Value of Commissioning Database - Update

BCxA Marketing Committee/Task Force
Lawrence Berkeley National Laboratory
AIA Quality Assurance

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.
Learning Objectives

1. Share the value and cost of commissioning with building community stakeholders
2. How market and quantitative data will be used to support the roadmap for future commissioning
3. Improve communication among project stakeholders with regard to commissioning requirements
4. Demonstrate the strengthen of advocacy at the BCxA.
2016 BCxA Leadership Conference
BCA Experiment Design Worksheet

EXPERIMENT NAME: Create Database to Demonstrate Value

TESTABLE PROPOSITION (We believe that...) providing metrics on the benefits/costs of the process (ABC) with enhanced the value proposition to stakeholders.

INTENDED EXPERIMENT (To test our proposition, we would like to...) define database inputs, acquisition process, create focus groups, start to obtain data.

ASSESSMENT CRITERIA (We will determine what’s happening by ...) Can you build a database? Go to stakeholders to ask if this has value?

LEARNING OUTCOMES (We want to learn...) Can a database be built? Would the stakeholders see its value and use it? Would stakeholders participate in process to build database?
**January 2017 – Initial Marketing Cmte Survey**

Would you value an up-to-date project-focused commissioning database as a membership benefit?

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>86.40%</td>
</tr>
<tr>
<td>No</td>
<td>2.40%</td>
</tr>
<tr>
<td>Need more information</td>
<td>11.20%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

![Bar chart showing the distribution of responses](chart.png)
Building Commissioning:


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Report Prepared for:
California Energy Commission
Public Interest Energy Research (PIER)

July 21, 2009
Value of Commissioning Database - Goals

- Refresh the LBNL 2009 survey
  - Maintain consistency in the dataset
  - Reflect changes to the industry due to maturity
  - Define effects of changes to Cx approach (such as Ongoing Cx)
  - Include economics for Cx of additional systems
  - Expand database for different building types, markets
- Update metrics that establish value of Cx
- Identify appropriate level of data to gather
- Create an iterative process for data gathering
- Take partial ownership of landmark survey
# 2009 LBNL Study

## Type and size of buildings in database

**Locational Sample**

- 643 buildings
  - 562 existing
  - 82 new
- 99 million square feet
- $43 million investment
- 26 states

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Existing</th>
<th>New Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>3,123,754</td>
<td>2,467,661</td>
<td>656,093</td>
</tr>
<tr>
<td>Higher Education</td>
<td>12,029,520</td>
<td>11,401,833</td>
<td>627,687</td>
</tr>
<tr>
<td>Food Sales</td>
<td>983,402</td>
<td>848,039</td>
<td>135,363</td>
</tr>
<tr>
<td>Food Service</td>
<td>187,724</td>
<td>187,724</td>
<td>-</td>
</tr>
<tr>
<td>Health Care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient healthcare</td>
<td>4,525,424</td>
<td>4,319,124</td>
<td>206,300</td>
</tr>
<tr>
<td>High-tech Facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleanrooms</td>
<td>301,000</td>
<td>-</td>
<td>301,000</td>
</tr>
<tr>
<td>Data Center</td>
<td>12,888</td>
<td>12,888</td>
<td>-</td>
</tr>
<tr>
<td>Laboratory</td>
<td>6,526,656</td>
<td>4,561,593</td>
<td>1,965,065</td>
</tr>
<tr>
<td>Inpatient</td>
<td>7,478,988</td>
<td>6,791,029</td>
<td>687,959</td>
</tr>
<tr>
<td>Lodging</td>
<td>10,037,291</td>
<td>9,880,307</td>
<td>156,984</td>
</tr>
<tr>
<td>Mercantile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td>2,926,038</td>
<td>2,926,038</td>
<td>-</td>
</tr>
<tr>
<td>Service</td>
<td>227,000</td>
<td>227,000</td>
<td>-</td>
</tr>
<tr>
<td>Office</td>
<td>40,867,062</td>
<td>39,972,765</td>
<td>894,296</td>
</tr>
<tr>
<td>Public Assembly</td>
<td>3,166,611</td>
<td>2,476,985</td>
<td>689,626</td>
</tr>
<tr>
<td>Public Order and Safety</td>
<td>4,756,949</td>
<td>2,485,277</td>
<td>2,271,672</td>
</tr>
<tr>
<td>Religious Worship</td>
<td>12,500</td>
<td>12,500</td>
<td>-</td>
</tr>
<tr>
<td>Warehouse and Storage</td>
<td>175,379</td>
<td>13,500</td>
<td>161,879</td>
</tr>
<tr>
<td>Industrial</td>
<td>475,000</td>
<td>475,000</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>1,411,622</td>
<td>1,351,622</td>
<td>60,000</td>
</tr>
<tr>
<td>Vacant</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Total** | 99,224,809 | 90,410,864 | 8,813,925

*Note in some cases floor area is apportioned among more than one building type.*
## Partnership Benefits

**LBNL**  
- Creditability  
- Consistency  
- Familiarity  
- Analytical capability  
- Network to organizations  

**BCxA**  
- Access to stakeholders  
- Connection to market demand  
- Peer Perspective

- Report to be co-authored by LBNL and BCxA, attribution to DOE, and availability as a DOE-CBI resource.  

- Available Mid Year 2018
Cx Database – Completed Tasks

- Created Task Force
- Researched existing surveys
- Reviewed input forms
- Created revised forms
- Sent Data Survey Input to Pilot Group
- Sent Market Survey to BCxA stakeholders
- Outreach to Cx software companies
LBNL Cx Database – Project Data Input Form

• Separate survey forms for NCCx, EBCx, OCx
• Provide information per project (type):
  • Project Descriptions
  • Reasons for Commissioning
  • Deficiencies/Measures
  • Commissioning Cost Data
  • Baseline Energy Use and Savings
  • Non-Energy Impacts
• Pilot:  Started September 2017
• Launch:  October 2017
• Deadline:  March 30, 2018
## LBNL Cx Database – Project Data Input Form

<table>
<thead>
<tr>
<th>PROJECT DESCRIPTION</th>
<th>Project 1</th>
<th>Project 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBCx provider firm</td>
<td>Name</td>
<td>Enter &quot;in-house&quot; if done exclusively with internal staff. Enter &quot;unknown&quot; if information not available.</td>
</tr>
<tr>
<td>Utility-supported project? (received incentives and/or services)</td>
<td>Name of utility</td>
<td>Include multiple utilities if applicable</td>
</tr>
<tr>
<td>Location - City</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Project Location - State</td>
<td>Postal Abbreviation</td>
<td></td>
</tr>
<tr>
<td>Project Location - Country</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If country other than the US, indicate currency type</td>
<td>Text [3-letter code]</td>
<td>Use same currency throughout this form</td>
</tr>
<tr>
<td>Building ownership</td>
<td>Public; Private</td>
<td></td>
</tr>
<tr>
<td>Number of buildings in EBCx project</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Year original construction completed (if new construction Cx, only)</td>
<td>Year (NNNN)</td>
<td></td>
</tr>
<tr>
<td>Year EBCx project completed</td>
<td>NNNN</td>
<td></td>
</tr>
<tr>
<td>Entire building - Floor Area</td>
<td>square feet</td>
<td></td>
</tr>
<tr>
<td>Floor area served by EBCx project</td>
<td>square feet</td>
<td></td>
</tr>
<tr>
<td>If other floor area units, indicate here:</td>
<td>list unit used</td>
<td></td>
</tr>
</tbody>
</table>
### LBNL Cx Database – Project Data Input Form

#### EBCx COST DATA - [See "Cost Rules" tab for costs to include/exclude]

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total EBCx cost [$, or other currency in year incurred]</td>
<td></td>
</tr>
<tr>
<td>Of which, External Commissioning Provider Fee costs in year incurred</td>
<td></td>
</tr>
<tr>
<td>Agent fee (%)</td>
<td></td>
</tr>
<tr>
<td>Of which, monitoring/measurement-related costs costs in year incurred</td>
<td></td>
</tr>
</tbody>
</table>

#### BASELINE ENERGY USE AND SAVINGS

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPMVP Energy Savings Determination Method – DOMINANT METHOD SHOULD BE LISTED IN THIS ROW</td>
<td>A; B; C; D; or E</td>
</tr>
<tr>
<td>Engineering Estimates/Simulations (no measurements) = “E”</td>
<td>Y(es); N(no); U(unknown)</td>
</tr>
<tr>
<td>Total (Whole-Building) Electricity usage:</td>
<td></td>
</tr>
<tr>
<td>Before EBCx</td>
<td>kWh/year</td>
</tr>
<tr>
<td>After EBCx</td>
<td>kWh/year</td>
</tr>
<tr>
<td>Savings</td>
<td>kWh/year</td>
</tr>
</tbody>
</table>

#### REASONS FOR EBCx

- Ensure system performance (energy and non-energy-related systems)
- Obtain energy savings
- Ensure or improve thermal comfort
- Extended equipment life
- Train and increase awareness of building operators or occupants
- Smoother process and turnover (new construction)
- Increase occupant productivity
- Ensure adequate indoor air quality
- Comply with LEED or other sustainability rating system
- Reduce liability
- Qualify for rebate, financing, or other services
- Research/demonstration/pilot
- Participation in utility program
- Comply with organizational mandate/policy
- Comply with existing buildings ordinance
- Other

#### DEFICIENCIES & MEASURES

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Problems (deficiencies) Identified, by Component:</td>
<td></td>
</tr>
<tr>
<td>Total Number of Deficiencies Identified</td>
<td>(Number)</td>
</tr>
</tbody>
</table>
Cx Database – Market Input Form

• Separate survey questions for Market, NCCx, EBCx, OCx
• Assume general experience over last 12 months (not project based)
• Questions focus on:
  • Market influences
  • Drivers for procuring commissioning services
  • Incorporation of best practices
  • Effectiveness and persistence of Cx practices
• Round 1 – Completed (111 responders)
• Round 2 – Send out October 2017
• Round 3 – Send out January 2018 (Goal: 500)
Market Section - Job Classification

- Commissioning Provider
- Construction Manager
- Design Engineer
- Owner
- Energy Manager
- Owner's Representative
- Facility Manager
- Program Manager
- Mechanical Contractor
- Other

111 answered

94
Market – What is Influencing Cx Market?

Voluntary Rating Programs: Very Important
Owner Awareness: Important
Utility Programs: Neutral
Trade Associations: Neutral
Public Policies: Very Important
Building Codes: Important
Other: Neutral

Not Important  Slightly  Neutral  Important  Very Important

NCBC 2017
Market - % Projects are Qualifications vs. Price?

- Less than 20%: 28%
- 20 to 40%: 17%
- 40 to 60%: 26%
- 60 to 80%: 22%
- Greater than 80%: 6%
Market – Cx projects are Increasing Profitable?

- Strongly Disagree: 3%
- Disagree: 15%
- Neutral: 47%
- Agree: 31%
- Strongly Agree: 4%
Market - % of New Projects “Commissioning Lite”

- Less than 20%: 36%
- 20 to 40%: 23%
- 40 to 60%: 22%
- 60 to 80%: 13%
- Greater than 80%: 6%
How Long has your Firm offered Commissioning?

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>NCCx</th>
<th>EBCx</th>
<th>OCx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 years</td>
<td>6</td>
<td>10</td>
<td>34</td>
</tr>
<tr>
<td>3 to 5 years</td>
<td>6</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td>5 to 10 years</td>
<td>20</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Over 10 years</td>
<td>65</td>
<td>42</td>
<td>7</td>
</tr>
</tbody>
</table>

NCCx: 6, 6, 20, 65
EBCx: 10, 13, 24, 42
OCx: 34, 19, 12, 7
NCCx – Systems in scope outside of MEP?

[Bar chart showing distribution of systems in scope outside of MEP]
NCCx - % of Projects with Sampling?

- Less than 20%: 20%
- 20 to 40%: 15%
- 40 to 60%: 19%
- 60 to 80%: 21%
- Greater than 80%: 26%

NCBC 2017
NCCx - % of Design Review Comments are included in Contract Documents?

- 28% Less than 20%
- 19% 20 to 40%
- 20% 40 to 60%
- 25% 60 to 80%
- 9% Greater than 80%

NCBC 2017
EBCx/OCx – Average Simple Payback

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>EBCx</th>
<th>OCx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 6 months</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>6 to 12 months</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>1 to 2 years</td>
<td>15%</td>
<td>20%</td>
</tr>
<tr>
<td>3 to 5 years</td>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td>Over 5 years</td>
<td>35%</td>
<td>40%</td>
</tr>
</tbody>
</table>
EBCx/OCx – Average Energy Savings

![Bar Chart]

- Less than 5%
- 5 to 10%
- 10 to 20%
- 20 to 30%
- More than 30%

EBCx  OCx
OCx - % Projects including Fault Diagnostics?

- 39% Rarely
- 26% Sometimes
- 7% Often
- 7% Always
- 21% Never
OCx - % Projects Renewed Past First 12 Months?

- Less than 10%: 52%
- 10 to 20%: 11%
- 20 to 40%: 9%
- 40 to 80%: 22%
- Greater than 80%: 6%
Cx Database – Remaining Tasks

• Engage and survey providers to obtain project costs/benefits, information on systems and measures, market drivers
  • Market Survey Round 1 - Complete
  • Market Based Survey Round 2 – October to November 2017
  • Market Based Survey Round 3 – January to February 2018
  • Project Data Survey – Pilot – Complete
  • Project Data Survey – October 2017 to March 2018
  • Cx Software Company Survey – November 2017 to March 2018
• Analyze data, develop findings and conclusions (LBNL) – Start March 2018
• Document findings in ppt, fact sheet, journal article (LBNL/BCxA) – Start May 2018
• Disseminate findings in webinars, news articles, websites, conferences (LBNL/BCxA) – Start June 2018
Acknowledgment and Thanks to:

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