



**Newman Consulting Group, LLC**  
 Consultants for Energy-Efficient and Sustainable Buildings ...  
 and a Sustainable Planet




**LEED-EB O&M: Being More Sustainable in Existing Buildings**

NFM&T, Baltimore, 3/16/10

## Agenda


- Background: General, USGBC & LEED
- LEED-EB O&M – It’s not just about energy
- Methods of Reducing Energy
- Energy Audits
- Operation and Maintenance
- Outside Assistance Available (including the Government)
- New Laws & Standards
- References
- Concluding Thoughts




- LEED® Certification Project Administration
- Energy Audits
- Retro-Commissioning of HVAC and Lighting Systems
- Tax Deductions under Energy Policy Act of 2005
- Seminars—IAQ, Energy, Green Design, Operating and Maintenance, Sustainability, ASHRAE Standards, LEED®, Legal Liability
- LEED® Exam Training

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**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)**

- Trainer, ANSI/ASHRAE/IESNA Energy Standard 90.1
- Past Member, Industrial A/C and Energy Recovery Technical Committees
- Past Board Member; Distinguished Service Award (Local), 2005
- Distinguished Lecturer, 2010-2012

**BUILDING OWNERS & MANAGERS ASSOCIATION (BOMA)**

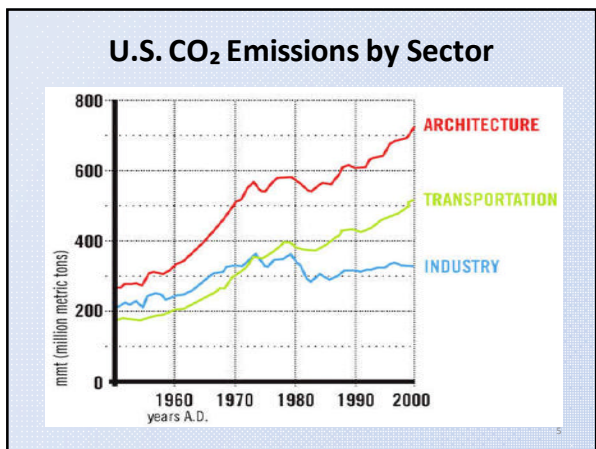
- Member, Energy & Environment Committee (National)
- Judge, TOBY Awards (The Office Building of the Year)
- Chair, Energy Education Committee (Local)

**ENGINEERING SOCIETY OF DETROIT (ESD)**

- Speakers Bureau
- Distinguished Service Award, 2007; Fellow, 2010
- Member, Construction & Design Committee
- Spokesperson on Energy & Environmental Issues

**U.S. GREEN BUILDING COUNCIL (USGBC)**

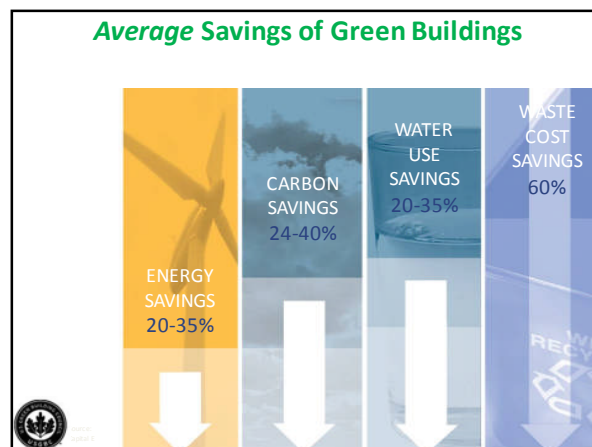
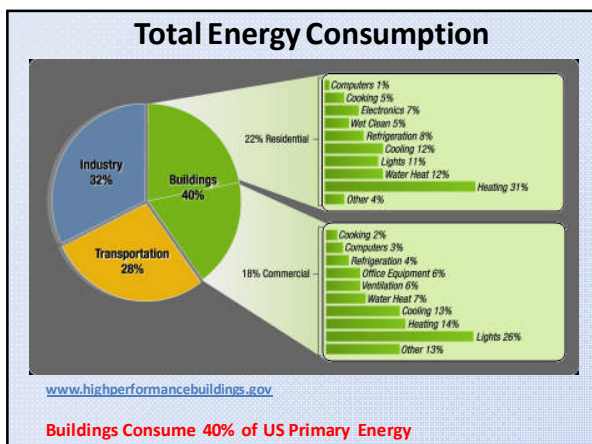
- LEED Exam Preparation Trainer
- Past Board Member; Distinguished Service Award (Local), 2008
- Past Co-Chair, Public Policy Committee (Local)
- Member, Green Schools Advocacy Committee (Local)



## Why Energy Efficiency and Sustainable Buildings?

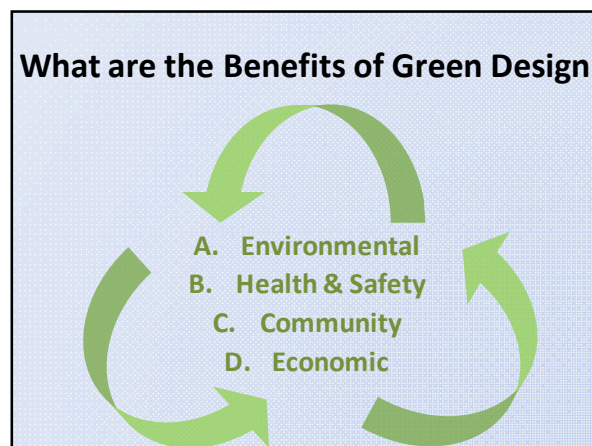
**Buildings Represent :**

- 17% - fresh water consumption
- 25% - wood consumption
- 33% - CO<sub>2</sub> emissions
- 30% - waste generation
- 40% - energy use
- 55% - natural gas use
- 72% - electrical energy use



**Q: What is a “Green” Building?**

- A. Intelligent, Integrated Systems
- B. Beyond Standards
- C. Costs Less to Operate & Maintain





## Benefits of Green Design

- **Environmental Benefits**
  - Reduce the Impacts of Natural Resource Consumption
- **Health and Safety Benefits**
  - Enhance Occupant Comfort and Health
- **Community Benefits**
  - Minimize Strain on Local Infrastructure and Improve Quality of Life
- **Economic Benefits**
  - Improve the Top and Bottom Lines

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## Why Design Green Buildings?

**A. Meet Needs of Today**

1. Operating Costs/Energy
2. Building Marketability
3. Occupant Health/Productivity
4. Return on Investment (ROI)
5. Potential Liability

**B. Don't Compromise Ability of Future Generations to Meet Their Needs**

1. Environmental Responsibility
2. Optimize Resource Efficiency

(The Definition of "Sustainability")

## What is the LEED System?

**LEADERSHIP in ENERGY and ENVIRONMENTAL DESIGN**

A leading-edge system for certifying DESIGN, CONSTRUCTION and OPERATIONS of the greenest buildings in the world

Scores are tallied for different aspects of efficiency and design in appropriate categories

For instance, LEED assesses in detail:

1. Sustainable Site
2. Water Efficiency
3. Energy & Atmosphere
4. Material & Resource
5. Indoor Environmental Quality
6. Innovation & Design Process



## USGBC has Four Levels of LEED

Green Buildings worldwide are certified with a voluntary, consensus-based rating system.

Levels of LEED Certification are based on points achieved on a checklist.



40



50



60



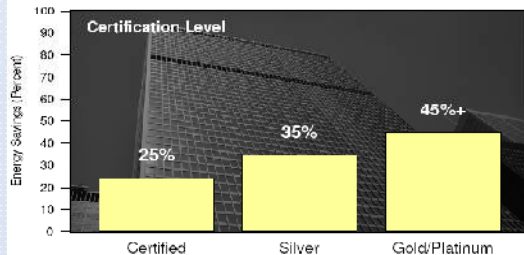
80

Number of points for each level of certification for LEED  
Total points available = 110

Note: Certain prerequisites must be met

© U.S. Green Building Council, 2008

## What are Green Building Energy Savings Compared with Typical Buildings?



Certification Level	Energy Savings (Percent)
Certified	25%
Silver	35%
Gold/Platinum	45%+

\*Source: New Building Institute Report

## Results...Increased Productivity, Healthier Environments

SCHOOLS  
20% BETTER TEST PERFORMANCE

HOSPITALS  
2 1/2 DAY EARLIER DISCHARGE

RETAIL  
INCREASE IN SALES PER SQUARE FOOT

OFFICES  
2-16% PRODUCTIVITY INCREASE

Factories  
INCREASED PRODUCTION

## LEED-EB O & M – Point Breakdown

Area	No. Points
Sustainable Sites (SS)	26
Water Efficiency (WE)	14
Energy and Atmosphere (EA)	35
Materials and Resources (MR)	10
Indoor Environmental Quality (IEQ)	15
<i>Subtotal</i>	100
Innovation in Operations (IO)	6
Regional Priority (RP)	4
<i>Total</i>	110

## Sustainable Sites

Point	Description	Points
26	Sustainable Sites	26
Credit 1	LEED Certified Design and Construction	4
Credit 2	Building Exterior and Hardscape Management Plan	1
Credit 3	Integrated Pest Management, Erosion Control, and Landscape Management Plan	3 to 15
Credit 4	Alternative Commuting Transportation	1 to 15
Credit 4.1	10% Reduction	3
Credit 4.2	25% Reduction	7
Credit 4.3	50% Reduction	11
Credit 4.4	75% Reduction or greater	15
Credit 5	Site Development - Protect or Restore Open Habitat	1
Credit 6	Stormwater Quantity Control	1
Credit 7.1	Heat Island Reduction, Non-Roof	1
Credit 7.2	Heat Island Reduction, Roof	1
Credit 8	Light Pollution Reduction	1

26 Points Possible

LEED for Existing Buildings:  
Operations & Maintenance 2009  
Project Scorecard

- LEED Certified Design and Construction**
- Building Exterior and Hardscape Management Plan**
- Integrated Pest Mgmt, Erosion Control, and Landscape Mgmt Plan**
- Alternative Commuting Transportation**
- Site Development - Protect or Restore Open Habitat**
- Stormwater Quantity Control**
- Heat Island Reduction - Non-Roof**
- Heat Island Reduction – Roof**
- Light Pollution Reduction**

## Water Efficiency

Point	Description	Points
14	Water Efficiency	14
Reqmt 1	Minimum Indoor Plumbing Fixture and Fitting Efficiency	1 to 2
Credit 1	Water Performance Measurement	1
Credit 1.1	Whole building metering	1
Credit 1.2	Submetering	1
Credit 2	Additional Indoor Plumbing Fixture and Fitting Efficiency	1 to 5
Credit 2.1	10% Reduction	1
Credit 2.2	15% Reduction	2
Credit 2.3	20% Reduction	3
Credit 2.4	25% Reduction	4
Credit 2.5	30% Reduction	5
Credit 3	Water Efficient Landscaping	1 to 5
Credit 3.1	5% Reduction	1
Credit 3.2	10% Reduction	2
Credit 3.3	15% Reduction	3
Credit 3.4	20% Reduction	4
Credit 3.5	25% Reduction	5
Credit 4	Cooling Tower Water Management	1 to 2
Credit 4.1	Chemical Management	1
Credit 4.2	Non-Potable Water Source Use	1

14 Points Possible

LEED for Existing Buildings:  
Operations & Maintenance 2009  
Project Scorecard

- Prereq 1:  
Minimum Indoor Plumbing Fixture & Fitting Efficiency**
- Water Performance Measurement**
- Addl. Indoor Plumbing Fixture & Fitting Efficiency**
- Water Efficient Landscaping**
- Cooling Tower Water Mgmt**
- Chemical Management
  - Non-Potable Water Source Use

## Energy & Atmosphere

Point	Description	Points
35	Energy & Atmosphere	35
Prereq 1	Energy Efficiency Best Management Practices: Planning, Documentation, and Opportunity Assessment	Required
Prereq 2	Minimum Energy Efficiency Performance: ENERGY STAR Rating 59	Required
Prereq 3	Refrigerant Management - Ozone Protection	Required
Credit 1	Optimize Energy Efficiency Performance	1 to 15
Credit 1.1	ENERGY STAR Rating: 71 / Above National Average: 21%	1
Credit 1.2	ENERGY STAR Rating: 73 / Above National Average: 23%	2
Credit 1.3	ENERGY STAR Rating: 75 / Above National Average: 25%	3
Credit 1.4	ENERGY STAR Rating: 77 / Above National Average: 27%	4
Credit 1.5	ENERGY STAR Rating: 79 / Above National Average: 29%	5
Credit 1.6	ENERGY STAR Rating: 81 / Above National Average: 31%	6
Credit 1.7	ENERGY STAR Rating: 83 / Above National Average: 33%	7
Credit 1.8	ENERGY STAR Rating: 85 / Above National Average: 35%	8
Credit 1.9	ENERGY STAR Rating: 87 / Above National Average: 37%	9
Credit 1.10	ENERGY STAR Rating: 89 / Above National Average: 39%	10
Credit 1.11	ENERGY STAR Rating: 91 / Above National Average: 41%	11
Credit 1.12	ENERGY STAR Rating: 93 / Above National Average: 43%	12
Credit 1.13	ENERGY STAR Rating: 95 / Above National Average: 45%	13
Credit 1.14	ENERGY STAR Rating: 97 / Above National Average: 47%	14
Credit 1.15	ENERGY STAR Rating: 99 / Above National Average: 49%	15
Credit 1.16	ENERGY STAR Rating: 101 / Above National Average: 51%	16
Credit 1.17	ENERGY STAR Rating: 103 / Above National Average: 53%	17
Credit 1.18	ENERGY STAR Rating: 105 / Above National Average: 55%	18

35 Points Possible

LEED for Existing Buildings:  
Operations & Maintenance 2009  
Project Scorecard

- Prereq 1: Energy Efficiency Best Mgt Practices**
- Prereq 2: Min Energy Efficiency Performance**
- Prereq 3: Refrigerant Management**
- Optimize Energy Efficiency Performance**

## Energy & Atmosphere

(cont.)

Point	Description	Points
2	Credit 2.1 Existing Building Commissioning: Investigation and Analysis	2
2	Credit 2.2 Existing Building Commissioning: Implementation	2
2	Credit 2.3 Existing Building Commissioning: Ongoing Commissioning	2
1	Credit 3.1 Performance Measurement: Building Automation System	1
1 to 2	Credit 3.2 Performance Measurement: System-Level Metering	1 to 2
3	Credit 4.1 Renewable Energy: 10% Metered	3
1 to 8	Credit 4.2 Renewable Energy: 30% Metered	1 to 8
1	Credit 4.3 Renewable Energy: On-site 5% / Off-site 25%	1
2	Credit 4.4 Renewable Energy: On-site 15% / Off-site 37.5%	2
3	Credit 4.5 Renewable Energy: On-site 25% / Off-site 50%	3
4	Credit 4.6 Renewable Energy: On-site 35% / Off-site 62.5%	4
5	Credit 4.7 Renewable Energy: On-site 45% / Off-site 75%	5
6	Credit 4.8 Renewable Energy: On-site 55% / Off-site 87.5%	6
1	Credit 5.1 Refrigerant Management	1
1	Credit 6.1 Emissions Reduction Reporting	1

35 Points Possible

LEED for Existing Buildings:  
Operations & Maintenance 2009  
Project Scorecard

- (cont.)**
- Exist Bldg Commissioning**
- Investigation & Analysis
  - Implementation
  - Ongoing Commissioning
- Performance Measurement**
- Bldg Automation System
  - System-Level Metering
- Renewable Energy**
- Refrigerant Management**
- Emissions Reduction Reporting**



### Materials & Resources

Prereq	Requirement	Required
Prereq 1	Sustainable Purchasing Policy	1
Prereq 2	Solid Waste Management Policy	1
Credit 1	Sustainable Purchasing: Ongoing Consumables 40% of Purchases	1
Credit 2.1	Sustainable Purchasing: Durable Goods, Electric	1
Credit 2.2	Sustainable Purchasing: Durable Goods, Furniture	1
Credit 3	Sustainable Purchasing: Facility Alterations and Additions	1
Credit 4	Sustainable Purchasing: Reduced Mercury in Lamps 10 µg/gm-hr	1
Credit 5	Sustainable Purchasing: Food	1
Credit 6	Solid Waste Management: Waste Stream Audit	1
Credit 7	Solid Waste Management: Ongoing Consumables 50% Waste Diversion	1
Credit 8	Solid Waste Management: Durable Goods	1
Credit 9	Solid Waste Management: Facility Alterations and Additions	1

**10 Points Possible**

LEED for Existing Buildings: Operations & Maintenance 2009 Project Scorecard

Prereq 1: Sustainable Purchasing Policy  
Prereq 2: Solid Waste Mgt Policy

Sustainable Purchasing:  
•Ongoing Consumables  
•Electric  
•Furniture  
•Facility Alts & Additions  
•Reduced Mercury in Lamps  
•Food

Solid Waste Management  
•Waste Stream Audit  
•Ongoing Consumables  
•Durable Goods  
•Facility Alterations & Additions

### Indoor Environmental Quality

Prereq	Requirement	Required
Prereq 1	Minimum IAQ Performance	1
Prereq 2	Environmental Tobacco Smoke (ETS) Control	1
Prereq 3	Green Cleaning Policy	1
Credit 1.1	IAQ Best Management Practices: IAC Management Program	1
Credit 1.2	IAQ Best Management Practices: Outdoor Air Delivery Monitoring	1
Credit 1.3	IAQ Best Management Practices: Increased Ventilation	1
Credit 1.4	IAQ Best Management Practices: Reduce Particulates in Air Distribution	1
Credit 2.1	Occupant Comfort: Occupant Survey	1
Credit 2.2	Controllability of Systems: Lighting	1
Credit 2.3	Occupant Comfort: Thermal Control Monitoring	1
Credit 2.4	Occupant Comfort: Daylight and Views, 50% Daylight / 45% Views	1
Credit 3.1	Green Cleaning: High Performance Cleaning Program	1
Credit 3.2	Green Cleaning: Custodial Effectiveness Assessment - Score of ≥ 3	1
Credit 3.3	Green Cleaning: Sustainable Cleaning Products and Materials Purchases	1
Credit 3.4	Green Cleaning: Sustainable Cleaning Equipment	1
Credit 3.5	Green Cleaning: Indoor Chemical & Pollutant Source Control	1
Credit 3.6	Green Cleaning: Indoor Integrated Pest Management	1

**15 Points Possible**

LEED for Existing Buildings: Operations & Maintenance 2009 Project Scorecard

Prereq 1: Min IAQ Performance  
Prereq 2: ETS Control  
Prereq 3: Green Cleaning Policy

IAQ Best Mgt Practice:  
•IAQ Management Program  
•Outdoor Air Delivery Monitoring  
•Increased Ventilation  
•Reduce Particulates in Air Distribution  
•IAQ Mgmt During Construction

Controllability of Systems  
Occupant Comfort:  
•Lighting  
•Thermal Comfort Monitoring  
•Daylight & Views

Green Cleaning  
-High Perf Cleaning Program  
-Custodial Effectiveness Assessment  
-Sust Cleaning Products, Purchases  
-Sust Cleaning Equipment  
-Indoor Chem & Pollutant Source Control  
-Indoor Integrated Pest Management

### Innovation in Operations

Prereq	Requirement	Required
Credit 1.1	Innovation in Design: Provide Specific Title	1
Credit 1.2	Innovation in Design: Provide Specific Title	1
Credit 1.3	Innovation in Design: Provide Specific Title	1
Credit 1.4	Innovation in Design: Provide Specific Title	1
Prereq 2	LEED® Accredited Professional	1
Credit 3	Documenting Sustainable Building Cost Impacts	1
Credit 1.1	Regional Priority Credit: Region Defined	1
Credit 1.2	Regional Priority Credit: Region Defined	1
Credit 1.3	Regional Priority Credit: Region Defined	1
Credit 1.4	Regional Priority Credit: Region Defined	1


**10 Points Possible**

LEED for Existing Buildings: Operations & Maintenance 2009 Project Scorecard

Innovation in Design  
LEED AP  
Documenting Sustainable Building Cost Impacts  
Regional Priority

### Low-Cost Measures

- switch to energy efficient lighting
- adjust HVAC temperature controls
- educate facilities operations staff
- install lighting sensors
- conduct 'professional' energy audit



### Methods of Reducing Energy (Building Envelope)

**Windows**

- Replace
- Window film
- Indoor storms

**Roof**

- Green
- Materials
- Colors

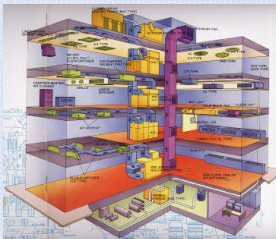
**Walls**

- Insulation
- Caulking
- Fenestration
- Orientation
- Materials
- Colors

### Methods of Reducing Energy (HVAC)

- Programmable thermostats
- Multiple units, discharge temperature
- Air & water economizers
- Improved duct sealing
- Occupancy-based control systems
- Variable frequency, flow on fans, chillers, pumps
- High, smaller, more efficient motors & compressors
- Power factor correction capacitors
- Indirect evaporative cooling
- Passive heating/cooling
- Dedicated outdoor air systems (DOAS)
- Energy recovery heat exchangers
- Geothermal heat pumps
- Low S.P. drop, high MERV-rated filters
- Cool storage (water or ice)

## Why Be So Concerned about HVAC Systems??



HVAC is “Heart and Lungs” of Building

Why compromise?

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## Methods of Reducing Energy (Lighting)

- Fluorescent Lamps: T-8, T-5 – Electronic Ballast
- Compact Fluorescent Lamps (CFL)
- LED Lamps
- Sensors: Light, Motion
- Dimming
- Zoning
- Natural Daylighting
  - Light Shelves
  - Skylights
  - Light Tubes



## Smarter Water for a Smarter Planet



**Q:** How many billion gallons of potable water do Americans use *every day* – just to flush toilets?

**A:** 4.8 Billion Gallons !!

## Water Savings

### EXTERIOR

- Irrigation
- Water efficient landscaping
- No potable water use or no irrigation
- Watch out for leaks



### INTERIOR

- Toilets & urinals (low-flow or waterless)
- Sinks (low-flow, with or without sensors)
- Showers (low-flow)
- Watch out for leaks

Remember, it also requires electrical energy to move the water...

## Water Reuse

Water that can be recycled & reused:

### Gray Water

- Condensate from (clean) drain pans
- Water from sinks
- Water from washing machines, dishwashers
- Rainwater
  - Collection cisterns
  - “Green” Roofs

## Operation & Maintenance

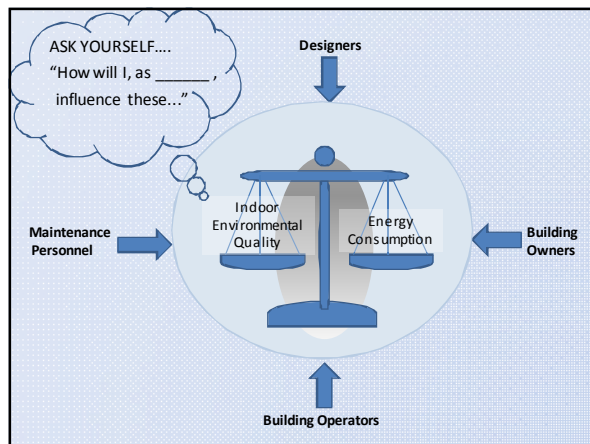
- **Best Designs & Construction**  
Doomed to Failure Without *Proper* and Ongoing Maintenance
- **Retro-Commissioning:**  
Return to Original Design Concepts and Operation
- **Continuous Commissioning**



### Technology ≠ Performance

“An inefficient system run well  
can perform better than  
an efficient system run poorly.”

- Newman




### Government Help (Maybe)

- **American Recovery & Reinvestment Act of 2009 (ARRA 2009):**
  - Energy Conservation & Greenhouse Gas Emissions Reductions of **\$34 Billion**
  - State Energy Program: \$3.1 Billion
  - Green Schools: \$9.75 Billion
  - Federal Buildings: \$8.5 Billion
  - Weatherization for Low-Income Homes: \$5 Billion
  - Assisted Housing: \$1.76 Billion
- **Energy Policy Act of 2005 (EPAct 2005)**
  - Up to **\$1.80/SF Tax Deduction**
  - Extended to **12/31/2013**

### EPAct 2005, Applicability to Commercial Buildings – (1)

1. **Offices, Retail Buildings, Warehouses, etc.**
  - Also Includes Public Buildings, e.g., Schools
  - Rental Housing > 4 stories
  - No Process Loads




Note: For Public Buildings, Credit Can Pass Through to "Person or Entity Primarily Responsible for Designing the Building (Designer(s) of Record)"

### EPAct 2005, Applicability to Commercial Buildings – (2)

2. **New Construction in Existing Building Also Eligible for Deduction**
  - Up to \$0.60 / sq. ft. for any of the 3 Energy-Using Systems: Lighting, HVAC, Service Water, Building Envelope

Based on ASHRAE Energy Standard 90.1-2001

Note: "Plug Loads" Not Included



### EPAct 2005, Deduction for Commercial Buildings

3. **Total of Up To \$1.80 / sq. ft. of Building Area**
  - 1/3 of Incentive Available Separately for Each of Main Building Systems:
    - Envelope – Up To \$0.60 (16 2/3% > 90.1)
    - HVAC, Water Heating – Up To \$0.60 (16 2/3% > 90.1)
    - Lighting – Up To \$0.60 (25% > 90.1, with exceptions)

Note: Can do something in any of the 3 areas and get partial deduction, except for lighting in warehouses

## Other Help

- Utility Energy Optimization Programs
- Organizational Grants
- Municipal, county or state energy grants
- Local Tax Reductions (primarily new construction)
- Faster permitting and inspections from some local jurisdictions if building to LEED® (Leadership in Energy & Environmental Design) Guidelines (primarily new construction)
- Better insurance rates

## Green to Grey??

## Q. How Do You Maintain Sustainability?



- A. Energy Audits**
- B. Re-commissioning and Retro-commissioning**

## Energy Audits



- **Purpose:**  
Identify and develop modifications to reduce energy use and/or cost of operating a building
- **Type(s):**
  - Level I: Walk-Through Analysis (very basic)
  - Level II: Energy Survey & Analysis
  - Level III: Detailed Analysis of Capital Intensive Modifications
- **Examine:**
  - Envelope (Walls, Windows, Roof)
  - Lighting (Interior & Exterior)
  - HVAC
  - Domestic & Process Water (Hot & Cold)
  - Other: Laundry, Food Preparation, Conveying Systems, Plug Loads, etc.

## What To Do After the Audit

- Re-commissioning or retro-commissioning based on audit results
  - Repair building envelope (walls, windows, roof) as required
  - Ensure HVAC systems are operating properly and most efficiently – beyond simple thermostat adjustments
  - Remove and replace inefficient HVAC and service water systems
- Then, Continuous Commissioning

## What's Coming Up (or Here Now)?

- ASHRAE Building Energy Quotient (bEQ) Label (3<sup>rd</sup> Qtr. 2010 – in Pilot Now)
- ANSI Standard 189.1 for High Performance Green Buildings (Just Came Out)
- ICC's International Green Construction Code (release in March? – will be published as new code in 2012)
- ASHRAE 90.1 – 2010
- Energy Use Index (EUI) – Btu/sq. ft./ yr.



## Building Energy Quotient™

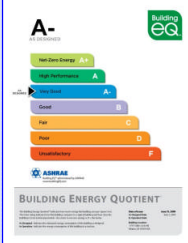
ASHRAE's Building Energy Labeling Program



Providing Valuable Information to Building Owners and Operations Staff

March 2010

## Building Energy Labels Provide. . .



- Information on the potential and actual energy use of buildings
- Feedback to building owners and operators on how their building is performing
- Insight into the value and potential long-term costs of a building
- Differentiation in the marketplace

## Why Now?

Potential utilization outside of North America for areas without existing labeling programs

Mandatory labeling requirements already in place:

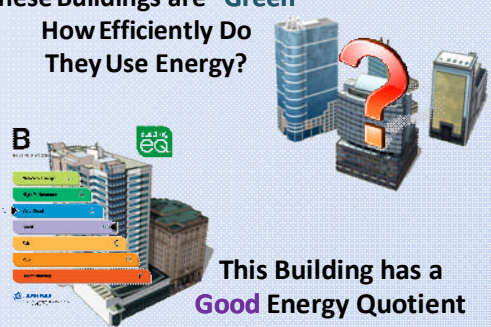
- European Union
- California
- Washington, DC
- Austin, TX



*Building owners need a technically sound label that can serve as a consistent model for such mandatory programs.*

## These Buildings are "Green"

### How Efficiently Do They Use Energy?

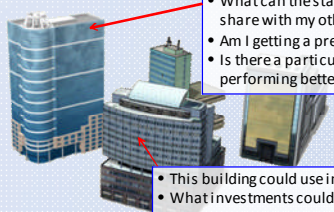


**This Building has a Good Energy Quotient**

## Why Should Owners be Interested?

### Manage portfolios and identify investment opportunities

Existing Building Portfolios (*In Operation Rating*):



- What can the staff managing this building share with my other building managers?
- Am I getting a premium for this building?
- Is there a particular reason this building is performing better?

- This building could use improvement.
- What investments could improve energy use?
- Does the O&M team need additional training?
- Can re-commissioning or retro-commissioning address poor performance?

## Why Should Owners be Interested?

### Make educated decisions on new building design

Design Options for a New Building (*As Designed Rating*):



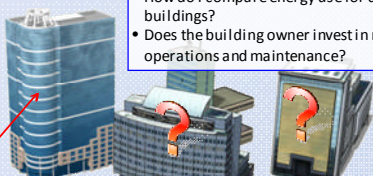
- Which design will be most marketable?
- What can I expect in future energy costs?
- Does the design meet my initial energy use expectations?
- What will I need to do to assure the building performs to its potential?

## Why Should Owners be Interested?

Tenants are looking to understand energy use and cost

### Potential Lessees:

- Is this a bad building or just not measured?
- What will my energy bills be?
- How do I compare energy use for different buildings?
- Does the building owner invest in necessary operations and maintenance?



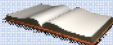
- This is a high-performance building.
- My energy costs will be manageable.
- The building owner pays attention to operations and maintenance.
- I can afford to put more money towards rent.

## Benefits for Building Owners

- Measurement-based Indoor Environmental Quality (IEQ) indicators to assure levels of service are maintained
- List of operational features including commissioning activities, energy efficiency improvements
- Provides information on how the building is using energy and how performance can be improved
- **Differentiate building from peers to attract tenants or potential buyers**

## Where To Get Information

- USGBC: LEED®-EB: O & M Guidelines  
Based on EPA Energy Star® Portfolio Manager  
Look at ASHRAE Energy Standard 90.1-2007
- ASHRAE: Advanced Energy Design Guides (AEDG)
- ASHRAE: Procedures for Commercial Building Energy Audits
- BOMA: Preventive Maintenance & Building Operation Efficiency



## References & Resources (1)

[www.ashrae.org](http://www.ashrae.org) (American Society of Heating, Refrigerating and Air-Conditioning Engineers)  
[www.usgbc.org](http://www.usgbc.org) (U.S. Green Building Council)  
[www.gbci.org](http://www.gbci.org) (Green Building Certification Institute)  
[www.aia.org/cote](http://www.aia.org/cote) (AIA Committee on the Environment)  
[www.eren.doe.gov](http://www.eren.doe.gov) (Department of Energy)  
[www.sustainable.doe.gov](http://www.sustainable.doe.gov)  
[www.energystar.gov](http://www.energystar.gov) (EPA Energy Star)  
[www.nrel.gov](http://www.nrel.gov) (National Renewable Energy Laboratory)  
[www.rmi.org](http://www.rmi.org) (Rocky Mountain Institute)  
[www.peci.org](http://www.peci.org) (Portland Energy Council – O & M Techniques)  
[www.greenseal.org](http://www.greenseal.org)  
[www.greenguard.org](http://www.greenguard.org)  
[www.fpl.fs.fed.us/ahrc/mold/mold-methods.html](http://www.fpl.fs.fed.us/ahrc/mold/mold-methods.html) (Forest Products Lab)

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## References & Resources (2)

[dsireusa.org](http://dsireusa.org) (Info on federal, state, local, utility incentives and policies)  
[epa.gov/air/caa/peg](http://epa.gov/air/caa/peg) (Guide to the Clean Air Act)  
[facilitiesnet.com](http://facilitiesnet.com) (specialized site for facility professionals)  
[myfacilitiesnet.com](http://myfacilitiesnet.com) (social networking site for facility professionals)  
[energystar.gov/benchmark](http://energystar.gov/benchmark) (EPA Portfolio Manager)  
[advancedbuildings.org](http://advancedbuildings.org) (energy eff. technologies, strategies for commercial buildings, case studies)  
[bcxa.org](http://bcxa.org) (building commissioning)  
[newbuildings.org](http://newbuildings.org) (promotes energy efficiency in bldgs. through technology research, guidelines and codes)  
[buildingEQ.com](http://buildingEQ.com) (ASHRAE bEQ Program)

## Why Do People Change?

Two Reasons:

1. They *realize* it's in their best interests
2. They're forced to

**Both of these are happening today**



### Why Change?

“It’s not the strongest who survive, nor the most intelligent – it’s those most adaptable to change” - Charles Darwin



Stay flexible

Don’t fear difficult moments

Try new things

Educate yourself – *continually*

**Growth comes from change - and so does survival!**

### So What Now?

- Use what you’re learning today – never stop learning
- Think “Outside the Box”
- Keep up-to-date
  - ASHRAE Standards, LEED Guidelines
  - BOMA/IFMA/USGBC
  - Government Regulations
- Join professional organizations
- Get a professional certification
- Be a teacher, not just a student



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**“If We Do Not Change Our Direction, We Are Likely To End Up in the Place We Are Headed”**  
- Chinese Proverb

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