

Commissioning Study Update



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Project Summary

Timeline:

Start date: June 2017

Planned end date: October 2018

Key Milestones

1. Study design: Q4 FY17
2. Engage and survey Cx providers: Q3 FY18
3. Analyze data: Q4 FY18
4. Document findings: Q1 FY19

Budget

Total Project \$ to Date:

- DOE: \$225K
- BCxA Cost Share: \$95K

Total Project \$

- DOE: \$225K
- BCxA Cost Share: \$110K

Key Partner:

Building Commissioning Association (BCxA)

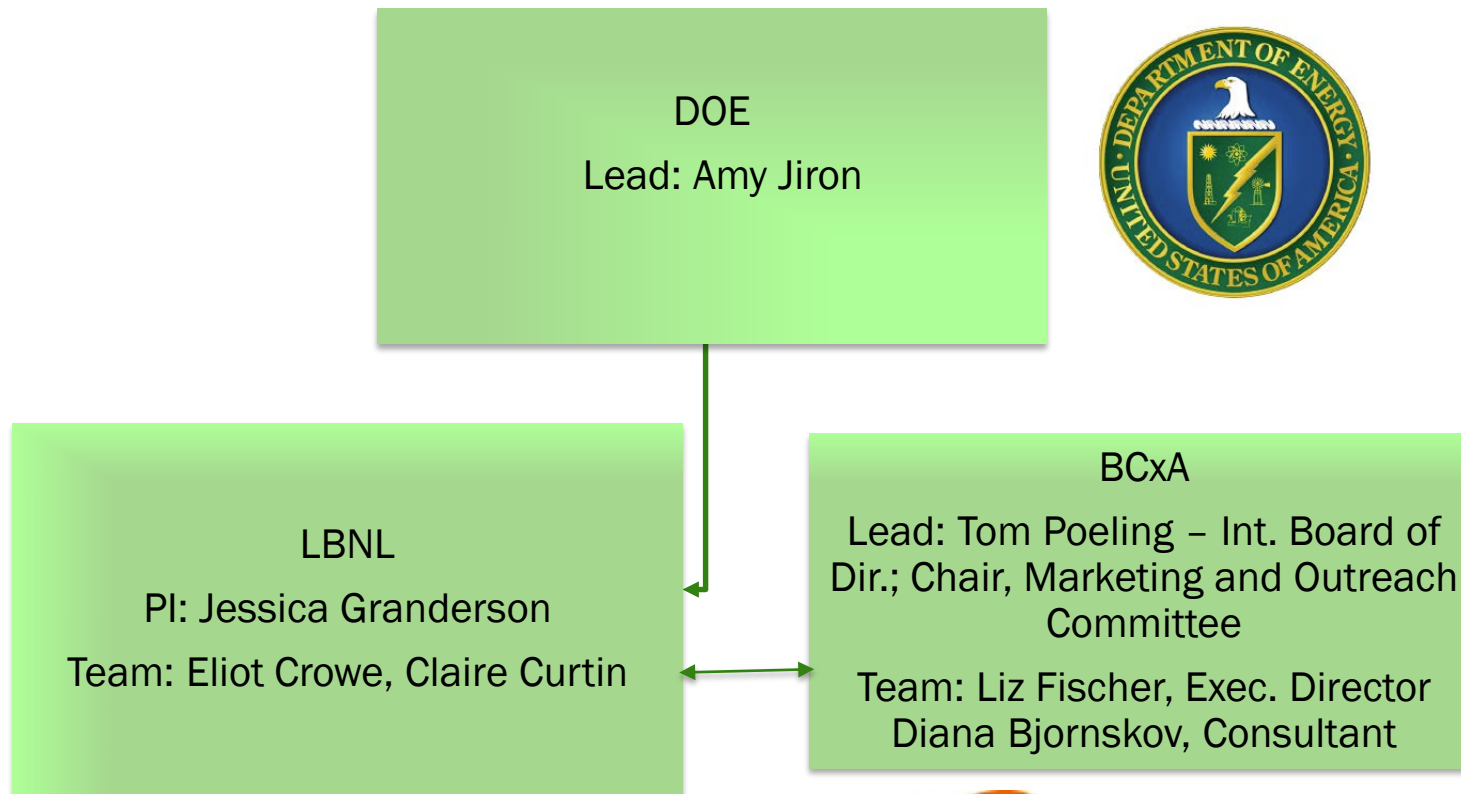
Project Outcome:

Meta-analysis of costs and benefits of commissioning, updating 2004/2009 study, *The Cost Effectiveness of Commercial Building Commissioning*

Maintain relevance as the world's largest and current resource of Cx cost and benefit data for commercial buildings

CBI MYPP Strategy S2, prove energy saving solutions in new and existing buildings that can greatly reduce EUI through market partnerships on a national scale

Team



The Building Commissioning Association (BCxA) is an international non-profit organization that serves as an authority and resource on commissioning.

BCxA membership internationally is 5000+ members.

Challenge

Cost-effectiveness of Commercial Buildings Commissioning (Cx) (2004/2009), is go-to reference to make case for implementing Cx, for owners and **policymakers**

- Systematic process to ensure intended operation
- **16% savings existing, 13% new constr., payback 1 yrs and 4 yrs**

But stakeholders want current information on:

- Today's costs and benefits
- Advances, e.g. use of analytics
- Expansion of systems of focus
- New building types



And the time is right for an update, given industry's evolution over the last 10 yrs

- Utility Cx programs have matured, are expanding
- City disclosure ordinances, e.g., NYC and SF, have created new stimulus to understand building performance
- CBI partners, BCxA members, Cx providers have requested updated, standardized analysis on savings and cost-effectiveness of Cx

Approach

Qualitative Market Study

- Gather data from >100 Cx providers on procurement drivers, market influencers, profitability certifications, project scopes, etc.

Quantitative Data Study

- Adapt 2004/2009 data collection tool to capture new areas, e.g. ongoing Cx, use of analytics
- Obtain project data from BCxA membership and Cx utility programs
- Compare new data to prior findings to assess changes in Cx costs, benefits, scope, methods
- Merge with qualitative study findings

Primary Elements of Survey

- **Project description** – location, sq ft, bldg type
- **Reasons for Cx** – energy savings, improve comfort, utility program
- **Deficiencies & Measures** – lighting, envelope, plug load
- **Cx Cost Data** – scope of Cx, fees, who paid
- **Baseline Energy Use & Savings** – usage by fuel types, baseline method
- **Non-Energy Benefits**

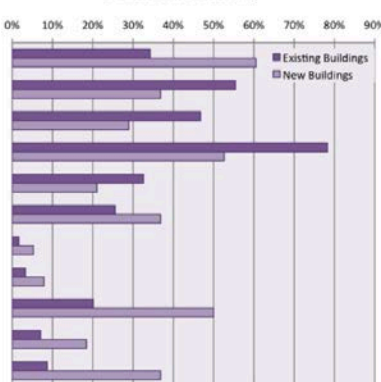
Number of Deficiencies

Number of deficiencies discovered

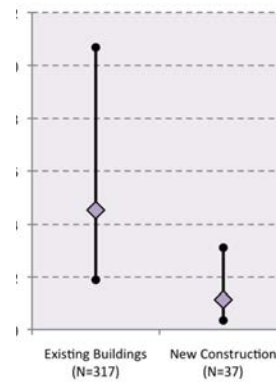


Frequency of Deficiencies

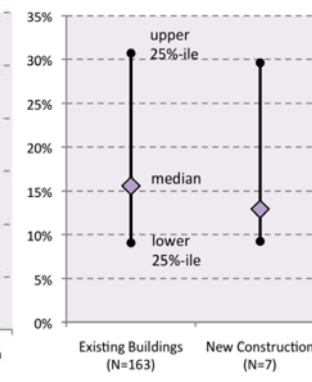
% of sites with deficiency



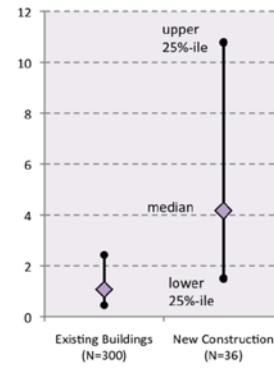
Benefit-Cost Ratio



Energy Savings (%)



Payback Time (years)



Impact

CBI MYPP Impact Pathways:

Accelerate adoption of EE by **providing information ...**

Facilitate ... access to **standardized transparent performance data**

Owners, investors equipped with tools to understand and value energy performance

Stakeholders use performance data to **incorporate EE into financial transactions**

Adoption of solutions to improve whole-building energy performance

Consistency & Continuity

Data collected in a standard, transparent manner by an objective 3rd party with related prior work (LBNL)

Continuity with prior study

Findings tie back to earlier studies to document stable value prop for Cxing

Reaching Stakeholders with Recent, Relevant Data

Provide information via journal articles, webinars, conferences outreach, website, social media posting

Build upon extensive use and familiarity with prior study - credibility

Resulting Actions

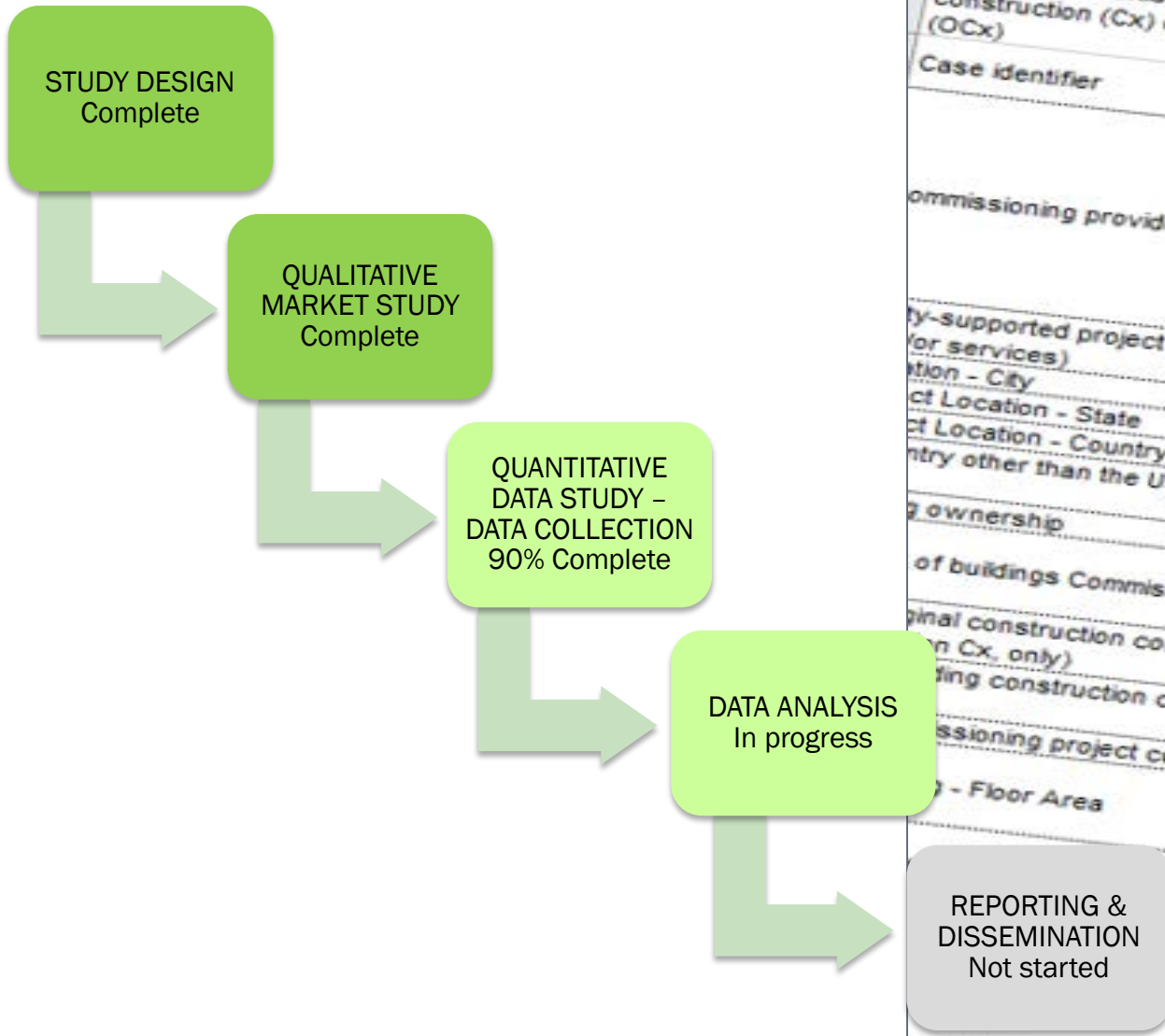
Use of data to understand the cost effective paths and methods to improved energy performance

Owners use the data to support business case to implement Cx

Providing better data for Cx policies to be implemented in more cities and states

Progress - Mid-Stage

Graphic: Cx Data Survey spreadsheet



| | |
|--|----------------------|
| Person completing this | Text |
| Project Type: Existing building (EBCx) or New construction (Cx) or Ongoing Commissioning (OCx) | Cx; EBCx; OCx |
| Case identifier | PECL; LBNL |
| Commissioning provider firm | Name |
| Utility-supported project? (received incentives for services) | Name of utility |
| Location - City | Text |
| Location - State | Postal |
| Location - Country | Country |
| Country other than the US, indicate currency | Text [3-letter code] |
| Ownership | Public; Private |
| Number of buildings Commissioned | Number |
| Original construction completed (if new construction only) | Year (NNNN) |
| Commissioning construction cost [\$, or other currency] | amount in year built |
| Commissioning project completed | NNNN |
| Floor Area | Number |
| Controlled systems | Number |
| Other: | list unit used |
| | N(p); G(p) |

Progress – Study Design

Revisions to 2004/2009 survey design

- Maximized consistency with prior survey instrument, while condensing - reduce overwhelm, improve response rate (voluntary!)
- Removed low response rate multi-year savings questions
- Condensed questions on non-energy benefits
- Usability improvements, grouping, instructions,
- Initially distributed to small ‘pilot’ group, to check usability and category definitions

$$\frac{\overset{3}{\cancel{12}}}{\underset{5}{\cancel{20}}} = \frac{3}{5}$$

PILOT TESTING

Getting It Right
(*Before*) the First Time

Progress – Data Acquisition

Data acquisition

- BCxA outreach to members through NCBC conference, email, social media, newsletter, blog posts, direct contact
- LBNL outreach to utilities

Data quality check plan

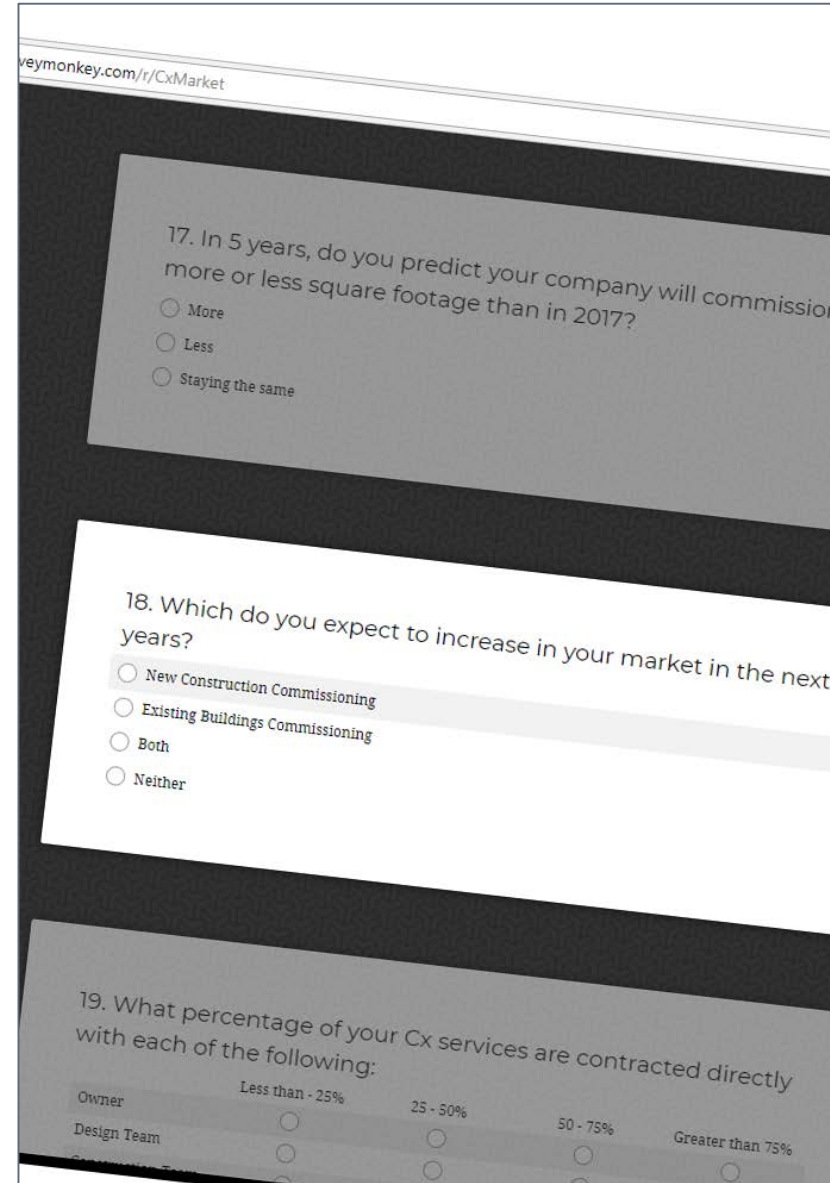
- Review all incoming data for consistency of input, seek clarification from data provider where necessary
- Assessment, e.g., correct units, presence of required data, feasible range/magnitude

| Study year | Total Buildings | New Construction | Existing Buildings | # of states |
|------------|-----------------|------------------|--------------------|-------------|
| 2004 | 224 | 74 | 150 | 21 |
| 2009 | 643 | 82 | 561 | 26 |
| 2018* | 1300-1500 | 167 | 1150-1350 | 31 |

* Awaiting responses from 2 data sources. Some buildings may be cut, QC in progress

Progress – ‘Lite’ Qualitative Survey, Market Assessment

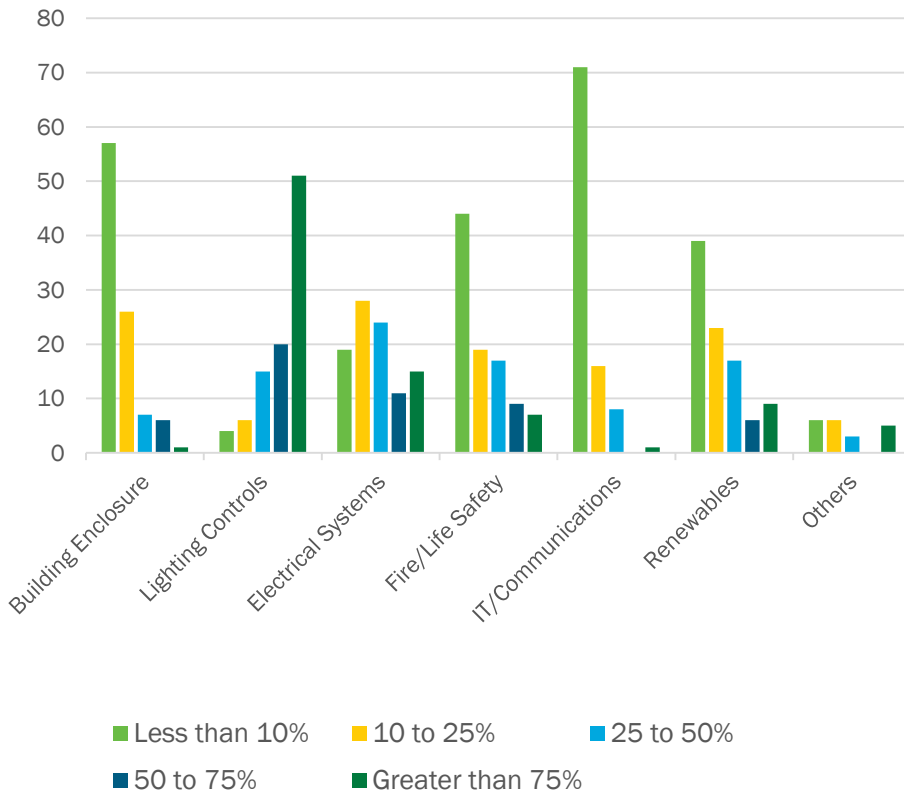
- Online survey developed
- 90 questions, on procurement drivers, market influencers, profitability certifications, project scopes, etc.
- 111 survey responses
- Preliminary findings reviewed (see following slides) additional analysis to be conducted



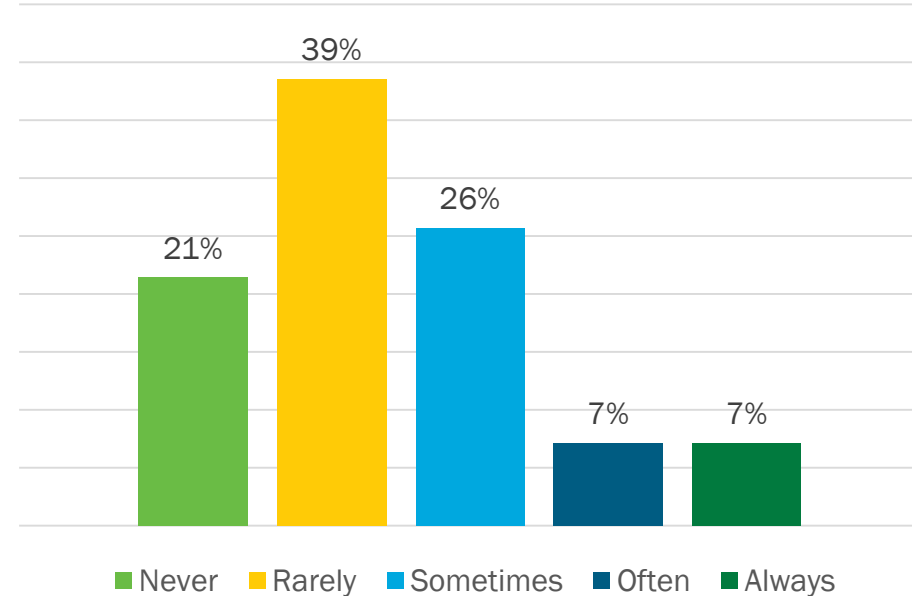
Progress – ‘Lite’ Qualitative Survey, Market Assessment

111 survey responses, selection of initial findings

Systems being Cx'ed, beyond mech/electr/plumbing



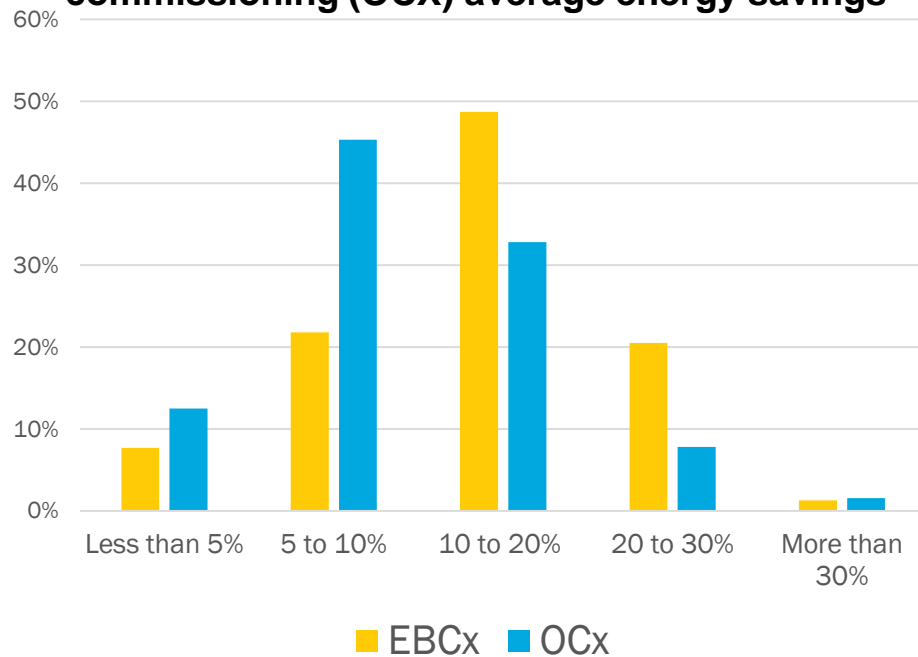
Use of fault detection and diagnostics for ongoing commissioning projects



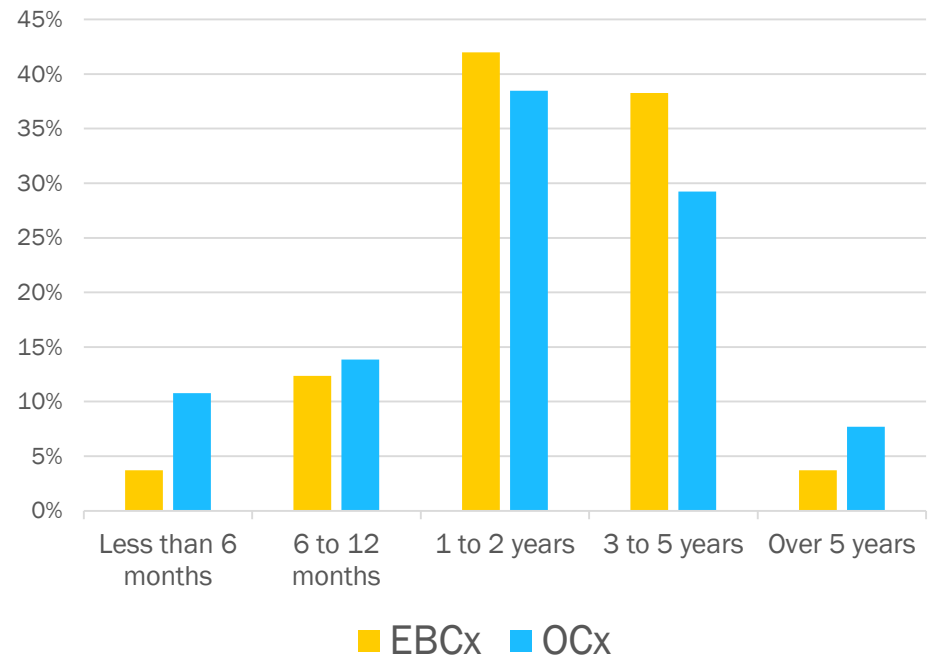
Progress – ‘Lite’ Qualitative Survey, Market Assessment

Initial findings (Continued)

Existing building (EBCx) and ongoing commissioning (OCx) average energy savings



EBCx and OcX average simple payback



Stakeholder Engagement

High demand for the 2004 study suggests strong stakeholder interest; engagement will leverage BCA membership, but extend far beyond it

| Key Stakeholder | Engagement pathways | | | |
|---|-------------------------|----------|------------------|---------------------------------------|
| | NCBC & BCxA newsletters | Webinars | Other Conference | News Articles/Social Media/Other Comm |
| Building owners procuring Cx | ✓ | ✓ | ✓ | ✓ |
| Utilities, Policymakers designing delivery of Cx programs | | ✓ | ✓ | ✓ |
| Cx and MBCx providers | ✓ | ✓ | ✓ | ✓ |
| BCxA membership | ✓ | | | ✓ |
| Other Cx trade groups | | | ✓ | ✓ |
| SEA Campaign participants | ✓ | ✓ | ✓ | ✓ |
| BBA/BBC partners | | ✓ | ✓ | ✓ |

Stakeholder Engagement

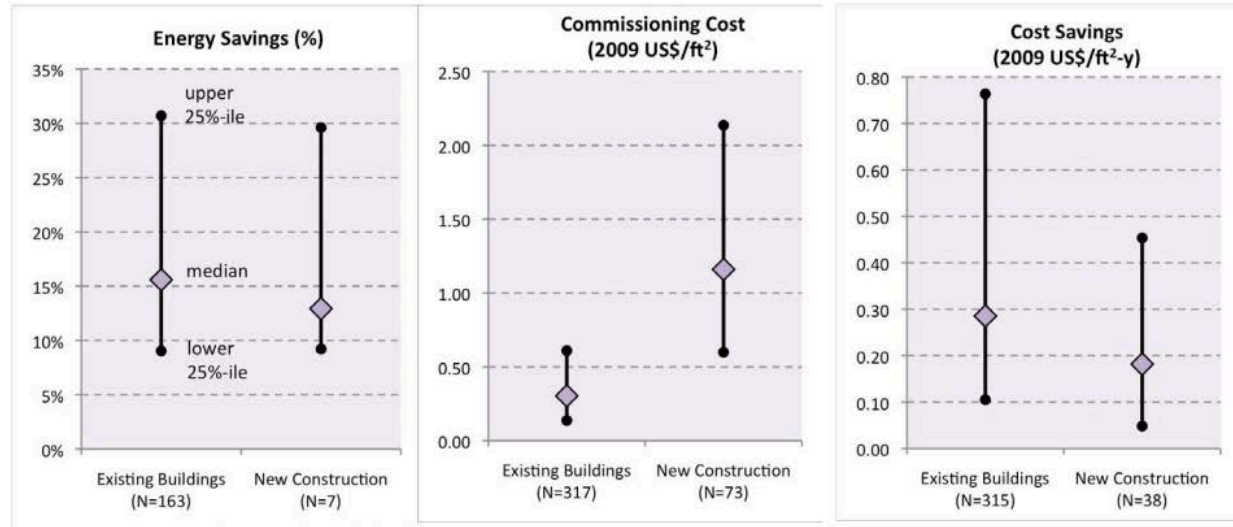
“One current BCxA activity of immediate interest to us is your organization’s collaboration with LBNL to redo the 2009 Mills Cx/EBCx market study.

We’ve often cited the 2009 data in our own Cx promotion/education work, so are very encouraged to see it updated.”

Office of Energy Efficiency, Natural Resources Canada

Remaining Project Work

- Complete data quality review process, contact any project owner with open questions to resolve
- Organize data for newly collected 600-800 projects (alongside 643 projects from prior study), construct analysis formulas, analyze & chart data, review findings and key takeaways
- Publish technical article, fact sheet, and presentations for dissemination in webinars and conferences beginning with National Conference on Building Commissioning (Oct 2018)
- Formalize & execute plan for ongoing dissemination of results



Thank You

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REFERENCE SLIDES

Project Budget

Project Budget: \$225K total DOE funding

Variances: No variances from original planned budget

Cost to Date: Spending on track, \$37K of \$225K spent through March 2018

Additional Cost/Share Funding: \$110K

Budget History

| FY 2017 (past) | | FY 2018 (current) | | FY 2019 (planned) | |
|----------------|------------|-------------------|------------|-------------------|------------|
| DOE | Cost-share | DOE | Cost-share | DOE | Cost-share |
| \$225K | \$65K | \$0K | \$30K | \$0K | \$15K |

Project Plan and Schedule

| Project Schedule | | | | | | | | | | | | |
|---|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Project Start:6/17 | Completed Work | | | | | | | | | | | |
| Projected End: 12/18 | Active Task (in progress work) | | | | | | | | | | | |
| | ◆ Milestone/Deliverable (Originally Planned) | | | | | | | | | | | |
| | ◆ Milestone/Deliverable (Actual) | | | | | | | | | | | |
| | FY2017 | | | | FY 2018 | | | | FY2019 | | | |
| Task | Q1 (Oct-Dec) | Q2 (Jan-Mar) | Q3 (Apr-Jun) | Q4 (Jul-Sep) | Q1 (Oct-Dec) | Q2 (Jan-Mar) | Q3 (Apr-Jun) | Q4 (Jul-Sep) | Q1 (Oct-Dec) | Q2 (Jan-Mar) | Q3 (Apr-Jun) | Q4 (Jul-Sep) |
| Past Work | | | | | | | | | | | | |
| Organize & Orient with BCxA Study Team | | | | ◆ | | | | | | | | |
| Outreach for market and data survey responses | | | | | | ◆ | | | | | | |
| Current/Future Work | | | | | | | | | | | | |
| Analyze Data, develop findings, conclusions | | | | | | | | | | | | |
| Document findings in PPT, Fact Sheet, journal article | | | | | | | | | | | | |
| Disseminate finding in webinars, news articles, websites, conferences | | | | | | | | | | | | |