electricity consumption for 2007. Less volatile electricity consumption reduces the management and operational risks for building and can help managers and owners budget and manage cash flow.

Figure 28: Steam Consumption for Case Study #2 Building

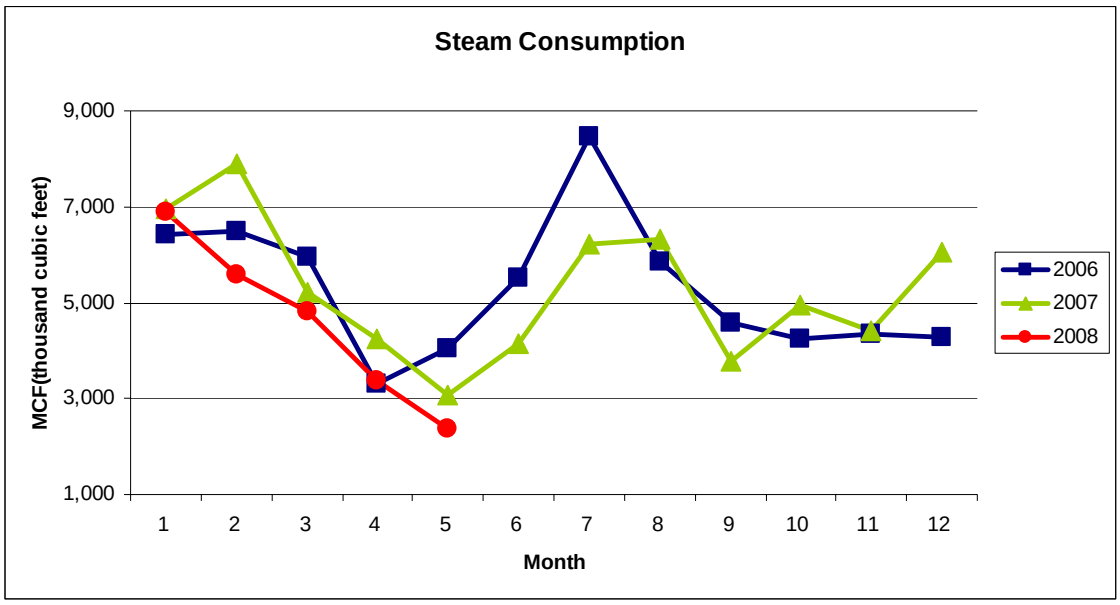


Figure 29: Energy Costs for Case Study #2 Building

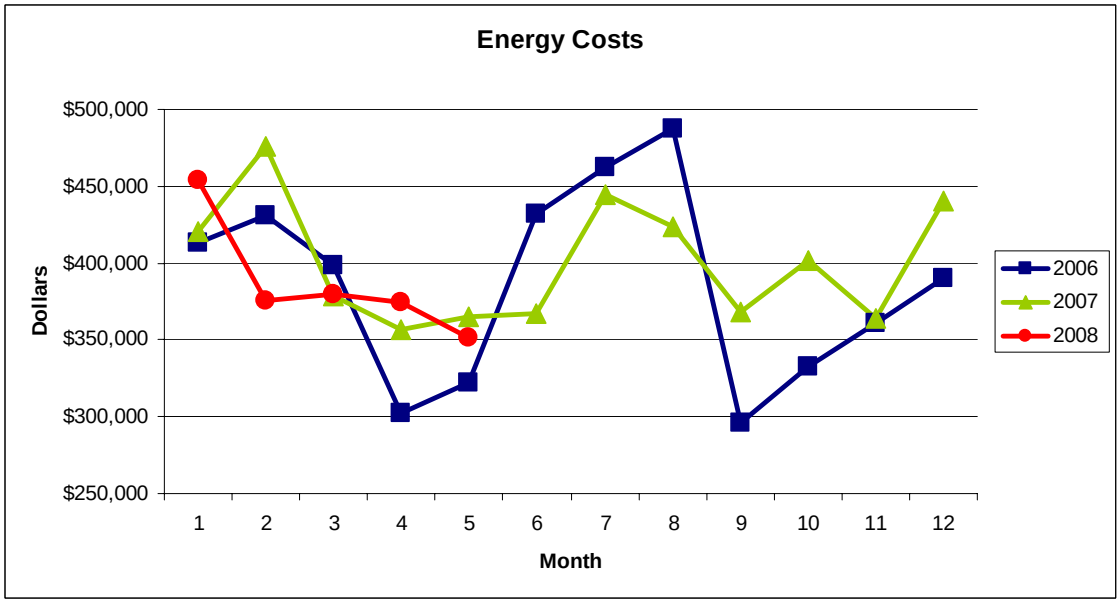


Figure 28 illustrates the decrease in steam consumption as well as a decrease in volatility. This has the same benefits for owners and managers as mentioned for Figure 27: the fewer fluctuations in consumption the easier it is to budget and manage future cash flows. Figure 29 depicts both the price of electricity and steam as energy costs and has a similar theme. The reduced energy costs in the month of February as well as decreased volatility of the first 5 months in 2008, (which correlate to the previous consumption charts) are presumably related to the upgrades. The three

graphs are beginning to tell an interesting story about the results of energy-related upgrades and operational changes.

3.7 Conclusion

As we have underlined in this chapter, a variety of factors shape the current of multi-tenanted office buildings seeking LEED-EB certification. While some owners/managers may be doing it as risk management and others because of tenant demand, the characteristic that is consistent through all these early adopters is the desired result: a building of superior quality. In most markets, this shift towards LEED-EB appears to be occurring in primarily Class A office buildings, for whom achieving LEED-EB certification the process seems to be rather straightforward and painless process. Many of the policies, procedures, and building systems required for LEED-EB have already been implemented or installed by these large, knowledgeable, and proactive management teams. In contrast, LEED-EB is a much more arduous task for a Class B and C building owners. These smaller and sometimes less educated owner/management teams find it harder to absorb the extra time and money needed to improve their buildings to this high standard. This is not to mention the fact that Class B and C buildings have substantially more ground to cover, especially in the case of water and energy efficiency. With tenants and investors are asking for LEED space, the market is pushing what appears to be best for everyone. The LEED for Existing Building program appears to be working as designed, helping building owners and managers to deliver efficient, healthy, and environmentally friendly space.

Chapter 4: Potential Financial Solutions for LEED-EB

4.0 Overview

In the United States and around the world, we have seen energy prices dramatically increase during the last decade. With all developed and emerging economies competing for the same scarce energy resources, this price run-up appears to be here to stay. In fact, experts have predicted that China will consume more energy than the United States in a matter of a few years. Less volatile and more predictable alternative energy sources, as well as low-risk energy efficiency projects, are gaining popularity among business owners around the world.

Additionally, there apparent shift to green office buildings is currently primarily in the Class A segment of the commercial office market. Owners of Class B and C buildings often agree that energy efficiency and sustainability are important goals to strive for; however, they have voiced three main reasons for their lack of involvement in this green trend. One, the tenants of their Class B and C buildings are almost never corporations or high-tech companies with sustainability initiatives, so they have less motivation to green their building. Class B tenants are mostly concerned with low rental rates.[76] Two, it takes more time and money to bring Class B and C buildings up to LEED-EB standards, not to mention there being less money available for the necessary upgrades and changes because of their smaller operating budgets.[77] Three, Class B and C property management teams are often substantially smaller and less experienced, making it harder to absorb the extra time and acquire know-how needed to manage the green upgrade. An Energy Savings Performance Contract (ESPC) should be able to help these Class B and C, and sometimes A, building owners with their capital and knowledge constraints.

Over the course of our research on greening existing buildings, we discovered two financial mechanisms that could assist owners in securing higher energy and water efficiency and/or fixed and low priced efficient or renewable energy: Energy Savings Performance Contracts and Power Purchase Agreements. The following chapter will look at ESPCs and PPAs. Both help minimize the risks of ownership while assisting building owners towards greening their buildings.

[76] Hard for anyone to put money into a cash flowing building…except for that it is the right thing to do and that green buildings are more energy efficient – thus having lower operating expenses…increase NOI.

[77] (Class B and C buildings are often maintained and operated with less diligence and constructed to lower standards because the tenants are less concerned about amenities and whether the building is ran efficiently but more about rental rates…Class B & C space is a commodity…).

4.1 Energy Savings Performance Contracts (ESPCs)

An Energy Saving Performance Contract (ESPC) is a financial mechanism that enables building owners to use future energy savings to pay for up-front costs of energy-saving projects.[78] Typically, an ESPC is conceived and implemented by an Energy Service Company (ESCO)[79]. For an ESPC, an ESCO will design, finance, construct and install, guarantee, maintain, and conduct follow-up monitoring and verification of the energy conservation measures (ECMs).

4.1.1 Energy Audit

First, the Energy Service Company conducts an energy audit to identify inefficiencies and opportunities to improve the facility and its operations. The audit provides the energy service engineer with enough knowledge to establish an energy use baseline for the building, so he or she can begin to recommend building system upgrades or retrofits that will conserve energy. The ESCO calculates the costs and savings of each ECM and bundles a group of these ECMs together into an ESPC.

4.1.2 Financing

The ESCO will guarantee a specified number of energy units saved by implementing the identified Energy Conservation Measures (ECMs). To allow for some margin of error, the ESCOs guaranteed savings are usually 5 to 15 percent below projected savings, otherwise known as a safety factor. As the ESCO does not want to take on the risk of energy price volatility, this guarantee is almost never for specific monetary savings. Nevertheless, the ESCO designs the ESPC so that these guaranteed energy savings will provide sufficient monetary savings to cover the amortized costs of the upgrade that are owed to the financier. In Figure 30, we have constructed a visual representation of how an Energy Service Performance Contract is usually structured.

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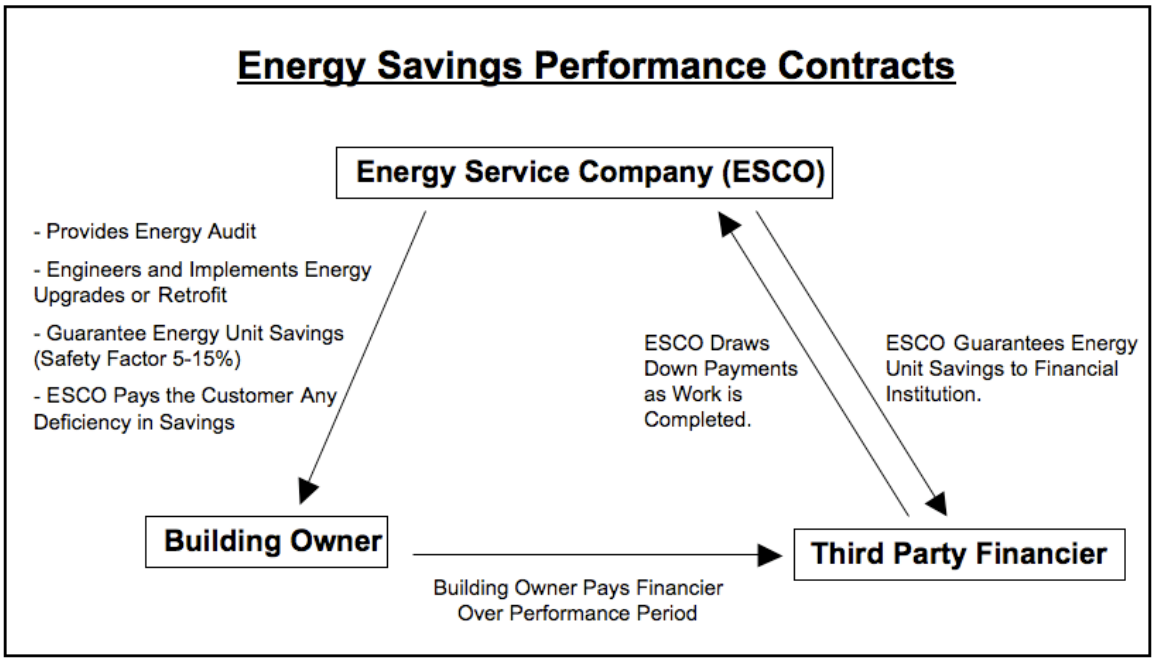
[78] "Step 4 Packet: Energy Performance Contract with Negotiating Tips." Energy Service Coalition. 1-51. Accessed 18 June 2008. <http://www.energyservicescoalition.org/resources/documents/index.html>.

[79] An Energy Service Company, or ESCO, is a business that develops, installs, and finances projects designed to improve the energy efficiency and maintenance costs for facilities over a seven to twenty year time period. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. (Source: National Association of Energy Service Companies)

Figure 30: Energy Savings Performance Contracts



The financier is also very concerned with the experience and track record of the ESCO since they are responsible for designing, guaranteeing, installing, maintaining, monitoring and verifying the ECMs. As the lender cannot use savings as collateral (savings aren't true cash flows), the credit position of the building owner is very important. Also, the lender is unable to use the new equipment that will be installed as part of the energy savings upgrade, such as a new boiler or HVAC system, because not only would it be cost prohibitive to remove a majority of this hardware but also there is no secondary market for used chillers, boilers, lights or other used equipment. Therefore, it is not asset-based lending but really credit-based lending. Overall, the ESCO serves as a turnkey general contractor, handling financing and installation of the energy saving projects.

4.1.3 Risks

The biggest risk of an Energy Savings Performance Contract (ESPC) is that there will not be sufficient monetary savings to pay off the amortized costs of the upgrades. Since the Energy Service Company (ESCO) only guarantees energy savings over the baseline amount and these are not guaranteed monetary savings, a drop in energy prices would decrease the monetary savings of the ECMs. Furthermore, one energy service engineer that we spoke with commented that the

accuracy of these energy savings projections is approximately plus or minus 10 percent. However, this is only a risk to the ESCO, as the building owner should make sure to obtain guaranteed energy savings from the ESCO in the ESPC.

An ESPC may also fail to capture all possible energy or water efficiency projects since the energy engineer is unfamiliar with the building and its systems. As one building owner commented, "Often, it is a junior energy engineer auditing your building for a couple of days. Off of a few observations, they make some recommendations, install some software and/or hardware, and implement a energy plan. On top of that, they are only there for a day or so to train your in-house staff." Therefore, there is a risk that the hardware or software is not utilized as engineered or the energy plan is not followed. The in-house building staff may not understand the plan and/or want to change their habits of operating the building. It is wise to spend significant time and effort on optimizing a building's in-house facility management staff as well as incentivizing them to run the building as efficiently as possible.

4.1.4 Opportunities

Facility managers and engineers most often do not speak the same language as the building owners. "The 'wrenches' (facility managers and managers)," as one engineer expressed, "just don't speak the language the of the 'ties' (owners and bankers)."[80] This language barrier is responsible for the fact that only a small fraction of the energy-efficiency investments in buildings have been implemented, leaving many high-yielding investments still available.[81] The communication disconnect exists because energy management is usually considered a physical necessity, not a financial opportunity. Additionally, energy performance contractors, as engineers, tend to avoid or devalue metrics that show risk or uncertainty. They seek to eliminate risk by engineering it out or discounting the potential downsides. If they would only quantify this uncertainty rather than eliminate it, it would allow the building owner to use risk management and recognize potential upsides.

"Serious energy efficiency," according to Joseph Romm, who was acting assistant secretary of energy for energy efficiency and renewable energy in 1997, "is not a one-shot resource, where

[80] Electrical Engineer (Confidential). Interview. May 22,2008.
[81] Mills, Evan, Steve Kromer, Gary Weiss, and Paul Mathew. "From Volatility to Value: Analyzing and Managing Financial and Performance Risk in Energy Savings Projects." Energy Policy, Volume 34. Elsevier, 2006. 188-199.

you pick the low-hanging fruit and you're done. In fact, the fruit grows back. The efficiency resource never gets exhausted because technology keeps improving and knowledge spreads to more people."[82] According to his recent article, "Why we never need to build another polluting power plant," companies like Dow Chemical has been consistently "picking" energy efficiency's low-hanging fruit for twenty years. Additionally, in his five years at the Department of Energy, Mr. Romm never saw a building or factory that couldn't reduce its energy consumption by 25 or 50% by implementing energy efficiency upgrades that had less than four year simple paybacks.

4.1.5 Typical Users of ESPCs

In the past, ESCOs have offered ESPCs to stable long-term owners or tenants with excellent credit, such as museums, large industrial or manufacturing plants, schools, libraries, courthouses, military facilities and other governmental agencies. With their good credit standings, these customers can access easy financing. Having a long-term horizon is also important because an ESPC, typically, has a 10- to 20-year life over which to amortize the capital costs. ESPCs work exceptionally well for government agencies because the agencies can outsource the upgrading and maintenance of their facilities as well as obtain financing without having to raise taxes or issues bonds.

In order to absorb all the necessary auditing, designing and engineering, the building or building owner's portfolio must be of substantial size. Typically, the utility cost of the building or buildings (one could place an ESPC across many buildings at once) would be $300,000 to $500,000 per year.

4.1.6 Using ESPC in the Private Sector

Performance contracting has not been utilized in the private sector for several reasons. One, commercial owners have shorter time horizons. They typically hold a building anywhere from 3 to 7 years, which is not a long enough time to amortize the costs of many ECMs. Auditing a building and designing and engineering an ESPC alone can take 18 to 36 months. Two, the Limited Liability Company (LLC) – the legal entity that usually owns the building – often has no credit, as it was created solely to own that building. This makes it difficult for a credit-based

[82] Romm, Joseph. "Why we never need to build another polluting power plant." Salon.com. 28 July 2008. 29 July 2008 <http://www.salon.com/news/feature/2008/07/28/energy_efficiency/>.

lending business like ESPCs, since it is difficult to “fence in” the cash flows (savings). Three, the ESCO has no real assurance that the commercial building owner will pay the amortized costs of the upgrades, except that the ESCO can bring the owner to court. This is not only costly for both parties, but also time consuming.

However, even with all these hurdles, the Clinton Carbon Initiative (CCI) sees ESPCs as highly effective mechanisms for furthering energy efficiency in the commercial real estate sector. Working with financial services firm Hannon Armstrong, CCI claims that they have created a boilerplate ESPC for commercial office buildings. This boilerplate contract compresses the due diligence and design period down to 6 months from 18 to 36 months. Hannon Armstrong has structured deterrents into the ESPC in order to have more assurance that the building owner will pay. Additionally, Hannon Armstrong has made the ESPC assumable by the next purchaser to help eliminate problems associated with a commercial building owner’s short investment hold period.

Lastly, Hannon Armstrong has decided to underwrite the credit of a building, especially for multi-tenanted buildings – its geography, stability, quality of the construction, its leverage ratio, occupancy rate, anchor tenants, and so on. It should be noted, this should make it harder to underwrite Class B & C properties, as they are not as stable or high quality investments, they may have higher vacancy, antiquated building systems, and less credit worthy tenants.

4.2 Renewable Energy and Power Purchase Agreements

A Power Purchase Agreement (PPA) can be a useful financial vehicle to make renewable energy work for commercial properties. It is a legal contract between the energy generator and the energy purchaser, stating a specific price for each unit of electricity or steam and set amount to be purchased per month.

In LEED-EB: O&M there are four points available in the Energy & Atmosphere section for on-site and off-site renewable energy. To earn points under this credit, an applicant can choose to utilize on-site or off-site renewable energy or a combination of the two. The options for renewable energy sources include solar, wind, biomass and hydropower generation and the USGBC states that for on-site renewable energy, applicants must employ nonpolluting renewable

technologies that contribute to the total energy requirements for the building and site.[83] Some examples of eligible on-site renewable energy systems are listed in Figure 31.

Figure 31: Eligible On-Site Renewable Energy Systems

- Photovoltaic systems
- Solar thermal systems
- Bio-fuel based systems
- Geothermal heating systems
- Geothermal electric systems
- Low-impact hydro electric power systems
- Wave and tidal power systems

Source: LEED-EB v2.0 Reference Guide

To earn points for using off-site renewable energy, an applicant has to purchase renewable energy or renewable energy tradable certificates to meet some or all of the building's energy requirements. Renewable energy certificates (RECs) can be purchased separately from an energy purchase and represent the environmental benefits of the power produced from renewable energy projects.[84] Points can be earned by demonstrating the use of renewable energy as a percentage of building energy use, as shown in Figure 32.

Figure 32: LEED-EB Points Associated with Renewable Energy

LEED-EB points	On-site Renewable Energy		Off-site Renewable Energy / Certificates
1	3%	or	25%
2	6%	or	50%
3	9%	or	75%
4	12%	or	100%

Source: LEED-EB O&M Rating System

Eric Silagy, vice president and chief development officer for Florida Power & Light (FPL) says that "although [FPL is] at an early stage in the process, renewable energy ultimately helps us to achieve more energy independence by reducing our demand and exposure to price fluctuations for natural gas and fuel oil."[85] Building and property owners with the same goal can, on a much

[83] "LEED for Existing Buildings Version 2.0 Reference Guide. 2nd ed." U.S. Green Building Council. 2006. 203-212.

[84] "Green Power Markets: Renewable Energy Certificates." U.S. Department of Energy, Energy Efficiency and Renewable Energy. U.S. Department of Energy. Accessed 11 July 2008 <http://www.eere.energy.gov/greenpower/markets/certificates.shtml?page=0>.

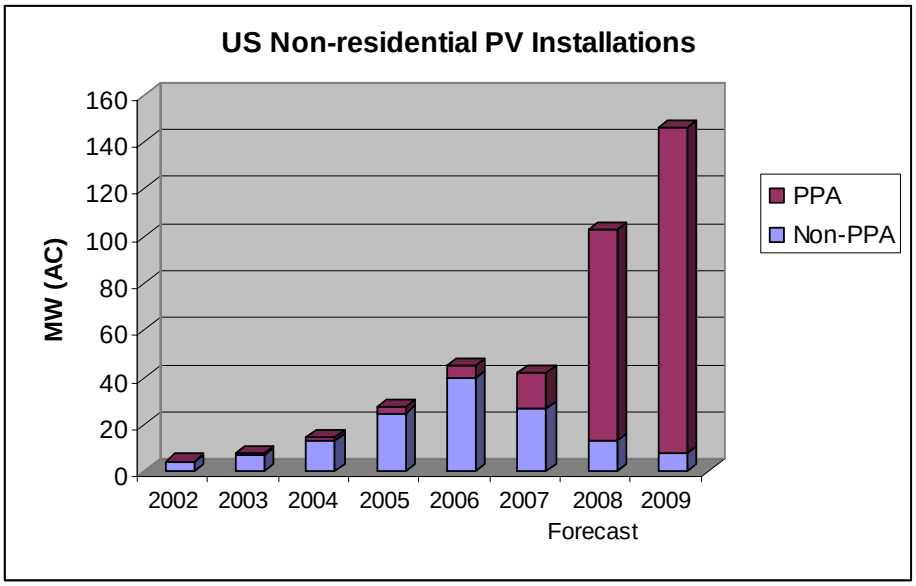
[85] Silagy, Eric. "FPL Committed to Solar Energy." Miami Herald. 11 July 2008. Accessed 11 July 2008. <http://www.miamiherald.com/456/story/600885.html>.

smaller scale, take steps to do reduce the risk and exposure to fluctuation in energy price. LEED-EB has tried to encourage such efforts with the On-Site and Off-Site Renewable Energy credit.

Since building owners are not typically in the energy production business, many firms have stepped up to provide more efficient and renewable on-site power producing technologies, such as photovoltaics, wind turbines, and combined heat and power plants. A Power Purchase Agreement (PPA) can be a useful financial vehicle to make renewable energy work for commercial properties.

For the solar industry, PPAs are gaining ground. In 2006, 10% of non-residential photovoltaic installations in the United States used a PPA; in 2007, the number had grown to 50%, and it's expected to exceed 90% by 2009, as seen in Figure 33 below.[86]

Figure 33: Non-residential Installations by Financing Type, 2002-2009



Source: Greentech Media. "Solar Power Services: How PPAs are Changing the PV Value Chain." (recreation of chart)

[86] Guice, Jon, and John D.H. King. "Solar Power Services: How PPAs are Changing the PV Value Chain." Greentech Media, In Detail. 14 February 2008. Page 4. Accessed 11 July 2008. <http://www.greentechmedia.com/reports/research-report-solar-power-services.html>.

4.2.1 Motivations

A building owner or tenant might enter into a PPA for several reasons: fixed energy prices; reliable energy; and cheaper energy.

1) Fixed Energy Prices

Some building owners may want to fix energy or electricity prices to eliminate the risk of energy price volatility. The more stable building owners can make their operating costs by fixing energy prices, the less susceptible they are to price fluctuations and the more valuable and attractive the asset can be in the market.

2) Reliable Energy

Most electrical grids in the United States are currently operating at their maximum capacity, or possibly beyond. These antiquated electrical grids are often seen as a liability, as they are undercapitalized and overused. Utility companies have no incentive to invest too much capital.

On August 14, 2003, 50 million Americans lost power in what marked the worst blackout in United States and Canadian history. The cascading power outage first hit Toronto, then Rochester, then Boston, and finally New York. It took just 13 minutes for the blackout to spread throughout the 80,000 square-mile Canada-United States Eastern Interconnection power grid.[87]

The grid was originally built to transfer power from monopolistic utilities to local customers, a movement of relatively small amounts of power over short distances. But deregulation of the electric power industry over the last decade has created a market-driven system in which power can be immediately traded over long distances from a region with a temporary surplus to a region with a temporary deficit. This system was intended to provide consumers with access to cheaper electricity from various suppliers. However, the resulting increase in the flow of electricity over congested transmission lines drastically increased the risk of major power outages and ultimately led to the blackout of that August. Currently, there is "[n]o single authority ... in charge of the grid, and few have an incentive to invest the money needed to improve its reliability."[88]

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[87] Franklin, Joshua J. “Upgrading the National Power Grid: Electric Companies Need an Economic Incentive to Invest in New Technology.” Rutgers Computer & Technology Law Journal (2004) : 159-186.

[88] Franklin, Joshua J. “Upgrading the National Power Grid: Electric Companies Need an Economic Incentive to Invest in New Technology.” Rutgers Computer & Technology Law Journal (2004) : 159-186.

3) Cheaper energy

PPAs may save the electricity purchaser money, as the contract between the electrical generator and the building owner usually states a price lower than what the public electrical grid can provide it. Most building owners will then turn around and sell the electricity to their tenants at grid prices, making the spread between the PPA contract price and grid price for electricity; or else they pass on the savings to their tenants, bolstering tenant loyalty and enticing new tenants.

4.2.2 Types

1) Power Purchase Agreements for Solar Energy

Many solar energy manufactures and/or installers will build a solar energy facility on a building and maintain and operate the facility for 15 years or longer. This facility generates reliable, long-term clean energy for the building. Under the terms of a PPA, these solar manufacturers and installers assume the risks and responsibilities of ownership when they purchase, operate, and maintain the turn-key facility. They clean the solar panels regularly, provide preventative maintenance services, repair any faults, and monitor the energy production and the system's health and well-being. The building owner simply runs the business as usual, without any of the headaches of owning, operating, and maintaining a power plant. At the end of the PPA term, the facility can be purchased by the building owner at fair market value or the PPA can be renewed on favorable terms. One PPA contractor stated that “fair market” value of an existing photovoltaic facility, which is offered to the building owner, is really less than “fair market” value of the facility because it is cost-prohibitive to remove that facility from one site and reinstall on another site.

2) Cogeneration Power Purchase Agreements

Cogeneration, also known as Combined Heat and Power (CHP), is a system that efficiently generates electricity (or shaft power) and uses the heat generated in the process to produce steam, hot water, and/or hot air for other useful purposes such as absorption chillers. Although a cogeneration plant rarely creates energy utilizing renewable resources, experts say that using both the electricity and heat generated by the micro turbines can help harvest as much as 70 percent to 80 percent of the energy available, compared with efficiency rates as low as 30 percent for some

older power plants owned by utilities.[89]

Like a PPA for solar-generated power, a PPA can be drawn up and structured between the combined heat and power (CHP) producer and the power and steam purchaser (the building owner). While CHP does not supply electricity from renewable resources it still is a very reliable and more efficient electrical producing technology. Not only does this efficient on-site energy generation save owners money but it also can help earn LEED-EB points. One building owner in New York City told us that their on-site CHP generator would be 45% more efficient than grid power and thus push the building's Energy Star Rating from 63 to 71.

Overall, a PPA enables building owners to benefit from the use of green energy, while still receiving some of the benefits of ownership – lower and/or hedged electricity costs, positive public image, etc – and allows them to spend their capital budget on their core business.

4.3 Conclusion

Energy Savings Performance Contracts and Power Purchase Agreements are very useful financial mechanisms for building owner's who don't have the money, time, or knowledge to conduct energy and water efficiency projects or generate renewable or efficient energy. They are useful financial mechanisms available in the market place that every building owner should be aware of while they may not be the right choice for every project. In these times of rapidly rising energy prices, such mechanisms can help minimize exposure through reducing energy consumption (ESPCs) and can provide a reliable and more stable source of energy (PPAs). Simultaneously, these instruments can make sustainable initiatives increasingly attractive by limiting the amount of upfront capital and required potential to speed up market transformation.

[89] Tarquinio, J. Alex. "Partly Off the Grid, with a Mini-Utility in the Cellar." The New York Times. 26 March 2008. Accessed 29 March 2008. <http://www.nytimes.com/2008/03/26/realestate/commercial/26turbine.html>.

Chapter 5: Conclusion

5.0 The Quiet Storm

As the environmental impacts of buildings seep into the consciousness of the real estate industry, the efficiency and environmental performance of the existing building stock is getting a closer look. There are many factors responsible for this rising level of awareness – from an expanding knowledge of greenhouse gases and their impact on climate change to the rising prices of electricity and natural gas. Municipalities and state governments are playing a more active role in regulating the "green" standard to which new development is built. Class A commercial office owners are very aware of this trend and are looking to the LEED-EB rating system as a way to compete with the new "green" or LEED certified projects. There is also increase demand: high-tech companies that place high value on their talent, design firms and others who have sustainability as a core mission, and the law offices where employees want to feel that they are doing their part to help the environment – are demanding LEED certified space or at least beginning to ask the right questions. Such activity is resulting in a quiet storm that will permeate its way into other real estate product types, transforming how space is managed and operated.

Education about environmental impacts in the real estate industry is still crucial. There is currently a lot of "buzz" around green development and sustainability as it relates to real estate, and the authors consider the LEED rating system framework to be an effective tool for sifting through this noise. The rating system concept that examines the "greenness" of new or existing building provides the real estate industry an objective framework to evaluate green performance. The LEED categories of Sustainable Sites, Energy & Atmosphere, Materials and Resources, Indoor Air Quality, Water Efficiency and Innovation each have performance standards that are intended to remedy an environmental impact, standards the USGBC is constantly looking to improve. This challenges the industry to keep upgrading and perfecting the performance of their buildings. In addition to criteria such as location, building amenities, space efficiency, financial performance, the systems like LEED help owners, managers and potential tenants analyze the holistic performance of the building and its space.

In the course of our literature research and interviews with real estate professionals, we have confirmed that the first adopters of green standards in the commercial multi-tenant office space

are in the Class A market, on both the ownership and tenant side. The owners of quality Class A office space are looking to differentiate their building in the market, and to closely monitor and manage the performance of their building systems. The LEED-EB rating system is confirming what many are doing – while challenging others to aim higher. Tenants that are seeking this kind of space are firms whose employees are their biggest asset and who look to use their facilities to recruit potential employees. This becomes important if employers want their staff to work especially long and hard (and productively), making it imperative that the space they occupy be healthy and comfortable – not to mention the lower operating costs. We feel that these employees will not only push their employers to seek LEED certified building but also LEED certified office space (i.e. LEED for Commercial Interiors).

The owners of Class B office space have yet to act, driven by the fact that tenants of Class B space are looking more for value than quality. Class B space also tends to be in older, less energy-efficient buildings, with fewer staff available to monitor and improve the energy and environmental performance. This quandary led the authors to explore creative ways for Class B buildings owners to participate in “greening” their buildings without significant capital or engineering knowledge. Energy Savings Performance Contracts can offer opportunities to building owners to upgrade their building systems and decrease operating expenses. However, problems arise for multi-tenant buildings where vacancy and energy demand can fluctuate in any given year making it difficult for Energy Service Companies to underwrite energy savings to a given energy consumption baseline. Power Purchase Agreements can help developers and building owners get the most out of their site or building by introducing on-site power generation for little or no upfront cost. Economies of scale for various systems help both the buyer and seller move forward with an on-site power project, but then developers and owners begin to walk a delicate line between the real estate and utility business.

While LEED-EB may not be easily achievable for Class B office it does provide a good framework for benchmarking a building’s performance. To keep this market segment engaged, the USGBC would be well served to identify clear paths for B owners to achieve certification.

5.1 Thoughts looking forward

An interesting topic for further study would be to evaluate the top green building rating systems on a single project. With sponsorship and developer/owner participation it would be instructive to

get a side-by side comparison of the usability of the various rating systems worldwide and conclude with recommendations and best practices for the systems going forward.

Another helpful contribution to the green building movement in the U.S. would be an analysis of how the commercial office market responds to LEED-EB projects. At the time of this publication, there are very few examples of multi-tenant commercial office buildings that have been LEED-EB certified, so the data simply do not exist. Further research on lease-up velocity and tenant retention in LEED-EB building would go a long way to toward convincing the market that such efforts are worthwhile. Despite the challenges, an encouraging trend is that both the supply and demand sides of the property market see the benefits of green initiatives.

Appendix A: Compilation of LEED-EB Projects

The following 8 LEED-EB project summaries are an assemblage of information gathered from websites, news articles, and presentations posted on the internet. We found it helpful to research the projects and firms that have been early participators in LEED-EB and what their experience has been. The majority of the information found in the literature portrayed the projects in a positive light and highlighted the benefits with little discussion of hurdles. This compilation confirmed that the early adopters were long term owners from across the industry, including for-profit companies, governments, universities and non-profits. This profile of owner has a long term view on real estate and a desire to keep buildings running efficiently. The actions and improvements discussed below seem commonsensical for those who want to actively managing a property. The owner type that was missing was commercial non-owner occupiers that lease out their space, and our inability to find examples was the impetus for our interviews.

Our criteria for including the following 8 project summaries was some mention and discussion of costs, paybacks and upgrades implemented.

1. Project: Merchandise Mart
   Owner: Vornado Realty Trust, owner of Merchandise Mart Properties, Inc.
   Industry type: Commercial
   Use: Office, retail, exhibition space
   Location: Chicago, Il.
   Size: 4.2 million square feet
   Year built: 1930

Upgrades:

- In 1986, The Mart began operating the largest thermal storage facility in the world, capable of building 2,000,000 pounds of ice per night, cooling 71 buildings in the surrounding neighborhood, and saving $200,000 in electricity costs in the first year. [MMPI website]
- Replacing a pair of one-speed electric motors, which pump water and drive parts of the cooling system, with variable-speed upgrades. That should shave $50,000 a year from the Mart's power bill. The project's estimated price tag: $350,000 [Business Week Article]
  Payback: 7 years (potentially)
- It put in dozens of meters to track lighting and cooling gear in common areas to pinpoint waste. A $16,000 sensor, for instance, helped identify numerous leaks in the cooling system that was causing air compressors to work overtime. Since maintenance workers sealed the leaks, the compressor uses about $4,000 less energy per year. The repairs also allowed the Mart to forego the purchase of a replacement compressor that would have cost many times more than the meter. [Business Week Article]
  Payback: approx. 4 years (potentially)

Incentives: Support from Illinois Department of Commerce and Economic Opportunity for an undisclosed amount.

Sources:
Merchandise Mart Properties, Inc. website:
<http://www.mmart.com/mmart/green/greenmart.cfm>.
Aston, Adam. "Past is Prologue." Businessweek.com 19 March 2008.
<http://www.businessweek.com/bwdaily/dnflash/content/mar2008/db20080319_978885.htm>.

2. Project: Adobe System Headquarters

Owner: Adobe Systems Incorporated.
Industry type: Company Headquarters
Use: Office
Location: San Jose, CA
Size: 989,358 million square feet (Occupied Space)
Year built: West Tower in 1996 (18 stories), East Tower in 1998 (16 stories), and Almaden Tower in 2003 (17 stories)

Process	
1	Benchmark with Energy Star
2	Perform an energy self-audit (see Energy Star website)
3	Implement low-cost high-return projects first
4	Apply for Energy Star label (75 or higher)
5	Select LEED Accredited Professional (LEED AP)
6	Perform LEED Green Building self-audit
7	Select your team (key members of staff, key contractors)
8	Host formal team orientation using 3rd party facilitator
9	Register the building with USGBC
10	Assign champions based on areas of specialization
11	Begin addressing, item-by-item, low-hanging fruit first
12	Meet regularly with team champions to monitor progress
13	Apply for certification (three months to several years)

Adobe spent $1.4 million on energy and related projects (over 5 years), received $389,000 in rebates and we have reduced operating costs by $1.2 million per year (primarily through energy conservation). This is an average simple payback of 9.5 months and a return on investment (ROI) of 121%.

Description	# of Projects	Cost	Rebate	Savings	ROI
Load Management	26	$445,248	$205,437	$729,185	304%
Lighting	19	$300,701	$44,918	$155,616	61%
Equipment	6	$298,439	$122,575	$107,976	61%
Monitor & Controls	1	$39,472	$11,000	$12,001	42%
Water Management	3	$145,732	$5,396	$31,287	22%
Waste Stream	1	$0	$0	$137,380	immediate
Office Supplies	1	$0	$0	$8,700	immediate
Sustainable Janitorial	1	$0	$0	$0	n/a
Indoor Air Quality	1	$0	$0	$0	n/a
Alternative Trans	1	$0	$0	$0	n/a
Compostable Paper	1	$0	$0	$0	n/a
Purchase Alter Energy	1	$16,000	$0	$0	n/a
LEED Consult(3 bldgs)	1	$105,000	$0	$0	n/a
Register/Cert (3 bldg)	1	$12,000	$0	$0	n/a
Total	64	$1,362,592	$389,326	$1,182,145	121%

Incentives: Pacific Gas and Electric Company, California Public Utilities Commission, and City of San Jose

Sources:

USGBC Case Study, <www.usgbc-ncc.org/storage/usgbcncc1/documents/pdf/**adobe**_leed_eb_the_business_case_9-11-07.pdf>.

Randy H. Knox III, Senior Director, Global Facilities Services, Adobe Systems Incorporated , “Case Study: Adobe's "Greenest Office in America" Sets the Bar for Corporate Environmentalism” <http://www.fmlink.com/ProfResources/Sustainability/Articles/article.cgi?USGBC:200707-16.html>.

Orsborn, Maureen. “Three High-Rise Towers Make Green a Reality.” Buildings.com. October 2007. <http://www.buildings.com/articles/detail.aspx?contentID=5268>.

Yudelson, Jerry. "The Business Case for Greening Your Facilities – As Fast as Possible!" Buildings.com. 2 April 2007. Accessed 14 April 2008. <http://www.buildings.com/articles/detail.aspx?contentID=3690>.

3. Project: California EPA headquarters

Owner: Thomas Property Group
Industry Type: Government, Commercial
Use: Office
Location: Sacramento, CA
Size: 950,000 square feet
Stories: 25
Year Built: 2000

Upgrades:

- Thomas Properties invested $500,000 in efficiency upgrades to equipment, operations and employee practices. These improvements generated $610,000 in annual savings, paying for themselves in less than one year. Using an 8% capitalization rate, the annual cost savings have increased the asset value of the building by nearly $12 million.
- Native, drought-resistant grasses, plants, and trees minimize storm water runoff and reduce heat build up.
- The building also features low-flow toilets, water-free urinals, and water-efficient fixtures. These measures have decreased exterior water use by 50 % and interior water use by 20 %.
- Craig Sheehy, Director of Property Management for Thomas Properties, initiated a vermicomposting program which diverts over 10 tons of waste from landfills and saves $10,000 annually.
- Energy saving measures include highly efficient HVAC and lighting systems, photovoltaic rooftop panels, and a plate and frame heat exchanger that reduces on/off cycling of the chiller equipment, extends equipment life, and saves energy. The Cal/EPA building is 34% more efficient than California's 1998 energy code and earned an ENERGY STAR® rating of 96 (out of 100) from the U.S. Environmental Protection Agency in 2002.
- Other non-traditional improvements include eliminating garbage can liners and using reusable cloth bags in centrally located recycling bins, which together save $80,000 per year.
- Specific Costs and Paybacks:
    - Systems calibration, monitoring, commissioning, and maintenance for energy performance –$190,000
    - After-hours heating and lighting controls - $100,000
    - Exterior lighting systems - $9,500
    - Landscaping and grounds management – $95,000
    - Water-efficient landscaping, restrooms and cooling cycles - $19,000
    - Elimination of garbage can liners - $60,000
    - Collection and storage of recyclables – $48,000
    - Occupant recycling - $29,000
    - Reduced landfill disposal costs - $10,000
    - Entryway cleaning to prevent particle and dirt buildup - $9,500

Sources:
Arny, Michael. "Strong Incentives Exist for LEED-EB." HPAC Engineering.
http://hpac.com/mag/strong_incentives_exist/

Yudelson, Jerry. "The Business Case for Greening Your Facilities – As Fast as Possible!" Buildings.com. 2 April 2007. Accessed 14 April 2008. <http://www.buildings.com/articles/detail.aspx?contentID=3690>.

4. Project: California Department of Education building

Owner: State of California, Department of General Services
Industry type: Government Office / Headquarters
Use: Office
Location: Sacramento, CA
Size: 336,000 square feet
Year built: 2003

The building was under LEED for New Construction with a Gold rating. The second to the sixth floors have an under-floor air distribution system.

- Several Green Building operations and maintenance practices have been implemented including the following:

  - Improving indoor environmental quality for building employees and visitors through improved ventilation, and air distribution.
  - Increasing water efficiency by reducing water in plumbing fixtures and irrigation system.
  - Using metering systems that provide evidence of lower energy use.
  - Reducing waste stream through recycling.
  - Implementing policies to purchase environmentally preferable products containing recycled content.
  - Encouraging use of alternative transportation through proximity of building to mass transit.
  - Reducing heat gain by maintaining "cool roofing" and paving materials.
  - Using green cleaning supplies and low-impact environmental pest management.

- Sustainable features include a white roof system to deflect heat, open floor designs to maximize the use of natural light, high performance window glazing, and "smart" light controls, such as daylight and motion sensors.

- An upper floor of the building uses a solar photovoltaic system to generate electricity.

According to Theresa Townsend, Senior Architect for the State of California and the California Department of Education building project, "The most significant expense was labor for application preparation, an estimated cost of $328,000, based on applying for 73 credits and 40 hours per credit. The project team had no LEED-EB experience prior to starting the Education Building Project, and the cost of future projects will be considerably lower because the team is more experienced and templates and the Best Practices Manual have been created. Facility upgrade costs included $300 for a new water meter and $24,000 for renewable energy for the building. In addition, LEED-EB Registration and Application fees cost $7150."

Sources:
State of California website -
<http://www.green.ca.gov/factsheets/leedebplat0706.htm>.

Arny, Michael. “An Inside Look at a LEED for Existing Buildings Project Interview with Theresa Townsend”
<http://www.managinggreen.com/Newsletters_2006/MG0806/ArnyArticle.html>.

5. Project: National Geographic Society headquarters

Owner: National Geographic Society
Industry: Education and non-profit
Use: Commercial office
Location: Washington, DC
Size: 840,000 square feet
Year Built: 4 interconnected buildings ranging from 20 to 100 years old

The return on investment has been documented at the increased market value of this property by $4 for every $1 invested. “The Society added $24 million in value from this LEED® certification from higher appraised value, raising tenant rents, lower operating costs, increased credit ratings and lower interest rates on debt instruments,” reported Chris Liedel, Chief Financial Officer for National Geographic Society.

The challenges were the age of the buildings and the need for several major HVAC system improvements. An energy savings performance contract was used to implement the HVAC system improvements. This approach allowed the $5.5 million HVAC system improvements to be carried out with a guarantee that the expected energy savings would be achieved. To respond to the concern of applying LEED-EB in older buildings, the team used a holistic approach to ensure that emphasis on crucial areas was not overlooked. With more efficient heating, cooling, and interior lighting systems, energy use has now been reduced by 20%. In addition, water utility expenses have decreased by 18%.

Sources:
USGBC Case Study: National Geographic’s green headquarters shows off their pioneering spirit. <http://www.usgbc.org/showfile.aspx?documentid=745>. Accessed 3 June 2008.

Yudelson, Jerry. "The Business Case for Greening Your Facilities – As Fast as Possible!" Buildings.com. 2 April 2007. Accessed 14 April 2008. <http://www.buildings.com/articles/detail.aspx?contentID=3690>.

6. Project: JohnsonDiversey Global Headquarters

Owner: JohnsonDiversey Corp.
Industry: Commercial
Use: 70% Office and 30% Lab
Location: Sturtevant, WI
Size: 277,440 sq ft
Stories: 3
Year Built: 1997

Original Design: The building was designed based on green-building principles, including high-energy efficiency, extensive use of natural lighting, and individual control of workspace environments.

Upgrades:

- Individual/personal environment controls (air flow, temp, acoustics and lighting) significantly increase occupant comfort, virtually eliminate hot/cold calls to maintenance, and allow for general building zone temperature range to exceed normal building comfort ranges thereby resulting in additional energy savings.
- The irrigation system serving the JohnsonDiversey building operates solely on captured rain and runoff from surrounding areas, using no potable water in any application. The current system used for irrigation of the grounds pumps irrigation water from the detention pond, which is supplied by captured rain and storm water runoff. The sprinkler system is automated with a timer, which can be enabled or disabled based on a moisture content analyzer reading for ground soil moisture content.
    - Use of collected stormwater for turfgrass irrigation reduces potable water use by 2-4 million gallons per year
- JohnsonDiversey has achieved water use performance that is 32% below the baseline standards as designated by LEED-EB (consistent with EPA Policy Act of 1992 Fixture Performance Requirements) by installing aerators in all lavatory faucet fixtures and shower fixtures. The toilets and urinals have replacement Sloan Valve Company valve diaphragms rated at 1.6 gpf for toilets and .5 gpf for urinals. JohnsonDiversey's total actual annual meter usage for 2002 was 21,032,264 gallons. The actual plumbing fixture load (1,641,900 gallons) was calculated by subtracting the process loads, the irrigation load, and the cooling tower from the meter use, and represents a reduction from a baseline of 32%.
- Participation in the LEED-EB program has renewed focus on integrated pest management, cleaning worker training, certified cleaning chemicals, systems approach to cleaning, and cleaning equipment, and has allowed JohnsonDiversey to construct an integrated cleaning program in alignment with LEED requirements.
- Occupant interest and involvement in environmental aspects of building operation have increased.

Initial Implementation Cost: $73,800
Initial Implementation Cost per sq.ft: $0.27
Annual Net Savings: $137,320
Annual Net Savings per sq ft: $0.49
ROI: 0.5 years

Sources:
"LEED-EB Project Case Study." Momentum Advantage Partners, LLC. 30 July 2008 <http://www.momentum-advantage.com/johnson-diversey-case-study-usgbc.htm>.

Yudelson, Jerry. "The Business Case for Greening Your Facilities – As Fast as Possible!" Buildings.com. 2 April 2007. Accessed 14 April 2008. <http://www.buildings.com/articles/detail.aspx?contentID=3690>.

7. Project: Monona Terrace Convention Center

Owner: City of Madison
Industry type: Municipal Convention Center
Use: Convention Center
Location: Madison, WI
Size: 250,000 square feet
Year built: 1997

Converting the building to meet LEED standards as part of the application process cost an estimated $111,000, but Hess said the audience Monona Terrace appeals to is now much broader.

"Environmental groups are a lot more excited about having their own conventions and conferences here and as a result, we've already booked eight conventions and conferences for these groups," he said. "The net revenue on those eight alone is almost $300,000."

The investments required to obtain LEED certification were about $111,000. Monona Terrace has already booked eight additional conventions and conferences as a result of its seeking LEED-EB certification according to the Greater Madison Convention and Visitor's Bureau. The economic impact from these conventions and conferences is estimated to be about $292,000, already creating a payback of almost 3 to 1, not counting operational savings.

Sources:
Snyder, Paul. “Monona Terrace in Madison gets LEED certification.” Daily Reporter (Milwaukee). 24 August 2007. <http://findarticles.com/p/articles/mi_qn5302/is_20070824/ai_n24424227>.
City of Madison, Wisconsin News Release. <http://www.cityofmadison.com/news/view.cfm?news_id=524>.

8. Project: Goizueta Business School

Owner: Emory University
Industry type: Education
Use: General purpose class room building
Location: Atlanta, GA
Size: 119,000 square feet
Year built: 1997

Project Costs: $0.79 per/sq. ft.
Annual Net Savings: $1.26 per sq. ft.

ROI: 8 months

Some collapsed ductwork meant that the building's HVAC system was heating and cooling air at the same time. This was causing the building to use an excessive amount of energy. 'The project turned out to be much larger than we expected," says Hascall. "We spent $100,000 to fix it all, but we calculate that we'll save $150,000 per year just in energy, so it was easily worth it." The Goizueta Business School Building earned a Gold rating.

The program helped Emory University uncover problems with its Goizueta facility. The university selected the building because it seemed like it required little effort to achieve LEED-EB certification, Smith says.

“It was relatively new, only about five years old, he says. “We didn’t have any complaints from occupants, and the equipment appeared to have worked really well. We didn’t realize, however, that we were heating and cooling the building at the same time. That is a fairly common problem, but unless you really do an exceptional job on your metering and monitoring, it’s something you’ll never know.”

“Thanks to the LEED-EB program, we discovered we were wasting $151,000 in energy costs a year. We spent about $94,000 to fix the building. We recouped those costs in less than a year, and now we’re making money.”

Sources:

Greg Zimmerman “U.S. Green Buildings Council Introduces LEED - EB for Existing Buildings.” Facilitiesnet.com < http://www.facilitiesnet.com/bom/article.asp?id=3301>.

Iczkowski, Ed. “LEED-EB: How to Achieve Certification and Reduce Operating Costs.” Texas A&M; Energy Systems Laboratory. 2005. 1-8. Accessed 29 May 2008. <http://repository.tamu.edu/handle/1969.1/5134>.

Arabe, Katrina. “5 Essential Facts about Green Buildings.” ThomasNet 15 March 2005. <http://news.thomasnet.com/IMT/archives/2005/03/5_essential_fac_1.html>.

Gryzkewicz, Renee. “The 'Greening' of Existing Facilities” Maintenance Solutions, February 2005. **www.facilitiesnet.com/ms/article.asp?id=2583**

Appendix B: Energy Star Portfolio Manager

STEP	ACTIVITY	ACTION
1	Access Portfolio Manager	http://www.energystar.gov/benchmark Scroll down to the Login section
2	Access your account ■ Create a new account ■ Login to an existing account ■ Get a brief system overview	 ■ Click NEW USER ■ Enter user name and password and click LOGIN ■ Click SYSTEM TOUR or LEARN MORE
3	Add a new facility	Click ADD FACILITY
4	Enter general building data	Enter data and click SAVE
5	Enter space use data 	Go to "Space Use" section and click ADD SPACE ■ Enter a facility name and select the space type Click CONTINUE ■ Enter the square footage, occupants, PCs, and operating hours. Click SAVE *Repeat for all space types*
6	Enter energy use data 	Go to "Energy Meters" section and click ADD METER ■ Enter Meter name, type, units. Click SAVE ■ Enter number of months and start date. Click CONTINUE ■ Enter energy use and cost. Click SAVE *Repeat for all fuel types*
7	Review and interpret results	Go to "Facility Performance" section and review your results. Guidance is provided on page two of this guide.
8	Manage account and apply for recognition	Share data, generate a Statement of Energy Performance, apply for the ENERGY STAR, create a building profile, and perform other administrative tasks.

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