Welcome

Conservation Applied Research & Development (CARD) Webinar

March 14, 2018
Improving Energy Code Compliance through Support and Assistance Programs
Webinar Basics

• Attendees in listen-only mode
• Type your questions into Question Box
• Questions addressed at end
• Webinar recorded & archived online
• Handout: Slide Deck in GoToWebinar Panel
• Purpose to help Minnesota utilities achieve 1.5% energy savings goal by:
  • Identifying new technologies or strategies to maximize energy savings;
  • Improving effectiveness of energy conservation programs;
  • Documenting CO₂ reductions from energy conservation programs.

  Minnesota Statutes §216B.241, Subd. 1e

• Utility may reach its energy savings goal:
  • Directly through its Conservation Improvement Program (CIP).
  • Indirectly through energy codes, appliance standards, behavior, and other market transformation programs.
CARD RFP Spending by Sector thru mid-FY2017

- 8 funding cycles
- Nearly 380 proposals
- 92 projects funded
- Over $21 million in research

- Commercial (36), 37.6%
- Residential 1 - 4 unit (15), 18.7%
- Industrial (10), 8.6%
- Multifamily 5+ unit (4), 6.6%
- Agricultural (6), 3.1%
- Multi-sector (21), 25.3%
CARD Webinar
March 14, 2018

COMMERCIAL ENERGY CODES SUPPORT PROGRAM PILOT

Russ Landry, PE, LEED AP
Sr. Mechanical Engineer

Megan Hoye, LEED AP
Engagement Manager
What We’ll Be Discussing Today

• Introduction
  • Other programs outside of Minnesota
  • Codes/CIP Status in Minnesota
  • Pilot Program Objectives

• Design of Pilot Compliance Program
  • Focused on short list of measures
  • Services for individual building projects
  • Two market delivery approaches

• Findings
  • Recruitment
  • Compliance rates & potential savings
  • Achieved savings & cost-effectiveness
  • Participant surveys

• CIP Recommendations
Introduction:
Other Programs, Minnesota Status, & Objectives
Utility/Public Benefits Programs Elsewhere

- Code Compliance vs. Code Adoption
- Other Places
  - CA, Pacific Northwest, IL, CO, AZ, RI, NY, MA, VT
- Program Activities
  - Classroom type education
  - Available to answer technical support questions
  - Involvement with very few individual building projects
  - Residential vs commercial buildings
How the Stage is Set in Minnesota

- Codes & Compliance
  - High % line-item compliance ≠ energy performance
  - New energy code in 2015—more options than before
  - Similar new code expected in 2020
- Regulator Interest & Flexibility: Since Next Generation of Energy Act of 2007
  - Policy signals
  - CARD Funding for this pilot & compliance studies
Overview: MN Commercial Energy Code

- **2015 MN Energy Code**
  - **2012 IECC w/MN amnd.**
    - Prescriptive + Option Package
      - Performance (15% better than baseline)
    - Prescriptive
      - Performance (meet baseline)
  - **ASHRAE 90.1 - 2010**
How the Stage is Set in Minnesota

• Codes & Compliance
  • High % line-item compliance ≠ energy performance
  • New energy code in 2015—more options than before
  • Similar new code expected in 2020

• Regulator Interest & Flexibility: Since Next Generation of Energy Act of 2007
  • Policy signals
  • CARD Funding for this pilot & compliance studies
CARD Study Objectives

- Establish a local precedent for a focused, service-oriented code compliance enhancement program
- Evaluate the program to inform utilities and regulators
Program Design: Focused, Individual Assistance, & Approaches
Focused Scope of Program Measures

- **Complete Energy Code**
  - Envelope: 5
  - Mechanical Systems: 12
  - Service Hot Water: 0
  - Electrical Power & Lighting: 7
  - Additional Energy Performance: 1

- **Pilot Program Measures**

Program Performance: 16%
### Scope of Pilot Measures

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
<th>STATUS</th>
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</thead>
<tbody>
<tr>
<td><strong>ENVELOPE REQUIREMENTS</strong></td>
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<td><strong>MECHANICAL SYSTEM REQUIREMENTS</strong></td>
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</tr>
<tr>
<td>Roof Insulation R Value</td>
<td>IECC</td>
<td>Economizer</td>
<td>IECC</td>
</tr>
<tr>
<td>Above Grade Wall Insulation</td>
<td>ASHRAE</td>
<td>Demand Controlled Ventilation</td>
<td>ASHRAE</td>
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<tr>
<td>Daylight Zone Control</td>
<td></td>
<td>Piping Size</td>
<td></td>
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<tr>
<td>Multilevel Lighting Control</td>
<td></td>
<td>Supply Air Temperature Reset</td>
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<td>Low Leakage Intake and Exhaust Dampers</td>
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<td>Lighting System Functional Testing</td>
<td></td>
<td>HVAC Commissioning</td>
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<td>Conductor Sizing</td>
<td></td>
<td>Additional Energy Efficiency Package (3 Options)</td>
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<td>Add. EE</td>
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**Additional Energy Efficiency Package (3 Options)**

- Low Leakage Intake and Exhaust Dampers
- HVAC Commissioning
- Additional Energy Efficiency Package (3 Options)
## Two Approaches to Marketing & Delivery

<table>
<thead>
<tr>
<th>Approach 1: Design Team Support</th>
<th>Approach 2: Code Official Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Buildings</td>
<td>Large/Complex Buildings</td>
</tr>
<tr>
<td>Prescriptive Code Path</td>
<td>Performance or Prescriptive</td>
</tr>
</tbody>
</table>
Two Approaches to Individual Building Project Support

**APPROACH 1: DESIGN TEAM TEAM SUPPORT**
- Recruit
- Kick-Off Mtg *
- Consult & Review *
- Contractor Guidance
- Field Verify
- Incentive

**APPROACH 2: CITY STAFF SUPPORT**
- Partner Cities Select Projects
- Track Project Status
- Surveys
- Plan Review Support *
- On-Site Verification
## Design Team Support: Pilot Features

<table>
<thead>
<tr>
<th>Program Scope</th>
<th>Benefits/support to design and development teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small buildings or simple systems</td>
<td>Early design stage kick-off meeting</td>
</tr>
<tr>
<td>22 energy code line items</td>
<td>Energy code quick reference guide</td>
</tr>
<tr>
<td>4 specific building types</td>
<td>Documentation best practices guide</td>
</tr>
<tr>
<td>Whole building tier 2 package</td>
<td>Incentives to owner &amp; design team</td>
</tr>
<tr>
<td>New &amp; existing buildings</td>
<td>Plan review(s) prior to permit application</td>
</tr>
<tr>
<td>Prescriptive compliance paths</td>
<td>Construction phase support</td>
</tr>
</tbody>
</table>
Targeted Tools

### Early Design

#### APPLICABILITY GUIDE For New Construction Projects

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Recommendation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Additional Tables and Figures

- Table 1: Detailed energy-saving strategies for various building types.
- Diagram 1: Flowchart for early design phase implementation.

For more detailed information, please refer to the supporting materials and the comprehensive guide available on the program's official website.
Tool 1 | Making Early Design Decisions

- **Scenario:** Restaurant renovation
- Tools help guide decisions around mechanical & lighting system controls so that air conditioner sizing & cost can be estimated most accurately early in design

### Supply-Air Temperature Reset

<table>
<thead>
<tr>
<th>ASHRAE:</th>
<th>IECC:</th>
</tr>
</thead>
<tbody>
<tr>
<td>This applies to multizone HVAC systems EXCEPT zones with &lt;300 cfm airflow. Is not required if reheat is via site recovered heat or site solar.</td>
<td>This applies to multizone HVAC systems EXCEPT when total system fan nameplate hp ≤ 5 hp (including exhaust fans). Is not required if reheat is via site recovered heat or site solar.</td>
</tr>
</tbody>
</table>

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| Multifamily | [ ] Seldom applies--only if multizone hvac system with reheat. |
| Offices     | [ ] Applies to multizone systems with reheat. |
| Restaurants | [ ] Seldom applies--only if multizone hvac system with reheat. |
| Retail Spaces | [ ] Seldom applies--only if multizone hvac system with reheat. |
Targeted Tools
Tool | Construction Document Best Practices

- Tool lays out CD & specification documentation best practices for making plan reviews, simplifying plan review revisions & inspections

### Electrical Requirements

<table>
<thead>
<tr>
<th>Measure</th>
<th>Required Information (when applicable)</th>
<th>Documentation Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic Off Lighting Controls</td>
<td>1. Indicate controls meeting requirements or exemption for all lights.</td>
<td>1. Include a Lighting Controls Schedule that notes the type of control by room (or space type). This would include note of occupancy sensors, mutiple light level controls, and if a space needs 24 hour lighting.</td>
</tr>
<tr>
<td>Daylight Zone Control</td>
<td>1. Document daylight zone control locations and the fixtures controlled by each controller. 2. Document the power level steps that each daylight zone control will use.</td>
<td>1. Include a Daylight Zone Control section in the Specifications. 2. Besides noting daylighting sensors and fixtures controlled by each on drawings, include a Lighting Controls Schedule that includes notations about lighting control by room.</td>
</tr>
</tbody>
</table>
## City Reviewer Support: Pilot Features

<table>
<thead>
<tr>
<th>Program Scope</th>
<th>Support to City Code Officials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large buildings or complex systems</td>
<td>Permit set plan review and detailed, formal report</td>
</tr>
<tr>
<td>24+ energy code line items</td>
<td>Review of building energy simulations submitted for performance documentation</td>
</tr>
<tr>
<td>New building, additions, and major renovations</td>
<td>Checklist for inspection of performance path items</td>
</tr>
<tr>
<td>Prescriptive and performance compliance path</td>
<td>Construction phase inspection assistance</td>
</tr>
</tbody>
</table>
City Review Support: Sample Report

**PLAN REVIEW COMMENTS**

For City Code Officials

**Project:**
City of Minneapolis

**ICU Certified Energy Code Planner:** D. Gu & Russ Landry, PE

**Feb 29, 2016**

This report summarizes the findings of a non-invasive energy code review that was focused on the most problematic and energy-impactful items in the 2015 Minnesota Energy Code. Based on a clear communication from the City of Minneapolis, this review was based on the ASHRAE 90.1-2010 path within the 2015 Minnesota Energy Code. With a presumption that the intent is to follow the prescriptive path (since no performance path documentation was provided). While the building based similarities to a multi-family residential building. It was reviewed as a house because there did not appear to be permanent provisions for cooling within the units (per the dwelling unit definition on page 8 of ASHRAE 90.1-2010). If it were to be classified as a multifamily building, there would be a higher requirement for slab edge insulation, there would be no dwelling unit lighting power density or control requirements, and the building area method option for lighting power density would have a much lower limit.

**REVIEW SUMMARY**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Prescriptive</th>
<th>Performance</th>
<th>Code Requirement Met</th>
<th>Note</th>
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</thead>
<tbody>
<tr>
<td>Roof Insulation R-Value</td>
<td>20</td>
<td>30</td>
<td>Yes</td>
<td>This project was assessed for compliance with the ASHRAE 90.1-2010.</td>
</tr>
<tr>
<td>Insulation of Wall Insulation</td>
<td>14.2</td>
<td>14.3</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Windows &amp; Insulation</td>
<td>3.1</td>
<td>3.5</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Vents</td>
<td>4.2</td>
<td>4.3</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Solar glare</td>
<td>7.1</td>
<td>7.2</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>11.2</td>
<td>11.3</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

**SPECIFICATION AND COMPLIANCE REPORT**

The specifications were not provided along with the construction drawings. Instead, a compliance report containing useful information was provided. The report was used as a very helpful reference when certain details of information could not be found in the construction drawings. However, we will be reviewing the project team for these specifications, as we assume that the compliance report is not part of the contract documents that will be used for construction, and it only provides performance levels without detailing how they are achieved. Besides, part of the report was based on ASHARE 90.1-2004, while the 2015 Minnesota Energy Code is using ASHARE 90.1-2010.

**SECTION 1**

**Envelope**

Roof Insulation R-Value

While this is not fully documented as meeting the energy code requirement, we would be very surprised if the additional documentation that is generally required would show that the roof insulation requirement is met. The thermal performance of the insulation materials is completed documented in the drawings (and no specifications were provided). However, based on the general type of materials and thicknesses (a rigid plate with an average of 3.5") shown on the drawings, we believe the roof insulation will exceed the requirement.

Above Grade Wall Insulation

The continuous insulation R-value is not clearly indicated in the construction documents provided. While the values listed in the report (R-3.0) do not meet the requirements (R-7.5), the 1 1/2" EPS shown on the drawings could meet the requirement—depending on the exact thermal performance of the material used. Construction document specification of thermal performance of EPS/IPE rigid insulation on the exterior walls is needed to demonstrate the design's compliance with this requirement.

Window U-Value

No information about the window U-values were found in the construction drawings or the compliance report, so we cannot check against the code requirement. We recommend asking the project team for the specifications. Note that the rated thermal performance of the whole window assemblies (including the frames) shall be clearly stated and used for the compliance check, including the values for standard windows.

Window Area & Orientation

ASHRAE requires that the window areas on the east and west sides are each equal to or less than the window area on the south side of the building. Meeting this requirement would require drastic modifications of the design (e.g., orientation of the building on the site). Note that the IECC compliance path in the 2015 Minnesota Energy Code does not have this requirement (although the IECC is more stringent in some other areas).

Slab Edge Insulation

The rigid insulation R-value is not clearly indicated in the construction documents provided and the depth of the insulation is not clearly indicated. The 2" x 3" of rigid insulation shown on the drawings could meet the requirement—depending on the exact thermal performance of the material used. Construction document specification of thermal performance of the rigid insulation used around the edges of the slab and a clear indication of its depth are needed to demonstrate the design's compliance with this requirement. Also note that if the project is classified as a multifamily building (instead of hotel), the slab edge insulation requirement will be higher (R-20 for 2").
## Plan Review Report Summary Table

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
<th>STATUS</th>
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<th>STATUS</th>
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</thead>
<tbody>
<tr>
<td><strong>ENVELOPE REQUIREMENTS</strong></td>
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<td><strong>MECH</strong></td>
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<tr>
<td>Roof Insulation R Value</td>
<td>Green</td>
<td>Economizer</td>
<td>Green</td>
</tr>
<tr>
<td>IECC: C402.2.1</td>
<td></td>
<td>Demand Controlled Ventilation</td>
<td>Red</td>
</tr>
<tr>
<td>Above Grade Wall Insulation</td>
<td>Yellow</td>
<td>Energy Recovery Ventilation</td>
<td></td>
</tr>
<tr>
<td>IECC: C402.2.3</td>
<td></td>
<td>Boiler &amp; Chiller System Control</td>
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</tr>
<tr>
<td>Window U value</td>
<td>Red</td>
<td>Variable Flow Pump Control</td>
<td></td>
</tr>
<tr>
<td>IECC: Table C402.3, Sec C402.3.3 &amp; C402.3.4, (C303.1.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window Area &amp; Orientation</td>
<td>Green</td>
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<td></td>
</tr>
<tr>
<td>IECC: C402.3.1</td>
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<tr>
<td>Slab Edge Insulation</td>
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<td>IECC: C402.2.6</td>
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<tr>
<td><strong>ELECTRICAL REQUIREMENTS</strong></td>
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<td><strong>Duct Sealing</strong></td>
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<tr>
<td>Automatic Lighting Shutoff</td>
<td>Red</td>
<td>Supply Air Temperature Reset</td>
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<tr>
<td>IECC: C405.2.2.2 &amp; C405.2.2.1</td>
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<td></td>
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<tr>
<td>Daylight Zone Control</td>
<td>Green</td>
<td>Fan Motor Sizing vs bhp</td>
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<tr>
<td>IECC: C405.2.2.3.1, C405.2.2.3.2 &amp; C202</td>
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<tr>
<td>Multi-level Lighting Control</td>
<td>Green</td>
<td>Pool Cover</td>
<td>Red</td>
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<tr>
<td>IECC: C405.2.1.2</td>
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<td>Interior Lighting Power Density</td>
<td>Green</td>
<td>HVAC Commissioning</td>
<td>Green</td>
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<tr>
<td>IECC: C405.5</td>
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<td>Low Leakage Intake and Exhaust Dampers</td>
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<td>Conductor Sizing</td>
<td>Red</td>
<td></td>
<td>Red</td>
</tr>
<tr>
<td>IECC: C405.8</td>
<td></td>
<td>Additional Energy Efficiency Package (3 Options)</td>
<td>Red</td>
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<tr>
<td>Lighting System Functional Testing</td>
<td>Yellow</td>
<td>IECC: C408.2</td>
<td></td>
</tr>
<tr>
<td>IECC: C408.3</td>
<td></td>
<td>IECC: C402.4.5</td>
<td></td>
</tr>
<tr>
<td><strong>Add. RE</strong></td>
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<td></td>
</tr>
</tbody>
</table>

**Status Legend:**
- Green: Code requirement met
- Yellow: Not enough information to determine/ensure
- Red: Code requirement not met
- Gray: Not required for this project
Findings:
Recruitment, Compliance/Potential Achieved, & Surveys
Program Participation

- Design Team Support
  - Goal: 40
  - Participated: 10

- City Support
  - Goal: 9
  - Participated: 8
Program Target Measure Compliance: 24 Buildings at Permit Plan Submission

- Compliant: 28%
- Inadequate Information: 28%
- Not Compliant: 20%
- Not Applicable: 25%
Savings Potential Available Through Increased Code Compliance

<table>
<thead>
<tr>
<th>Savings Estimate Basis</th>
<th>Annual Electric Penalty (kWh)</th>
<th>Annual Gas Penalty (therms)</th>
<th>Annual Cost Penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Estimate (Clearly Non-Compliant)</td>
<td>35,402</td>
<td>545</td>
<td>$4,179</td>
</tr>
<tr>
<td>High Estimate (Not Compliant + Inadequate Info)</td>
<td>71,501</td>
<td>1,476</td>
<td>$8,702</td>
</tr>
</tbody>
</table>
Top Savings Measures

• Verifying Control & Performance
  • HVAC Commissioning
  • Lighting Control System Functional Testing

• Design Elements
  • Roof Insulation
  • Above-grade Wall Insulation
  • Duct Sealing
  • Damper Leakage
  • Pool Cover

• Future Recommendation: HVAC Sizing
## Energy Savings Evaluation Approach

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<tr>
<td>Prescriptive Code Path</td>
<td>Performance or Prescriptive</td>
</tr>
<tr>
<td>Participant Vs. “Control” Buildings</td>
<td>Design Vs. Code (Potential)</td>
</tr>
<tr>
<td>Calc/simulation based on statistical summary of test &amp; control bldgs: %, values &amp; quantities (e.g. sf window area)</td>
<td>Pre-post comparisons: 6 buildings where cities had us perform a subsequent review after requesting design updates</td>
</tr>
</tbody>
</table>
Pilot Program Impact: Savings Achieved Per Building

- Electric Savings (kWh): Potential, Design Team Support, City Review Support
- Gas Savings (cubic feet)
- Annual Energy Cost Savings: $4,179, $2,976, $3,574
Projected Program Costs

- Designer Support: All Buildings
- Designer Support: Last 9 Months
- Designer Support: Future Program
- City Support: All Buildings
- City Support: Last 9 Months
- City Support: Future Program

Costs are categorized into:
- Recruitment (+City Reports)
- Kick Off & Consulting
- Plan Review
- Incentives
- Inspection/Other

Cost range is from $0 to $6,000.
Project Program Cost-Effectiveness

Benefit to Cost Ratio

- Societal Test
- Electric Utility Test
- Gas Utility Test

Design Team Support
City Review Support
Qualitative Survey of Participants

Survey Objectives:

1. Observed value of the pilot services, now and as potential future services
2. Program design preferences

- Surveyed code officials mid-pilot and post-pilot
  - Asked for input on services provided in the previous 6-9 months
  - Mid-stream survey – 5 respondents
  - Post-pilot survey – 4 respondents

- Surveyed members of the design team post-project
  - 11 respondents
How often do you work on a project that needs revisions to pass city plan review or inspection? (10 responses)

- Frequently: 33%
- Sometimes: 22%
- Most projects; it is part of the process: 45%

How Valuable Were the Pilot Program Services?
Score 1-6 (6 = highest value/extremely helpful)

- Score 3: 1 response
- Score 4: 3 responses
- Score 5: 3 responses
- Score 6: 4 responses
Surveys Said...

Value of services provided – TOP 3

1. Kick-off meetings
2. Documentation Checklist (late design tool)
3. Applicability Guide (early design tool)

4. First plan review
5. Second plan review
6. Convey technology requirements to contractors
7. On-demand technical support (in person/by phone)
Surveys Said...

Value of services provided – TOP 3

1. 1st review of project plans & pro
2. Guidance provided during inspection walk-alongs
3. 2nd review of project plans with comments (post-revisions)
4. Direct coordination with design engineers regarding compliance at plan review time
5. Identifying the best compliance path
6. Review of submittals during construction
7. Post-inspection comments
8. Energy simulation review (performance-based projects)
Would you be interested in having access to these energy code technical support services on an ongoing basis?

- 1 Response (33.3%)
- 2 Responses (66.6%)

Options:
- Yes, very interested
- Yes, slightly interested
- Not very interested
- Not interested
Participant Commentary

Design Team Services

When asked what was least helpful:

[We] *did not experience* anything that was. The *energy code was difficult, but this program made it comprehensible.*

City & Code Official Services

*Since the implementation of the new Energy Code in Minnesota, the trades haven't fully embraced it, if at all. [The pilot] helped us first understand it ourselves as code officials and, secondly, [helped] enforce it as it pertained to each individual project.*
Key Findings

• For at least a few, key commercial energy code items, there is significant potential to save energy through increased compliance.

• The pilot CIP program model of building-specific technical assistance cost-effectively captured most of the savings potential.

• While both pilot program approaches — design team support and city reviewer support — achieved similar energy savings.

• The city reviewer support had more success with participation, with much lower marketing/sales costs
CIP Program Recommendations:
Design, Claiming Savings
CIP Program Recommendations

• For Any Code Compliance Program
  • Focus on a limited # of high impact items
  • Work with regulators to establish savings/evaluation methodology
  • Separate, specialized recruitment or delivery for renovations

• For Similar Individual Commercial Project Assistance
  • Partner with cities to support their design review
  • Emphasize project team kick-off meeting
  • Quality for perception as a valuable resource

• Relationship with Other Programs
  • Complementary to design assistance type programs
  • Savings opportunities through Commissioning & Lighting Control Functional Testing
THANK you!

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Questions?

Improving Energy Code Compliance through Support and Assistance Programs

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Send us your questions using GoToWebinar question box
**Conservation Applied Research and Development**

Funds projects to identify new technologies or strategies to maximize energy savings, improve the effectiveness of energy conservation programs, or document the carbon dioxide reductions from energy conservation projects.

**Background**

The Next Generation Energy Act of 2007 (the Act) established energy conservation as a primary resource for meeting Minnesota’s energy needs while reducing greenhouse gases and other harmful emissions. The Act also established a savings goal of 1.5 percent of annual retail electricity and natural gas sales for all utilities in the state. The utilities may reach this annual goal directly through its utility Conservation Improvement Program (CIP) and, indirectly, through energy codes, appliance standards, behavioral and other market transformation programs.

To help utilities reach their energy savings goal, the Act authorizes the commissioner to assess utilities $3,600,000 annually for grants for applied research and development projects:

- $2,600,000 for the Conservation Applied Research and Development (CARD) program through which Commerce awards grants in a competitive Request for Proposal (RFP) process.
- $500,000 for the Center for Sustainable Building Research to coordinate activities related to Sustainable Building 2030 (SB2030)
- $500,000 for the Clean Energy Resources Teams (CERTs) for community energy technical assistance and outreach.

**Webinar Recording & Final Report available in few weeks**

**R&D Web Page** (https://mn.gov/commerce/industries/energy/utilities/cip/applied-research-development/)
Thanks for Participating!

Upcoming CARD webinar:
• Mar 27: Increasing Residential Boiler Efficiency with QI & Retro-Cx
• Apr 25: Beyond Lighting Programs in the Small Commercial Sector

Commerce Division of Energy Resources e-mail list sign-up

If you have questions or feedback on the CARD program contact:
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