ASHRAE's Initiatives for Sustainable Design

Lynn G. Bellenger, PE
ASHRAE President
Pathfinder Engineers & Architects LLP

Agenda

- **Today's Presentation**
  - ASHRAE sustainability standards & design guidance
  - The business case
  - Learning more/keeping up with changes
- **Questions and Answers**

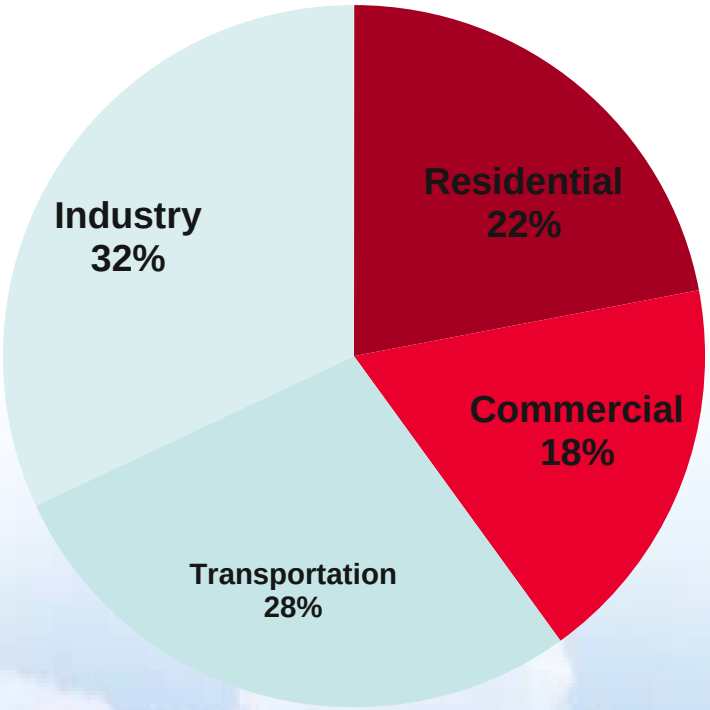
Who Are You?

- Government representatives
- Building owners and managers
- Educators
- Manufacturers
- Designers
- Plant operators
- Media
- _____

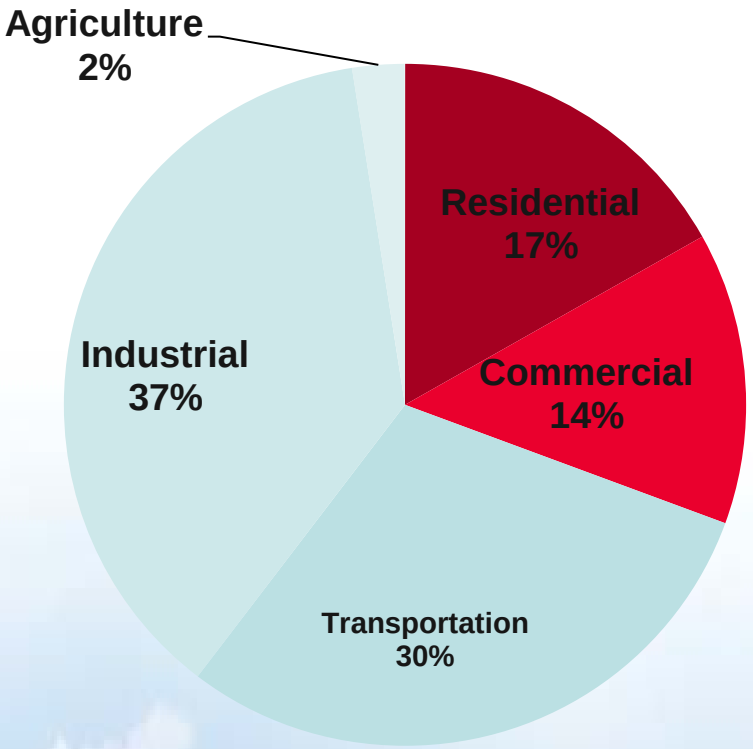
Setting the Stage

Total Energy Consumption

United States



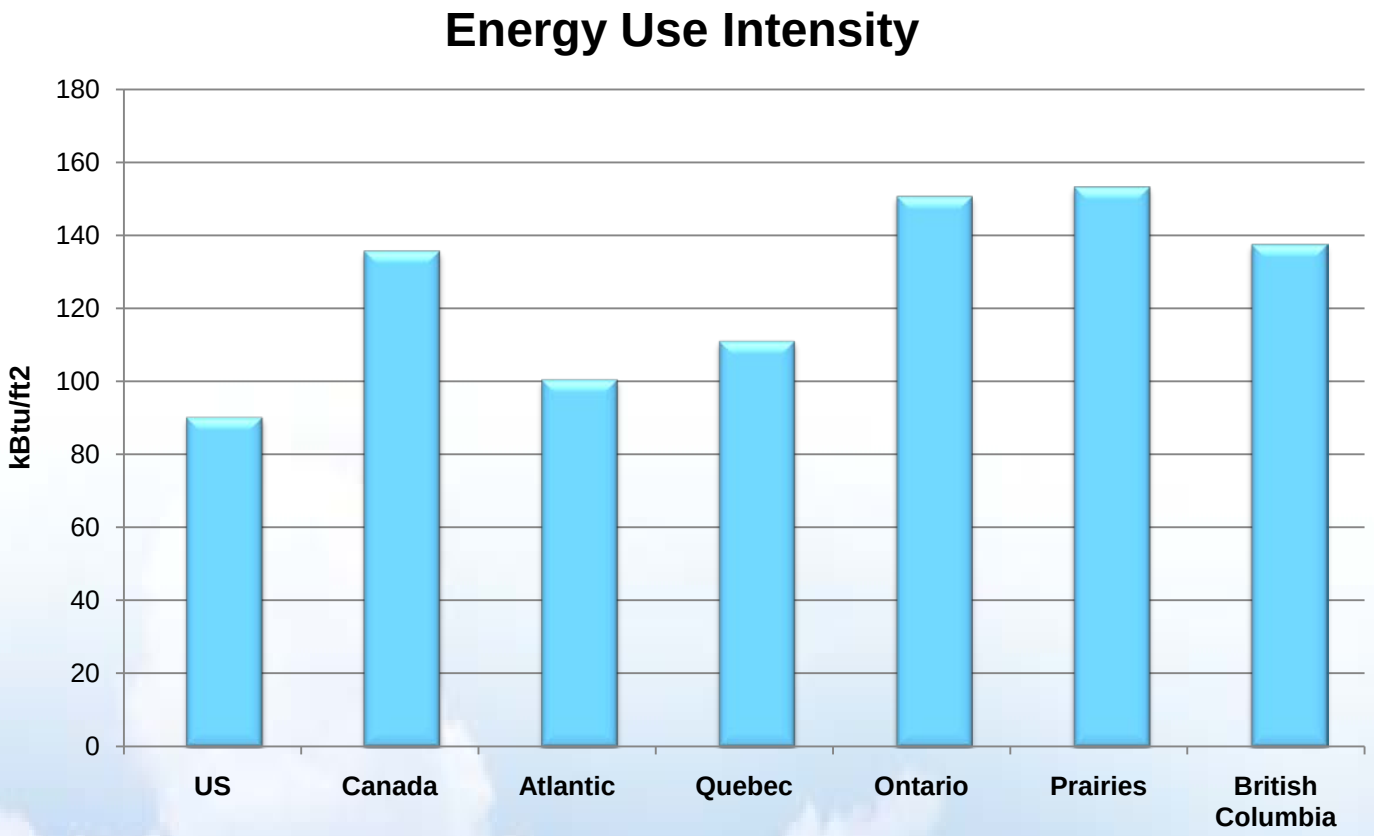
Canada



National Resources Canada Office of Energy Efficiency, Commercial and Institutional Energy Use Survey 2000

US DOE, Energy Information Agency, 2007 Buildings Information Data Book

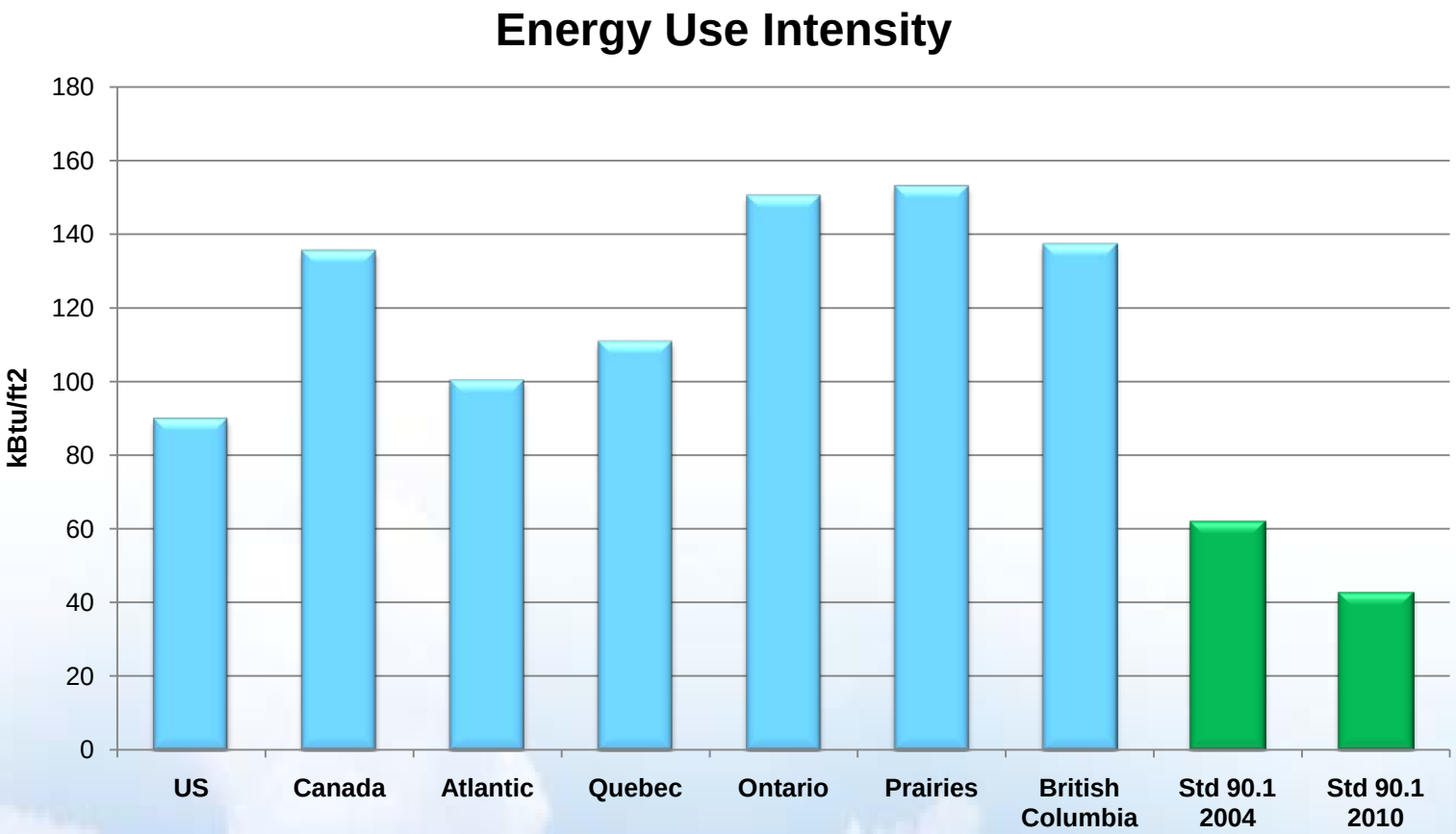
Commercial Building Energy Use



National Resources Canada Office of Energy Efficiency, Commercial and Institutional Energy Use Survey 2005

US DOE, Energy Information Agency, Commercial Building Energy Consumption Survey 2003

Commercial Building Energy Use



National Resources Canada Office of Energy Efficiency, Commercial and Institutional Energy Use Survey 2005

US DOE, Energy Information Agency, Commercial Building Energy Consumption Survey 2003

ASHRAE Sustainability Standards and Design Guidance

ASHRAE Sustainability Standards

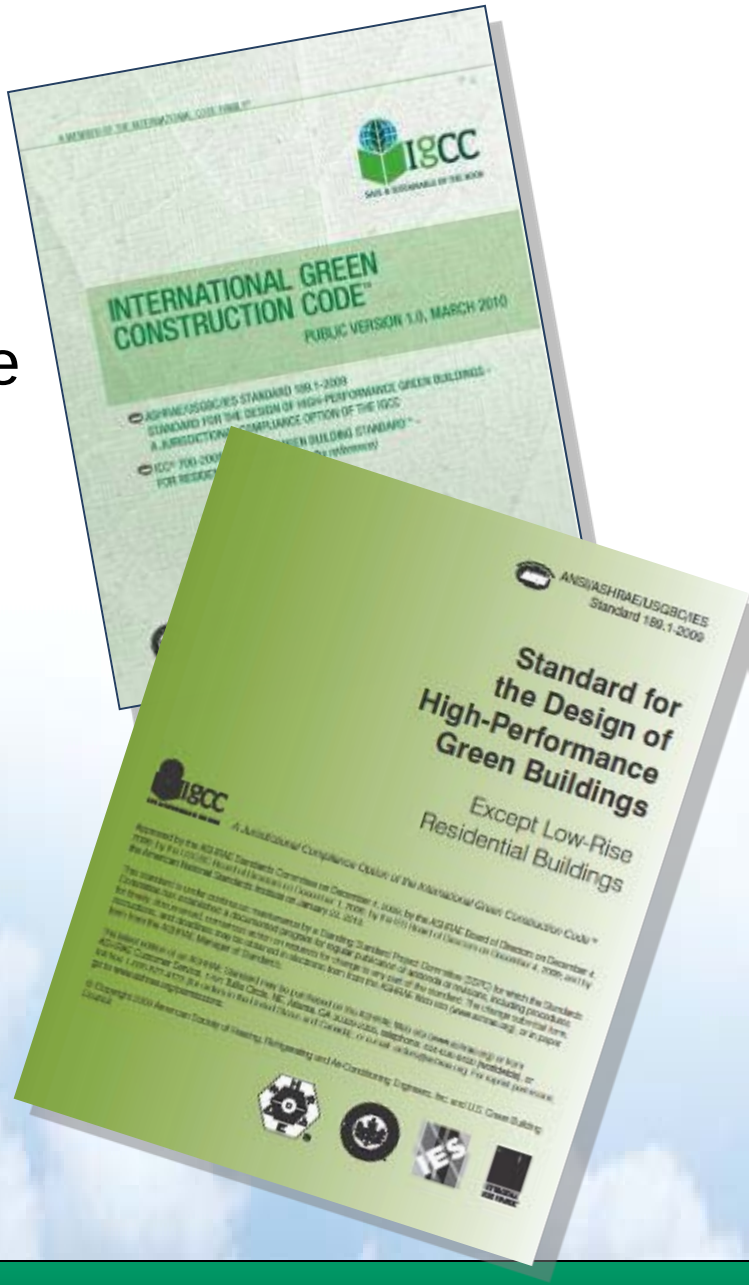
- Standard 55, *Thermal Environmental Conditions for Human Occupancy*
- Standard 62.1, *Ventilation and Acceptable Indoor Air Quality*
- Standard 90.1, *Energy Standard for New Buildings Except Low-Rise Residential Buildings*
- Standard 100, *Energy Conservation in Existing Buildings*

ASHRAE Sustainability Standards

- Standard 189.1, *Standard for the Design of High-Performance, Green Buildings*
- Standard 189.2P, *High Performance Green Healthcare Facilities*
- Standard 191P, *Standard for the Efficient Use of Water in Building, Site and Mechanical Systems*
- Standard 180, *Standard Practice for Inspection & Maintenance of Commercial-Building HVAC Systems*

Green Building Standard

- Standard for the Design of High-Performance Green Buildings
- Serves as benchmark for sustainable green buildings
- Applies to all buildings except low-rise residential buildings (same as ASHRAE/IESNA Std 90.1)
- Jurisdictional compliance option for International Green Construction Code



www.ashrae.org/greenstandard

Goals for Standard 189.1

- Establish mandatory criteria in all topic areas
  - Existing green building rating systems contain few mandatory provisions
- Provide simple compliance options
- Complements green building rating programs
  - Not intended to compete with green building rating programs

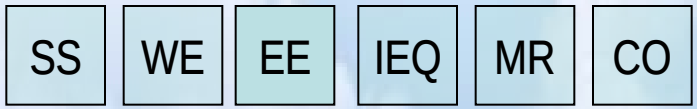
Standard 189.1 Topic Areas

- SS Sustainable Sites
- WE Water Use Efficiency
- EE Energy Efficiency
- IEQ Indoor Environmental Quality
- MR Building's Impact on the Atmosphere, Materials & Resources
- CO Construction and Operations Plans

Energy Efficiency Requirements

Highlights

- More stringent than Standard 90.1-2007
- Includes plug & process loads
- Peak load reduction
- Energy measurement for verification
- Renewable energy provisions



New Standards Projects

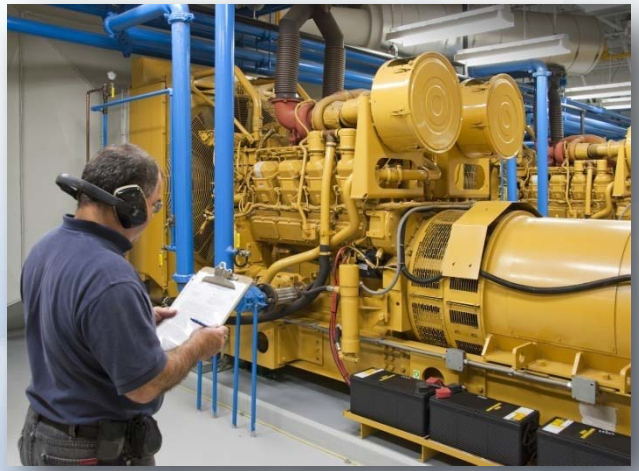
ASHRAE/NEMA Standard 201P, Facility Smart Grid Information Model

Purpose: to define information model to enable appliances and control systems in homes, buildings, and industrial facilities to manage electrical loads and generation sources …

ASHRAE Standard 203P, Method of Test for Determining Heat Gain of Office Equipment Used in Buildings

Purpose**:** establishes methods & procedures for the determination of sensible heat gain and radiant/convective fractions in all modes …

ASHRAE Sustainability Guidelines

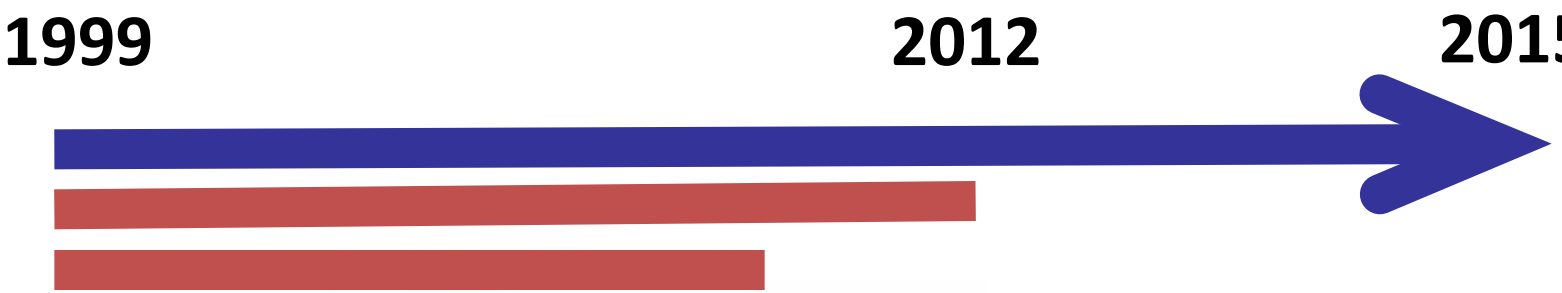


- Guideline 0, *The Commissioning Process*
- Guideline 1.1, *HVAC&R Technical Requirements for the Commissioning Process*
- Guideline 4, *Preparation of Operating and Maintenance Documentation for Building Systems*
- Guideline 14, *Measurement of Energy and Demand Savings*
- Guideline 32P, *Sustainable, High Performance Operations & Maintenance*

Advanced Energy Design Guides

- Office Buildings
- Retail Buildings
- K-12
- Warehouses
- Highway Lodging
- Health Care

Advanced Energy Design Guides



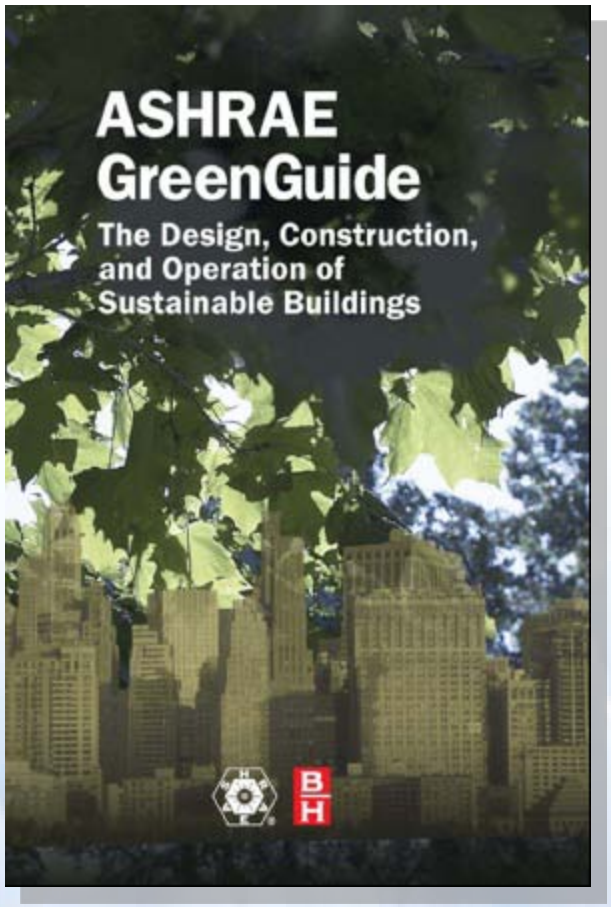
Std 90.1

30% AEDG

50% AEDG

NZEB AEDG

ASHRAE GreenGuide

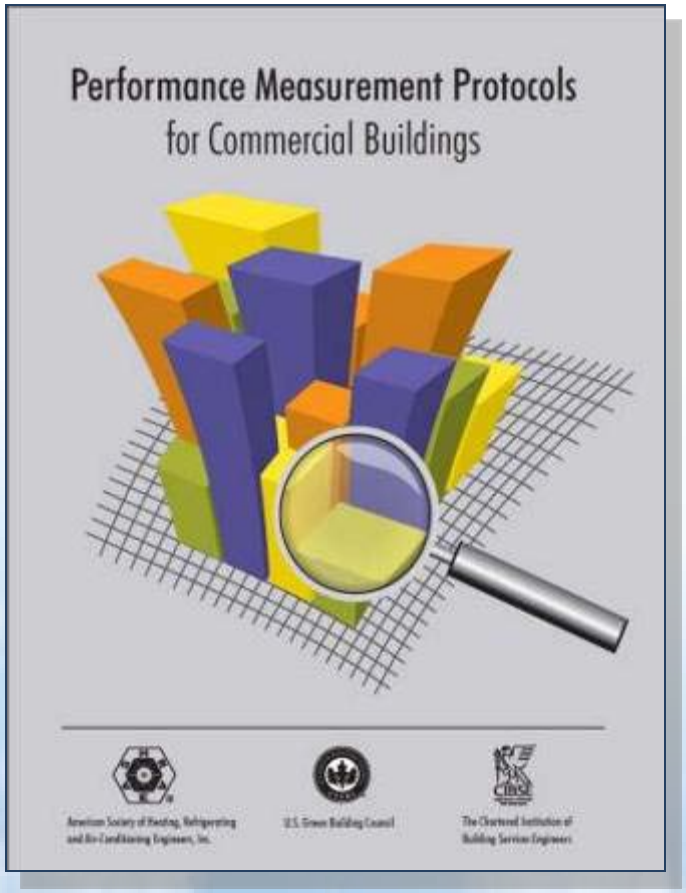


- Third Edition, Nov 2010
- Step-by-step manual for the entire building lifecycle
- Sustainable master planning
- Teaming strategies
- Case studies, checklists, and other practical information

Performance Measurement Protocols

- Addresses the what, how and when of measurement
- Protocols for six performance categories:
  - Energy
  - Water
  - Thermal comfort
  - Indoor air quality
  - Lighting
  - Acoustics
- Companion book focusing on best practices due out in June 2011
- Developed with CIBSE and USGBC

www.ashrae.org/bookstore



Indoor Environmental Quality

- *The Indoor Air Quality Guide: Best Practices for Design, Construction and Commissioning*
- Practical guidance on achieving good IAQ in commercial buildings
- Joint effort of ASHRAE, AIA, BOMA, US EPA, SMACNA, USGBC

www.ashrae.org/publications/page/1936

Guidance for Datacom Energy Efficiency

Sustainable design, energy efficiency, operating cost

= critical importance

Best Practices for Datacom Energy Efficiency

Environmental Criteria

Adoption of temperature and humidity ranges provided in ASHRAE's *Thermal Guidelines for Data Processing Environments* publication can result in increased energy efficiency.

Mechanical Equipment and Systems

For computer room air-conditioning equipment, focus the cooling solution on very high sensible/total cooling capacities per the revised ANSI/ASHRAE Standard 127-2007.

Economizer Cycles

Raising the supply air setpoint in a facility can significantly increase the number of cooling hours in economizer mode.

Best Practices for Datacom Energy Efficiency

Airflow Distribution

Recognize that datacom equipment loads will change over the next 10 to 15 years. Develop a cooling distribution strategy that can adjust to these changes.

HVAC Controls and Energy Management

Investigate the costs and benefits of different methods for humidity control. System design and control algorithms should allow the primary cooling coils to ‘run dry’ and thus allow for chilled-water reset at light loads without impacting relative humidity.

Electrical Distribution Systems

Consider distributing high-voltage AC or DC power to point of use.

Best Practices for Datacom Energy Efficiency

Datacom Equipment Efficiency

Select power equipment from the highest input voltage available within its input voltage rating range.

Liquid Cooling

Consider the use of a cooling distribution unit (CDU) to isolate the liquid cooling loop from the building chilled-water cooling loop. This allows the liquid cooling loop temperature to be set above the room dew-point temperature, thus eliminating condensation.

Total Cost of Ownership (TCO)

Use energy system modeling software to aid in developing an accurate TCO.

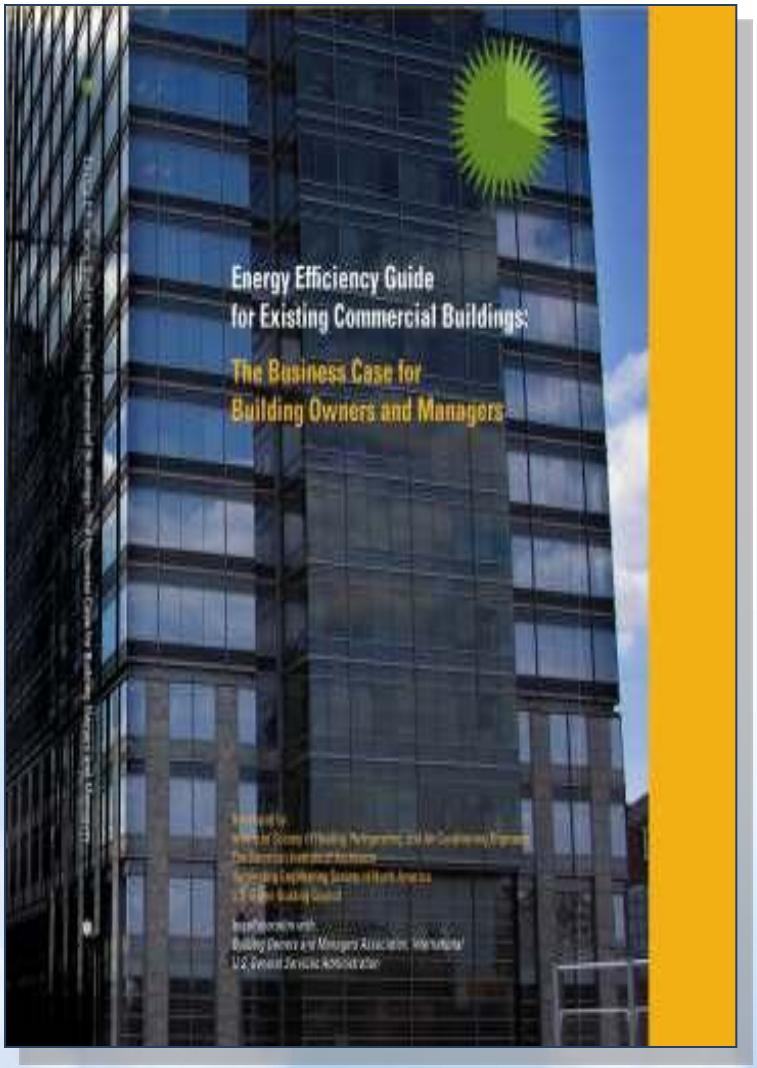
ASHRAE's *Best Practices for Datacom Facility Energy Efficiency*

Is there a business case for sustainable design?

Existing Building Guidance

- Provides business case for energy improvements
- Demonstrates how to benchmark performance against comparable buildings
- Illustrates how energy use and cost can be reduced by up to 30 percent
- Developed with BOMA, AIA, USGBC, IES, GSA
- Follow up Technical Guidance due in June 2011

www.ashrae.org/bookstore



Existing Building Guidance

- Next in Series – Technical Guidance for 30% Energy Savings for:
  - Energy Upgrades
  - Retrofits
  - Renovations

Making the Business Case for Green

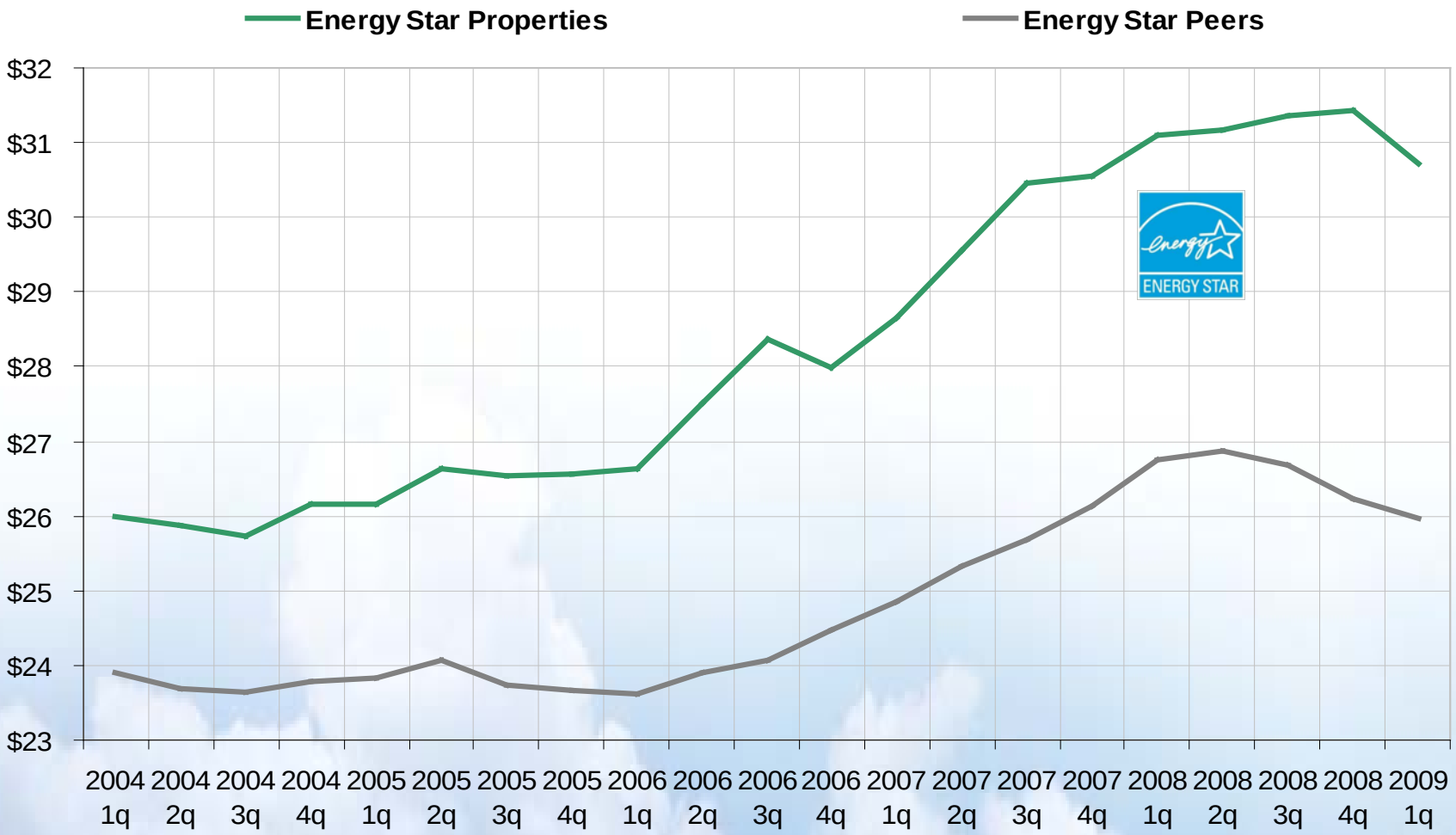
Performance History, Office

LEARN MORE AT energystar.gov

Results	Baseline	Current	Delta	Industry Average	ENERGY STAR®
Energy Performance Rating	61	73	12	50	75
Energy Cost					
$/year	764,098	649,483	-114,615	1,012,429	641,824
$/ft²/year	2.00	1.70	-0.30	2.65	1.97
CO_2 Emissions (1,000 lbs/year)	18,591	17,717	-874.00	23,486	17,464
Energy Intensity (kBtu/ft²/year)					
Site	79	73	-6	96	71
Source	241	220	-21	291	216

Energy Star reports 10-20% lower operating costs

ENERGY STAR
Direct Rental Rates vs. Peers



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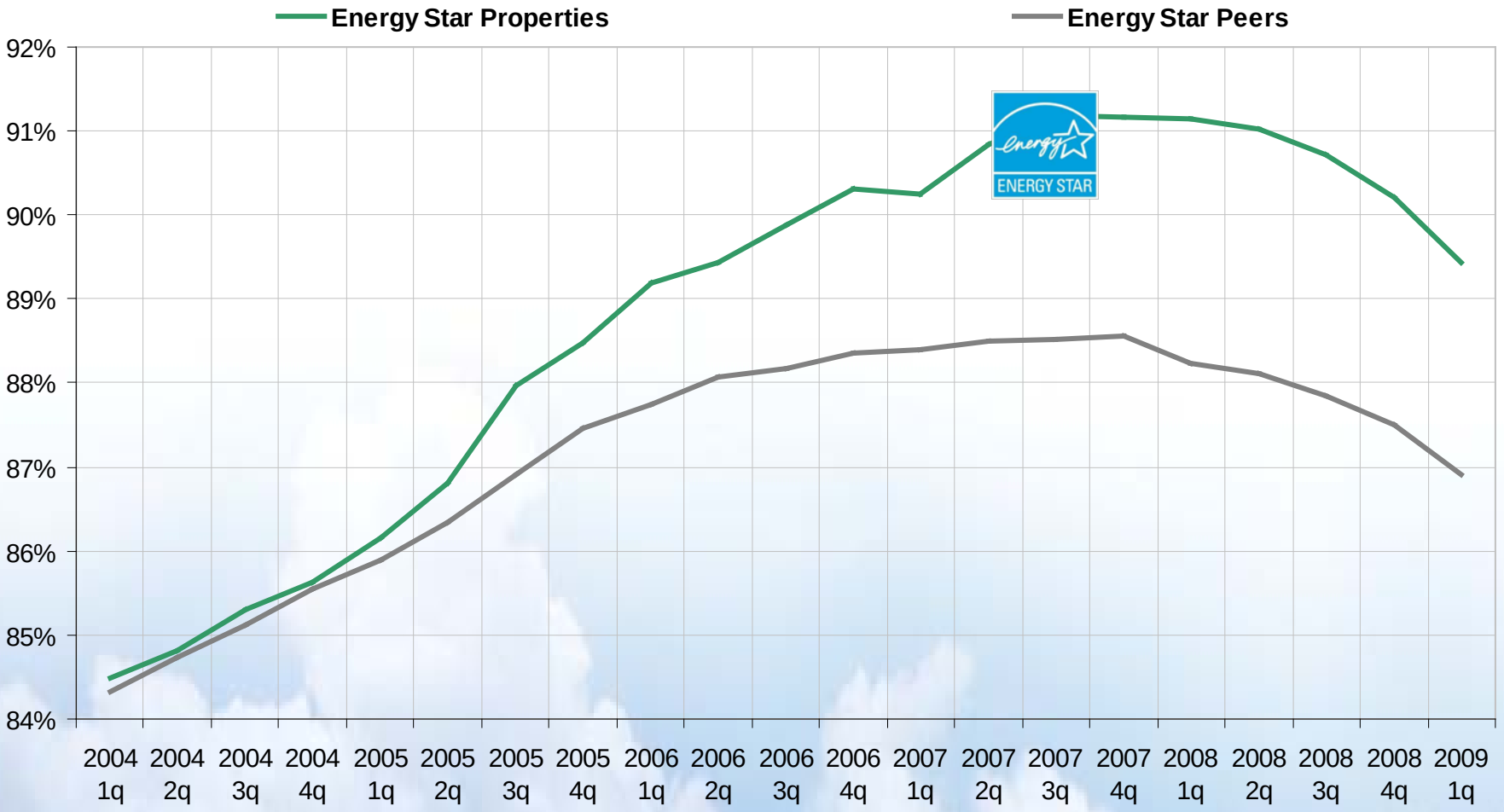
ENERGY STAR
Occupancy Rates vs. Peers

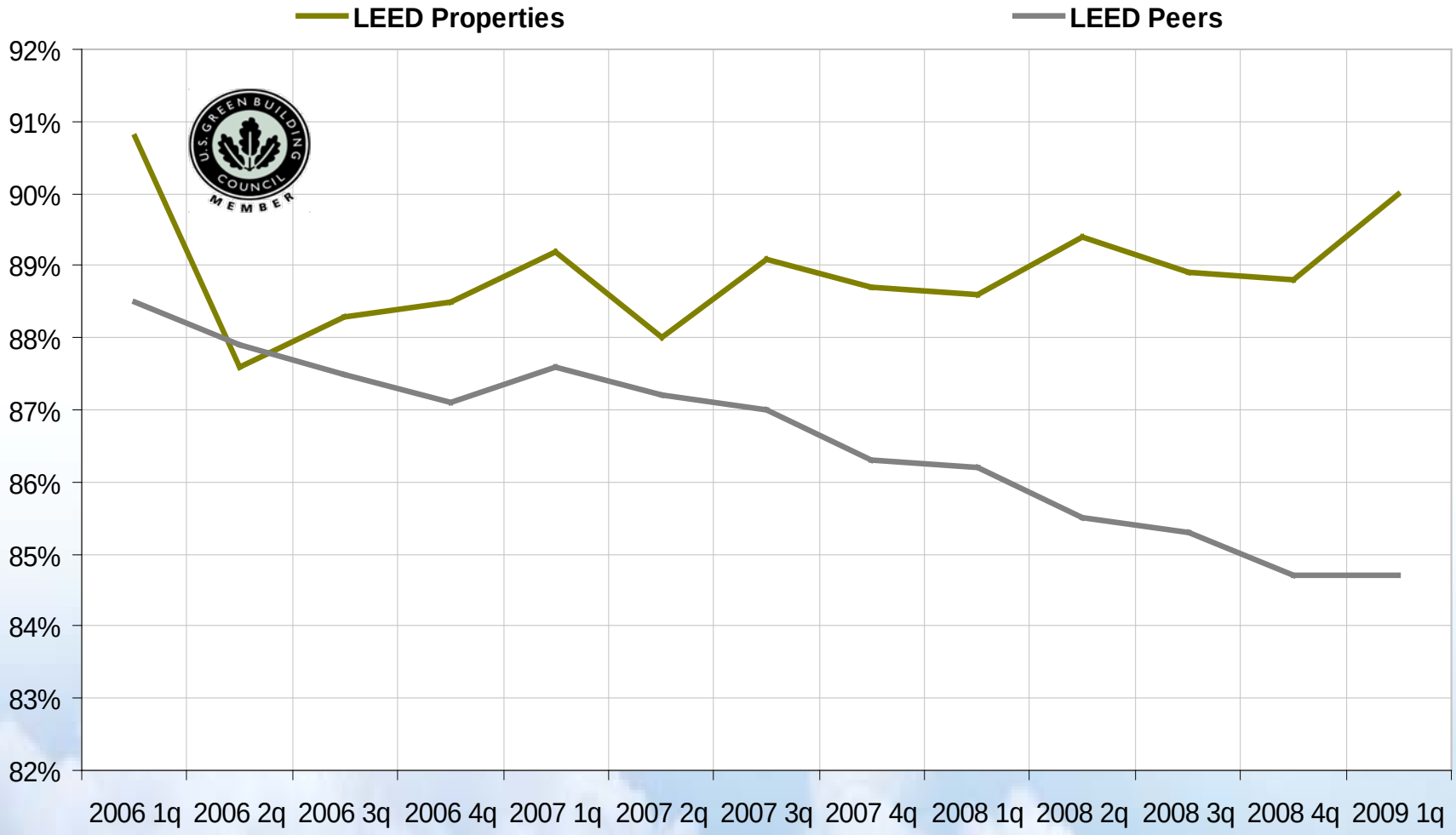


Used with permission from CoStar Group, Inc. (www.costar.com)

LEED Direct Rental Rates vs. Peers

Used with permission from CoStar Group, Inc. (www.costar.com)

LEED Occupancy Rates vs. Peers



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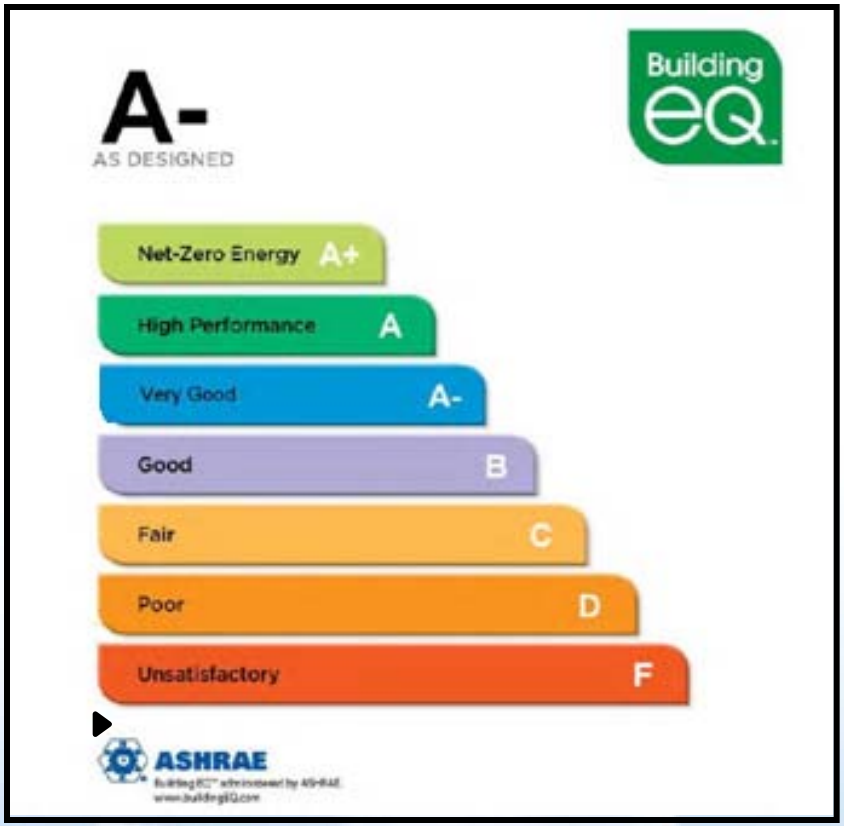
Building EQ



Two ratings:

- "As designed" rating – new buildings
- "As operated" rating – existing buildings

www.buildingeq.com
www.buildingeq.com/files/state_labeling.pdf

Commercial Building Energy Alliances

Commercial Building Energy Alliances

Informal associations among building owners and operators who want to reduce energy consumption

Information network for sharing best practices and ideas

- *Current* CBEAs:
  - Retailer Energy Alliance
  - Commercial Real Estate Energy Alliance
  - Hospital Energy Alliance
- *Future* CBEAs:
  - Higher Education Energy Alliance
  - State and Municipal Energy Alliance

Retailer Energy Alliance Members

that was easy.

Commercial Real Estate Energy Alliance Members

Hospital Energy Alliance Members

NewYork-Presbyterian
The University Hospital of Columbia and Cornell

Gundersen Lutheran your health. our passion.

Catholic Healthcare West

IES Illuminating ENGINEERING SOCIETY

PARTNERS HEALTHCARE

PROVIDENCE Health & Services

HCA

Cleveland Clinic

UPMC

ASHE

HEALTHSOUTH

KAISER PERMANENTE

DARTMOUTH-HITCHCOCK MEDICAL CENTER

MetroHealth

Market Share of Alliance Members

7.5 billion square feet total

Retailer Energy Alliance

39 member companies
2.8 billion sq. ft.

Hospital Energy Alliance

29 member companies
500 million sq. ft.

Commercial Real Estate Energy Alliance

44 member companies
4.5 billion sq. ft.

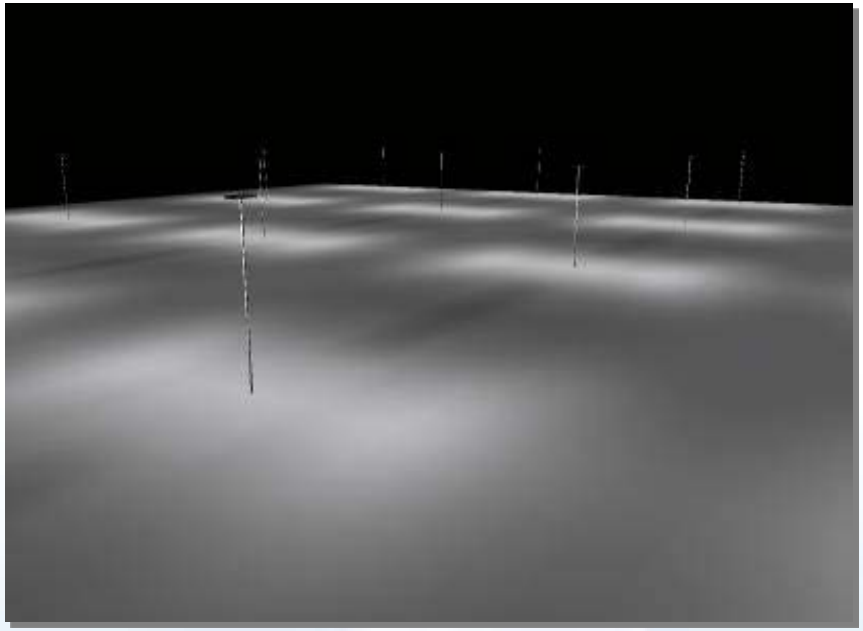
Key Alliance Activities

- Supplier Summits
  - Foster communication between building owners and manufacturers
  - February 3, 2011 in Las Vegas
- Commercial Technology Solutions
  - Commercial Lighting Solutions (www.lighting-solutions.org)
  - In development:
    - Packaged HVAC Systems Solutions
    - Supermarket Refrigeration Solutions
    - Daylighting Solutions

Key Alliance Activities (continued)

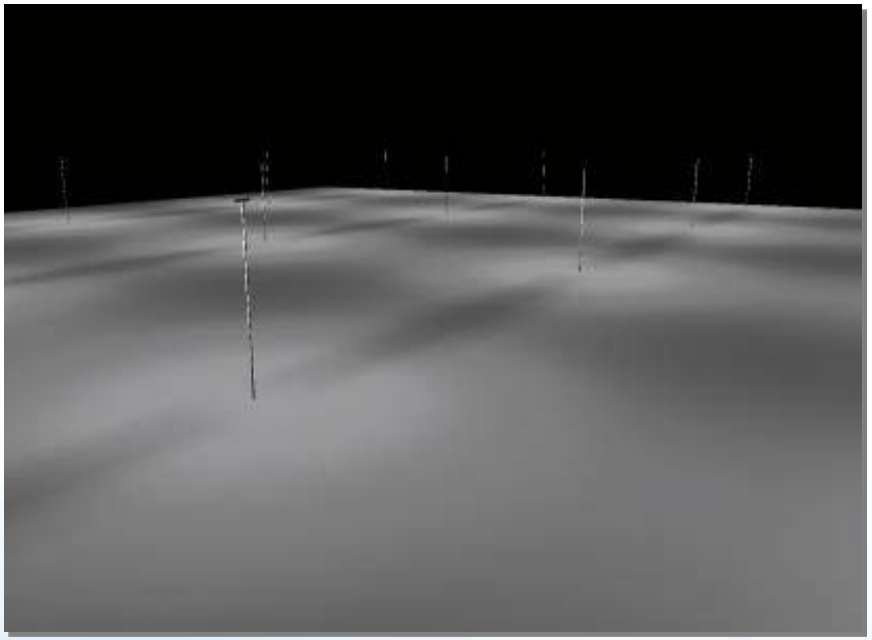
- Technology Identification and Screening
  - Nominated, promising energy-efficient technologies are evaluated by DOE and national laboratories.
  - Speeds application of “proven” technologies in commercial buildings
  - Supports identification of suitable technologies for possible Technology Procurements
- Technology Procurements
  - *1st project*: LED Outdoor Area Lighting
  - Pending
    - Rooftop HVAC
    - Parking garage lighting

Metal Halide Parking Lot



Average: 3.5
Maximum: 9.0
Minimum: 0.9
Max : Min: 10.0

455W MH



Average: 2.8
Maximum: 5.2
Minimum: 1.2
Max : Min: 4.3

218W LED

The Future of Sustainability

Sustainability Trends - Legal

- More adoptions of sustainability standards in model codes (national and regional)
- More local jurisdiction adoptions
- More required use in federal buildings
- Voluntary consensus standards vs. government mandates
- Increasing stringency of minimum codes

Sustainability Trends - Economics

- Increased demand for verification of sustainability claims and performance metrics
- Owner/Operator demands for solid business case, readily available technology
- Move toward life-cycle cost analysis versus first cost
- More tax incentives
- More utility rebates partnered with equipment manufacturers – need for timely, simplified system of rebates

Sustainability Trends - Standards

- Will have to develop uniform definitions of sustainable, green, and high performance
- Development of performance metrics and verification methods
- More standards with broader scopes
- Different system types such as Hydronic based for example

Sustainability Trends - Design

- More integrated design
- Building information modeling (BIM)
- Performance over prescriptive-based standards

How to Get Involved in ASHRAE Standards Development

Submit a change proposal

(http://www.ashrae.org/technology/page/812)

Recommend a new standard or guideline

(http://www.ashrae.org/technology/page/97)

Sign up for the ASHRAE Standards Action List Server

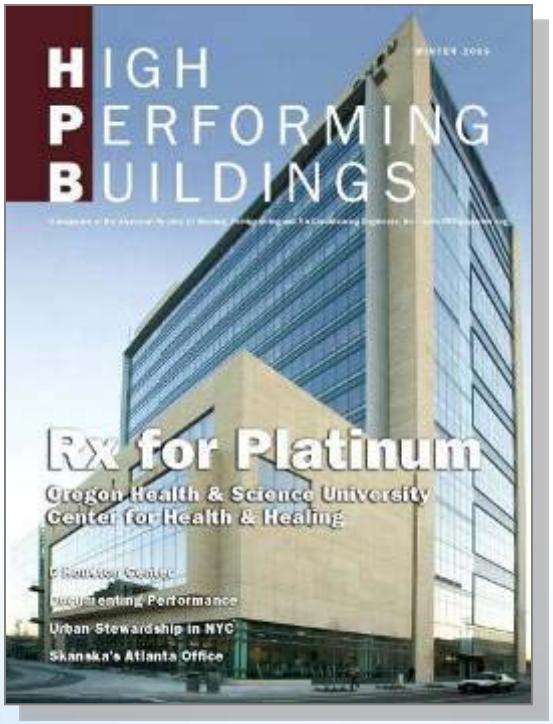
(http://www.ashrae.org/technology/page/331)

Visit the project committee website (if applicable)

(http://www.ashrae.org/publications/detail/15373)

Highlighting Innovative Technologies

- Cases studies featured provide performance data, verifying actual sustainability performance
- Free subscription for architects, building owners and facility managers
- www.HPBmagazine.org



Education and Training

Seminars developed and delivered by subject matter experts

- Face-to-face
  - at ASHRAE and other industry meetings
  - at your chapter, for discounted rates
- Online

Self-paced courses

- eLearning
- Text-based

www.ashrae.org/education

Sustainable Design eLearning

- Full courses – 5 to 35 hours each on topics including
  - Standard 90.1
  - Small Retail AEDG
  - Small Office Building AEDG
  - Data Center Energy Use
  - Fundamentals of Sustainable Buildings and High Performance System Design
- Short courses – 1 to 5 hours each
  - Stand-alone modules based on the full courses
  - Literally dozens of short courses, with more being added all the time
- Annual Subscription – 12 month access to all courses

www.ashrae-elearning.org

Certification

ASHRAE certification provides members with benefit of professional designations that showcase their body of knowledge to the industry

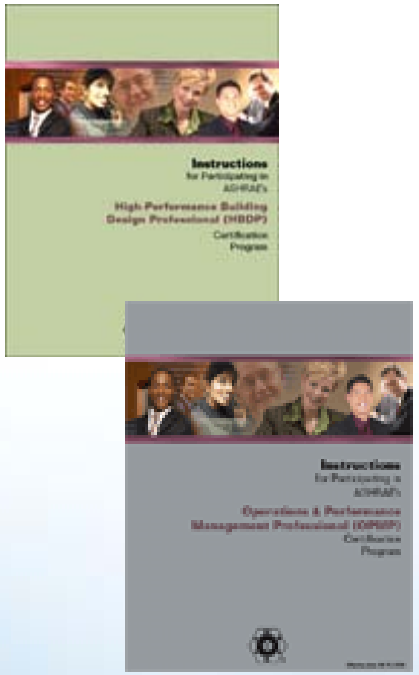
More than 200 certified

- High-Performance Building Design Professional
- Commissioning Process Management Professional
- Operations & Performance Management Professional
- Healthcare Facility Design Professional
- Building Energy Modeling Professional
- Building Energy Assessment Professional

www.ashrae.org/certification

Certification

- Exams are 2 – 2½ hours with 115 multiple choice questions
- 200 testing centers worldwide
- 12 sites in Canada
  - ✓ Alberta - Edmonton
  - ✓ British Columbia – Kelowna
  - ✓ Ontario – Courtice, Mississauga (3), Hamilton, Oakville, Etobicoke, Ottawa
  - ✓ Nova Scotia – Halifax
  - ✓ Quebec – Montreal



High Performance Buildings Database

- Share successes and lessons learned about projects
- Public database
- Actual Energy Information
- FEMP, USGBC, AIA, DOE all have “front ends”

www.highperformancebuildings.gov

ASHRAE Resources

ASHRAE References

ASHRAE	www.ashrae.org
Advanced Energy Design Guides (free download)	http://www.ashrae.org/technology/page/938
Building Energy Labeling	http://www.buildingeq.com/
Certification	http://www.ashrae.org/certification/
Education	http://www.ashrae.org/education/
Engineering for Sustainability	http://www.engineeringforsustainability.org/
Government Affairs Update	http://www.ashrae.org/advocacy/page/1344
Headquarters Renovation	http://images.ashrae.biz/renovation/
High Performing Buildings Magazine	http://www.hpbmagazine.org/
Membership	http://www.ashrae.org/members/page/589
Online Learning	http://www.ashrae.org/education/page/1476
Special Projects	http://www.ashrae.org/technology/page/678
Standards - general	http://www.ashrae.org/technology/page/548
Standards - project web sites	http://www.ashrae.org/publications/detail/15373

ANSI References

American National Standards Institute	www.ansi.org
Global Standards Search Engine	www.nssn.org
Manufacturer Member Roundtable in China	http://www.ansi.org/news_publications/news_story.aspx?menuid=7&articleid=2286&source=whatsnew082409
Standards Action newsletter	http://www.ansi.org/news_publications/periodicals/standards_action/standards_action.aspx?menuid=7
US – China Standards Portal	www.standardsportal.org

Other References

CoStar Green Study	www.CoStar.com/Partners/CoStar-Green-Study.pdf
Department of Energy (U.S.) – Energy Efficiency & Renewable Energy	http://www.eere.energy.gov/
Building Energy Codes Training	http://www.energycodes.gov/training/
Commercial Building Energy Alliance	http://www1.eere.energy.gov/buildings/commercial_initiative/alliances.html
High Performance Buildings	www.highperformancebuildings.gov
Environmental Protection Agency – Energy Star	http://www.energystar.gov/
EU Directorate-General for Energy and Transport	http://ec.europa.eu/dgs/energy_transport/index_en.html
European (EN) Standards and Implementation	www.buildingsplatform.eu
National Institute of Building Sciences	www.nibs.org
High Performance Buildings Council	http://www.wbdg.org/news/release_061808.php
Whole Building Design Guide	http://www.wbdg.org/index.php

Questions?