Initial Results of Report to Support Utility Commissioning Programs

April 27, 2005
**Initial Results of Report to Support Utility Commissioning Programs**

**Presentation Outline**

- Objectives of Project (Phil) 5 minutes
- Approach (Eric) 5 minutes
- Findings (Eric) 15 minutes
- Next Steps (Eric) 5 minutes
- Discussion (Phil) 15 minutes
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Objectives

- Utility and Program Representative Identification of Market Needs and Program Potential for Cx and RCx
- Summarize Industry Research on Costs and Benefits
- Recommend Program Design Elements for Utility-Sponsored Cx and RCx Programs
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Research Questions

• What are the basic design elements of RCx programs now available in California? ...in other States?

• What program elements and strategies have been effective and/or essential for program success and/or potential for success?

• What are the opportunities for expansion of commissioning programs in California?
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Research Questions

- Is there more opportunity in new building commissioning or retrocommissioning at this time?

- Should building types be targeted by programs?
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Research Questions

• What are the costs and benefits of Cx and RCx according to most recent data?

• How do these costs and benefits translate in CPUC workbook inputs?

• What are some possible design elements and marketing strategies for upcoming programs
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Research Questions

• Does the CPUC need to convinced of the potential of Cx and RCx for energy savings potential and cost effectiveness?
  – If yes, how?

• How did commissioning come to be accepted and promoted in the Governor’s Executive Order S-20-04?
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Approach

• Interviews (16)
  – California IOU Planners (5)
  – Program Managers: CA (5), Out-of-State (4)
  – Researchers (2)

• Secondary Research
  – California Programs and Pilots
  – Out-of-State Programs and Pilots
  – Other related research
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Approach

**Interview Topics**
- Current Program Characteristics
- Needs Assessment
- Verification of Commissioning Savings
- Opinions on potential program characteristics
- Policy and Legislation
- Commissioning and Retro-commissioning Strategies
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Findings

The Current Status and Potential for Cx and RCx Programs

- Perceptions of Cx and RCx
- Opportunities for program expansion
- Barriers to expansion
- Holding Cx and RCx to measurable savings goals
- Needs to convince the CPUC of cost effectiveness
- Building type targeting
- Program preference
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Findings

California Programs

– Building Tune-Up Program
– San Diego RCx Program
– UC CSU IOU Partnership
– LA County ISD-SCE-SoCalGas Partnership
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Findings

Out of State Programs

– NYSERDA
– City of Austin/TAMU-ESL Continuous CommissioningSM
– Northeast Utilities
– Xcel RCx Program administered by Nexant
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Findings

General Perceptions of Commissioning
– Many opportunities for expansion
– Lack of awareness the most common barrier
– Misconceptions Exist
– Clients need to be educated on the service
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Findings - CPUC Policy

Does CPUC need to be convinced of Cx and RCx benefits and cost effectiveness?

- Respondents see CPUC as willing to go forward
- Evaluation of current programs is key
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Findings - CPUC Policy

Helpful CPUC Policy Changes

• TRC is stacked against RCx programs
  – Favors equipment based programs
  – Peak electrical demand reduction is not a factor
  – Facility for demand response has no bearing
  – Interpretation of “IMC” doubles TRC cost of all program provided costs
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Findings - CPUC Policy

- $\text{TRC} = \frac{\text{Benefits}_{\text{TRC}}}{\text{Costs}_{\text{TRC}}}$

  - $\text{Benefits}_{\text{TRC}} = \text{Net lifecycle avoided kWh and therm costs}$

  - $\text{Costs}_{\text{TRC}} = \text{Program Budget-Installation/Hardware/material Costs + Net IMC}$
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## Findings - RCx

<table>
<thead>
<tr>
<th>Commissioning Existing Buildings</th>
<th>Units</th>
<th>ESI</th>
<th>%WB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric</td>
<td>kWh/ft²*yr</td>
<td>1.7</td>
<td>9.00%</td>
</tr>
<tr>
<td>Gas</td>
<td>kBtu/ft²*yr</td>
<td>6.5</td>
<td>6.00%</td>
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<tr>
<td>Peak*</td>
<td>W/ft²</td>
<td>0.6</td>
<td>2.00%</td>
</tr>
<tr>
<td>Total</td>
<td>kBtu/ft²*yr</td>
<td>17</td>
<td>15.00%</td>
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<table>
<thead>
<tr>
<th>Best Practices</th>
<th>Units</th>
<th>ESI</th>
<th>%WB</th>
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</thead>
<tbody>
<tr>
<td>Median</td>
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</tr>
<tr>
<td>Electric</td>
<td>kWh/ft²*yr</td>
<td>2.76</td>
<td>15.00%</td>
</tr>
<tr>
<td>Gas</td>
<td>kBtu/ft²*yr</td>
<td>13.5</td>
<td>23.00%</td>
</tr>
<tr>
<td>Peak*</td>
<td>W/ft²</td>
<td>0.8</td>
<td>9.00%</td>
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<tr>
<td>Total</td>
<td>kBtu/ft²*yr</td>
<td>56</td>
<td>29.00%</td>
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</table>

<table>
<thead>
<tr>
<th>RCx Cost</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Energy Impact</td>
<td>$2003/ft²</td>
<td>$0.27</td>
<td>Median</td>
</tr>
<tr>
<td>Median</td>
<td></td>
<td>$0.18</td>
<td>Median</td>
</tr>
</tbody>
</table>

ESI = Energy Savings Index; Total Energy is weather normalized.

*Peak is the Average kW, actual peak savings will be significantly greater.
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### Findings - Cx

<table>
<thead>
<tr>
<th>Commissioning New Buildings</th>
<th>Units</th>
<th>ESI</th>
<th>%WB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>Electric</td>
<td>kWh/ft²·yr</td>
<td>0.5</td>
</tr>
<tr>
<td>Median</td>
<td>Gas</td>
<td>kBtu/ft²·yr</td>
<td>2.2</td>
</tr>
<tr>
<td>Peak*</td>
<td></td>
<td>W/ft²</td>
<td>0.1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>kBtu/ft²·yr</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Best Practice</strong></td>
<td>Units</td>
<td>ESI</td>
<td>%WB</td>
</tr>
<tr>
<td><strong>Electric</strong></td>
<td></td>
<td>kWh/ft²·yr</td>
<td>1.36</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td></td>
<td>kBtu/ft²·yr</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Peak</strong></td>
<td></td>
<td>W/ft²</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>kBtu/ft²·yr</td>
<td>8</td>
</tr>
<tr>
<td><strong>Cx Cost</strong></td>
<td>$2003/ft²</td>
<td>$1.00</td>
<td>Median</td>
</tr>
<tr>
<td><strong>Non Energy Impact</strong></td>
<td>$2003/ft²</td>
<td>$1.24</td>
<td>Median</td>
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</table>

ESI = Energy Savings Index; Total Energy is weather normalized.

*Peak is the Average kW, actual peak savings will be significantly greater.
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### Findings – RCx in CA

#### Commissioning Existing California Buildings

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>ESI</th>
<th>%WB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Energy</td>
<td>kBtu/ft²*yr</td>
<td>8.1</td>
<td>7%</td>
</tr>
<tr>
<td>(weather normalized)</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>ESI</th>
<th>%WB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Energy</td>
<td>kBtu/ft²*yr</td>
<td>11.02</td>
<td>9%</td>
</tr>
<tr>
<td>(weather normalized)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                      |                |      |     |
| RCx Cost             | $2003/ft²      | $0.17| Median |
|                      |                |      |     |
| RCx Cost             | $2003/ft²      | $0.32| Average |
# Initial Results of Report to Support

## Findings - Scoping

### Cx Scope (Excludes plan development and final report)

(Highlights represent opportunities for best practices)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Verification Checks</td>
<td>100%</td>
</tr>
<tr>
<td>Functional Testing</td>
<td>100%</td>
</tr>
<tr>
<td>Write Specifications</td>
<td>85%</td>
</tr>
<tr>
<td>Review Submittals</td>
<td>30%</td>
</tr>
<tr>
<td>Develop Design Intent</td>
<td>25%</td>
</tr>
<tr>
<td>Trend Analysis</td>
<td>21%</td>
</tr>
<tr>
<td>Design Review</td>
<td>20%</td>
</tr>
<tr>
<td>Construction Observation</td>
<td>20%</td>
</tr>
<tr>
<td>Develop Sequence of Operations (Controls)</td>
<td>15%</td>
</tr>
<tr>
<td>Develop Systems/Recommissioning Manual</td>
<td>10%</td>
</tr>
<tr>
<td>Evaluate Energy Savings</td>
<td>5%</td>
</tr>
</tbody>
</table>

### RCx Scope (Excludes plan development and final report)

(Highlights represent opportunities for best practices)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend Analysis</td>
<td>99%</td>
</tr>
<tr>
<td>Operations and Maintenance Implementation</td>
<td>95%</td>
</tr>
<tr>
<td>Monitor Fixes</td>
<td>75%</td>
</tr>
<tr>
<td>Measure Energy Savings</td>
<td>75%</td>
</tr>
<tr>
<td>Update Design Intent</td>
<td>70%</td>
</tr>
<tr>
<td>Update Systems Documentation</td>
<td>70%</td>
</tr>
<tr>
<td>Develop Systems/Recommissioning Manual</td>
<td>25%</td>
</tr>
</tbody>
</table>

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California Commissioning Collaborative
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Findings

Successful Program Elements

- Outreach and marketing
- Preliminary benchmarking
- Initial assessment incentives
- Measure incentives
- Training
- Clarity for deliverables
- M&V strategies
- Ensuring persistence
- Non-energy benefits
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Findings

**Recommended Program Elements**
- Marketing and Outreach strategies
- Integrate Cx Marketing with SBD representatives
- RCx with existing retrofit programs (standard offer)
- Integrate Cx and RCx into demand response programs
- Include persistence strategies in program design
- Improved permanent monitoring and automation
- Focus Cx incentives on design review and design intent documentation
- Define service requirements for RCx providers
- Provider training requirements
- Conduct simultaneous EM&V
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Findings

Outreach and Marketing

- There is greater potential savings for Labs and to a lesser extent Class A office

- All building types have potential savings, limiting building types leads to lost opportunities

- Market RCx to building operators as well as owners
  - The building operators network could benefit program once their confidence is gained
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Findings – Recommended Strategies

Screening and Scoping

• Use Interact with benchmarking/load shape analysis tools to determine RCx candidates
• Completely fund initial screening/assessment/scoping study
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Findings – Recommended Strategies

Provide RCx as Standard Offer
• Define requirements for providers
• May have supply side issues
Findings – Recommended Strategies

Market Cx through Savings by Design
• Contacts and relationships are in place
• Timely influence is crucial
• Most SBD representatives are on board
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Findings – Recommended Strategies

Integrate Commissioning into DR programs

- Holistic approach to demand response
- Improving controls and operation will increase demand response capabilities
- Case studies are needed
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Findings – Recommended Strategies

Include Persistence Strategy in Program Design

- Rolling whole premise EUI at minimum
- Include regular performance verification at the end-use or equipment level
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Findings – Recommended Strategies

Improve Permanent Monitoring and Automation

• Provide for increased points
• Improve access
• Justified by persistence (longer EUL)
• Yields better evaluation data
Focus Cx incentive program on design intent documentation and design review

- These services are schedule dependent
- Reduces lost opportunities
Define service requirements for RCx providers

- Limit interpretation of requirements
- Establish definitions of ambiguous terms or concepts
- Example: *Original Design Intent or Optimal Performance*
Incorporate Training for Providers

- Addresses supply-side issues
- Establishes minimum service requirements
- Clears possible misconceptions
Conduct simultaneous EM&V

- Diagnostic data doubles as evaluation data
- Secondary check on monitoring plans etc.
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Discussion

Questions?