



California Commissioning Collaborative

# Verification of Existing Building Commissioning Project Savings

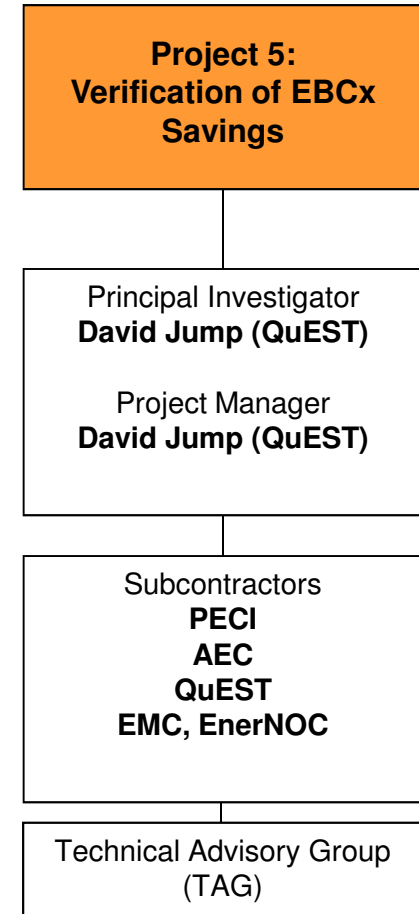
*Presentation to the  
California Commissioning Collaborative*

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## Project Team

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- Production
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# Agenda

- Project Summary
  - Recent Developments
- Feedback on Outreach Plans

## Verification of Savings Project

- Develop additional VoS guidelines for existing building commissioning projects
- Pilot demonstrations and case studies
- Refine existing Option B/C guideline
- Develop criteria and guidance on selecting appropriate methods
- Conduct outreach

## 2008 CCC VoS Guideline

- Based on interval data method:
  - Hourly or daily regressions
  - Applied to whole building or subsystems
  - IPMVP adherence if strictly applied
    - Option B (retrofit isolation)
    - Option C (whole building)
- Downside:
  - Cannot verify individual ECMs, when many ECMs within system or building, only total savings within

## Current VoS Project

- Additional methods developed:
  - Engineering calculations & field verification
  - Equipment or system energy measurement
  - Energy models using interval data
  - Calibrated simulation

## Method 1

- Engineering Calculations & Field Verification
  - Verifies individual ECM savings
  - Applies to equipment or systems
  - Mirrors industry practice
  - Recommends best practices
  - Describes use of post-installation operational verification in “truing up” savings estimates
  - Not IPMVP adherent

## Method 2

- Equipment or System Energy Measurement
  - Verifies individual ECM savings
  - Applies to equipment or systems
  - Methodology framework based on
    - Baseline load and schedule characteristics
      - constant or variable
    - Impact of ECM
    - Post-install load and schedule characteristics
  - IPMVP adherent

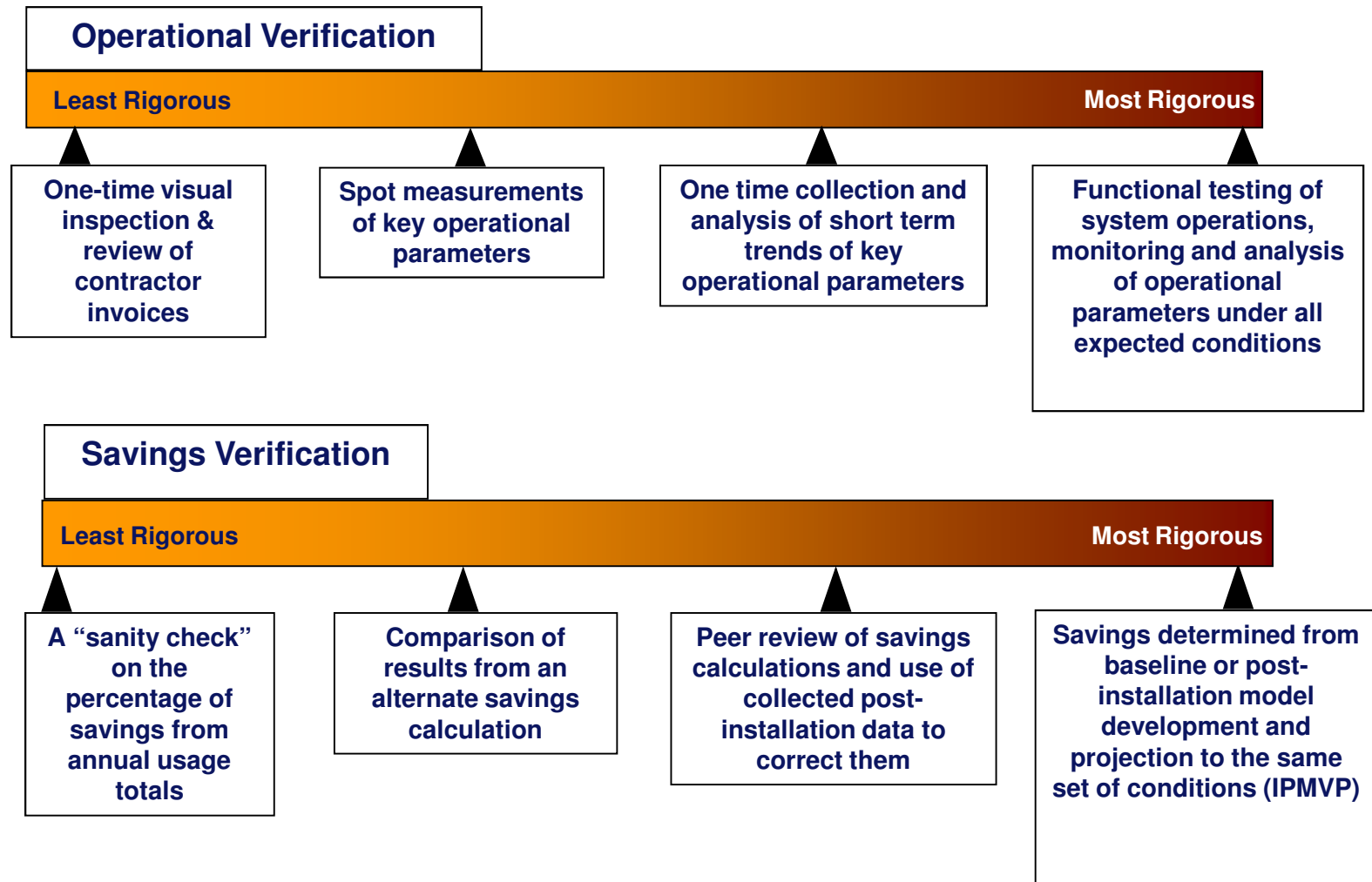
## Method 3

- Energy Models using Interval data
  - Verifies system or whole building total savings
  - Regression-based methodology
    - ASHRAE RP1050 change-point models
  - Hourly or daily time intervals
  - Improved based on feedback from pilots, previous guideline comments
  - IPMVP adherent

## Method 4

- Calibrated Simulation
  - Whole building or systems, depending on software
  - Can identify individual ECM savings
  - Useful when simulation used for ex-ante savings
  - Can be most difficult and expensive method
  - IPMVP adherent

# Essential Components of M&V



# Integrating Savings Verification in EBCx

- EBCx Project Phases
  - Planning
  - Investigation (ex-ante savings estimates)
  - Implementation
  - Hand-off
  - Ongoing Commissioning
- Operational Verification is already a part of EBCx
  - in Hand-Off Phase

## Integrating Savings Verification into EBCx

- Each method describes what activities are required in different phases of an EBCx project
- EBCx is a quality assurance process
  - Savings Verification is one more attribute

# Pilot Project Summary

- Understand how Interval Data Method can be used in EBCx industry
  - Advantages/Disadvantages
- Engage two EBCx providers to:
  - Implement method on an existing project
  - Obtain feedback to improve Guideline
  - Understand technical issues involved
- Develop Case Studies
  - demonstrate use & results
  - highlight key issues

## Method Selection Criteria & Guidance

- Methods vary:
  - Meet different verification goals
    - ECM vs. whole building savings
    - Yield savings uncertainty estimates
    - Check savings persistence
  - Require different resources and impose constraints
    - Have different data and analysis requirements
    - Shorter or longer monitoring requirements
    - Tool availability
    - Expertise

# Summary

- Guideline in “book” format with chapters:
  1. Introduction
  2. Integrating Savings Verification into EBCx projects
  3. Method Selection
  4. Method 1: Engineering Calculations with Field Verification
  5. Method 2: Equipment or System Energy Measurements
  6. Method 3: Energy Models Using Interval Data
  7. Method 4: Calibrated Simulation
  8. Appendices
- Near-final drafts of chapters & appendix to Technical Editor

## Connections to external research/activities

- Other CCC/CEC projects:
  - EBCx Tools Development
  - EBCx Persistence Improvement
- Other Tools
  - ECAM and Universal Translator for data preparation
  - Private sector tools (QuEMS, Energy Explorer, etc.)
  - LBNL/CEC UT-M&V Tool Module (future)
- Program evaluation requirements/directives from CPUC
  - IPMVP methods
- ASHRAE Research Project 1404
  - Minimum data requirements for energy models

## Outreach Goals

- EE-EBCx programs reference guideline
  - For a specific method
  - For any method
  - Add savings verification as a process requirement
- EBCx providers apply methods in projects
- Improve industry understanding of M&V
  - Appropriate data
  - Baseline requirements
  - Methods and algorithms
- EE and Cx industry endorse guideline

## Outreach Plan

- Overall Goal
  - Owners & Program Managers have high confidence in EBCx savings & lifetimes
  - Raise realization rates for EBCx programs
    - Programs and evaluators work from same verification standards

## Outreach Activities - High Priority

- Post guideline & case studies on CCC website
  - Track downloads
- Conduct utility program-focused workshops
  - ½ to 1 day for program managers
  - Northern CA (SMUD, PG&E)
  - Southern CA (SCE, SoCalGas, SDG&E, LADWP)
  - High-level discussion, not rigorously technical
  - What is needed for program endorsement?
  - What follow-up?

## Outreach Activities – High Priority

- Training for service providers
  - Series of web-based meetings
  - On integrating M&V in EBCx & selecting a method
  - On the methods (1 or many webinars)
- Other ideas?

## Outreach Activities – Next Priorities

- Present guide to industry groups
  - Obtain endorsement and promotion
  - Efficiency Valuation Organization (IPMVP)
    - NR Canada has agreement for EVO to review & endorse if OK
  - ASHRAE
  - Others?
- Conference presentations
  - e.g. ASHRAE, NCBC, AEE EMC, etc.

- Questions? Comments?

*Thank you for your participation!*