Deep Energy Savings Research in Existing Commercial Buildings

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October 18, 2012
Urban Land Institute Fall Meeting
Denver, Colorado
New Buildings Institute (nbi)

nbi is a driving force behind improved energy performance in commercial buildings.

Deep technical expertise & understanding

- Leadership & Policy
- Design Guidance
- Research, Building Science & Performance
3 Topics Today

1. Program Trends
   (regulatory & voluntary)

2. Proven Performance & Costs

3. Technology & Tenants
3 “Truths” to Take Away

• Future Proofing Buildings through Efficiency Improvements is a Sound Business Strategy

• 50% Savings on Energy is Realistic and Proven

• Technologies matter but Operators and Tenants Rule
Ratings and Labels
LEED

• ~1.5 Msf Certified Each Week
• 170,000 LEED AP in 2011; (~100,000 registered architects in the US)
• Market recognition and demand for High Performance Buildings
• Broad adoption of Integrated Design Strategies
• Widespread use of performance tools
  – Energy Modeling
  – Commissioning
  – Energy Codes
Certified
(Score of 75+): 17,000 bldgs
2.5 billion SF
ULI Greenprint Center for Building Performance

A Groundbreaking high-performance building district in Downtown Cleveland

Pittsburgh 2030 District, and others coming soon!

Reduce Energy, Water, and Transportation Impacts by 50% by the year 2030
CBRE Green Bldg. Study: 147 properties – 58m SF

Rental Rates

Green buildings:

1. Have higher rents by 2-5%
2. Have higher effective rents by 6-7%
3. Have higher selling prices by 11-13%

2009: $27.00
2010: $27.22
2011: $27.62

Pogue, CBRE< Kwok, et. al “Do Green Buildings Make Dollars and Sense, 2011”
Buildings Rating and Disclosures
Topic 2: Proven Performance & Costs
The Beardmore Building
Priest River, ID, USA

PROJECT OVERVIEW:
• Multi-Tenant Office
• 2-Story, 28,800 sf
• Constructed in 1922
• Retrofit 2006 – 2008
• EUI: 32 kBtu/sf/yr
• Energy Star Rating: 90
• LEED Gold and National Historic Registry
• Investment Fund

“...Sparked new economic life into the community, giving it a renewed sense of pride and entrepreneurial spirit.”
-Brian Runberg, Owner

Source: NBI
Photo Credit: Marie Dominique Verdier

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The Beardmore Building
Priest River, ID, USA

YOUR BUILDING

SITE EUI

COMPARATIVE BUILDING

160
140
120
100
80
60
40
20
ZERO

60% less

Beardmore EUI

National Avg. Office EUI (CBEECS)
Portfolio Manager EUI
Best practice existing building

Source: NBI
Photo Credit: Marie Dominique Verdier
The Beardmore Building
Priest River, ID, USA

BUSINESS

- Complete rebuild $105/ft²*
- ~ $25,000 per year energy savings
- Applied cost/benefit analysis to energy measures
- Rents average ~ 35% higher than other local properties.

*after tax credits and incentives

Source: NBI
Photo Credit: Marie Dominique Verdier
The Alliance Center
Denver, CO, USA

PROJECT OVERVIEW
- Multi-tenant non-profit office
- 6-story, 38,000 ft²
- Constructed: 1908
- Retrofit: 2006
- EUI: 42 kBtu/ft²/year
- EnergyStar rating: 85
- LEED EB Gold, CI Silver, EnergyStar Champion Award
- Owner: Alliance for Sustainable Colorado

Source: NBI
Photo Credit: Alliance for Sustainable Colorado
© U.S. Green Building Council 2012
The Alliance Center Office Building
Denver, CO USA

ALTERNATIVE VIEW OF ENERGY COMPARISON

<table>
<thead>
<tr>
<th>kBtu/ft²/year</th>
<th>Alliance Center Measured Energy Use</th>
<th>Average for comparable office buildings</th>
<th>Average for all U.S. Office Buildings</th>
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<td>42</td>
<td>69</td>
<td>93</td>
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Source: NBI, 2011
The Vance Building
Seattle, WA, USA

134,000 sf
1929 built,
2007 remodel
39 EUI

BUSINESS OVERVIEW:
- Building occupied during renovation
- Improvement cost: $26/sq ft
- Increased occupancy by 26% since renovation
- Created TI guidelines for tenant retrofits to guide design decisions for daylighting, ventilation, and finishes.

Source: NBI
Photo Credit: Lara Swimmer
NW High Rise: Less Chillers = new top floor space

Sketch of new top floor HVAC areas that become leasable if the retrofit is deep enough: 1st year rent approx. $500k!

‘Deductive Design’
Topic 3: Technologies & Tenants
The Vance Building
Seattle, WA, USA

EFFICIENCY MEASURES
• Removed ducted heating systems
• Recalibrated steam heating system
• Localized thermostats
• Operable windows
• Automated sunshades
• Lighting retrofit with automated controls
• Light shelves
• CO2 sensors
• Re-commissioning
SAVINGS STRATEGIES

**Lighting Measures:** high efficiency lighting, integrated daylighting, and lighting controls

**HVAC:** advanced systems, radiant heating/cooling, evaporative cooling, energy mgmt. controls, motorized ventilation dampers, demand controlled (CO₂) ventilation

**Daylighting:** integrated lighting controls, automated blinds, exterior shades, skylights

**Envelope:** operable windows, increased insulation, improved glazing

**Controls/Monitoring/Cx:** whole building monitoring, tenant-level metering, ongoing tracking, continuous commissioning

Source: NBI

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TENANT STRATEGIES

OPERATING YOUR GREEN SPACE

How you manage the details of ongoing operations in your space after you take occupancy can have a tremendous impact. Here are some things to consider:

Purchase Energy-Efficient Equipment and Products
- Purchase ENERGY STAR-rated equipment to ensure efficient computers, copiers, and appliances that reduce the consumption and expense of electricity.
- Use recycled paper products and other office products with high post-consumer recycled content.

Control Energy Consumption
- Switch off overhead lighting whenever possible. Barren daylight, and use task lighting rather than light the entire space.
- Actively manage electrical equipment, such as copiers and computers, to reduce their power consumption and heat gains and trim occupancy costs.
- Adjust the heating to your needs using the Duration temperature control feature on the ceiling radiators. Please contact the building manager if you need assistance setting the thermostat that is right for you.

Maintain Natural Ventilation and Thermal Comfort
- During summer months, try opening windows, shutters, and ceiling fans to improve indoor air quality and enhance thermal comfort. Here are some things you can do:
  - Increased air movement (opening windows). Open both the top and bottom of the windows to encourage natural ventilation through the diurnal movement of fresh air, which enters through the bottom or split at the top. Studies have shown that naturally ventilated buildings generally have lower incidences of sick building syndrome because greater quantities of outside air bring in more oxygen.
  - Increased air movement (using fans). Use ceiling fans to increase air movement, which can typically lower the effective comfort temperature by 3° Fahrenheit.

Source: NBI
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PLUG LOADS

NIGHT ENERGY USE AS A KEY PERFORMANCE INDICATOR (KPI)

PLUGS:
- Often 2-5 times lighting loads!
- Typically approximately 50-90% of day use still used at night

Source: NBI CEC PIER Research
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3 “Truths” to Take Away

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You influence.....
Questions?

If it’s possible – how do we make it prolific?

Thank you ULI!

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