Commercial Whole-Building Performance

The State of Retrocommissioning, New Directions, and Lessons Learned

Phil Welker, Executive Director
Aleisha Khan, Senior Program Manager

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CEE – Boston, MA

PORTLAND ENERGY CONSERVATION, INC.

Definition: *Commissioning*

A quality assurance process for new construction (design phase through operation) to ensure the building operates as intended
and
building staff are prepared to operate and maintain its systems and equipment

Definition: Retro*commissioning*

Applies a quality assurance process "retroactively" – to an existing building

- A method for **investigating** how and why a building's systems are operated and maintained, and for **identifying** ways to improve overall building performance

Retrocommissioning ≠ Tune-Up

Maintenance Tune-Up:

- conditions assessment
- addresses physical condition of equipment

RCx:

- a process not a set of prescriptive measures
- avoids "quick-fix" solutions and addresses root causes to systematically improve building systems so they operate efficiently, effectively, reliably, and
- ensures improvements persist over time

O&M: Striking a Balance Between "O" and "M"

- **Operation** is about schedules, energy efficient control strategies, and sequences of operation (primarily intellectual)
  - **Performance**
- **Maintenance** is about repairing, cleaning, lubing, of the equipment (primarily physical)
  - **Capacity**

Potential Energy Savings from Cx and RCx

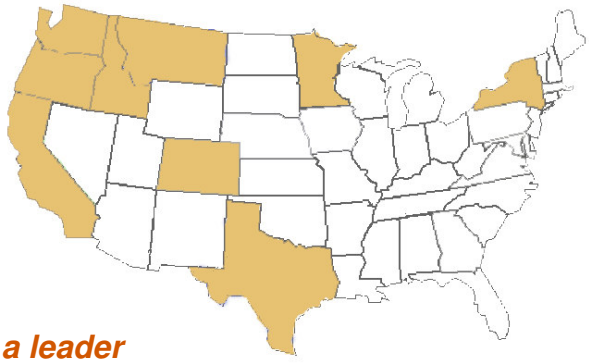
- Commercial buildings >25,000 sq ft pay $50 billion/yr for energy
- Cx energy savings range: 6% - 9%
  - California Market Characterization Study (2000)
- RCx energy savings range: 7% - 30%
  - LBNL study: *The Cost-Effectiveness of Commissioning New and Existing Commercial Buildings: Lessons from 224 Buildings (2005)*
- Most projects see a 5 - 25% reduction in utility cost as the result of low-cost RCx efforts
  - *Retrocommissioning's Greatest Hits; www.peci.org*

State/Local Cx Drivers

- Public benefits funds - $
  - California Public Interest Energy Research Program (PIER)
  - Utility Programs or Non-profit organizations
- Mandates (E.O. and Directives)
  - California, New York, Vermont, Minnesota
- Building Energy Codes include Cx
  - California, State of Washington, Massachusetts
- Collaboratives: STAC / NASEO, California, North Carolina

PIECI

Utility Programs: Public benefit charges give incentives for Cx and RCx



California is a leader

- *7th largest economy in the world*
- *$1 billion per year for energy efficiency programs*
- *$24 - 28 million over the next 3 years for RCx Programs*

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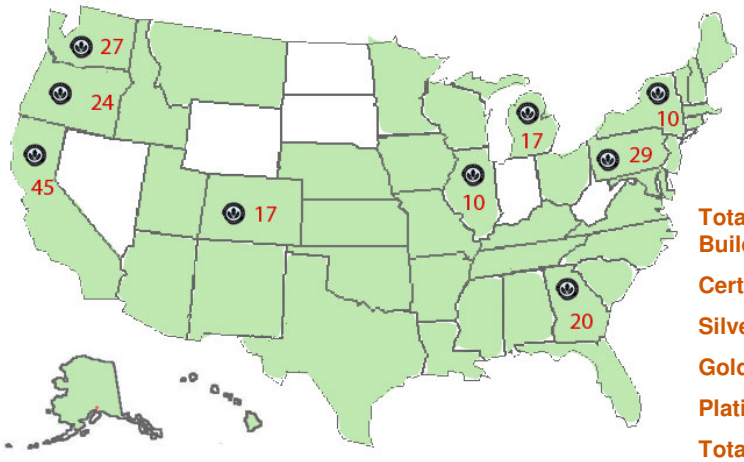
National Cx Drivers: Cx required for LEED certification by the USGBC



Total U.S. LEED Buildings

Certified:	134
Silver:	111
Gold:	91
Platinum:	22
Total:	358

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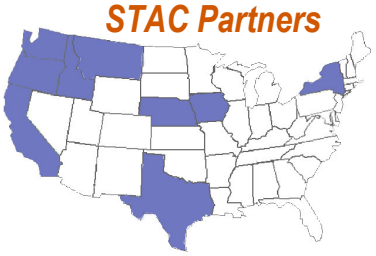
State Collaborative for Cx Research (Currently Underway)

- LBNL Semi-Automated Functional Testing Data Analysis Tool
- Automated Building Commissioning Analysis Tool (ABCAT)
- Functional Testing Guide and curriculum development
  - www.peci.org/ftguide

Streamlining testing, addressing persistence, and increasing quality delivery

STAC Partners



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Market Barriers

- Hesitant Market demand by Building Owners
  - Complex decision: financial and management
  - Aversion to risk
  - Bottom line focused
  - Influenced by first cost thinking
- Supply of Services Not Well Developed
  - Consistency
  - Need for guidelines and training
  - Professional Cx organizations still forming
  - Need for standardization of services
  - Tools to streamline delivery and reduce costs
  - Surprisingly long project timeframe

Lessons Learned: Filling the pipeline

- Recruiting Owners: (1) Reliance on a provider network versus direct program recruiting (2) Navigating the decision-making processes that many large commercial property managers face

- Scoping Phase: Definition of scope and needed outcome

Lessons Learned: Getting results

- Coordination: Between program, commissioning providers, and owners
- Program Timeframe: Allowing multiple phases of implementation

Lessons Learned: Ensuring quality

- RCx Protocols: Value of streamlining the RCx process
- Persistence: Requirements ensure follow-up documentation, training, and monitoring occurs

What's ahead?

- Diverse marketing channels and new partnerships
- Screening → Investigation (no scoping)
- Enhanced on-the-ground program role to move projects
- Updated protocols and tools
- Multiple implementation phases, plus new incentive for commissioning provider oversight through implementation
- Combined RCx, retrofit and demand response programs

Overcoming Barriers: Tools

- Tools
  - Commercialized diagnostics tools (PACRAT, ENFORMA)
  - Enabling tools (data management, EIS, Cx process tools)
  - Prototype tools developed during Annex 40 and Annex 47
    - National Institute of Standards and Technology (NIST): CITE-AHU
    - Natural Resources Canada: DABO
    - Texas A&M: ABCAT
    - LBNL: Semi-automated FT Tool

Resources

- Web Sites:
  - ASHRAE Guideline 0-2005 www.ashrae.org
  - Building Cx Association: www.bcxa.org
  - CCC Sample Documents and Library: www.cacx.org
  - Energy Design Resources www.energydesignresources.com
  - National Institute of Building Sciences: Total Building Cx Guidelines http://sustainable.state.fl.us/fdi/edesign/resource/totalbcx/
  - PECI Resource Library: www.peci.org
  - USGBC LEED Rating System www.usgbc.org