California Commissioning Collaborative
Advisory Council Meeting

November 6, 2008

Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter(s)</th>
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<tbody>
<tr>
<td>9:00 AM</td>
<td>Continental Breakfast</td>
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<tr>
<td>9:30 AM</td>
<td>Welcome, Introductions, and Announcements</td>
<td>Phil Welker</td>
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<tr>
<td>9:40 AM</td>
<td>Market Research and Toolkit Update</td>
<td>Kirstin Pinit</td>
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<td>9:50 AM</td>
<td>Verification of Savings Update</td>
<td>Kirstin Pinit</td>
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<td>10:00 AM</td>
<td>PIER Tech Innovations Proposal Update</td>
<td>Kirstin Pinit</td>
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<tr>
<td>10:20 AM</td>
<td>BREAK</td>
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<td>10:30 AM</td>
<td>Training Center Tour</td>
<td>John Wimer</td>
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<td>11:00 AM</td>
<td>SMACNA/SMWIA Commissioning</td>
<td>John Wimer, Jim Page</td>
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<td>11:30 AM</td>
<td>LUNCH</td>
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<tr>
<td>12:30 PM</td>
<td>LA County RCx Case Studies</td>
<td>Robert Austin</td>
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<td>1:15 PM</td>
<td>SCE RCx Programs</td>
<td>Mugimin Lukito</td>
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<td>1:45 PM</td>
<td>CCC Policy Initiative</td>
<td>Phil Welker, Jim Flanagan</td>
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<tr>
<td>2:15 PM</td>
<td>Utility Strategic Planning Update</td>
<td>Keith Forsman</td>
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<td>2:45 PM</td>
<td>Wrap - Up</td>
<td>Phil Welker</td>
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<td>3:00 PM</td>
<td>Advisory Council Meeting Adjourns</td>
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Introductions & Announcements

RFP for Cx Services

• The County of San Bernardino Architecture & Engineering Department (A&E) is soliciting written proposals from 3rd party commissioning providers to provide services on an on-call/as-needed basis.

• The RFP will be available on A&E website at www.sbcounty.gov/ae
  – Click on current RFP, then on-call services.
Market Research and Toolkit Update

<table>
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<tr>
<th>Task</th>
<th>Status</th>
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<tbody>
<tr>
<td>Commercial Real Estate Due Diligence Plan</td>
<td>Draft plan completed in July; final plan by year end</td>
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<tr>
<td>Toolkit Training Plan</td>
<td>Draft plan completed in June; final plan by year end</td>
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<tr>
<td>RCx Energy Calc Tools Pilot Test and Revisions</td>
<td>Pilot test conducted in September-October; final report by year end</td>
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<tr>
<td>Analysis of Utility RCx Program Energy Calculations</td>
<td>Draft analysis completed in October; final report by end of November</td>
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CCC Market Research Background

Market Research Purpose
- Improve owners' understanding of the value of Cx and RCx

CRE Due Diligence Research
- In-depth interviews and a virtual roundtable to investigate integration of RCx-related activities into the property acquisition process
- Findings:
  - Significant interest in adding RCx activities to Property Condition Assessment (PCA) performed as part of the due diligence process
  - Benchmarking and RCx scoping studies can detect problems not typically addressed during due diligence
  - Identification of barriers to integrating RCx-related activities into PCAs.
Commercial Real Estate Due Diligence Plan

• Develop a plan for integrating RCx-related activities into due diligence requirements for asset transactions in the CRE market
• Desired outcomes:
  – Improve transparency of energy performance at time of sale
  – Give owners information and tools to implement RCx-related activities immediately post-acquisition

• Pilot proposed in PIER Tech Innovations proposal

CCC RCx Toolkit – Background

• Website launched RCx Toolkit in January
  www.cacx.org/resources/rcxtools

• Spreadsheet Tools
  – Energy Calculation
    • Variable Flow Pumping System Workbook
    • Variable Flow Fan System Workbook
  – Data Analysis
    • Energy Charting and Metrics (ECAM) Tool
    • Utility Consumption Analysis Tool
    • Findings Workbook
Draft Toolkit Outreach and Training Plan

- Analyzed cost and efficacy of various approaches to training for fan and pump workbooks
  - Recommend all day in-depth live training for chief target audience of CA RCx providers, program implementers, reviewers
- Researched how to improve tool instructions for potential users pulling tools from the web
  - Recommend adding on-line tutorials, text or video, as best practice in embedded instruction for spreadsheet tools
- Considered approaches to tool deployment, ie, Outreach
  - Recommend minor changes to CCC website for visibility, accessibility, tracking of tool downloads; additional outreach through cross-linking with our energy engineering focused sites

RCx Calculation Tools – Pilot Tests

- Pilot testing of pumping and fan system workbooks conducted in September and October
  - Usability
  - Programming issues or glitches
  - Clarity of instructions
- Participating firms
  - PECI – MBO, Inc.
  - Enovity – Nexant
  - EMC Engineers – TAC
  - P2S Engineering, Inc.
- Analysis of pilot results, initial revisions and recommendations for future revisions will be completed by the end of the year
- Limited CEC funds available for revisions
Review and Analysis of California Utility RCx Program Energy Savings Calculations

Goal:
• Identify/prioritize the next needed calculation tools

Approach:
• Review the history of technical reviews in 2006-2008 SCE, PG&E and SDG&E RCx programs to identify problem measures

Findings:
• The most problematic calcs are already addressed by the pump & fan workbooks – recommend efforts to deploy and train providers on these tools
• Economizer-related calculations are challenging and would benefit from a spreadsheet tool
• No other measures have consistent difficulty with calculations, but there is a need for increased training on the technical concepts related to RCx measures
Next Steps

Follow-on work proposed under PIER Tech Innovations
1. Pilot test due diligence approaches, market outreach
2. Expand RCx Toolkit, enhance ECAM Tool, market outreach

Verification of Savings Update

Guideline for Verifying Existing Building Commissioning
Project Savings, Using Interval Data Energy Models:
IPMVP Options B and C

• Prepared by: David Jump, QuEST
• Technical Advisor: Ken Gillespie, PG&E
• Reviewers:
  – Hannah Friedman, PECI
  – Sami Khawaja, The Cadmus Group
  – Tracy Phillips, Architectural Energy Corporation
  – Lia Webster, PECI
Technical Advisory Group

- Narendra (Amar) Amarnani, LA County
- Jim Flanagan, representing PG&E
- Steven Long, SCE
- Dakers Gowans, Left Fork Energy
- Ann McCormick, Newcomb Anderson McCormick
- Satinder Gulati, California State University
- John Cullum, SoCal Gas
- Ed Jerome, Cogent Energy
- Spencer Lipp, Lockheed Martin Business Process Solutions
- Tom Reichert, Engineered Mechanical Services, Inc.
- Howard Sacks, DGS
- Kevin Warren, Warren Energy Engineering, LLC

Guideline Content

- Introduction
- M&V Approach
- Required Resources
- Methods
- M&V Process
- Demand Savings
- Appendix A Empirical Models
- Appendix B Uncertainty Analysis
- Appendix C M&V Plan
- Appendix D Examples
Recent Activities and Next Steps

- October 16: TAG meeting to discuss final draft guideline
- October 31: Final guideline completed
- November:
  - Announce Guideline to CCC email list
  - Post on website
  - Two dissemination workshops for RCx program managers and service providers
  - Research Policy Roadmap
- 2009
  - Follow-on proposed to PIER
  - Continue dissemination (conferences, EVO, ASHRAE, etc.)

Workshop Details

- #1 Northern California, San Ramon, hosted by PG&E
  - November 18, 2008, 10am to 3pm

- #2 Southern California, CTAC Facility, hosted by SCE
  - November 19, 2008 1 to 5 pm
Workshop Details

- Present “Guideline for Verifying EBCx Project Savings
  - Using Interval Data Energy Models: IPMVP Options B and C”
- Provide Background:
  - Review Stakeholder needs and existing verification methods
  - Need to fill Gap: no structured guidance for verifying savings
  - Stakeholders: wanted guidelines for 2009-2011 programs
- Discussion:
  - Why use M&V in EBCx projects
  - Review guideline
  - Discuss requirements and issues
  - How to incorporate M&V in EBCx projects
  - Examples
  - Future methods

PIER Proposal Update
PIER: Technical Innovations in Buildings and Communities

• Three-year proposal, ~$1.8 million
• Partners: AEC, Cogent, EMC, Enovity, HMG, McHugh Energy Consultants, PECI and QuEST
• Stage 1 completed August 8
• Stage 2 submitted October 22
• Notice of award expected December 5

Proposal Development

CCC Priorities
• Policies and Standards
• Measurement and Verification
• Technical Research
• Training and Outreach

PIER Objectives
• Increase adoption of EE measures in CA; supporting related state policies and legislations
• Develop technically feasible & cost-effective strategies, processes and tools Inform next revision of Title 24
• Connect Program outcomes to the market participant who can put research results to work
Proposal Development

- Initial project ideas presented at June CCC meeting
- RFP released late June
- Final topic selection and direction with input from Review Committee
  - James Bryan, Keith Forsman, Paul Ham, Greydon Hicks, Randall Higa, David Jump
- Content development and authoring by PECI and partners.

Program Theme

- **Simplify decision-making** by providing building owners with actionable energy information that will put them on the path to implementing commissioning in their properties.
- **Strengthen commissioning practices** by developing standardized tools and processes for providers, owners, and other industry stakeholders to enable more effective implementation of retrocommissioning and long-term persistence of benefits.
- **Quantify the savings** from retrocommissioning by developing guidance for the selection and implementation of verification methods that are appropriate for retrocommissioning projects.
- **Increase building efficiency** achieved through Title 24 by supporting the CEC in improving the technical feasibility and compliance with acceptance testing requirements in California’s building efficiency code.
Program Connections to the Market

- Relevance: CA legislative and regulatory actions set high bar for EE in buildings, Cx is specifically named

- CCC provides a direct link to put advanced tools and knowledge to work
  - Program Advisory Committee comprised of industry stakeholders with technical and market expertise
  - Market transfer included in every project
  - Distribution channels already in place (Advisory Council and Board of Directors, CCC website, email distribution list, meetings, etc.)

Program Advisory Committee

- CCC Advisory Council and Board of Directors
- Represents spectrum of Cx industry stakeholders
- AC meetings to be a forum for PAC involvement and program integration
  - Receive project reports
  - Provide input on market and technical issues
  - Participate in working sessions as needed
  - Venue for market transfer
**Optimizing Integration of Energy Information and RCx Services in CRE Transactions**

**Purpose:**
- Improve transparency of energy performance at the time of sale, and increase the capacity of property condition assessment firms to provide energy assessment services
Optimizing Integration of Energy Information and RCx Services in CRE Transactions

Tasks:
• Pilot multiple approaches
• Analyze impacts and identify remaining barriers
• Communicate results to State energy policy makers
• Market Connections:
  – Increase capacity of PCA firms to provide these energy information services (develop templates and outreach)
  – Outreach to CRE owners on the opportunities and benefits of improving operational energy efficiency overall and through this approach

Team:
• PECI, Heschong Mahone Group

Key Partners:
• Commercial real estate owners
• PCA firms
• Utilities

Budget:
• $165,535
Tools for Standardizing the RCx Process

Purpose:
• Expand the CCC’s RCx Toolkit by developing additional tools that assist commissioning providers in providing consistent, effective, and cost-efficient services, with the following results:
  – Streamline review of savings estimates in utility incentive programs which will enable reallocation of project budgets to allow for identification of deeper savings potential
  – Expand provider firm capabilities and the throughput of projects (new and existing firms)
  – Minimize owners’ uncertainty in the outcomes of RCx projects they consider implementing.

Tasks:
• Select, develop and pilot energy savings calculation tools, user guidance and tutorials
• Develop enhanced usability and functionality for the Energy Charting and Metrics (ECAM) Tool
• Market Connections:
  – Announcements and demonstrations presented through utility incentive programs, CCC meetings, the Southwest Chapter of BCA, and relevant EE websites, organizations and events.
  – Technical papers presented at key conferences such as the National Conference on Building Commissioning.
Tools for Standardizing the RCx Process

Team:
• AEC, QuEST, PECI

Key Partners:
• Utility program implementers, managers and evaluators
• Northwest Energy Efficiency Alliance (match funding)

Budget:
• $326,583
• $15,000 match funding from NEEA

Best Practices for Maintaining Energy Savings from Retrocommissioning

Purpose:
• Develop best practices for selecting, implementing, and managing persistence strategies.
• Drive awareness, understanding and adoption of by:
  – Enabling owners to track and understand the costs, benefits, and performance of their investments in EE.
  – Strengthening the value proposition of EE and building performance investments by reducing savings degradation and making the energy benefits more stable and predictable over time.
Best Practices for Maintaining Energy Savings from Retrocommissioning

Tasks:
- Study buildings that have implemented persistence strategies
- Investigate performance tracking and diagnostic tools
- Identify key performance tracking metrics, how the metrics are selected, how benchmarks and baselines are established, and how the metrics are tracked over time.
- Synthesize results into a guide for owners
- Market Connections:
  - Announcements and articles in industry newsletters
  - Dissemination through CCC and other industry websites
  - Distribution by programs and providers

Team:
- PECI, Enovity

Key Partners:
- Technical Advisory Group
- Utility program managers and implementers

Budget:
- $395,820
Verification of Energy Savings from RCx

Purpose:
• Further develop the CCC’s Guidelines for Verifying Savings from Retrocommissioning Projects, by identifying and developing other appropriate methods for verifying energy savings from retrocommissioning projects.

Tasks:
• Pilot the Interval Data Models: IPMVP Options B and C methodology developed in 2008 (and revise/improve)
• Evaluate verification methods identified in the CCC’s Verification of Savings Project: Existing Methods Report and select methods for which guidance will be developed
• Develop guides and consolidated all content into a comprehensive document
• Market Connections:
  – Announcements and articles in industry newsletters
  – Dissemination through CCC and utility programs
  – Leverage with EVO and ASHRAE
Verification of Energy Savings from RCx

Team:
• Quest, PECI, AEC
• 1-2 provider firms for pilot (AEC, Cogent, EMC, Enovity)

Key Partners:
• Technical Advisory Group
• Utility program managers and implementers
• EVO
• ASHRAE
• LBNL

Budget:
• $396,825

Title 24 Acceptance Testing Requirements and Effectiveness

Purpose:
• Support research that will inform the revision of Title 24 related to acceptance test requirements, focusing on:
  – Enforcement Procedure: Are the organizational structures and enforcement mechanisms appropriate for ensuring compliance with the code?
  – Effectiveness: Are the current acceptance test requirements effective measures for achieving building efficiency?
Title 24 Acceptance Testing Requirements and Effectiveness

Tasks:
- Interview building inspectors, contractors and building owners; characterize barriers to compliance
- Assess effectiveness of tests through field observation of contractors retesting systems that were reported as passing the acceptance requirements
- Analyze results and develop recommendations for revisions
- Market Connections:
  - Outreach efforts to address identified issues surrounding awareness and understanding of the codes

Team:
- McHugh Energy Consultants, PECI

Key Partners:
- Technical Advisory Group
- California Energy Commission
- California Building Officials (CALBO)

Budget:
- $340,256
Best Practices for Maintaining Energy Savings from RCx

Jon McHugh, PI

Kim Crossman, PI/PM

Program Advisory Committee

Tudi Haasl Matt Tyler Doug Mahone Beth Littlehales Stuart Waterbury William Koran Ryan Fedie

Market

Tech for Standardizing the RCx Process

Tracy Phillips, PI
Eliot Crowe, PM

Hannah Friedman, PI
Eliot Crowe, PM

Verification of Energy Savings in RCx Projects

David Jump, PI/PM

Lia Webster Tracy Phillips William Koran Cx Provider Firms

Technical Advisory Group

Technical Advisory Group

Technical Advisory Group

Market

Break

10:20-10:30
Training Center Tour

John Wimer
National Center for Energy Management and Building Technologies

Jim Page
International Training Institute

SMACNA/SMWIA Commissioning

John Wimer
National Center for Energy Management and Building Technologies

Jim Page
International Training Institute
Lunch

11:30-12:30

LA County RCx Case Studies

Robert Austin
EMC Engineers
SCE RCx Programs

Mugi Lukito
SCE

CCC Policy Initiative

Phil Welker
Jim Flanagan
CCC Policy Initiative

Scope:
• Focus on policy issues related to energy efficiency and building performance
  – Help educate and inform policy-making processes about the effective use of Cx to deliver EE in commercial buildings
  – A presence for CCC at meetings, conferences and workshops
• Develop CCC as a resource for utilities and other organizations and agencies
  – Encourage statewide consistency in program approaches
  – Position/guidance on technical and programmatic issues related to EM&V, program design, etc.

Tasks:
• Work with Advisory Council, Board of Directors and CCC staff to determine direction, identify opportunities, leverage technical and market expertise.
• Network with utilities, regulatory agencies and other stakeholders.
• Monitor regulatory and legislative actions; provide analysis of proposed and pending actions and potential impact on CCC stakeholders.
• Prepare and deliver comments and testimony as needed; participate in coalitions, task forces and advisory committees and hearings.
• Support the CCC’s work related to Title 24 nonresidential building codes and standards.
CCC Policy Initiative

Contractors:

• Jim Flanagan
  – CPUC and utility program focus

• Misti Bruceri
  – CEC and Title 24, CA Green Building Initiative

Draft Action Plan

1. Participation in CPUC planning venues
   – Energy Action Plan
   – Long-term EE strategic planning
   – CPUC proceedings
   – EM&V

2. Participation in CEC planning venues
   – Building Codes & Standards

3. Develop CCC as a commissioning resource
   – Identify and articulate CCC point of view on key issues
   – Network with utilities and other stakeholders

4. Monitor other potential opportunities
   – DR, ENERGY STAR, smart grid, distributed generation, etc.
CCC Policy Initiative

Next Steps:
• Develop 2009 Action Plan Draft
• Brainstorming session at January meeting
  – Identify and establish direction on key technical and
    programmatic “point of view” issues

Utility Strategic Planning Update

Keith Forsman
PG&E
Wrap-Up

- 2009 Meeting Dates
- Agenda planning for January 15 meeting

2009 Meeting Schedule

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<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Host</th>
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<tr>
<td>January 15</td>
<td>TBD</td>
<td>PG&amp;E</td>
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<tr>
<td>March 18</td>
<td>Sacramento</td>
<td>Green CA Summit SMUD</td>
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<td>May 21</td>
<td>TBD</td>
<td>SCE</td>
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<td>August 20</td>
<td>SMUD Customer Service Center</td>
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<td>October 22</td>
<td>TBD</td>
<td>Sempra</td>
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Future Agenda Topics – January 15

• Topics of Interest
  – Case studies – volunteers or invitations
  – Program updates – volunteers or invitations
  – Other needs?

• Discussion:
  – “Key Issues” brainstorm – direction for Policy Initiative
    • Measure life; measure mix in RCx programs
    • Net to Gross
    • Monitoring requirements for impact evaluation
    • Demand Response + RCx
    • Others, based on discussion
  – Other discussion topics?

Adjourn

Thanks to SMACNA and Sempra for hosting the meeting today!