LEED Beyond Occupancy

April 27, 2012

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Innovative Design
USGBC NC Triangle Chapter

Agenda

1. Survey
2. LEED Building Performance
3. Common Issues
4. What Owners Should Know
5. Q&A
Annual Sponsors

Mission:
To transform the way buildings and communities are designed, built and utilized, enabling an environmentally and socially responsible, healthy, and prosperous environment for current and future generations in central and eastern North Carolina.

Vision:
Buildings and communities will regenerate and sustain the health and vitality of all life within a generation.
**About the Organization**

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter Members</td>
<td>~350</td>
</tr>
<tr>
<td>USGBC National Members in Territory</td>
<td>~175</td>
</tr>
<tr>
<td>Active Chapter Volunteers</td>
<td>100</td>
</tr>
<tr>
<td>Chapter Committees</td>
<td>9</td>
</tr>
<tr>
<td>Annual Budget</td>
<td>~$160,000</td>
</tr>
<tr>
<td>Board of Directors</td>
<td>15</td>
</tr>
<tr>
<td>Staff</td>
<td>1.5</td>
</tr>
<tr>
<td>How often does your board meet?</td>
<td>Monthly</td>
</tr>
<tr>
<td>How often do your committees meet?</td>
<td>Monthly (typically)</td>
</tr>
</tbody>
</table>

**USGBC/LEED in NC**

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEED Certified Projects in NC</td>
<td>~270</td>
</tr>
<tr>
<td>LEED Registered Projects in NC</td>
<td>~744</td>
</tr>
<tr>
<td>LEED APs in NC</td>
<td>~4375</td>
</tr>
<tr>
<td>Chapters (Triangle, Triad, Charlotte)</td>
<td>3</td>
</tr>
</tbody>
</table>

Branches

![Map Resources](www.mapresources.com)
2011-2013 Strategic Plan

• Education
• Public Policies on Green Buildings
• Social Equity
• Building Performance Initiative
• Organizational Excellence

Building Performance

Five Major Areas of Building Performance Within the LEED Program:
- Sustainable Site Development
- Water Savings
- Energy Efficiency
- Materials Selection
- Indoor Environmental Quality
Talk-n-Walk:  
The Art of Sustainability  
Sponsored by Lappas + Havener, PA  
Wednesday, April 25th - 4:30pm - 6:30pm  
NC Museum of Art  
2110 Blue Ridge Road  
Raleigh, NC 27607

Generation Green: Celebrating a New Generation of Builders  
Saturday, April 28th - 4:30 pm  
N.C. Museum of Natural Sciences  
11 West Jones Street  
Raleigh, NC 27601

Membership Luncheon w/ Governor Perdue  
Thursday, May 24th - 11am - 2pm  
Radisson Hotel RTP  
150 Park Drive  
Durham, NC 27709

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Survey

Do you have LEED certified buildings on your campus?

Do you manage LEED certified buildings?
Survey

As a FM, when do you begin participating in a new project?

a. At the beginning of the design
b. At the construction document phase
c. During the construction – usually during TAB/Commissioning
d. After project completion

Survey

As a FM, do you know how much of energy your buildings consume?

As a FM, do you know how much of energy your buildings are designed to consume?
LEED Building Performance

USGBC Cascadia, 2006

- 11 LEED Certified Buildings
- Actual compared to Design
- Actual compared to Baseline
- Actual compared to Energy Star Median

Source: USGBC Cascadia, 2006
LEED Building Performance

Source: USGBC Cascadia, 2006

New Building Institute Study, 2008

- 121 LEED Certified Buildings
- EUI comparisons to CBECs
- EUI comparisons to Energy Star
- Actual vs. modeled energy use comparison
LEED Building Performance

Source: New Building Institute Study, 2008
LEED Building Performance

Source: New Building Institute Study, 2008

GSA, 2009

• 12 LEED Certified Buildings
• EUI comparisons to CBECs
• EUI comparisons to Energy Star
LEED Building Performance

26%
Less energy use
(66 kBtu/sf/yr vs. 88 kBtu/sf/yr).

27%
Higher occupant satisfaction

13%
Lower aggregate maintenance costs ($2.88/sf vs. $3.30/sf)

33%
Fewer CO₂ emissions
(19 lbs/sf/yr vs. 29 lbs/sf/yr)

Source: GSA, 2008

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LEED Building Performance

![Graph showing energy use intensity](chart.png)

ENERGY USE INTENSITY
(kBtu/sf/yr)

Source: GSA, 2008
LEED Building Performance

Source: GSA, 2008

LEED Building Performance

USGBC Chicago, 2009

• 25 LEED Certified Buildings
• EUI comparisons to CBECs
• EUI comparisons to Energy Star
LEED Building Performance

Source: USGBC Chicago, 2009

LEED Building Performance

Source: USGBC Chicago, 2009
LEED Building Performance

USGBC NC Triangle, 2012

- 25 LEED certified buildings were contacted
- 12 buildings are analyzed
- Various project types
  - Hi-Ed = 5
  - Office = 2
  - Public Assembly = 1
  - Retail = 1
  - Education = 1
  - Data Center = 1
  - Mixed other = 1

LEED Building Performance

USGBC NC Triangle, 2012

- EUI comparison to CBECs
- EUI comparison to Energy Star
- EUI comparison to State Owned Buildings
- Actual vs. modeled (if model is provided)
- Water usage analysis
LEED Building Performance

USGBC NC Triangle, 2012

- 12 Buildings are within CBECs categories.
- 10 Buildings are within EPA Target Finder categories.
- 9 Buildings are within State’s energy data.
- 1 Building provided modeled energy data.
- Water comparison baseline is not available.

LEED Building Performance

Further Investigation Needed

Source: USGBC NC Triangle Chapter, 2012
LEED Building Performance

Average

- Actual compared to CBECS = 32% more
- Actual compared to Target Finder 50 = 22% more
- Actual compared to State Avg. = 9.9% more

Source: USGBC NC Triangle Chapter, 2012
**LEED Building Performance**

**SB 668**

- Passed in 2007
- Been effective since summer 2008
- 30% more efficient than ASHRAE 90.1-2004 (could be approx. 50% less than CBECS)
- Not many buildings complete and been in operation

Source: USGBC NC Triangle Chapter, 2012

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**LEED Building Performance**

**Phase I Wrap-Up**

- Will deliver individual project report to owners (confidential)
- Will publish overall analysis report in May (open)
- Will contact owners to recruit Phase II participants
- Will call for sponsorship for Phase II (goal = $30K-45K)

Source: USGBC NC Triangle Chapter, 2012
LEED Building Performance

Phase II Study

• Teamed up with NCSU professor and grad students
• Will select 2-5 projects
• Will install monitoring devices and track records for months
• Will analyze data and possibly recalibrate modeling
• Will recommend improvement strategies
• Will publish

Source: USGBC NC Triangle Chapter, 2012

LEED Building Performance

Common Findings

• Energy saving = 15-30% to CBECs
• BUT, not as great as anticipated.
• No co-relation between LEED level and energy saving
• Energy saving relative to EAc1 points.
• Modeling and actual are very inconsistent.
• Project types with high process load are problematic.
### Early Involvement

- Understanding design intent for good maintenance
- Maintenance concern in design
- Investigating energy efficiency options together – plug load, operation sequence, etc.

### Knowing what to expect

- Goal setting at the beginning
- Understanding energy modeling
  - What’s included and what’s not
  - Plug load
  - Schedule assumption
- Prescriptive method is not good
Common Issues

Lack of monitoring systems

• Difficult in monitoring
• Lack of submetering and M&V
• Submetering, if there is, not following modeling categories

Common Issues

Example

- Lighting
- Plug loads
- Space heating
- Space cooling
- Heat rejection
- Pumps & auxiliary
- Fan energy
- Exterior lighting
- Domestic hot water
Common Issues

Lack of involvement

- Many building owners not having energy modeling files and LEED documents
- Lack of connection between facility planners, finance office and facility managers
- Designers disconnected after occupancy

What Owners Should Know

RFP for Designers

- LEED project experience requirement is not enough.
- Specify energy and water goals.
- Require modeling and verification experience or capability and include in the service.
- Require LCCA experience and include in the service.
## What Owners Should Know

### Design Process

#### Team

- Can your project use Integrated Project Delivery method instead of design-bid-build?
- Assign owner’s PM and **FM** from the beginning.
- Involve end-users.
- Combine CxA + LEED consultant as owner’s rep.

#### Contracts and Submissions

- Design decision making must be backed up by LCCA.
- Clearly define deliverables
  - Energy modeling
  - LCCA
  - LEED scorecard and checklist
- Post Occupancy Involvement
What Owners Should Know

Design Process

Coordinations and Owner’s Inputs

• FM’s inputs throughout
• O&M cost and accessibility consideration
• Be familiar with energy and water projections
• Question designers how systems and products are selected

Reedy Fork Elementary Energy Performance

Btus/square foot/year (projection based upon first half year of data)
EXAMPLE

Reedy Fork ES
Greensboro, NC

Heritage Middle School

Heritage Middle School N.G. Consumption

2004-05
2005-06
2006-07
2007-08
Typical Climate Year

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000

jul  aug  sep  oct  nov  dec  jan  feb  mar  apr  may  jun

2007

2004
Thank You!

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