JONES LANG LASALLE®

Real value in a changing world

BEACON CAPITAL PARTNERS

Building *value* through sustainability

June 4, 2009

Agenda

- Questions
- Strategic Overview
- Assessment/Baselining
- Delivery
- Results

Questions

- What are Beacon's motivations in pursing sustainability for its investment buildings?
- What are Beacon's biggest concerns in implementing sustainability programs for its properties?
- What is the one thing that JLL could best do to help Beacon take advantage of the sustainability movement?

Questions

- What specific JLL capabilities or service products are of greatest interest to Beacon?

- **Upstream**: Comprehensive environmental consulting for corporate-wide programs.

- **PEERS**: Sophisticated energy management program based on detailed metrics

- **Green Globes**: Portfolio or building specific sustainability assessment system

- **LEED Gap Analyses**: First step in LEED certification process

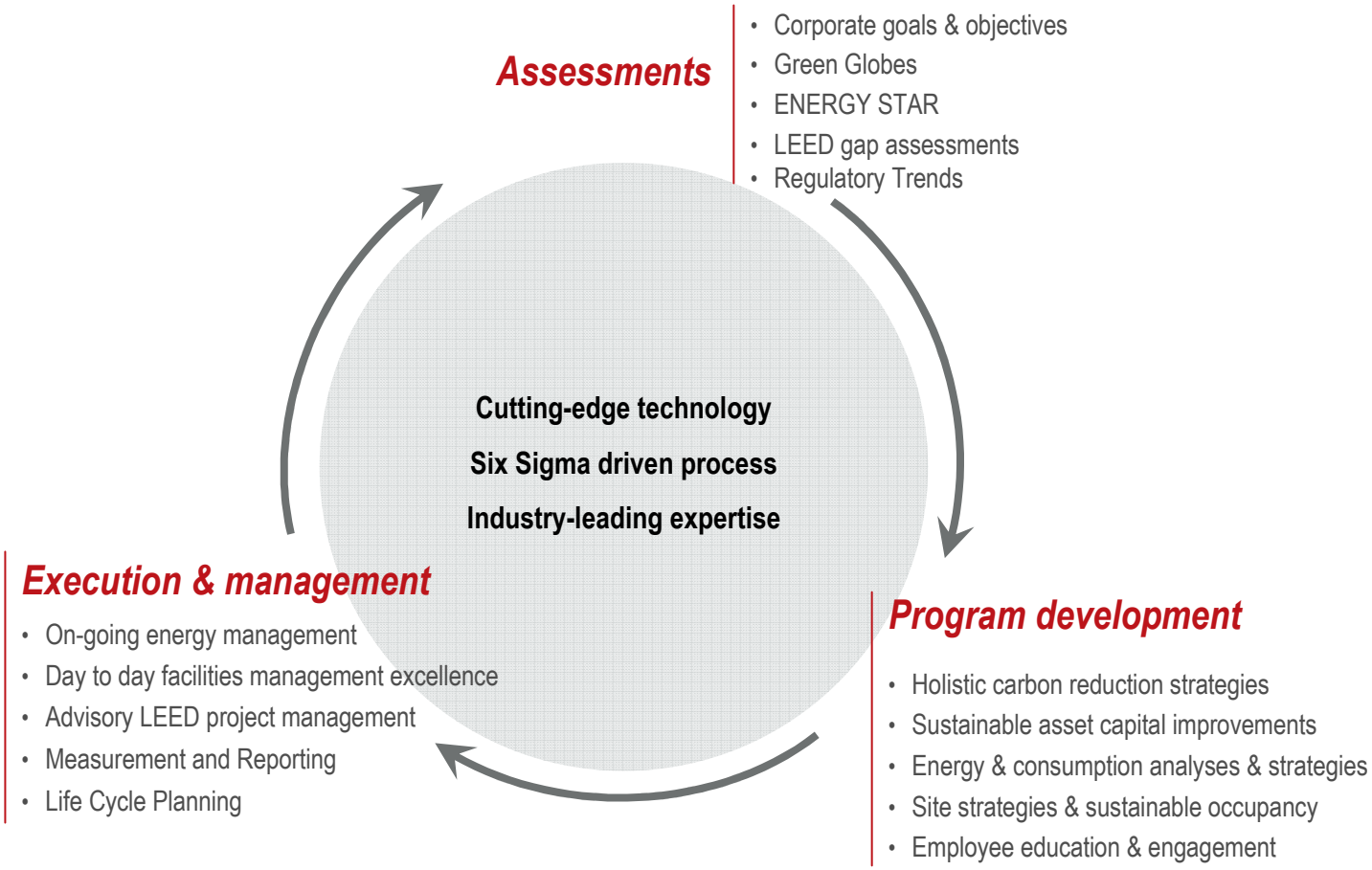
- **LEED Certification**: Management of the entire LEED process through actual certification

- **LEED Design Charretts**: Management of team discussions on specific sustainability issues/problems

- **Energy Star Management**: Directing Energy Star participation for single or multiple buildings

Strategic Overview

A holistic approach—from strategy to execution



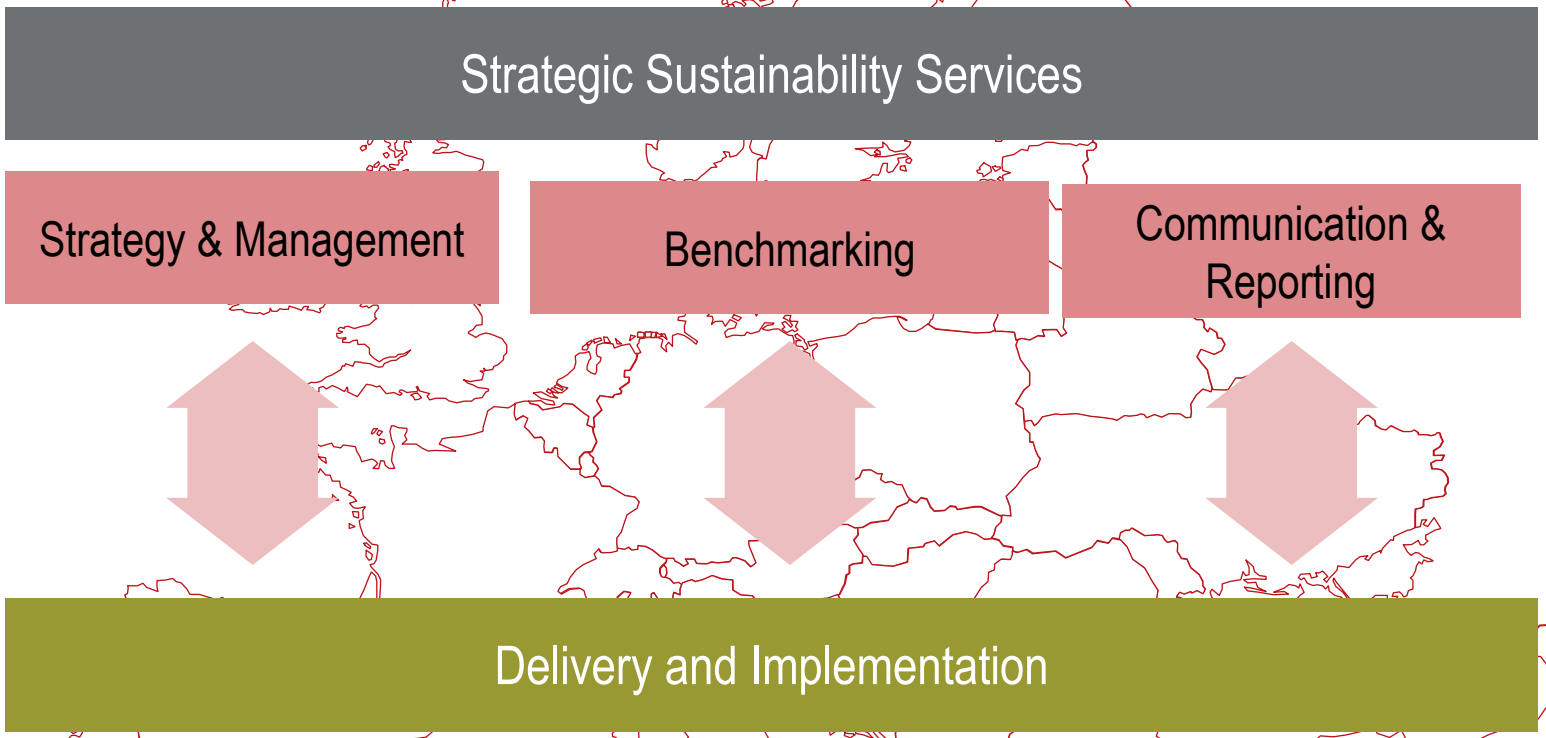
JLL's leadership position in real estate industry

Industry leading expertise	Recognized leader	Making an impact
• 70 FTEs (globally) • Over 400 LEED APs • 20 CEMs • Upstream • ECD	• 100 Best Corporate Citizens, CRO Magazine (2007) • Chairman's Award, Alliance to Save Energy (2007) • Partner of the Year, ENERGY STAR (2007) • Sustainable Cities Award, Financial Times and ULI (2008) • International Energy Engineer of the Year, Association of Energy Engineers (2008) • World's Most Ethical Companies, Ethisphere Institute (2008)	• Documented **$95 M** in energy savings • Reduced **438,000 tons** of greenhouse gas emissions • Saved **790,000,000 kWh** • Provided **20,000 facilities** with specialized energy services • Managed **73** LEED projects, totaling over **35 MSF**

Upstream

- Established in 1997
- Acquired in November 2007 by Jones Lang LaSalle
- A team of 44 people
- Various backgrounds and disciplines: environmental science, law, geography, business, international development…

Our Services



Why should sustainability be important to you?

Because sustainability is about ….

- **Managing risk**
- **Reducing Costs**
- **Protecting and enhancing asset value**
- **Optimising the development process**
- **Ensuring good quality asset management**
- **Sustaining rental value**
- **Protecting and enhancing your reputation**

} = Future proofing your assets and products

Proven results

Bank of America Tower New York, NY

- Overseeing development of 2.1 million s.f 52-story, crystalline skyscraper that will be second tallest building in New York City
- Pursuing LEED® Platinum certification on core and shell
- Project will exceed $2 million of lease building, infrastructure & tenant improvement investments
- Manage relocation of 4,000 bank employees to this site

HSBC Corporate Headquarters Mettawa, IL

- Consolidate headquarters into a single, 560,000 s.f. facility
- The headquarters includes a full-service cafeteria, fitness center and recreation center for 3,000 employees
- Achieved LEED ® Silver certification by including abundant natural lighting, under-floor air distribution, rainwater capture, a green roof and other sustainable components
- Completed on time and under budget

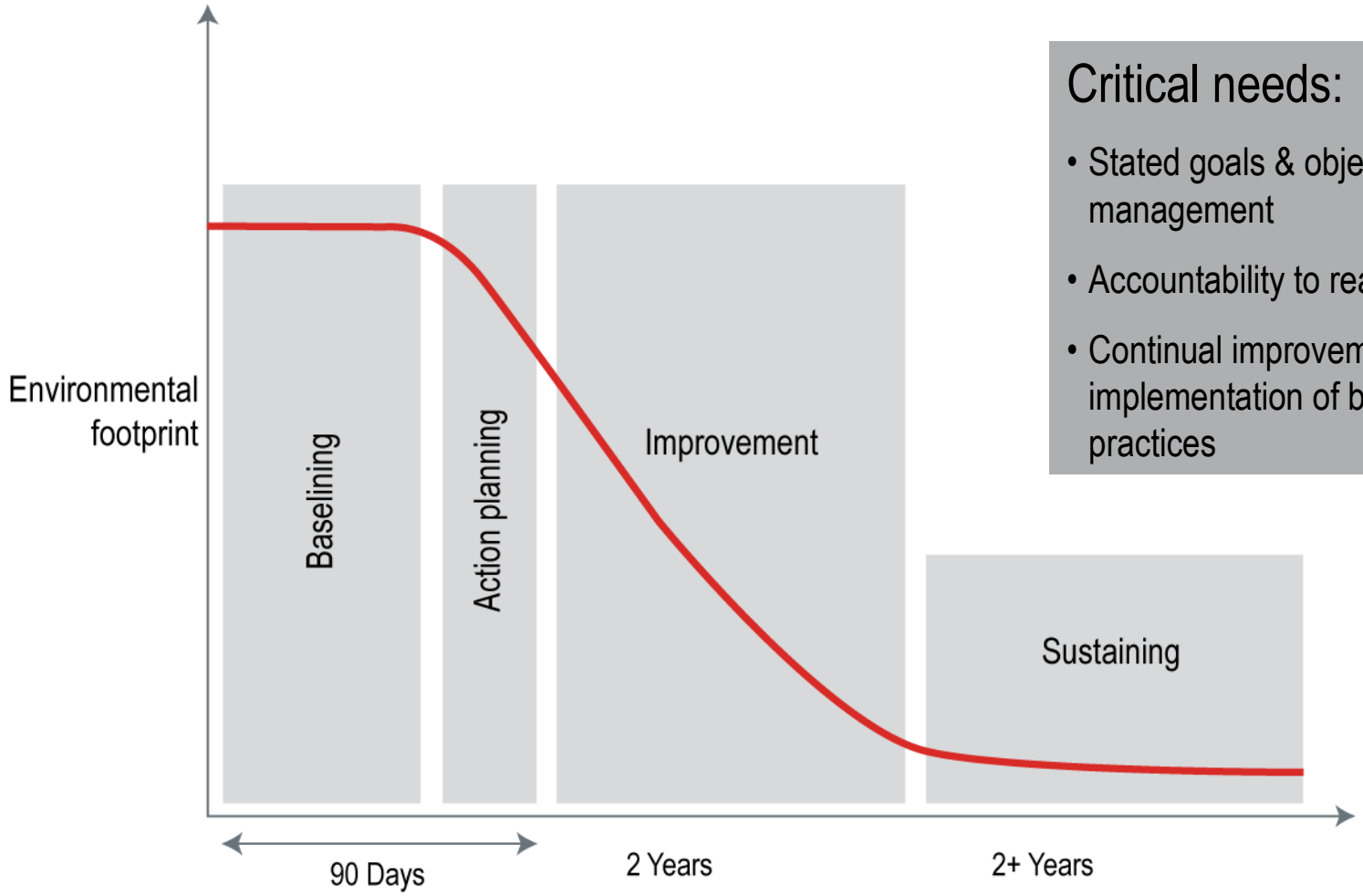
Kendall Square Cambridge, MA

- Genzyme World headquarters
- Pursuing LEED® Certification
- Completed in 2005
- Multi-use bioscience office space
- 9,000 rsf retail space
- $99 million total project cost including land and capitalized development costs
- $170 per rsf construction cost

Managing sustainability projects and programs for …

Assessment/Baselining

Path to sustainability



Critical needs:

- Stated goals & objectives from management
- Accountability to reach goals
- Continual improvement and implementation of best practices

Green Globes and LEED

Green Globes	LEED

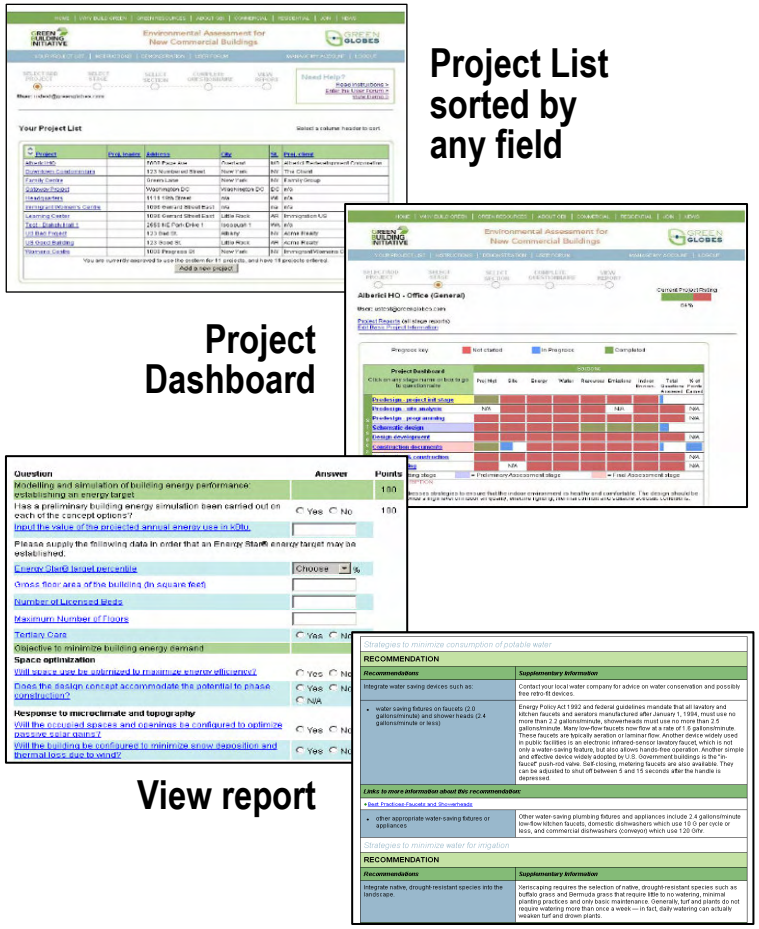
• Management tool
• Inexpensive and user-friendly
• Baseline & benchmark your building
• Building or portfolios
• Certification optional
• ANSI standard (LCA approach)
• Focused on:
  • Environmental Management
  • Site
  • Energy & Carbon
  • Water
  • Recycling & Resource Management
  • Emissions, effluents
  • Indoor environment
	• Certification
	• Costly and time intensive
	• Stand alone
	• Just building
	• Certification based
	• Consensus document
	• Focused on:
	  • Site
	  • Energy & Atmosphere
	  • Water
	  • Resources
	  • Indoor environment
	  • Innovation

Green Globes background

- Online web tool
- Quick and easy questionnaire (completed by the property manager)
- Report immediately and automatically generated
- In the U.S., overseen and licensed by the Green Building Initiative (GBI)
- Green Globes standards will be kept independent from Jones Lang LaSalle and operated under the governance of the GBI in the US and BOMA Canada in Canada

Green Globes self-assessment

- On-line self analysis performed by the on-site building management team.
  - Takes about 1/2 day
- Developed in 2004 by the environmental consulting firm ECD in conjunction with the non-profit organization GBI (Green Building Initiative) and BOMA Canada.
- Can update information and track progress.



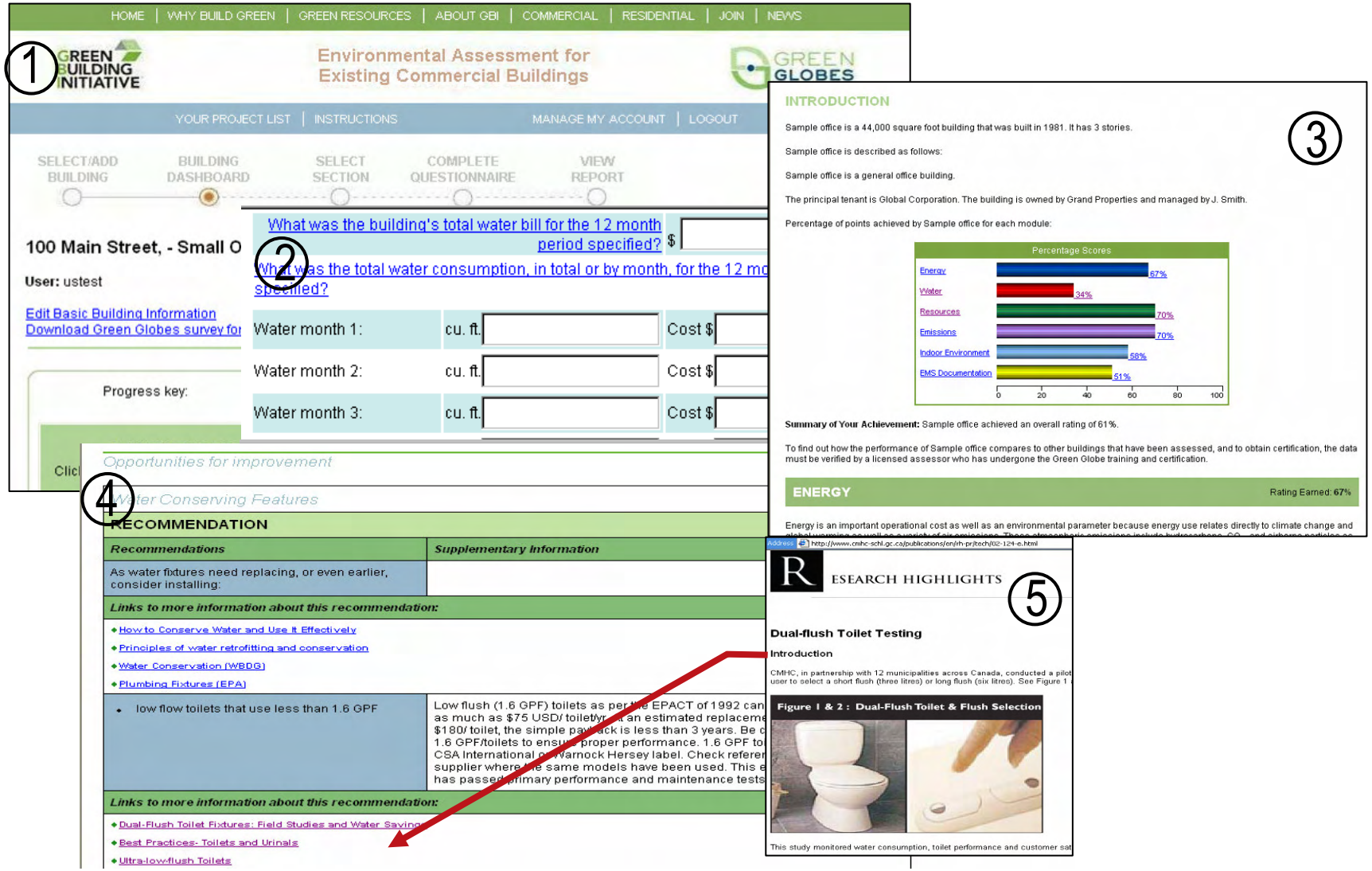
Sample questionnaire

0.0	BASIC INFORMATION
0.1	What is the name of the building? Tip: Please enter the name as you would like it to appear on the certificate if the building becomes certified
0.2	What is the street address?
0.3	When was the building constructed? Tip: Specify year of construction OR choose an era
0.4	What is the gross floor area of the building (in square feet)? Tip: The gross floor area for the purposes of the assessment is the total h floor area within the perimeter of the exterior walls of the building, inclu common, mechanical and structural support areas, and excludes unheated parking garage areas
0.5	How many storeys are there?
0.6	Is there underground parking?
0.7	The building is:
0.8	How many dwelling units (apartments) are there?
0.9	What is the approximate number of people living in the build
0.10	Are there other tenancies such as:
0.11	Who is the owner of the building?
0.12	Who is the building manager?
0.13	How many years has the building manager been with the building?
0.14	Is the building manager stationed on-site or off-site?
0.15	Building description?

1.0	ENERGY			
1.1	Energy Consumption			
1.1.1	Please select the fuels or utilities used by the building, for which energy consumption figures will be entered. Tip: Check each fuel for which consumption will be entered.			
	☐ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ Steam ☐ Chilled Water			
1.1.2	Please specify the ending month of the 12 month period for which energy consumption figures are being entered. Tip: Please select the month and year corresponding to the last month of the 12 month period for which you will be entering energy consumption figures.	Mon Yea		
1.1.3	What was the building's total energy bill for the 12 month period specified?	$		
1.1.4	What was the total energy consumption for each non-renewable fuel type, in total or by month, for the 12 month period specified?			
	Gas month 1:	cu.ft.		Cost $
	Gas month 2:	cu.ft.		Cost $
	Gas month 3:	cu.ft.		Cost $
	Gas month 4:	cu.ft.		Cost $
	Gas month 5:	cu.ft.		Cost $
	Gas month 6:	cu.ft.		Cost $
	Gas month 7:	cu.ft.		Cost $
	Gas month 8:	cu.ft.		Cost $
	Gas month 9:	cu.ft.		Cost $
	Gas month 10:	cu.ft.		Cost $
	Gas month 11:	cu.ft.		Cost $
	Gas month 12:	cu.ft.		Cost $
	Electricity month 1:	kWh.		Cost $
	Electricity month 2:	kWh.		Cost $
	Electricity month 3:	kWh.		Cost $
	Electricity month 4:	kWh.		Cost $
	Electricity month 5:	kWh.		Cost $
	Electricity month 6:	kWh.		Cost $
	Electricity month 7:	kWh.		Cost $
	Electricity month 8:	kWh.		Cost $
	Electricity month 9:	kWh.		Cost $
	Electricity month 10:	kWh.		Cost $
	Electricity month 11:	kWh.		Cost $
	Electricity month 12:	kWh.		Cost $

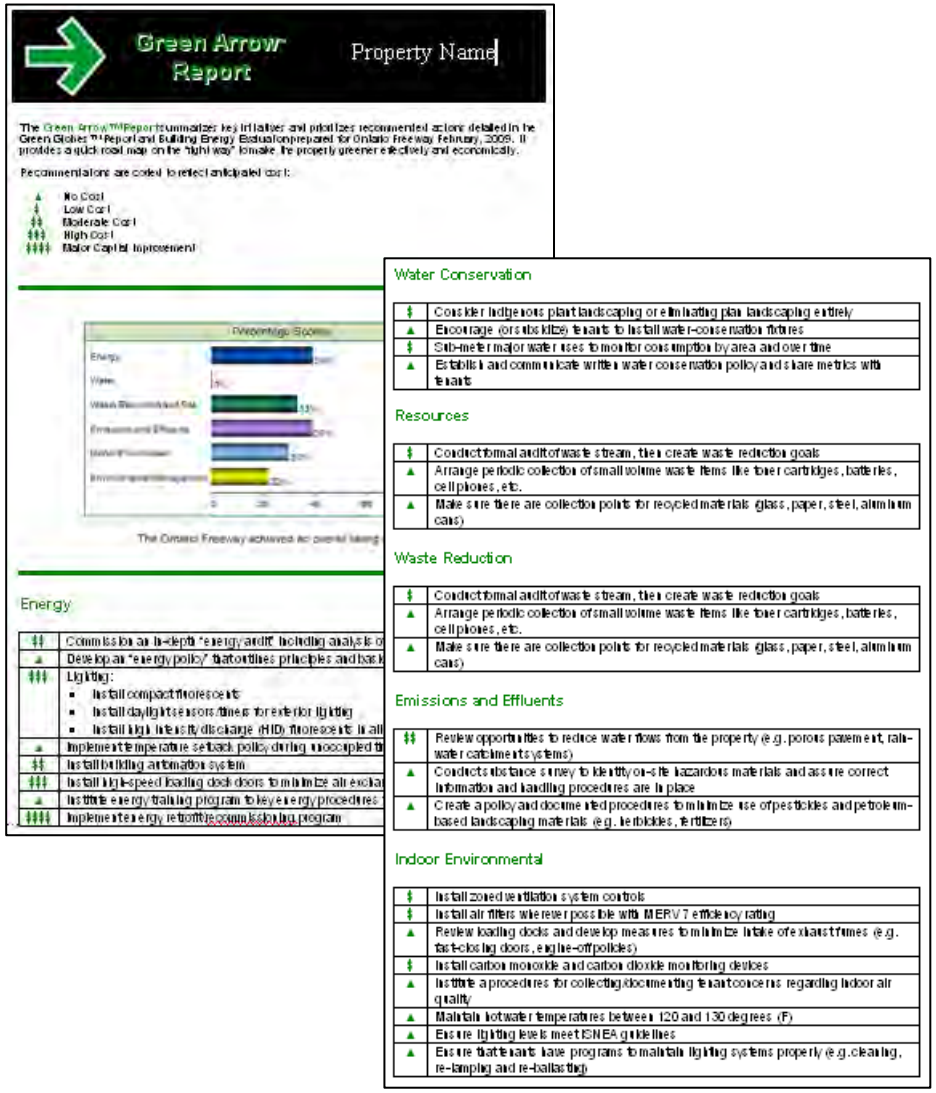
5.0	INDOOR AIR QUALITY		
5.1	Ventilation System		
5.1.1	How is the building ventilated?	☐ Natural ventilation ☐ Corridor air exhaust system with suite or central exhaust ☐ Central ventilation system to all dwelling units	
5.1.2	Are air intakes located far from sources of pollution such as parking areas, bus stops, cooling towers or stagnant water?	☐Yes	☐No
5.1.3	Are air intakes located at least 30 ft. away from building exhaust outlets?	☐Yes	☐No
5.1.4	Are fresh air intakes checked regularly to ensure that the openings are protected and free from obstruction?	☐Yes	☐No
5.1.5	Is there free-standing water which cannot drain away in the condensate drip trays? Tip: Verify that there is no free-standing water in the air-conditioning ductwork, particularly in the condensate drip trays of cooling coils, downstream from humidifiers, which can result in contamination of ducts by bacteria and fungi If there is no air-conditioning, mark "non-applicable"	☐Yes ☐No ☐N/A	
5.1.6	Are there signs of corrosion, loose material (such as damaged filter bags) or sound attenuation material in the air-handling unit (AHU)? Tip: Inspect the air-handling units (air-mixing chambers, coils and fan blades) and duct interiors including any crawlspaces, tunnels or other areas that are used as ducts or which may be in contact with the ventilation air stream Investigate whether commissioning took place If there are no air-handling units, mark "non-applicable"	☐Yes ☐No ☐N/A	
5.1.7	Is there at least one openable window provided for all habitable rooms, except for water-closet rooms or bathrooms and kitchens, and is their size, placement and operation likely to result in reasonably effective ventilation?	☐Yes	☐No
5.1.8	Does every dwelling unit have an adequate supply of air with no blockages?	☐Yes	☐No
5.1.9	Are exhaust systems, particularly the bathroom and kitchen exhaust, operating effectively?	☐Yes	☐No
	Filtration System		
5.1.10	Are filters rated at 10 Minimum Efficiency Reporting Value (MERV)?	☐Yes	☐No
5.1.11	Are manometers fitted to indicate when filters should be changed?	☐Yes	☐No
5.1.12	Is there easy access for cleaning and inspecting filters?	☐Yes	☐No
5.1.13	Do the filters fit snugly within the filter supports?	☐Yes	☐No
	Humidification System		
5.1.14	What type of humidification system does the building use? Tip: Because of the risk of microbial contamination associated with spray humidification, a preferred method is humidification by steam If there is no	☐Steam ☐Spray ☐ N/A	

Online assessment with recommendations from data



Green Arrow™ Report

- Quick Start Guide
- Highlight key recommendations
- Categorizes costs
- Creates property level game plan



Green Arrow Report — Property Name

The Green Arrow™ Report summarizes key initiatives and prioritizes recommended actions detailed in the Green Globes™ Report and Building Energy Evaluation prepared for Ontario Freeway February, 2009. It provides a quick road map on the "right way" to make the property greener effectively and economically.

Recommendations are coded to reflect anticipated cost:

- No Cost
- Low Cost
- Moderate Cost
- High Cost
- Major Capital Improvement

Percentage Scores

The Ontario Freeway achieved an overall rating

Energy

	Commission an in-depth "energy audit" including analysis o
	Develop an "energy policy" that outlines principles and basi
	Lighting: install compact fluorescent; install daylight sensors/timers for exterior lighting; install high intensity discharge (HID) fluorescent in all
	Implement temperature setback policy during unoccupied ti
	Install building automation system
	Install high-speed loading dock doors to minimize air exchan
	Institute energy training program to key energy procedures
	Implement energy retrofit/recommissioning program

Water Conservation

	Consider indigenous plant landscaping or eliminating plan landscaping entirely
	Encourage (or subsidize) tenants to install water-conservation fixtures
	Sub-meter major water uses to monitor consumption by area and over time
	Establish and communicate written water conservation policy and share metrics with tenants

Resources

	Conduct formal audit of waste stream, then create waste reduction goals
	Arrange periodic collection of small volume waste items like toner cartridges, batteries, cell phones, etc.
	Make sure there are collection points for recycled materials (glass, paper, steel, aluminum cans)

Waste Reduction

	Conduct formal audit of waste stream, then create waste reduction goals
	Arrange periodic collection of small volume waste items like toner cartridges, batteries, cell phones, etc.
	Make sure there are collection points for recycled materials (glass, paper, steel, aluminum cans)

Emissions and Effluents

	Review opportunities to reduce water flows from the property (e.g. porous pavement, rain-water catchment systems)
	Conducts substance survey to identify on-site hazardous materials and assure correct information and handling procedures are in place
	Create a policy and documented procedures to minimize use of pesticides and petroleum-based landscaping materials (e.g. herbicides, fertilizers)

Indoor Environmental

	Install zoned ventilation system controls
	Install air filters wherever possible with MERV 7 efficiency rating
	Review loading docks and develop measures to minimize intake of exhaust fumes (e.g. fast-closing doors, engine-off policies)
	Install carbon monoxide and carbon dioxide monitoring devices
	Institute a procedures for collecting/documenting tenant concerns regarding indoor air quality
	Maintain hot water temperatures between 120 and 130 degrees (F)
	Ensure lighting levels meet IESNEA guidelines
	Ensure that tenants have programs to maintain lighting systems properly (e.g. cleaning, re-lamping and re-ballasting)

Property portfolio assessment

- An environmental assessment of all properties in a client portfolio
- Uses Green Globes as initial assessment tool
- Uses “Sustainability Tracker” for tracking progress for each property
- Results presented in a consolidated report
- Can be applied to office, retail, industrial, multi-family and mixed-use properties

Portfolio sustainability program

Issue:

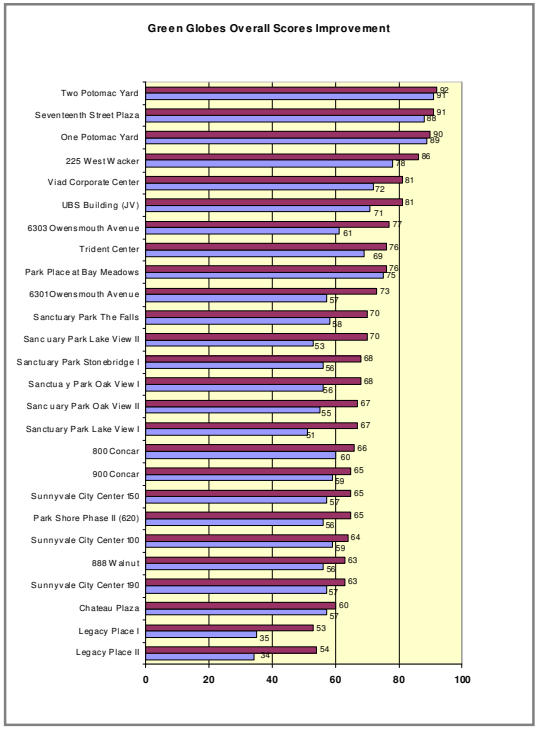
- A major financial institution needed a way to mitigate risk and increase asset values for a portfolio of investment properties.

Solution:

- JLL brought on as program developer and manager in a year-long program to baseline buildings in the portfolio by using Green Globes, devise building-level and portfolio-level strategies and action plans, implement the action plans and measure results.

Results to date:

- With three quarters of the program completed, all of the buildings in the portfolio have been baselined with building level actions identified and quick-wins beginning. The portfolio-level report was developed with opportunities for improvement being identified and prioritized.



ENERGY EFFICIENCY FEATURES

Building	Lighting controls	High efficiency boilers	Automatic vent damper on boiler	Temperature setback	BAS (Full or Partial Installation)	Efficient hot water heaters	Hot water saving fixtures	Water temp. 50-55°C	High efficiency chillers	Heat recovery	Cogeneration	Variable speed drives	Renewable energy	Energy efficient windows	Air seal top of building	Air seal bottom of building	Air seal vertical shafts	Shade to reduce cooling	Wall insulation meets MNECB	Roof insulation meets MNECB
Chateau Plaza	✓	N/A	N/A	✓	Partial	✓	✓	✓	X	X	X	✓	X	X	X	✓	✓	X	N/A	N/A
888 Walnut	✓	✓	X	X	Full	X	X	✓	✓	X	X	✓	X	X	✓	✓	✓	X	✓	✓
Park Shore Phase II (620)	✓	✓	X	✓	Full	X	X	✓	N/A	✓	X	✓	X	✓	✓	✓	✓	✓	✓	✓
Sanctuary Park Lake View II	X	N/A	N/A	✓	Full	X	X	✓	N/A	X	X	✓	X	✓	✓	✓	✓	X	✓	✓
Sanctuary Park Oak View I	✓	N/A	N/A	✓	Full	X	X	✓	✓	X	X	✓	X	✓	✓	✓	✓	X	✓	✓
Sanctuary Park Oak View II	✓	N/A	N/A	✓	Full	X	X	✓	N/A	X	X	✓	X	✓	✓	✓	✓	X	✓	✓
Sanctuary Park Stonebridge I	✓	N/A	N/A	✓	Full	X	X	✓	N/A	X	X	✓	X	✓	✓	✓	✓	X	✓	✓
Sanctuary Park Lake View I	✓	N/A	N/A	✓	Full	X	X	✓	N/A	X	X	✓	X	✓	X	X	X	✓	N/A	N/A
Legacy Place I	X	N/A	N/A	✓	Partial	X	X	✓	N/A	X	X	X	X	X	X	X	X	X	X	X
Legacy Place II	X	N/A	N/A	X	Partial	X	X	✓	N/A	X	X	X	X	X	X	X	X	X	X	X

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ENERGY STAR AWARD 2007 PARTNER OF THE YEAR

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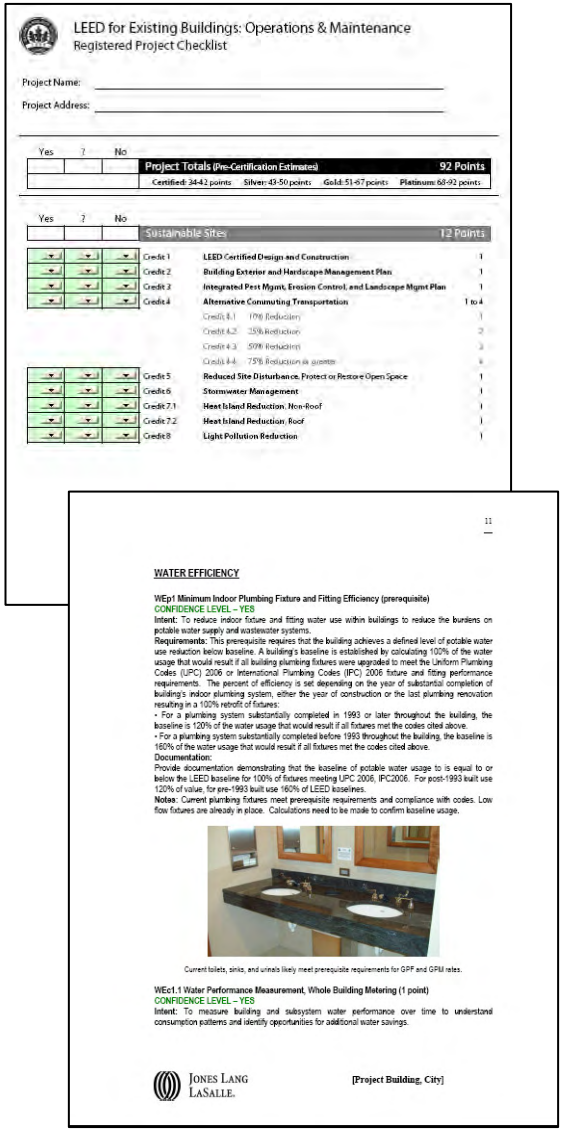
LEED gap assessment

- **Formal process conducted by Jones Lang LaSalle LEED® APs, taking the building through the full LEED® Checklist**
  - Provides an initial score and recommendations for addressing issues to allow the building to become LEED® Certified.
  - Takes up to 60 days
  - Cost is $5,000 to $10,000, depending on building size
- The LEED® Assessment uses the US Green Building Council checklist
- The Certification Roadmap provides an actionable set of recommendations estimating timing and cost for achieving certification most efficiently and economically.



LEED for Existing Buildings: Operations & Maintenance
Registered Project Checklist

Project Name:
Project Address:

Yes	?	No	Project Totals (Pre-Certification Estimates)	92 Points
			Certified: 34-42 points Silver: 43-50 points Gold: 51-67 points Platinum: 68-92 points	

Yes	?	No	Sustainable Sites	12 Points
			Credit 1	LEED Certified Design and Construction 1
			Credit 2	Building Exterior and Hardscape Management Plan 1
			Credit 3	Integrated Pest Mgmt, Erosion Control, and Landscape Mgmt Plan 1
			Credit 4	Alternative Commuting Transportation 1 to 4
			Credit 4.1	1% (Reduction) 1
			Credit 4.2	25% Reduction 2
			Credit 4.3	50% Reduction 3
			Credit 4.4	75% Reduction or greater 4
			Credit 5	Reduced Site Disturbance, Protect or Restore Open Space 1
			Credit 6	Stormwater Management 1
			Credit 7.1	Heat Island Reduction, Non-Roof 1
			Credit 7.2	Heat Island Reduction, Roof 1
			Credit 8	Light Pollution Reduction 1

11

WATER EFFICIENCY

WEp1 Minimum Indoor Plumbing Fixture and Fitting Efficiency (prerequisite)
CONFIDENCE LEVEL – YES
Intent: To reduce indoor fixture and fitting water use within buildings to reduce the burdens on potable water supply and wastewater systems.
Requirements: This prerequisite requires that the building achieves a defined level of potable water use reduction below baseline. A building's baseline is established by calculating 100% of the water usage that would result if all building plumbing fixtures were upgraded to meet the Uniform Plumbing Codes (UPC) 2006 or International Plumbing Codes (IPC) 2006 fixture and fitting performance requirements. The percent of efficiency is set depending on the year of substantial completion of building's indoor plumbing system, either the year of construction or the last plumbing renovation resulting in a 100% retrofit of fixtures:
• For a plumbing system substantially completed in 1993 or later throughout the building, the baseline is 120% of the water usage that would result if all fixtures met the codes cited above.
• For a plumbing system substantially completed before 1993 throughout the building, the baseline is 160% of the water usage that would result if all fixtures met the codes cited above.
Documentation:
Provide documentation demonstrating that the baseline of potable water usage to is equal to or below the LEED baseline for 100% of fixtures meeting UPC 2006, IPC2006. For post-1993 built use 120% of value, for pre-1993 built use 160% of LEED baselines.
Notes: Current plumbing fixtures meet prerequisite requirements and compliance with codes. Low flow fixtures are already in place. Calculations need to be made to confirm baseline usage.

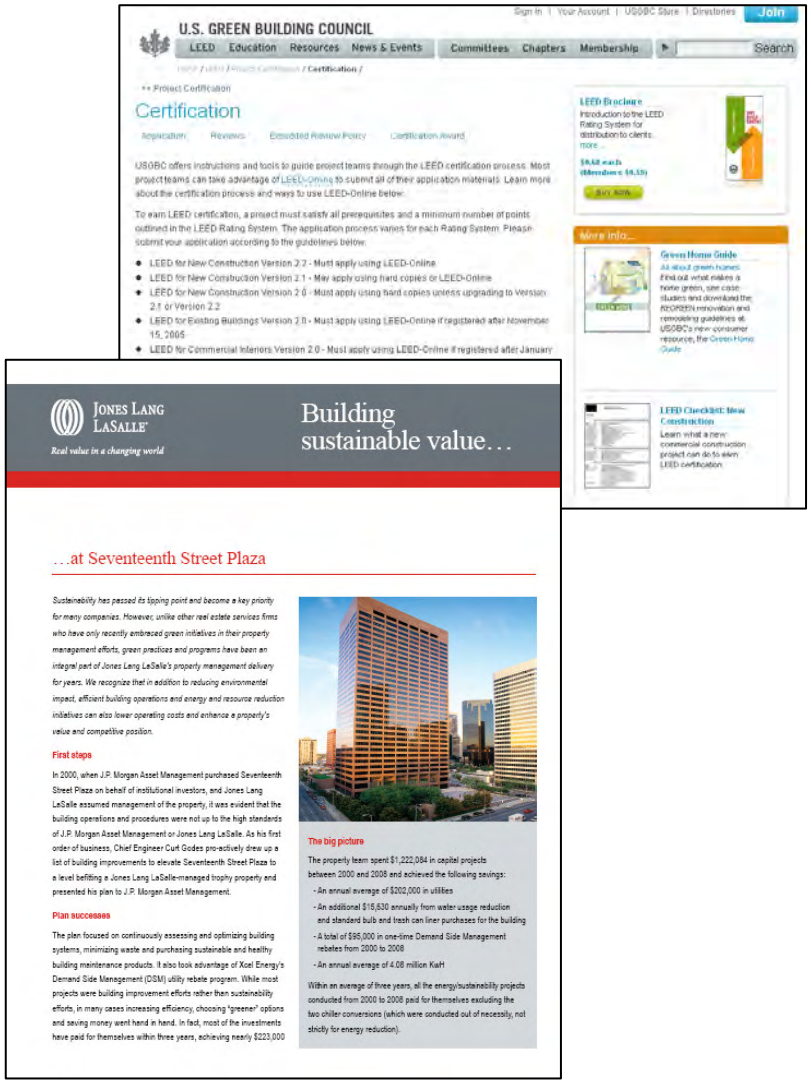
Current toilets, sinks, and urinals likely meet prerequisite requirements for GPF and GPM rates.

WEc1.1 Water Performance Measurement, Whole Building Metering (1 point)
CONFIDENCE LEVEL – YES
Intent: To measure building and subsystem water performance over time to understand consumption patterns and identify opportunities for additional water savings.

Jones Lang LaSalle [Project Building, City]

LEED certification management

- **If a building decides to register and work to LEED® Certification, Jones Lang LaSalle consultants are available to guide the <u>entire</u> process.**
- Includes working with the property management team to analyze all pre-requisites and credits, strategize ways to address each, and assembling all needed supporting documents.
- Generally takes between 6 and 24 months
- Typically costs over $40,000, depending on building size and complexity.



Delivery

Design Charrettes

Help identify the most cost effective initiatives with the greatest impact

Identify Opportunities

- Evaluate all potential initiatives
- Estimate theoretical minimum energy use
- Energy modeling

Evaluate Measures

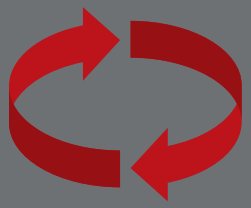
- Net present value
- Greenhouse gas savings
- Dollar to metric ton of carbon reduced
- Calculated for each measure

Create Packages

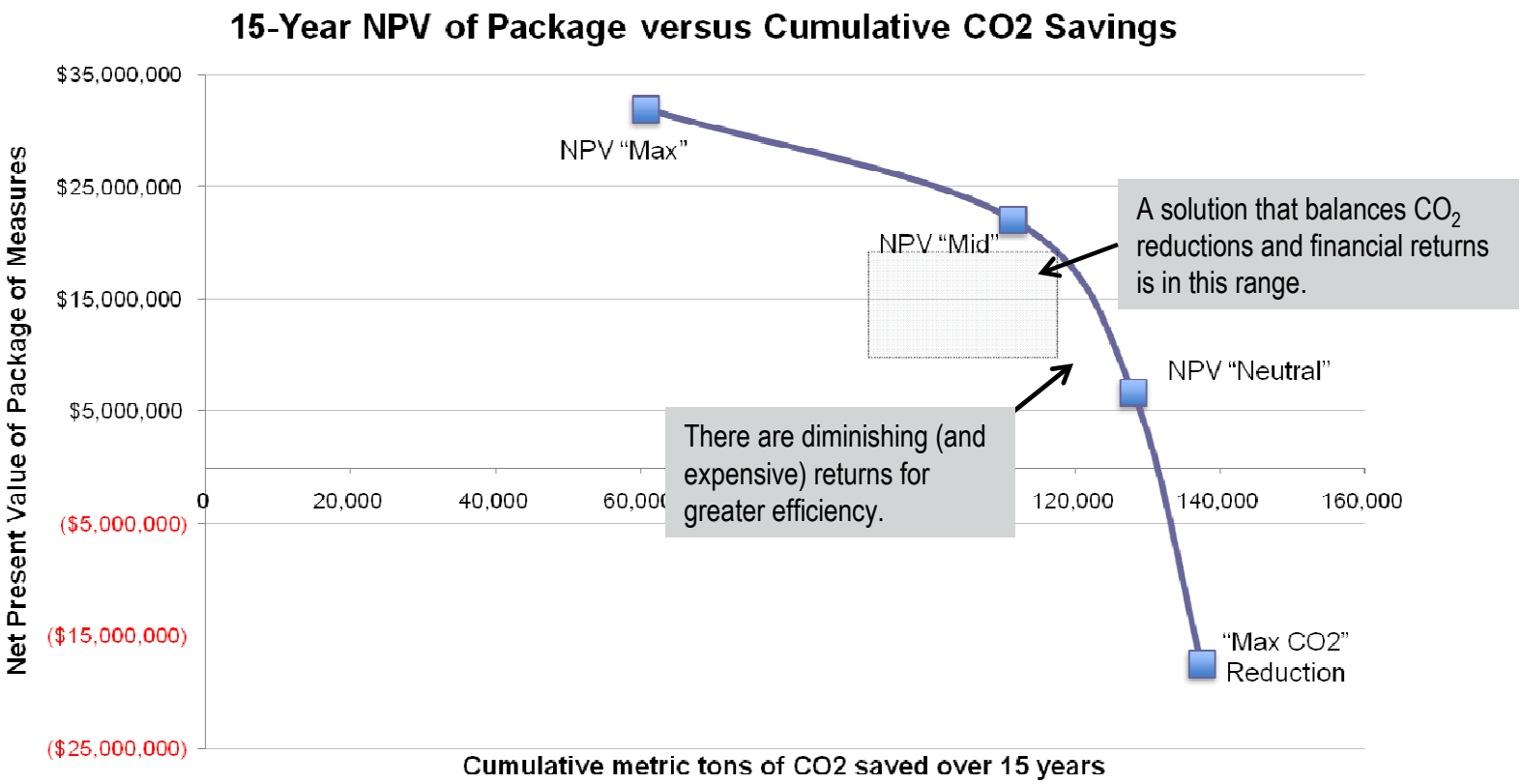
- Maximize net present value
- Balance net present value and CO2 savings
- Maximize CO2 savings for a zero net present value
- Maximize CO2 savings

Model Iteratively

- Iterative energy and financial modeling process to identify final eight recommendations



Design Charretts - Financial results

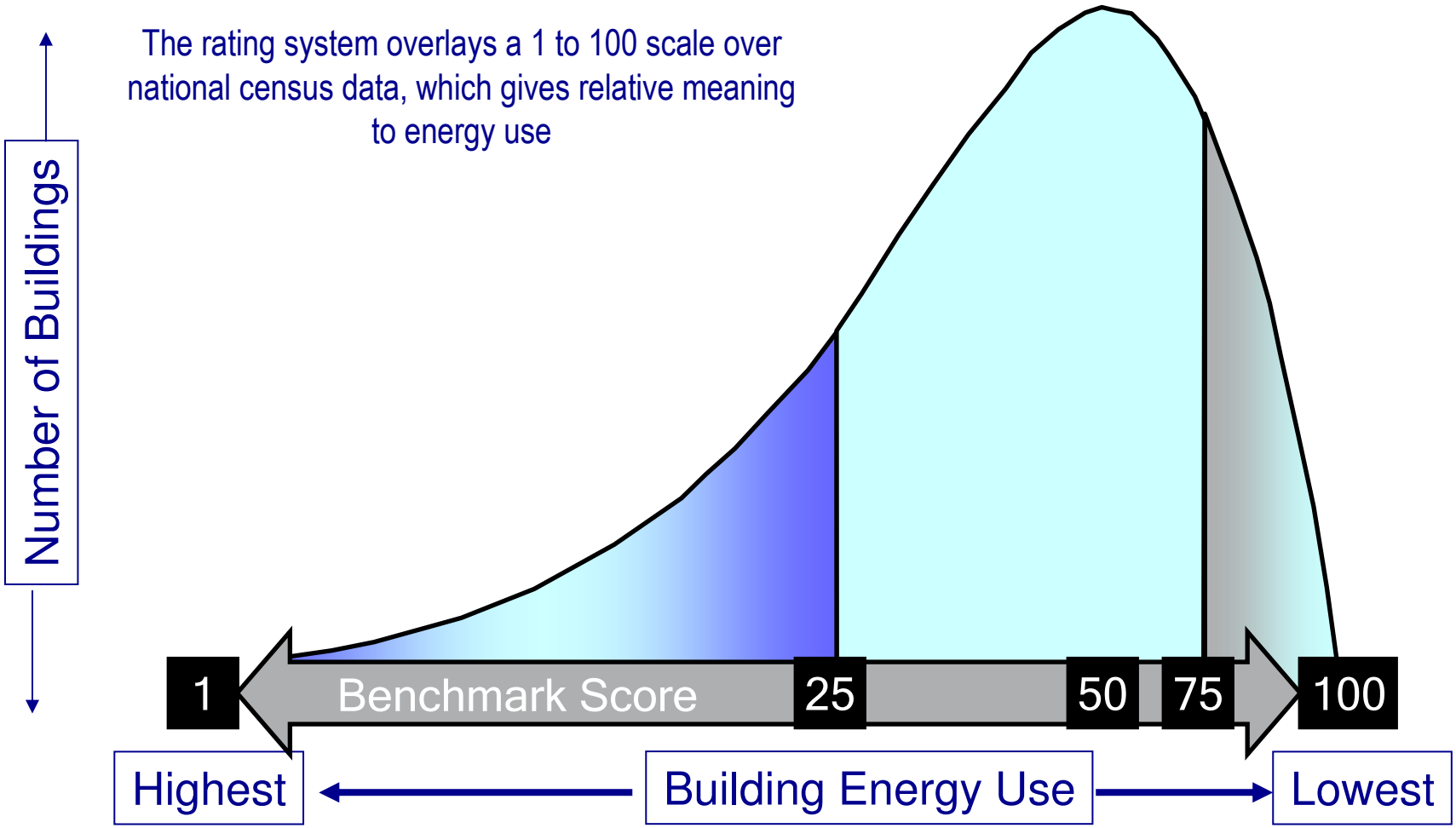


PEERS: Portfolio Energy and Environmental Reporting System

Proprietary platform to Track:

- Emissions & carbon footprint metrics
- Energy costs and consumption
- LEED, ENERGY STAR and Green Globes
- Calculate and project savings
- Real Time Improvements
- Multiple Views:
  - Portfolio
  - Regional
  - Building
- Capital investment prioritization

EPA Energy Star Expertise



Retro-commissioning services

Pro actively Optimize building performance

- In-depth equipment and systems analysis to identify operational short-falls
- Compare actual performance vs. related operational, financial and sustainable goals
- Present recommendation for maximizing efficiency including re-engineering, capital improvements and training
- Typical savings of 5-20%

Results

A landmark sustainability project for the Empire State Building

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ENERGY STAR AWARD 2007
PARTNER OF THE YEAR

BEACON CAPITAL PARTNERS

The new gold standard is green

The Empire State Building, an iconic, pre-war trophy office building, can catalyze change by cost-effectively reducing greenhouse gas emissions while attracting world class tenants.

Recognized throughout the world

3.8 million visitors per year

102 stories and **2.8 million** square feet

CO_2 emissions of **24,000 tons** per yr

$11 million in annual energy costs

Peak **office building** demand of **9.5 MW**

88 kBtu per SF per yr for the office building

A groundbreaking energy and sustainability program

Setting a new standard

When the Empire State Building Company decided to make the building one of the greenest in New York City, it turned to Jones Lang LaSalle and a team of experts to develop an innovative sustainability and energy retrofit strategy that would dramatically reduce energy consumption *and* result in a positive ROI.

Innovative, collaborative process

As the program manager, Jones Lang LaSalle developed the process and served as the owner's representative. We guided the team through a rigorous cost-benefit analysis, helping ensure alignment with key business objectives. Eight key initiatives were identified from more than sixty potential strategies including infrastructure projects, green design concepts and a tenant energy management program. Jones Lang LaSalle is now overseeing the implementation.

"I chose Ray Quartararo and Jones Lang LaSalle because of our successful history together taking on and figuring out difficult projects and the company's deep sustainability expertise and track record."

--Anthony E. Malkin
Building Owner
Empire State Building Company

As program manager, Jones Lang LaSalle…

- Served as the owner's representative ensuring program aligned with business objectives
- Led a team of diverse consultants, built consensus and accelerated progress
- Managed development of broad and complex strategy delivering an actionable, result-driven plan in 8 months
- Applied best practices from industry-leading projects from around the world (Bank of America Tower in Bryant Park, HSBC Tower in Mexico City and Shanghai)

The motivation

"Buildings in New York City create 65 to 70 percent of the city's entire carbon footprint. Constructing new green buildings won't move the needle in mitigating this problem. It is far more important to address the existing building stock."

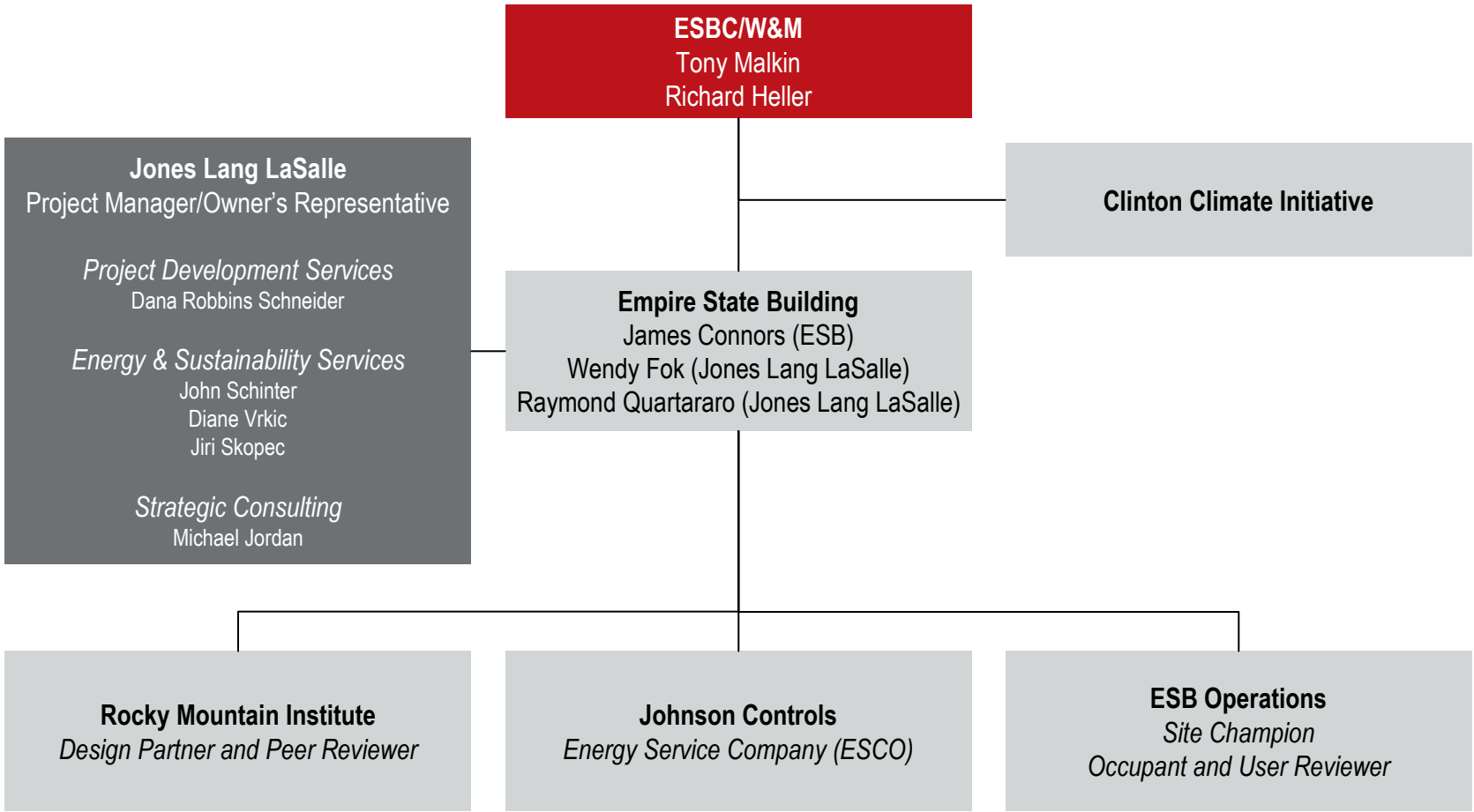
Tony Malkin, Metro Green + Business, June 2008

- Buildings contribute to nearly 40 percent of U.S. green house gas emissions, *99 percent of building stock is existing buildings*
- Building owners can gain competitive advantage from sustainability programs by reducing costs, providing superior environments, and capturing higher potential rents
- No cost-effective, value-driven method existed for greening older buildings

Unique methodology

- Assemble a collaborative team of world-class sustainability and energy specialists
- Develop an optimal solution through a four phase iterative process and rigorous cost-benefit analysis
- Leverage industry leading tools and standards, and develop new ones:
  - LEED
  - Energy Star
  - Green Globes
  - eQUEST
  - Energy Modeling Tool
  - Sustainability Metrics Tool (GHG/CO2)
  - Financial Modeling Tool

World-class energy and sustainability specialists



Methodology

Phase I: Inventory & Programming	Phase II: Design Development	Phase III: Design Documentation	Phase IV: Final Documentation

Key Outputs:

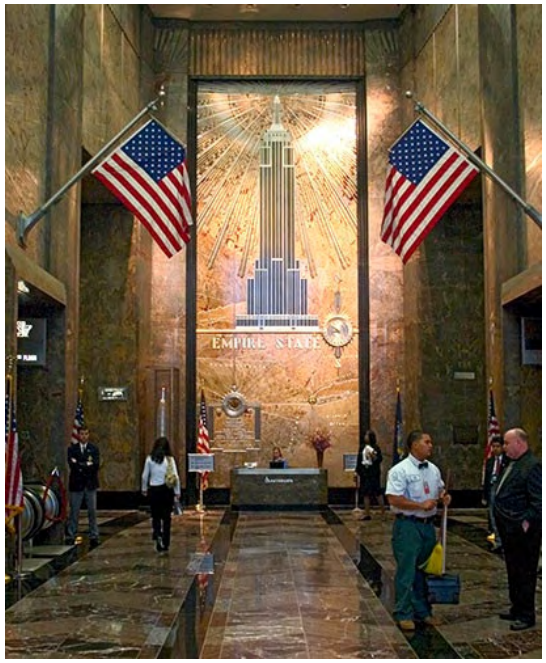
• Baseline Capital Projects Report: $244 • Projected JCI performance contract budget: $27m	• Baseline Energy Benchmark Report ($11.3m annual energy cost without broadcasting)	• Tenant Initiatives (pre-builts, design guidelines, energy management) Report • Tuned eQUEST model	• Model (eQUEST, financial, GHG) outputs • Integrated Sustainability Master Plan Report (including Energy Master Plan)

Eight select improvements for the greatest impact

- **Window Retrofit**: Refurbishment of approximately 6,500 thermopane glass windows, using existing glass and sashes to create triple-glazed insulated panels .
- **Radiator Insulation Retrofit**: Introduction of insulation behind radiators to reduce heat loss and more efficiently heat the building perimeter.
- **Tenant Lighting, Daylighting and Plug Upgrades:** Improved lighting designs, daylighting controls, and plug load occupancy sensors in common areas.
- **Air Handler Replacements**: Replacement of air handling units with variable frequency drive fans.

Eight select improvements for the greatest impact

- **Chiller Plant Retrofit:** Reuse of existing chiller shells while removing and replacing "guts" to improve chiller efficiency and controllability, including new variable frequency drives.
- **Building Control System Upgrade**: Upgrade of existing building control system to optimize HVAC operation and more detailed sub-metering information.
- **Ventilation Control Upgrade:** Introduction of demand control ventilation in occupied spaces.
- **Tenant Energy Management Systems**: Individualized, web-based power usage systems for each tenant.



Bottomline

The $20M plan is projected to:

- Reduce energy use by 38 percent, an annual savings of $4.4M
- Reduce carbon emissions by 105,000 metric tons over the next 15 years
- Be funded through energy and operational savings
- Be complete within two years
- Serve as a model for owners of existing buildings

Innovations

- *Right steps in the right order* – holistically approach all building systems
- Utilize existing tools and create new ones
- Transparently demonstrate how a retrofit can cost-effectively achieve 38 percent energy savings to serve as an model for existing buildings
- Design a pre-built office suite to showcase the link between base-building and tenant space improvements in accelerating a building's progress towards sustainability goals

Benefits for the owner/investor

LEED certified buildings on average have rent premiums of **$11.24/SF** and have **3.8%** higher occupancy rates on average than their non-LEED counterparts.

***Source**: Burr, Andrew. USGBC. USGBC in the News Details. March 26, 2008.

Energy Star buildings command a rent premium of **$2.38/SF** and on average **3.6%** higher average occupancy rates than their comparable non-Energy Star counterparts.

***Source**: Burr, Andrew. USGBC. USGBC in the News Details. March 26, 2008.

Energy Star buildings are selling for an average **$61/SF** than non-Energy Star buildings.

***Source**: Grossman, B. Sustainable Ink. CoStar Study Finds LEED, Energy Star Bldgs. Outperform Peers. April 17, 2008.

Many states are awarding **tax credits** to LEED buildings that usually depends on the size of the building and the extent that the building is "green".

***Source**: State Environmental Resource Center. Green Building Policy Issues Package. September 14, 2004.

A recent study of 33 LEED new construction projects reported an average **cost premium** of only **1.84%** over non-LEED projects.

***Source**: Broughton, Jim. Environmental Design + Construction and Marketer magazines. Green Building Costs, Savings and Value. July 2006.

Utility savings for 'green' buildings

LEED certified buildings use on average **30% less energy** than their non-green counterparts, resulting in an average annual savings of **$.60/SF**.

***Source**: State Environmental Resource Center. Green Building Policy Issues Package. September 14, 2004.

LEED buildings typically have water savings of **20-30%.**

***Source**: Broughton, Jim. Environmental Design + Construction and Marketer magazines. Green Building Costs, Savings and Value. July 2006.

LEED Buildings' Water and Energy Savings			
		Average % Savings	
LEED Rating	No. of Buildings	Water Efficiency	Energy Efficiency
Certified	64	30.1%	29.4%
Silver	49	30.4%	33.3%
Gold	46	32.5%	40.0%
Platinum	9	34.4%	55.0%
Total Number of Buildings: 168			

* Environmental Design + Construction and Marketer Magazine 2006

The average cost for utilities for non-LEED buildings ranges from **$1.40 to $2.50** per SF. By becoming **LEED certified**, savings of **$0.50 to $1.40** per SF can be achieved.

***Source**: Broughton, Jim. Environmental Design + Construction and Marketer magazines. Green Building Costs, Savings and Value. July 2006.

Economic 'rules of thumb'

According to McGraw-Hill *Smart Market Report*, a 'green building' generates:

- 3.5% higher occupancy rates
- 3% higher rental rates
- 7.5% greater building values
- 6.6% higher ROI

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Real value in a changing world

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Announcement Jones Lang LaSalle

Employee engagement can contribute up to 10% in energy savings

Jones Lang LaSalle is partnering with ENERGY STAR to celebrate Energy Awareness Month. We are encouraging all Jones Lang LaSalle employees to take the ENERGY STAR Pledge, and we invite you to learn more about this initiative and other tools available from ENERGY STAR:

- ENERGY STAR Training - Free online training to help you and your employees improve the energy performance of your organization including live and pre-recorded web conferences along with animated and self-guided presentations.
- Bring Your Green to Work - A toolkit that allows employees to test their Energy IQ and learn how to go green at work without leaving their desks.
- Green Team Checklist- A helpful guide to assist employees in creating teams committed to championing energy efficiency.

To learn more about how to raise awareness among your employees, visit the ENERGY STAR website or contact:

Michael Jordan
+1 503 662 2684

About ENERGY STAR

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping organizations save money and protect the environment through energy efficient products and practices.

Jones Lang LaSalle sustainability resources

Green Office Toolkit: Provides a series of tools to guide you in your leasing decisions and in implementing an effective sustainability program.

Effective strategies for engaging your employees in sustainability: A recorded webcast which discussed effective employee engagement strategies that can help CRE teams accelerate progress towards their sustainability goals.

JONES LANG LASALLE®
Real value in a changing world

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Jones Lang LaSalle

Real value in a changing world

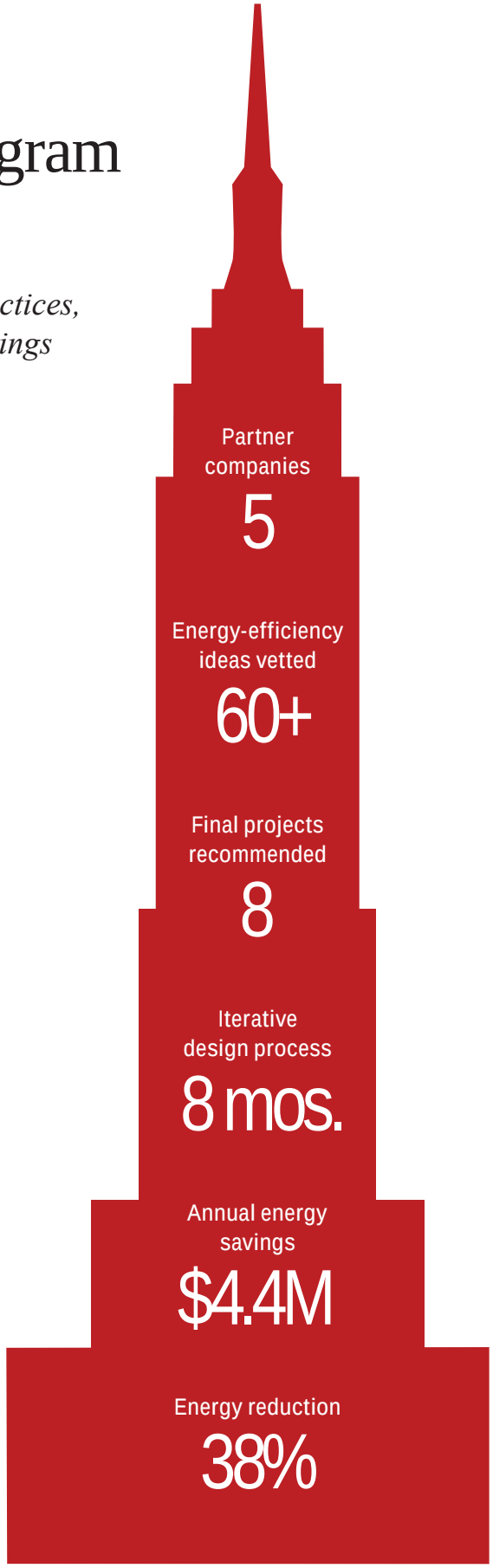
A landmark sustainability program for the Empire State Building

A model for optimizing energy efficiency, sustainable practices, operating expenses and long-term value in existing buildings

Efforts to make buildings more environmentally sustainable have produced hundreds of millions of square feet of greener office space. But tens of billions of square feet remain in office buildings worldwide for which owners have made little or no progress in the area of energy and sustainability.

Owners of multi-tenant buildings, which comprise the bulk of office space, are motivated by return on investment. To justify the costs associated with retrofitting buildings to support sustainability, owners must be convinced that the investment will be repaid by some combination of higher rental rates and greater occupancy levels. The percentage of tenants willing to pay higher overall occupancy costs for green space is not large, and tenants that greatly value sustainability gravitate towards newer buildings that have been designed and built to high energy and environmental standards. In general, retrofits of older buildings are more expensive and, therefore, more difficult to justify financially.

This context underscores the extraordinary nature of the commitment that Anthony E. Malkin of Empire State Building Company has made to establish the Empire State Building as one of the most energy efficient buildings in New York City, and arguably the world's most environmentally conscious office tower built before World War II. Just as extraordinary as Malkin's commitment to making the Empire State Building sustainable was his decision to infuse the process with a high degree of transparency so that other building owners–particularly those with pre-WWII or landmark properties–would have a model to follow in pursuing their own green projects.



Empire State Building Energy and Sustainability Team

- *The Clinton Climate Initiative*, a project of the William J. Clinton Foundation, was founded in August 2006, to create and advance solutions to the core issues driving climate change. As a part of its work in cities, CCI works with building owners to reduce greenhouse gas emissions from existing buildings. A sponsor of the project, CCI helps further develop and validate the ownership's vision, and introduce potential implementation mechanisms for the team.
- *Jones Lang LaSalle*, a global real estate services firm with the industry's leading sustainability services program, serves as the program manager and owner's representative, guiding the team through the highly collaborative process and taking the lead on areas of integrated sustainability beyond energy efficiency and the attendant reduction in greenhouse gas emissions.
- *The Rocky Mountain Institute*, a nonprofit organization recognized as a leader in energy-efficient solutions, provides vital expertise and conducts peer reviews on technical and design elements of the energy work in the building.
- *Johnson Controls Inc.*, a global Fortune 100 company focused on creating effective interior environments, performs the technical engineering work at the building as it pertains to energy efficiency.
- *Empire State Building Operations* acts as the site champion, to ensure that operations are not disrupted by the retrofit.

To ensure that this commitment was upheld, he assembled a team of best-in-class consultants in the fields of climate change, real estate sustainability, environmental design and energy services.

This report details the process for assessing, quantifying and documenting the costs and benefits of potential strategies for enhancing energy and sustainability at the Empire State Building. This process led to the adoption of a set of final strategies that, upon implementation, will reduce the Empire State Building's energy use and carbon footprint by up to 38 percent.

Empire State Building—one of a kind

The Empire State Building is no ordinary office tower. The world's most famous office building, it draws between 3.5 million and 4 million visitors each year to the Observatory on the 86th floor. At a height of 1472 feet (449 meters), the spire is used for broadcasting by most of the region's major television and radio stations. Its 2.8 million square feet of leasable office space hold a range of large and small tenants, drawn by the building's prestige, its unmatched skyline views and its convenient location at the center of Manhattan's mass-transit system. Opened in 1931, the building has undergone recent upgrades of lobbies, hallways and other common areas including the just-completed renovation of the observation deck–restoring the building to its original grandeur.

Vision beyond the Empire State Building

"Buildings in New York City create 65 to 70 percent of the city's entire carbon footprint," Malkin told Metro Green + Business in June 2008. "Constructing new green buildings won't move the needle in mitigating this problem. It is far more important to address the existing building stock."

About 43 percent of all the office space in New York City was built before 1945, including a majority of the 10 million-square-foot portfolio owned by partnerships affiliated with Malkin and other principals in Wien & Malkin. W&M has instituted green practices across its New York portfolio, such

as using integrated pest management and green cleaning products, and using energy-efficient maintenance vehicles. The Empire State Building signed onto the Energy Star program for buildings to measure and report its energy efficiency as soon as the U.S. Environmental Protection Agency and Department of Energy expanded the program to include buildings.

The rationale for pursuing more energy efficient office buildings was driven by rising energy costs in a volatile market, coupled with widespread interest in reducing carbon emissions that result from building and vehicle energy use. As the environmental focus on buildings has intensified, it has increasingly included issues such as water conservation, recycling, reuse of building materials, reduction of chemicals and pollutants, indoor air quality and other considerations.

These changes are anticipated to enhance the Empire State Building's long-term value based on the opportunity for higher occupancy and rents over time. Green buildings have a competitive edge in attracting companies interested in reducing their own carbon footprints as well as providing work environments that promote the health and well-being of employees. Furthermore, eventually buildings could be affected directly or indirectly by sustainability-inspired regulatory changes at various levels of government.

Malkin and his team also knew what many do not: A market is emerging for financing capital improvements based on the cash flow from reduced energy costs. Developing a solid business case for these financing avenues requires a robust analytical process that produces valid data on retrofit costs and energy cost reductions. "We will be working to establish a financing format to provide the ability to otherwise indebted properties to participate in this sort of project, though the work on this project is not financing contingent and is going forward out of already available cash," Malkin said.

A multi-phase analytical process to establish a replicable model

Between April and November 2008, the collaborative team followed a comprehensive process to determine which energy and sustainability strategies could be implemented at the building, and what costs and obstacles might arise for each strategy. The purpose was to determine where cost and benefit intersected to result in the most sustainable building possible within reasonable cost parameters.

Expected income stream enhancements:

- Reductions in existing capital improvement program costs
- Reduced utilities budget due to greater efficiencies in energy and water usage
- Reduced building operations budget due to lower maintenance and repair costs
- Increased rent and occupancy due to enhanced value placed on updated services
- Additional income from new tenant service offerings, such as chilled water and emergency power

Initially, the team decided to consider criteria established by Leadership in Energy and Environmental Design (LEED®), established by the U.S. green Building Council, as well as Green Globes, a system administered in the U.S. by the Green Building Initiative and in Canada (under the more widely recognized name Go Green) by BOMA Canada, as points of reference rather than goals to be achieved. The comparative process of determining the building's current status along with the development of strategies that could feasibly be implemented in order to achieve increasing levels of LEED® for Existing Buildings: Operations & Maintenance (EBOM) certification was called a LEED® Gap Analysis. Eventually, the team decided to pursue the LEED® Gold building certification.

Before the multi-phase program got under way, an initial presentation laid out program goals, the anticipated roles of each team participant and the framework for ensuring an organized, thorough process. Goals included:

- Develop a replicable model for retrofitting pre-war buildings in a cost-effective way
- Develop practices to lower energy consumption costs by as much as 20 percent
- Increase overall environmental benefits of building retrofit through an integrated sustainability approach to maximize opportunities and market advantage
- Encourage the team to be objective, creative and provocative in its approach
- Develop a model that is marketable to existing and prospective tenants
- Coordinate with the ongoing capital projects within the building
- Develop a financial structure that is efficient and achievable

As Program Manager, Jones Lang LaSalle's role was to ensure team collaboration, stakeholder communication and timely execution, as well as to drive performance measurement and documentation of the repeatable model for industry-wide use. Jones Lang LaSalle also led development of the Sustainability Metrics Model for Greenhouse Gas Emissions, using internationally-accepted, scientifically-based data and calculations to evaluate the reduced impact on global warming and local environment resulting from the implementation of sustainability measures.

Under the initial proposal delivered in April 2008, the four-phase analysis would include:

Phase I: Inventory and Programming

Phase II: Design Development

Phase III: Design Documentation

Phase IV: Final Documentation

The four phases were completed in seven months.

Phase I: Inventory and programming

Team members conducted reviews of the building's mechanical systems and equipment, calculated tenant energy usage, and developed a baseline energy benchmark report and a preliminary system for measuring energy efficiency. A gap analysis was conducted to determine which LEED® and Green Globes criteria the building was already meeting, and which could be achieved feasibly. A plan was developed for the creation of pre-built green offices to serve tenants with an immediate need for finished space. The team steering committee met twice to discuss progress and refinements to the program, and Rocky Mountain Institute and Johnson Controls conducted a separate cross-functional workshop to look specifically at lighting strategies.

Process of elimination

1 Identify opportunities

- 60+ energy efficiency ideas were narrowed to 17 implementable projects
- Team estimated theoretical minimum energy use
- Developed eQUEST energy model

2 Evaluate measures

- Net present value
- Greenhouse gas savings
- Dollar to metric ton of carbon reduced
- Calculated for each measure

3 Create packages

- Maximize net present value
- Balance net present value and CO_2 savings
- Maximize CO_2 savings for a zero net present value
- Maximize CO_2 savings

4 Model iteratively

- Iterative energy and financial modeling process to identify final eight recommendations

The central initiative involved in the inventory and programming phase, however, was the integration of ESSB goals with goals of a separate capital projects team already in place. When the sustainability program got under way, the Empire State Building had already embarked on a major capital program that included a combination of restoration and upgrades to lobbies, hallways, restrooms and other common areas. A key element of the capital program was to enhance the experience of the building's primary attraction, the observation decks on the 86th and 102nd floors.

The process of value-engineering existing capital projects was a high priority for the newly assembled sustainability team as a way to avoid having to make changes later.

To accomplish the process effectively, an integrated team approach was adopted to deliver building services with minimal disruption to tenants and visitors. The Empire State Building Company capital program team, led by Jones Lang LaSalle as project manager, guided work performed by TPG Architects, mechanical-electrical-plumbing (MEP) consultant Lakhani & Jordan Engineers and others. For the sustainability program, a separate project management team of Empire State Building Company and Jones Lang LaSalle interfaced with the capital program team and worked with Johnson Controls and the Rocky Mountain Institute to identify opportunities for sustainable improvements.

The integration of the capital team and the sustainability team allowed the latter to pursue a "whole-building" approach, modifying existing capital project strategies so that they conformed to higher sustainability standards. In so doing, the team could make the building more green while staying within budgetary parameters. Expertise from members of the sustainability team suggested ways to lower the cost of several capital projects while enhancing environmental factors such as energy, water and ventilation.

The integrated team started by identifying baseline budgets for 23 existing capital projects and then examined how sustainable alternatives could affect costs. In its Inventory and Programming report, the team reported that sustainable options would result in a high level of savings on six projects. The team recommended putting four of those projects on hold while they examined alternatives thoroughly, including a multi-year air conditioner replacement program, central cooling plant replacement, exterior tower lighting and mid-pressure steam riser replacement. In addition, the corridor renovation project—the largest single budget item in the capital program—was viewed as a potential opportunity for greatly reduced costs by reviewing lighting and providing an optional air handling design.

Another six projects were seen as candidates for moderate cost reductions by following sustainable strategies. Among other things, the ESSB team recommended exploring gray water sources in restroom renovations and looking at modular green roof alternatives on selected setbacks. As the capital projects team worked toward the resolution of these items, the ESSB team pursued a parallel track to identify additional opportunities not contained within the scope of the original projects.

In the final Phase I report delivered to ownership on June 2, 2008, the ESSB team listed the following accomplishments:

- Development of a Project Charter
- Knowledge sharing within the team via: weekly team reports, bi-weekly team calls, two full-team workshops and a third workshop for lighting, and establishment of a Sharepoint site for all team members
- Feedback gained from building stakeholders, including a tenant sustainability charrette to discover green tenant needs
- Collaboration with building operations to implement immediate systems improvement measures
- Review of existing capital projects and implementation of a lobby lighting test case for energy improvement
- Measurement and verification of building equipment and conditions to establish a baseline for energy and sustainability performance
- Strategy session engaging advisory expertise, ownership and teams
- Development of a Sustainability Scorecard, LEED® EBOM Checklist and Green Globes Report

The Project Charter stated the team's mission succinctly: *The retrofit of the Empire State Building into a Class A pre-war trophy building will transform the global real estate industry by transparently demonstrating how to create a competitive advantage for building owners and tenants through profitably greening existing buildings.*

Outcomes of the first phase included a cost reduction of the baseline capital project of between three and four percent based on the review and suggestions of the ESSB team and a preliminary budget for energy projects compared to projected annual energy savings. This budget indicated a payback period of 15 years for energy-related work based on current energy costs; however, when the savings from the capital projects budget was considered, the payback period eventually was reduced to about five years.

Phase II: Design and development

By the time the Phase II kickoff meeting took place in early July, the team had already made substantial progress on several fronts: documenting tenant energy use, conducting preliminary mechanical tests, and refining criteria for measuring and benchmarking efficiency. The team was nearing completion of the LEED® gap analysis checklist for the base building, and a similar checklist for tenant spaces also was under way.

Goals of the Design and Development phase as reported to ownership on July 15 included:

- Create "360-degree" understanding of resource use at ESB (summarize in Baseline Energy Benchmark Report)
- Develop theoretical minimum energy use at ESB (identify key levers of energy reduction potential)
- Outline sustainability recommendations for pre-built spaces
- Initiate tenant engagement and design partnerships
- Begin development of energy-efficiency measures
- Continue development of project tools (Sustainability Scorecard, LEED®, Green Globes, GHG Protocol)
- Complete Phase II Deliverable Report

An important element of the design and development phase was to narrow the myriad of issues down to a manageable number of potential solutions, essentially creating order out of complexity. This winnowing process occurred throughout all four phases of the program, but it was in the second phase that consolidation of issue resolutions into a relatively small number of likely scenarios would become most prevalent.

In the Design and Development phase, Johnson Controls presented the Baseline Energy Benchmark Report in mid-July. The report examined energy usage between April 2007 and May 2008 from several perspectives:

- A month-by-month breakdown of electricity usage by kilowatt-hour, of steam usage by Mlbs, and the cost associated with each, along with a total energy cost, both with and without the broadcast towers
- Month-by-month breakdowns of electrical and steam usage showing the amount of energy expended toward lighting, ventilation, broadcast towers, main plant cooling, tenant sub-metering and other uses
- An annual breakdown showing the share of total energy expended that went to different tasks, including broadcast (23 percent), radiator heating (17 percent), lighting (16 percent), main plant cooling (15 percent), tenant sub-metering (7 percent), steam cooling (4 percent), and ventilation (5 percent), as well as the same data without including broadcast uses
- Areas of opportunity for using steam power more effectively, in particular radiator steam load (60 percent of total achievable gain), base load steam (19 percent), steam chiller (15 percent) and AHU HW HX (6 percent)

Rocky Mountain Institute also discussed its findings in examining theoretical minimum energy usage to address occupant comfort requirements, passive measures and other systems impacts, system design characteristics, technology, controls and changed operating schedules.

By raising the cooling set-point, enhancing the envelope and ventilation, reducing internal gains and improving cooling efficiency, Rocky Mountain Institute estimated that the building could reduce non-broadcast energy usage by up to 65 percent; however, the implementable minimum reduction under the existing charter was between 15 and 25 percent. Rocky Mountain Institute's analysis suggested that a reduction of 40 to 50 percent was not merely theoretical but achievable—if the cost-benefit equation did not devolve into a cost-avoidance strategy in the latter stages of the process.

Rocky Mountain Institute also discussed several issues that needed to be addressed. These included the challenge of incorporating bold concepts within conventional budget limitations, providing incentives for tenants to follow ESSB guidelines, designing more efficient HVAC systems while recognizing that loads are likely to increase over time and the challenge of achieving maximum efficiency gains by getting all parties to commit to average load reduction and life-cycle costing rather than merely efficient system design.

The July presentation also provided Jones Lang LaSalle and Johnson Controls the opportunity to make recommendations on sustainable tenant pre-built spaces, comparing two potential options to standard pre-built spaces from an architectural, mechanical and lighting standpoint. Recommendations included reducing the number of interior wall enclosures to enhance natural light and views, selecting interior finishes to support sustainable goals and using task lighting to complement higher efficiency overhead lighting.

At the closing of Phase II, the team also set forth the goals for Design Documentation in Phase III:

- Complete Tenant Energy Management Report (guidelines for existing tenants)
- Complete Pre-Built Space Design Report (design for new pre-built spaces)
- Complete 90 percent of eQUEST model (test and understand key hypotheses)
- Begin financial modeling of synergistic combinations of measures, not isolated measures
- Begin in-depth lease review and tenant surveys
- Develop LEED® EB and CI Feasibility Report
- Complete Phase III Deliverable Report

Phase III: Design documentation

Phase III of the ESSB analytical process centered on two major deliverables: a final report assessing the tenant energy usage and the impact of pre-built spaces; and the development and refinement of the eQuest Energy Model.

The tenant energy program had four basic components:

1. Establish electric sub-metering for each tenant so that energy used by the tenant can be displayed and compared to industry norms via a dashboard linked to the building web page.
2. Identify key building personnel to be the face of the program, suggest each tenant designate a point of contact. Provide training to the contact so they understand the basics.
3. Provide education through online training, and seasonally-specific recommendations and best practices for tenants to reduce their carbon footprint.
4. Report on progress.

Tenant energy usage had been documented over a period of months ending in mid-August. The ESSB team had discussed ways for the building's facility management staff to easily monitor energy usage of each floor and each tenant on that floor. The proposed plan was to create a computer "dashboard" that would automatically translate numeric data into visual data such as charts and graphs so that managers could more easily spot trends and act on them. A typical tenant's data might show month-to-date and year-to-date energy usage in terms of kWh and cost, as well as high, low and average usage per square foot and a month-by-month breakdown of actual and ideal usage.

The plan as proposed to ownership on August 27 was to optimize energy systems floor by floor as spaces became available through vacancy or restacking tenants within the building. Following the building's existing restacking plan, 14 floors could immediately be made available for optimization, with up to 33 floors available for optimization by the end of 2011.

At this phase of the analysis, the team also had final plans in place for pre-built tenant spaces and had started the vendor bid process. Different pre-built layouts had different sustainability impacts, and the team developed multiple scenarios to achieve different levels of energy efficiency within these spaces. The cost of the different scenarios exceeded the cost of non-sustainable pre-built spaces by 6.5 percent to 12 percent.

The most sophisticated element of the Design Documentation phase was the development of the eQuest Energy Model. Drawing on a program developed by the U.S. Department of Energy, the model was designed to be used for cost / benefit analysis for future improvements, modifications and operational changes. The purpose of the eQuest Energy Model was to compare the energy consumption baseline to various facility improvement measures in order to calculate energy savings of these measures on a stand-alone basis and in combinations with other measures. The ESSB team created a matrix that analyzed the costs and financial benefits of facility improvements and other potential green strategies, and integrated the data with sustainability ratings, architectural programming and operational best practices, creating a comprehensive sustainability scorecard. The result was a sophisticated understanding of how different strategies, implemented individually or in various combinations, would affect project cost and building performance.

Johnson Controls and Rocky Mountain Institute conducted parametric runs on strategies relating to chillers, heating units, water pumping equipment, air handling units, controls, co-generators, lighting, plug loads and the building envelope. These exercises helped identify scenarios that would provide the most value, taking into account life-cycle costs and benefits, economics and logistics of implementation. For each scenario, the team needed to document variables that could affect the results. For example, if tenant engagement and adoption rates were higher or lower than anticipated, or if more of the building was used for broadcast than anticipated, there could be an impact on the estimated results. Recognizing these variables and attempting to quantify their impact was a significant element of the analysis.

Phase IV: Final documentation

The final phase of the analytical process was to create an Integrated Sustainability Master Plan Report, synthesizing data from all available standards and measurement tools, including ENERGY STAR, LEED®, Green Globes, eQUEST Energy Modeling Tool, the Sustainability Metrics Tool and Financial Modeling Tool.

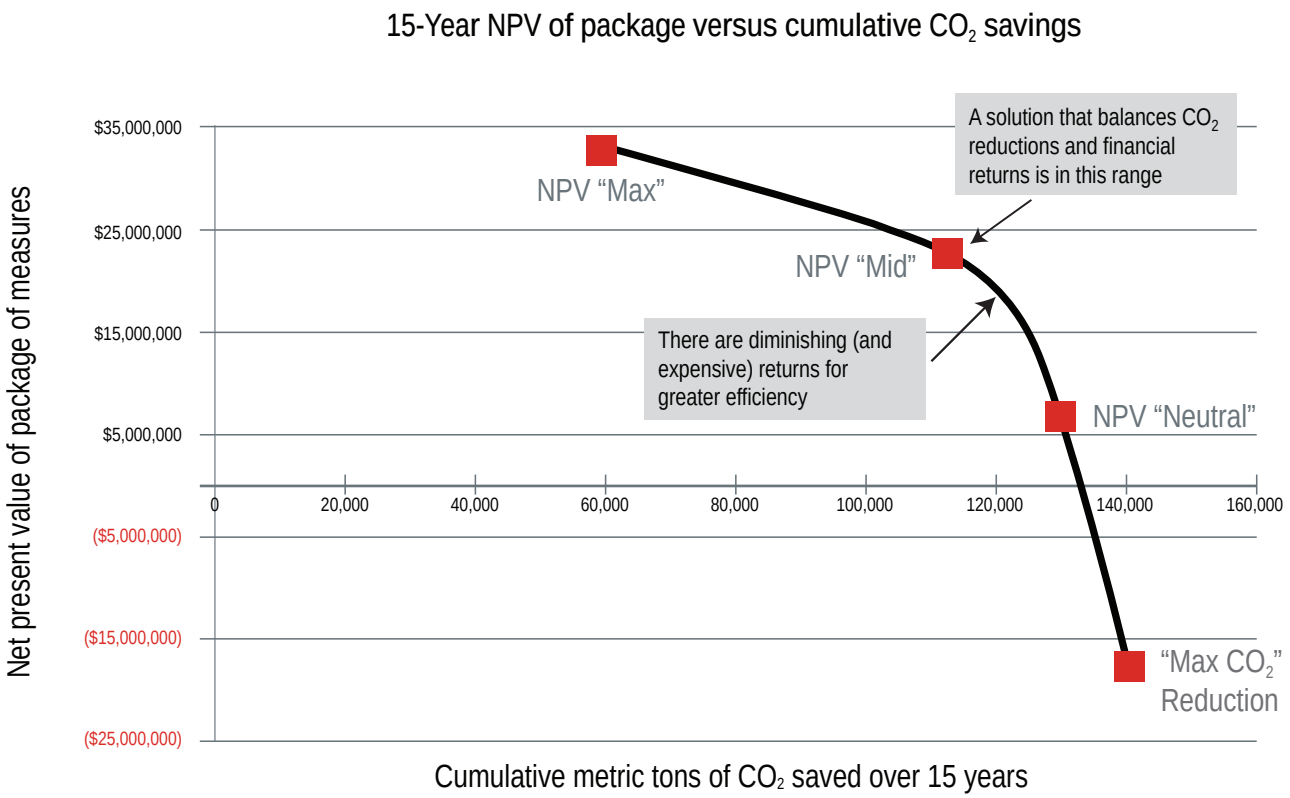
Modeling to pull the project together via iterations between the energy (eQUEST) and financial (spreadsheet) models included several global energy and financial assumptions:

- Base case fuel escalation = 1%
- Base case construction escalation = 2.5%
- Base case inflation = 2%
- Base case real discount rate = 8%
- Base case green rent premium = 1%
- 15-year time horizon

The recommended strategy was called the "net present value midpoint" because it considered strategies based on a balance of NPV with the amount of carbon dioxide avoided. The NPV midpoint was compared with other options, including one that would maximize NPV, and another that would maximize carbon dioxide reductions regardless of NPV. Comparing the midpoint option to the two extremes would help identify best-case scenarios.

The results pointed to a clear solution: The team should pursue a program that would reduce energy use and greenhouse gas emissions by 38 percent, saving 105,000 metric tons of carbon dioxide over the next 15 years.

Empire State Building can achieve a high level of CO_2 and energy reduction cost-effectively



"Achieving an energy reduction greater than 38 percent appears to be cost-prohibitive," the team noted in its final report to ownership. The analysis had examined strategies that could have reduced emissions by nearly 45 percent, out of a theoretical maximum of 55 percent. A total of 40 energy-efficiency ideas were narrowed down to 17 implementable strategies that were analyzed in depth. Of these, the first 90 percent of reduced carbon dioxide would also save costs over time by an average $200 per ton of carbon saved. The last 10 percent, by contrast, would carry a life cycle cost of more than $300 per ton of carbon saved.

Carbon dioxide reduction

The greatest reduction in carbon dioxide from the baseline would come from completing the task of installing digital demand controls that had been started in the capital projects. This strategy alone would reduce energy use by nine percent from the baseline. Tenant daylighting—working with tenants to ensure that layouts maximize the use of natural light—would save six percent from the baseline. Three other strategies would save five percent each: installing air handling units with variable air volume controls, retrofitting the chiller plant and addressing window glazing. Other strategies contributing to the 38-percent reduction included tenant energy management (three percent), radiative barrier (two percent) and tenant demand-controlled ventilation (two percent).

Chiller plant retrofit

The greatest cost savings came from the ability to retrofit the chiller plant rather than replace it. This was made possible by the reduction of the cooling load by 1,600 tons. The load reduction resulting from the sustainability program's demand control ventilation project, which reduces outside air

infiltration, and the window light retrofit, which reduces solar heat gain, would allow the chiller plant to be updated rather than replaced entirely.

Peak electrical usage reduction

Under the proposed plan, peak electrical usage would also be reduced by 3.5 megawatts, from its current peak and capacity of 9.6 megawatts to just over six megawatts. At the same time, the team looked at several options for additional capacity, including co-generation, gas-fired generation, fuel cells, renewable energy and purchasing capacity. After analyzing all options, the team recommended a two-megawatt gas-fired generator to power variable chiller-plant loads, thereby increasing capacity to 11.6 megawatts.

Enhanced tenant environment

In addition to reducing energy and carbon dioxide emissions, the proposed sustainability program would deliver an enhanced environment for tenants including improved air quality resulting from tenant demand-controlled ventilation; better lighting conditions that coordinate ambient and task lighting; and improved thermal comfort resulting from better windows, the radiative barrier and better controls.

> The net present value of the midpoint option was estimated at $22 million over 15 years, compared with $32 million if NPV was maximized and negative $17 million if carbon dioxide reduced as much as possible regardless of NPV.

A key variable in the NPV calculation was the rent premium that could be gained from establishing the Empire State Building as a green building. The baseline calculation assumed that sustainable features would allow the building to gain rents one percent higher than if no such program were implemented. If in fact the sustainability program did not result in higher rent, the NPV over 15 years would be cut in half, to about $11 million. In its due diligence for making the calculation, the team identified key studies from CoStar Group, University of California-Berkeley and the University of Reading, which estimated the rent premium for green buildings between three and nine percent compared with similar buildings without those features. If the Empire State Building were to achieve the low end of this estimated spectrum by gaining a three-percent average rent premium, the 15-year NPV would be greater than $40 million.

Rocky Mountain Institute examined the impacts of potential miscalculation of energy savings, and found that the impact on NPV was fairly small. If energy savings were to fall short of the estimate by 20 percent, or exceed the estimate by 20 percent, the impact on NPV would be less than $3 million over 15 years. The impact of energy variance on CO_2 emissions, however, could be substantial. If the baseline estimate were to be met, the proposed initiative would save about 115,000 metric tons of CO_2 emissions over 15 years. If performance fell short of the estimate by 20 percent, CO_2 emissions would be less than 95,000 metric tons; if performance exceeded the estimate by 20 percent, more than 135,000 metric tons of CO_2 would be saved.

The team looked at anticipated near-term changes in U.S. CO_2 costs and concluded that legislation likely would not significantly change CO_2 calculations. In addition to recommendations on which strategies to implement, the ESSB team had also examined the length of time it would take to implement various strategies. This was a significant consideration, because a key metric of each strategy was the payback period for capital invested. If a strategy with a relatively short payback period required a long period of time to implement, that would affect the cost-benefit equation for that strategy. Under the proposed plan, 61 percent of the energy savings were part of a program that Johnson Controls would implement quickly. Another 22 percent of the savings would come from two projects that the Empire State Building Company would implement over several years: the tenant energy management program, and the installation of two variable air volume air handling units on each floor. The other 17 percent of energy savings would depend on tenant actions that would not be fully complete for 12 years as leases rolled over, a front-loaded process given that 40 percent of leases are set to expire over the next four years.

Tenant participation to drive energy savings

In order to capture the 17 percent of energy savings involving tenant spaces, the Empire State Building team was given the responsibility for a program that would include both aggressive guidelines and incentives for tenants to achieve energy savings of about six percent. Since nearly 40 percent of the building's leased space was due to turn over within four years, the team emphasized immediate adoption of guidelines for tenant improvements. The proposed green pre-built design would help the team establish design principles for all tenant spaces. Tenants could review the experience of the pre-built spaces and access the eQUEST model and tenant financial tool to verify the economic validity of the guidelines in terms of cost (estimated at $6 per square foot) and operational cost savings to the tenant ($0.70 to $0.90 per square foot annually).

A program of sub-metering all tenant spaces and management of a reporting tool to inform tenants of their energy use was considered essential both to drive tenant focus on energy efficiency within their own space and to assist tenants in calculating their carbon footprints. Sub-metering would encourage tenants to follow the building guidelines on recommended strategies such as daylighting (creating space plans that maximize the use of natural light), and use of efficient lighting techniques such as task lighting.

The ESSB team also recommended exploration of tenant incentive programs such as a "feebate" plan wherein tenants that missed sustainability targets would pay fees that might be redistributed to those that exceeded sustainability targets.

Key lessons learned

In summary, the final presentation to management reviewed some key lessons from the team's collective experience:

Developing robust solutions requires dynamic, multi-year models and collaborative efforts. The implementation team would need to anticipate and address changes in tenant profiles, vacancy rates and technology as well as building renovations and the possibility of tenant disruptions. Maintaining flexibility and collaboration in the team would ensure the success of the program.

Delivering the maximum cost-effective CO_2 reduction requires a whole-system and life-cycle view. A proactive, long-term plan is required to maximize CO_2 and financial benefits. One reason is that the most cost-effective efficiency upgrades would have to be linked to major capital upgrade projects. In addition, the team's assessment showed that rapid acceleration of efficiency implementation produced significant extra cost without providing a similarly large benefit.

The results reinforce the need to address the natural tension between business value and CO_2 reductions. The scenario that maximized business value would avoid more than half of the CO_2 reduction opportunity. Even the recommended program merely balanced cost and benefit at a point where the greatest benefit could be achieved for the lowest cost, rather than pursuing every viable CO_2 reduction measure without regard to cost. In order to make the business case, perceived needs and industry norms needed to align with energy-efficiency levers.

Rapid dissemination and adoption of the results requires development of an efficient process to reduce time and costs. To drive speed and effectiveness, the team recommended development and use of tools to diagnose and categorize a portfolio of buildings; to rapidly develop a "first cut" answer; and to navigate through the iterative process between energy and financial modeling at the project level.

Empire State Building Company accepted the team's proposed solution in its entirety (final project scope TBD), allowing the team to move forward immediately on implementation. The thorough and collaborative process had resulted in a strong consensus backed by transparent information. Tools were developed to measure and give feedback on building-wide and tenant improvements. The team now had a mandate and a plan to move forward swiftly and with confidence that the framework for decisions would continue to yield positive results, ultimately serving the goals of the Empire State Building owners and tenants as well as overall environmental goals.

A look forward

The analytical process was merely the first step toward achieving an optimal energy and sustainability profile at the Empire State Building, but it was of critical importance to the ultimate success of the program. The strategies selected from this process will not only have a significant impact on the building's carbon footprint but will open doors to additional cost-effective avenues of financing the project.

The Empire State Building is just one drop in an ocean of commercial buildings that must undergo some form of rational energy and sustainability retrofit in the next several years if we as a society are committed to reducing the impact of buildings on the environment. It is hoped that by making available documentation and information such as this report, the Empire State Building sustainability team can clear a path for thousands of other buildings to follow.

Jones Lang LaSalle Energy and Sustainability Services

Jones Lang LaSalle offers a range of services to help you develop and implement a sustainability strategy that aligns with your business objectives. Our services include:

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Our managed properties average $53K in energy savings per year

Dear Libby,

Because energy management is so important to building owners, both in terms of sustainability and cost control, I want to share some of the successes we've had through our energy reduction efforts.

To date, Jones Lang LaSalle-managed properties enrolled in ENERGY STAR:

- Collectively represent **$14,959,844 in energy cost savings** each year
- Are, on average, **saving $53,428 per year in energy costs for each building**
- Have a current total energy cost of $2.53 per square foot, which is **7 percent (or $0.18 per square foot) less than the national average for buildings of similar size in the same regions**
- Have an average site energy intensity of 80.2 kBtu per square foot, which is **19.5 percent less** than comparable buildings of similar size
- Have an average ENERGY STAR score of 68, which means that on average our buildings are **18 percent more energy efficient** than the average building enrolled in ENERGY STAR

Click here for the full story on how our property management teams' commitment to sustainability is saving owners money on energy costs through ENERGY STAR.

Sincerely,
Tom Griffin

If you are interested in this topic, click on the links below for more insights into how sustainability issues are affecting real estate.

Publications
Marketing green buildings to drive competitive advantage
Results of the 2008 global survey on CRE and sustainability

Podcasts
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Jones Lang LaSalle

Real value in a changing world

Perspectives on sustainability

Results of the 2009 CoreNet Global and Jones Lang LaSalle global survey on Corporate Real Estate and sustainability

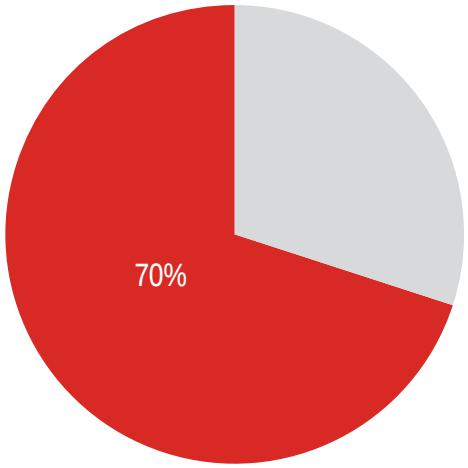
Corporate real estate (CRE) executives are more willing to invest in the sustainability of the space they own, despite economic pressures

The 2009 global survey shows that sustainability is still critical for 70% of CRE executives, with over 74% saying they are willing to pay more to retrofit owned space, but they remain focused on cost savings and are reluctant to pay more rent for leased "green" space.

CoreNet Global and Jones Lang LaSalle 2009 survey **key findings**

- Sustainability is a critical business issue today for 70% of respondents and 89% consider sustainability criteria in their location decisions
- Green building certifications are always considered by 41% and energy labels by 46% in administering their portfolio
- 74% say they are willing to pay a premium to retrofit space that they own for sustainability criteria
- 21% would only pay more rent for sustainable space if offset by lower operating costs, while 8% expect to pay less and 34% expect to pay the same
- 60% are adopting workplace strategies to meet sustainability goals while reducing overall occupancy costs

Respondents who think sustainability is a critical business issue



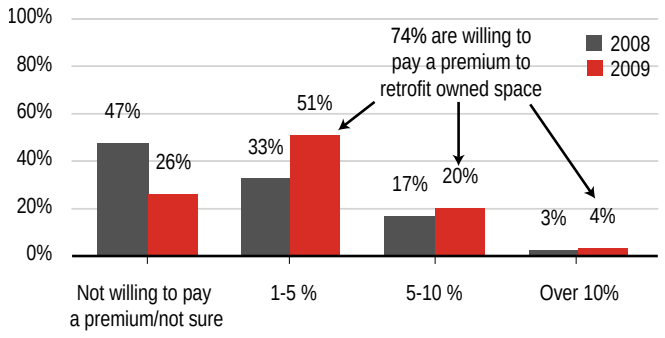
The third annual CoreNet Global and Jones Lang LaSalle sustainability survey, conducted in September and October 2009, shows that sustainability remains a key agenda item for CRE.

In a survey of CRE executives responsible for real estate portfolios across the globe, 70% said that they still consider sustainability a critical business issue today, despite the deepening of the global economic downturn since the last survey.

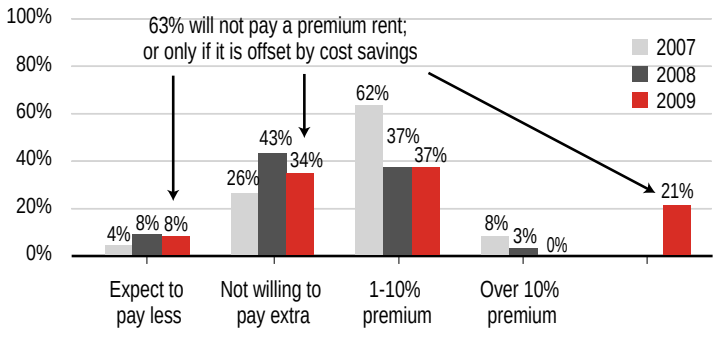
In 2009, 74% of respondents said they are willing to pay a premium to retrofit owned space, up from 53% in 2008. The majority (51%) are willing to pay 1–5% more, up from 33% last year, while 24% would consider a premium of 5% or more, up from 20% who said this in 2008.

CoreNet Global

Occupiers will pay premiums to ***retrofit*** owned space, but are reluctant to pay *rental* premiums for leased space



While more are willing to pay a premium, usually 1-5%, this could reflect an unwillingness to buy or build new sustainable space.



CRE executives are less focused on securing sustainable space and more focused on their budgets this year.

However, respondents remain reluctant to pay premium rent for leased "green" space without some form of payback. Similar to 2008, only 37% would consider paying a 1–10% premium in 2009, and 34% expect to pay the same while 8% would expect to even pay less for sustainable space. In addition, this year, 21% indicated that they would only be willing to pay a premium if it was offset by lower operating costs.

Energy cost was the most important portfolio metric for 37% of respondents, while 29% ranked employee health and productivity as the most important. There was also a significant year-over-year jump in the number of companies using workplace strategies in areas that not only serve sustainability goals, but that also help to reduce overall occupancy costs. This year, 60% stated that they use workplace strategies to help reduce energy costs by decreasing their overall space needs (up from 54%), while 49% use them to reduce employee commuting and business travel (up from 47%).

More respondents said they consider sustainability as a factor in their location decisions, rising to 89% this year from 76% in 2008. While a stable 89% of respondents continue to consider green building certification, the percentage that "always consider" them rose from 26% to 41%. A new question in 2009 further revealed that 90% of respondents consider energy scores or labels to be important and 46% "always consider" them in administering their portfolios.

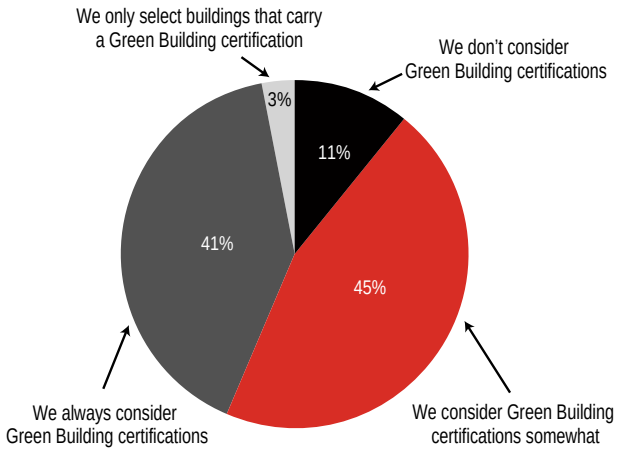
The importance being placed on building design and performance information suggests that the introduction of mandatory ratings for new developments and refurbishments (such as GreenMark in Singapore and ENERGY STAR in some US states and municipalities) or mandatory disclosure of building energy performance (such as that in the UK, Japan or Australia) may be welcomed by occupiers in many markets.

At the same time, the "number of buildings certified" was ranked as the least important portfolio sustainability metric in 40% of cases. This suggests that CRE executives are focused on using green building ratings as a mechanism to evaluate and compare the sustainability of available space; they do not consider that having a "green-rated" building is a goal in itself.

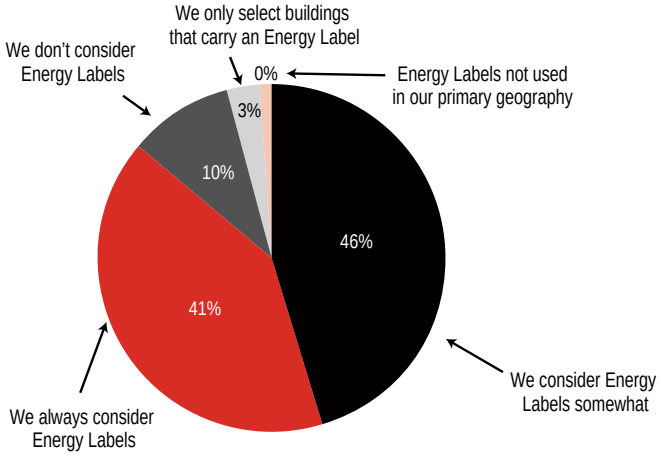
The importance of sustainability in real estate is not just being felt at the corporate level; it is also a professional and personal issue for CRE executives. Respondents indicated that they are more highly involved in sustainability activities across the board. Providing sustainability performance data topped the rankings with 45% of respondents "highly involved," followed by funding sustainability-oriented investment (35%), and employee communication and feedback (30%).

This year, CoreNet Global and Jones Lang LaSalle also asked CRE executives to rate the importance of five different aspects of their individual involvement in sustainability. More than a third of respondents ranked each aspect as "highly important," from enhancing their interaction with senior management to increasing career development opportunities. But the top-rated aspect by

Green building certifications and the influence of energy labels have increased in importance as a selection criteria



The increase in respondents who "always consider" shows that CRE executives see value in being able to effectively understand and compare the sustainability of different space.



The high importance placed on energy labels suggests that CRE executives also see value in being able to evaluate actual building performance.

far was the implementation of sustainability as an expression of personal values. Over half of respondents rate this as "highly important," with a further 38% ascribing it medium importance.

For these CRE executives who are both motivated by and instrumental in implementing sustainability strategies, there remain a few significant challenges. One of the greatest right now is the difficulty in obtaining funds to implement sustainability strategies—67% of respondents said this is a "difficult or an extremely difficult" challenge. Also identified as "difficult or extremely difficult" challenges were insufficient comparable industry metrics (63%) and the availability of tools necessary for data collection (59%), as well as difficulty of both the building certification process (56%) and in calculating the ROI of sustainability initiatives (54%).

The survey results clearly demonstrate that sustainability as an issue is here to stay, but companies are increasingly aware of the commercial realities. It is no longer enough to simply be "green"; organizations want to see the benefits to the bottom line. CRE executives have an important part to play and are increasing their influence in this space. They are in a position to drive change. Will they take up the challenge?

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