Pilot Program with Two Focused Approaches to Enhance Energy Code Compliance

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ABSTRACT

Center for Energy and Environment developed a commercial energy codes support program to establish a local precedent for utility-funded energy code compliance enhancement programs in Minnesota, a state with relatively low utility rates. Two specific innovative pilot program approaches were developed for 1) small building design support and 2) large commercial building plan review. Program marketing began in October, 2015.

In contrast to other efforts to comprehensively achieve compliance for all energy code line-items and building types, these carefully targeted approaches are designed to cost-effectively achieve significant energy savings while minimizing program costs. To accomplish this, the pilot program first identified the building types and code line-items expected to have the most potential savings, based on both energy impact and the frequency of specific missed code items.

Based on this information, the first program delivery approach supports design teams with four types of small building projects using a key energy code items cheat sheet and preliminary plan review services. The second program delivery approach provides technical support to code officials through plan review, as well as inspection guidance for large, complex buildings, especially where energy simulations are used. The design of these two targeted program approaches takes into account an appreciation for the challenges designers and reviewers face in understanding the complexity of the energy code. While the pilot will be more fully evaluated when it concludes in 2017, this paper reports on the program development and design, as well as the results of initial program delivery.

Introduction

This paper reports on Center for Energy and Environment's (CEE) commercial energy codes support pilot program that is supported by a grant from the Minnesota Department of Commerce, Division of Energy Resources through the Conservation Applied Research and Development (CARD) program. In Minnesota, it has been reported there is over 90 percent commercial energy code compliance, suggesting little potential for energy savings (Hernick, Nelson and Sivigny 2013).

However, a New York study with similar compliance at 85 percent based on the same measurement approach used a more detailed, energy impact quantification method and found a compliance rate of only 36 percent, indicating there may be more opportunity for energy savings than previously believed (Harper et al. 2012). This project has been undertaken to develop and test two specific innovative program approaches and optimize these for cost-effectiveness in Minnesota commercial buildings.

Rather than trying to broadly increase energy code compliance for all commercial building projects and code line-items, this project uses a carefully targeted approach. The project plans to achieve significant improvement in particular parts of the market through support of

project development teams and/or city staff at the time they are working on actual projects. The pilot will focus on the specific combinations of building project types and code requirements where the largest energy cost savings are expected. This targeted program approach takes into account the need to maximize program impact while minimizing costs, as well as an appreciation for the challenges of designers and reviewers who often are overwhelmed by the complexity of energy codes.

The pilot program was developed in the first three quarters of 2015. In June, 2015, Minnesota underwent a commercial energy code update, six years after the previous code update. The new code provides projects with the option of following IECC 2012 with Minnesota amendments or ASHRAE 90.1-2010 (unamended). Marketing of the program began in the fourth quarter of 2015. Program delivery began in January, 2016 and will continue into the third quarter of 2017, with an evaluation at the end of 2017. This paper reports on the program development efforts, resulting program design, and initial program implementation results.

Commercial Codes Program Climate in Minnesota

A number of codes compliance enhancement programs aimed at comprehensive energy code compliance for commercial buildings have been piloted or rolled out in the last few years, but CEE concluded that a more focused approach would be most appropriate in Minnesota for a number of reasons (Lee et al. 2013). First of all, the effective average utility rates of ~$0.10 per kWh are much lower than in most areas where codes programs are underway. Secondly, previous research has found that Minnesota has a higher rate of commercial energy code compliance than most states, so a blanket approach is likely to expend resources in areas where compliance is already strong, reducing the opportunity to maximize savings (Hernick, Nelson, and Sivigny 2013). It is also noteworthy that the programs in other states typically have elements that would intervene in the relationships between cities and development teams in ways that many cities in Minnesota may not accept (e.g. allowing a project team to hire a third-party plan reviewer and inspector of their choice from amongst “program approved” reviewers). While utility Energy Design Assistance programs have a proven record of success in Minnesota with cost-effective energy savings through early design intervention for large projects, that approach is too expensive to cost-effectively impact small projects. Finally, when asking about the energy code, the project team has consistently heard from designers and code officials that it is much too large and complex. This call for energy code simplification echoes the findings of previous commercial energy code compliance programs (Madison and Baylon 1998). Taking all of the above factors into account led us to believe the best approach to commercial energy code compliance improvement is Minnesota is a Conservation Improvement program (CIP) utility-funded program that strives to reap significant energy impact at low cost, rather than broadly pursue 100 percent compliance with all energy code items across all building types.

Besides questions about optimal program design and cost-effectiveness, utilities in Minnesota have also been hesitant to initiate energy codes support programs because of other uncertainties. In discussions with utility representatives, concerns were expressed about the coordination with other programs and appropriate crediting of savings for such programs. Utility regulators in Minnesota have historically been rigid in defining compliance with the current energy code as the reference point for calculating utility program impact in new construction situations. Policy discussions within the last few years have suggested that increased code compliance programs could be given credit for energy savings, but there has been no precedent set for this in the state.

The current energy code structure and history in Minnesota also has a big impact on this program. Minnesota had an ASHRAE 90.1-2004 based energy code in place for six years before the transition to the current combination of an amended IECC 2012 and unamended ASHRAE 90.1-2010. While the ASHRAE 90.1 standard is much more expensive by itself than the IECC code book, Minnesota is unique in providing a single code volume that combines the IECC as amended by Minnesota with ASHRAE 90.1 in a single volume that makes it more affordable and practical for industry professionals to have both documents readily available as a reference.

Program Development

The main technical program development challenge was the selection of key energy code line-items and building project types. Engineers reviewed information from a number of sources to develop targeted lists of energy code line items and building types, including:

- A study of energy code compliance in Minnesota (Hernick, Nelson, and Sivigny 2013).
- Interviews with 13 code officials representing 11 cities and 6 states that had adopted codes very similar to Minnesota's new code, but at an earlier time.
- An examination of specific updates to the codes (Wallace, Deringer, and Hudson 2014).
- Interviews with 17 code officials, architects, engineers and builders in Minnesota.
- Preliminary review of energy impacts of energy code changes.
- Historical data from a construction industry project database service.
- Historical data from partner cities on previous permits.
- Detailed line-item review of state-specific amendments.
- Detailed line-item review to consider likelihood of being missed in various project types.

Through these efforts, the pilot program developed a targeted list that represents only 14 percent of the total energy code line items. Figure 1 presents a summary of the breakdown of the list by building system.

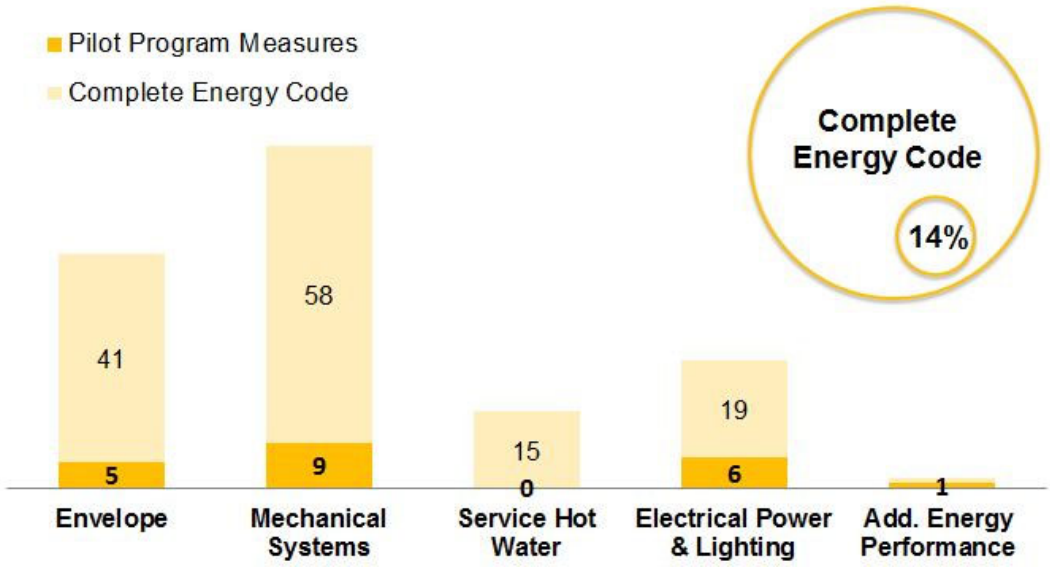

Figure 1. Results of target line-item measure selection by building system

After drafting a preliminary list of energy code line-items and building types to focus on, the pilot program developers obtained feedback from partner cities and a small number of local designers before establishing the list that would be used at the time of initial program rollout. Table 1 includes the current list of program target line-items.

Table 1. Energy code line items targeted by program

Envelope Measures		
Roof Insulation	Window U value	Slab edge insulation
Above Grade Wall Insulation	Window area/orientation	
Electrical Measures		
Automatic lighting shutoff	Interior lighting power density	Automatic outlet shutoff
Daylight zone control	Conductor sizing	Lighting functional testing
Multilevel lighting control		
Mechanical Systems		
Economizer	Variable flow pump control	Fan motor sizing vs bhp
Demand controlled ventilation	Duct sealing	Pool cover
Energy recovery ventilation	Piping size	HVAC commissioning
Boiler/chiller system control	Supply air temperature reset	
Additional Efficiency Package Option		
HVAC efficiency OR	Reduced LPD OR	Renewables

One key question the pilot program wrestled with in the program design was how to address the multiple path options in the code. While interviews with code officials in other states indicated IECC 2012 was overwhelmingly used by small projects and ASHRAE 90.1-2010 was dominant for large projects, the combination of Minnesota's history with ASHRAE 90.1 and the publication of a Minnesota specific energy code book that includes both IECC 2012 and ASHRAE 90.1-2010 gave us reason to suspect this pattern might be different in Minnesota. While the pilot program considered producing a series of separate documents for IECC vs. AHSRAE 90.1 to make each approach simpler, the similarities in the requirements of the two paths was consistent enough to make it practical to produce one document listing the requirements for both options.

The selection of a second-tier set of guidelines for those project teams wishing to go well-beyond the code was another technical challenge to the pilot program. Key considerations were both energy impact and simplicity for design teams to digest and implement. While New Building Institute's New Construction Guide (NBI 2015) was considered to be an appropriate option, we ultimately chose to use the ASHRAE Advanced Energy Design Guide 50% series for the pilot program (ASHRAE 2011-2012). The most critical factor for this trial use was the simplicity of having multiple people on the project team able to download the documents at no cost and without any special direction.

Program Description

The overall pilot program goal is to establish a successful precedent for a utility-funded commercial energy codes support program in Minnesota, and the pilot program believed a very targeted approach was needed to cost-effectively achieve energy savings in a state with relatively low utility rates. Rather than striving to achieve compliance with all energy code line-items for

all projects, the goal is to achieve higher compliance for line-items having a high energy impact and/or are most commonly missed. The method for selecting these line-items was described in more detail in the previous section. The pilot program is testing two different strategies to improve compliance, as outlined below. While these approaches could allow for overlap in terms of building projects served, the pilot is avoiding any overlap to better evaluate the impact of each approach.

Program Approach 1: Design Team Support for Specific Small Building Types

The first program approach aims to impact the underserved market of small building design by providing tools and support to project design/development teams from early design through construction. The approach is similar to design assistance programs, with a much narrower scope and program cost per project. The goal, and a key incentive for participating project teams, is to clearly address key energy code items early in the design and development process to avoid much more costly, late-stage changes. The pilot is targeted to specific building types in order to keep the set of project requirements and tools as simple, accessible, and useful as possible. While new construction projects are eligible, it is expected the majority of projects will be renovations of existing buildings. The key elements of program approach 1 are shown in Table 2 below.

Table 2. Features of program approach 1

Program scope		
Small buildings	4 specific building types	New & existing buildings
22 energy code line-items	Whole building tier 2 package	Prescriptive compliance paths
Benefits/support to design and development teams		
Energy code cheat sheet	Best practices guide	Plan review prior to permit
Incentive to owner	Incentive to design team	Construction phase support

Building owners and project team members participating in the pilot are given modest incentives for successfully incorporating a number of basic efficiency requirements into their project. The incentive amounts are $500 to the building owner/developer and $275 to the design team. Larger incentives of $750 and $475, respectively, also are offered for achieving a second-tier level of compliance with a simplified set of energy design requirements that exceed code (the 50% reduction series of ASHRAE Advanced Energy Design Guides, where applicable [ASHRAE et al. 2011-2012). The basic energy efficiency requirements represent a targeted list of energy code line-items having lowest compliance and/or largest energy impact for the specific types of buildings targeted— office, retail, restaurant, and multifamily/lodging. Participants are provided these requirements in the form of a one-page front and back document that provides design teams with guidance on the targeted energy code line-items. The document aims to provide a more accessible language approach to help designers determine whether a code line-item is required for a particular project and to understand just what is required (while also providing specific code section references). A second document also provides guidance in terms of best design practices for addressing and clearly documenting elements for the targeted code line-items. Figure 2 shows an excerpt from the key one-page summary document.

TECHNOLOGY	TECHNOLOGY DESCRIPTION / ENERGY IMPACT & CODE REFERENCE	MEASURE REQUIREMENT	WHEN IT APPLIES	Targeted Building Use Types	APPLICABILITY SUMMARY
Air Economizer	Equipment that uses cool outside air to meet air conditioning needs (when possible) instead of running the AC compressor(s). This reduces compressor	**IECC & ASHRAE:** Specify and install air economizer system capable of providing up to 100% of design supply air as outdoor air (for cooling). *IECC References:* ***C403.3.1 & C403.4.1*** *ASHRAE References:* ***6.5.1***	**IECC:** When a fan cooling unit has a cooling capacity of ≥33,000 Btu/hour (>2.75 tons); Multifamily: ≥165,000 Btu/hr (13.75 tons) **ASHRAE:** When a fan cooling unit has a capacity ≥54,000 Btu/hr (≥4.5 tons) [Multifamily: ≥270,000 Btu/hr (≥22.5 tons); Computer Rooms: ≥135,000 Btu/h (≥11.25 tons)]	**Multifamily** **Offices** **Restaurants** **Retail Spaces**	Seldom applies Applies to most systems serving floor areas large than listed (or smaller areas with high cooling loads): IECC ≥~1,100 sf ASHRAE ≥~1,800 sf
Demand Control Ventilation (DCV)	A control that automatically reduces the amount of fresh outside air being brought in through the ventilation system when few or no people are in a space. This reduces the energy use for heating and cooling outside air.	**IECC & ASHRAE:** Specify and install a demand control ventilation system (or exhaust air energy recovery ventilation) for high occupancy spaces (Occupant Density is based on the MN 2015 Mechanical Code, Table 403.3 *Minimum Ventilation Rates.*) *IECC References:* ***C403.2.5.1*** *ASHRAE References:* ***6.4.3.9***	**IECC & ASHRAE:** When design occupancy is: **IECC** ≥25 people/1,000 sf **ASHRAE** >40 people/1,000 sf for a space >500 sf with ≥1,200 cfm of supply air flow AND there is an economizer, automatic modulating outdoor air damper control, OR outdoor airflow is >3,000 cfm AND the hvac system has ≥1,200 cfm of outdoor air AND the hvac system does NOT have exhaust air ventilation recovery with and effectiveness of at least 50%	**Multifamily** **Offices** **Restaurants** **Retail Spaces**	May apply to common spaces Often if large meeting room, reception area or phone/data entry. Almost always applies unless very small Seldom applies (except mall commons or other gathering space)

Figure 2. Excerpt from program guidance document

After project teams are enrolled in the program and receive the guidance documents, the pilot program periodically checks in to discuss design progress and offer assistance in the form of preliminary design review by program staff who are International Code Council (ICC) certified[1] for the energy code. The program requires quick turnaround on requests for design review in order to allow time to redirect design teams while it is relatively simple and inexpensive to make design changes.

Once project design is complete, program staff track the progress of the project through monthly program level check-ins with city code officials and/or the project teams. In some cases, program staff will provide direction to contractors in how to avoid common pitfalls for particular energy code line-items. When construction is complete, program staff perform inspections to confirm compliance with the targeted code line-items before issuing the incentive checks. While the program will likely inspect all participating projects initially, the pilot program will also explore lower cost alternatives such as using building official inspection results and/or randomly inspecting a fraction of participating projects. The energy impact of this program approach will be gauged by a combination of notes on specific design changes made in response to preliminary design reviews and a comparison to a group of control building projects that will be reviewed and inspected over the same time period.

Program Approach 2: City Plan Reviewer Support for Large, Complex Buildings

The second program approach provides the technical assistance of an energy engineer to city staff as they review plans and other detailed submittals. Technical support of city staff during the permit plan review stage will allow for the identification and correction of problems before the time of construction, otherwise, it is generally impractical or cost-prohibitive to make substantial changes. Reviewers with specialized expertise in energy code and building simulation are expected to identify more energy code issues at the design submittal phase. This program approach is expected to have a much higher fraction of new construction or addition projects than the small buildings project, and also will likely serve a large number of renovation projects. The key elements of program approach 2 are highlighted in Table 3.

City staff have finite amounts of expertise and time available for the review of plans regarding health and safety concerns, resulting in little time for the review of energy specific issues. Projects requiring the review of building energy simulations will be a focus of this approach. These simulations allow exemptions from a large number of code line-items by showing a level of performance for the building as a whole, and few code officials have the

[1] See http://www.iccsafe.org/education-certification/certification-and-testing/

expertise or time to review these submittals. A specialist develops a checklist of the key design elements that exceed code and make up for exemptions in other areas (allowing inspectors to verify these), and review for accuracy and bias in the simulation analysis. The checklist of items exceeding code will be invaluable to city staff as they later inspect the project to verify compliance. City staff have also reported that technical assistance with the review of commissioning reports is valuable and is expected to be effective at providing energy savings through the identification of issues that can still be easily addressed at the end of the construction phase of the project. While third-party support of plan review and inspection has been a hallmark of a number of code compliance programs in other states, this pilot program will limit the design review to the key areas with the most significant energy impact and will not attempt to override existing code inspection services (which is relatively expensive and politically sensitive).

Table 3. Features of program approach 2

Program scope		
Large buildings	Complex mechanical systems	New building, additions, and major renovations
22+ energy code line-items	Prescriptive compliance paths	Performance compliance path
Support to city code officials		
Permit set plan review and report on 22+ items	Review of building energy simulations submitted for performance documentation	Checklist for inspection of performance path items

A full-scale program with this approach would be expected to eventually lead to upstream improvements in designs before these reach code officials, helping design teams come to expect a much closer review of energy code items than in the past. For this project, in order to better evaluate the potential energy impact of this program approach, the pilot program does not include efforts to encourage code officials to “warn” design teams that a third-party review of the design with respect to the energy code is taking place. The potential energy impact of this approach will be estimated through analysis of the line-items flagged as non-compliant during reviews.

Initial Results

City Partnerships and Recruitment for Large/Complex Projects

The pilot program has established close working relationships with three partner cities, which are looking to program staff as a resource beyond what was originally envisioned. Each partner city is a suburb in the Minneapolis-St. Paul metro area. The pilot program has generally found city staff are open to our third-party involvement in plan review and inspection, although this is not always the case. This is in contrast to our original expectations of city staff sensitivity to someone “looking over their shoulder.” The cities the pilot program is partnering with have even asked CEE to perform inspections alongside some of their staff for training purposes, and these relationships with city codes enforcement and planning staff have been invaluable for the first phases of the pilot program.

The most critical result from these city partnerships has been the commitment of seven specific large building projects for review within the first four months of program roll-out. The

cities had also asked for the inclusion of two other projects that did not fit our criteria for building size or type, and thus were not included in the pilot, and the commitments have included repeat requests from a city after receiving their first participating project's review report. This reinforces the project team's expectation cities will see value in the delivery of this program that goes far beyond a one-time training activity. In some cases, the actual timing of the permit submittal reviews will occur up to three months after commitment of pilot program services, putting the pilot program well ahead of the goal of reviewing 10 to 15 large buildings within an 18 to 24 month time period. Furthermore, the pilot program has seen no signals from the partner cities that the requests for pilot project reviews will decrease over time.

Beyond providing sites for large building reviews, the pilot program will be leveraging the relationships with partner cities to aid in the identification and recruitment efforts for small building program participants, and to help track projects after the design review so that the pilot program is able to time our field verification visits accordingly. To date, the partner cities have provided a small number of leads for projects that are early enough in the design process to be served by the small building design team assistance approach, and the pilot program remains hopeful this will increase to be a significant fraction of participating project leads as city staff start thinking more about the pilot program on a day-to-day basis. Moreover, the partnerships and code officials' awareness of our program activities lends more credibility in the eyes of the building project development and design teams.

Small Building Recruitment

The recruitment rate for small building participants was initially slower than expected, and the pilot program is now seeing signs of this accelerating. In the first four months of the program rollout, the pilot program has received six commitments for project participation. The actual delivery of services is projected at one to four months after successful recruitment due to building design timelines. This initial recruitment rate is substantially behind the rate needed to achieve the pilot program goal of 40 to 60 small building project reviews within an 18 to 24 month time period. Increasing the small building recruitment rate is currently the most pressing challenge for this program.

Since we have had difficulties achieving the initial vision of a focused, project-based recruitment, the pilot program is transitioning to a market player-based recruitment. The pilot program had originally hoped to be able to make the majority of recruitment calls to design and development team members when they were beginning to design a specific project in one of the partner cities. The pilot program had hoped the project status information in Dodge Report's database from McGraw Hill, along with information from city planners, would provide numerous leads for project team members to contact at just the right time for them to commit and then quickly move into program participation. However, over the first few months, it has become clear these sources and contacts are not as comprehensive in scope, and/or are not as reliable in providing current project design and development stage information as was hoped. For these reasons, our cold calls to design teams based on project database tracking information often failed to secure a commitment for the particular project flagged by the database. These calls have often led to discussions about other specific projects the industry contact would consider for inclusion in the program if and when reaching the appropriate design phase. In addition, the pilot program has reached out to a number of design firms within CEE's network of contacts, and obtained long-term program interest along with commitments for pilot program participation for specific building projects. While this approach of working on long-term relationships with

industry players has been very successful for CEE's One-Stop Efficiency Shop program, it can take significant time to fully gain traction in the market.

In addition to reaching out to a broader network of designers, the target area for inclusion of small building pilot participants has been expanded beyond the borders of the three partner cities. This change greatly increases the pool of eligible projects, while maintaining a level of consistency in the local commercial building industry players and market practices.

Compliance Reviews

The pilot program has completed two full large building reviews, and one partial large building review at the time of this paper, in March, 2016. All three of these projects are new construction and used ASHRAE 90.1-2010 as the compliance route. The compliance path was determined through verbal inquiry for two of the three projects because the construction documents did not indicate which energy code compliance path was being followed. Moreover, the submitting contractor for one project took a few days to answer this question because he had to ask the architect. Just over half a year since the new energy code took effect in Minnesota, building code officials reported it is still typical for project teams submitting plans to be unclear on the two compliance paths. While the third set of plans clearly noted the selected compliance path on the code summary sheet, this sheet had a number of incorrect values listed for envelope performance requirements. The poor level of basic understanding of the new code among project teams was reflected in the very low compliance rates for the targeted line-items reviewed by pilot program staff.

Figure 3 summarizes the lower than expected compliance rates for the targeted items. Just over half of the pilot program team's line-item reviews found the design documents either clearly showed the requirement was not met, or the element was not defined well enough to ensure the final construction would meet the requirement. Half of the line-items not needing correction are a combination of one of five items being required and the design adequately addressing it, and nearly one of three items not being required (because of the building usage and/or system selection). The very low compliance rate for the targeted items reflects both a common failure on the part of design teams to adequately address the current energy code design requirements, and a success in the program design efforts to target the most frequently missed items.

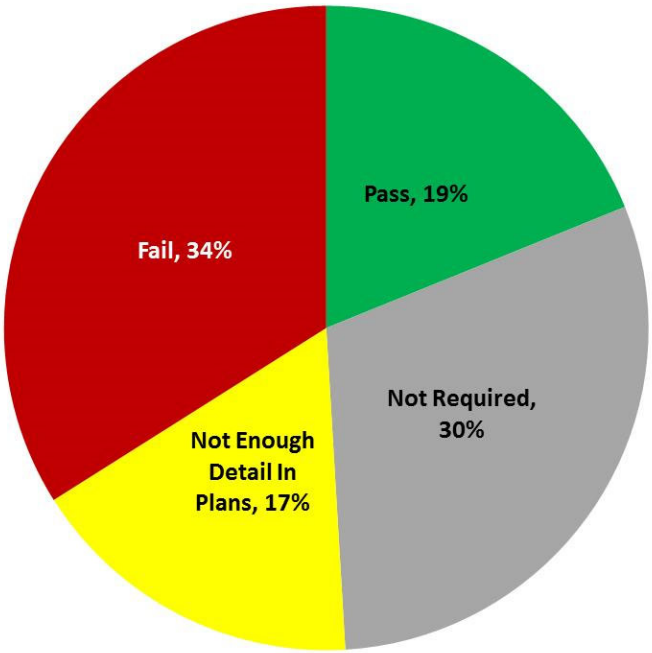

Figure 3.Summary of code line item review findings

The initial response from code officials in the city where the first two reviews were completed was that the program reviews were very helpful, and these comments were passed along to design teams. Assuming the identified deficiencies are appropriately addressed in design updates and construction, the pilot program is expected to have an even higher impact on building energy use than originally anticipated.

Figure 4 details how the initial review results varied for the three main categories of requirements. Lighting and other electrical items were found to have the worst compliance with only one of five line-items being adequately addressed in the design to meet the requirement. The majority of inadequacies in this category were clear failures to meet code requirements, as opposed to omissions of adequate detail. In other categories, omission was a higher fraction of the failures. Code officials also commented that electrical contractors and designers tend to be unfamiliar with energy code requirements as they are not used to worrying about anything other than the National Electrical Code. This observation, combined with the preliminary results, suggests a widespread campaign to increase energy code awareness within this specialty area could be beneficial.

The majority of the items not required for these particular projects were either HVAC-related requirements for systems that did not exist, or were smaller than the threshold for which these requirements apply. Because the first two full reviews were multifamily and hospitality projects that generally have simpler and smaller HVAC systems compared to other commercial buildings, it is likely a number of these items will be required in those other, large buildings. When the instances of required line-items are ignored, the percentage of items meeting code requirements (among those required and targeted) is less than 10 percent for the electrical category.

We found that the building envelope category had the highest pass rate of required items at 47 percent. This category also included the only item that was required and passed for all three projects — roof insulation. If the trend toward the choice of ASHRAE 90.1-2010 as the

compliance path continues, this line item will be eliminated from the program review list as the requirement in this path is generally less stringent than Minnesota's previous energy code requirement (while IECC 2012's requirement is more stringent). The envelope category also had the highest fraction of line-items that were not adequately defined. This echoes CEE's observations of common failures to adequately specify thermal performance values for key envelope elements, especially traditional windows, storefront windows, and rigid insulation.

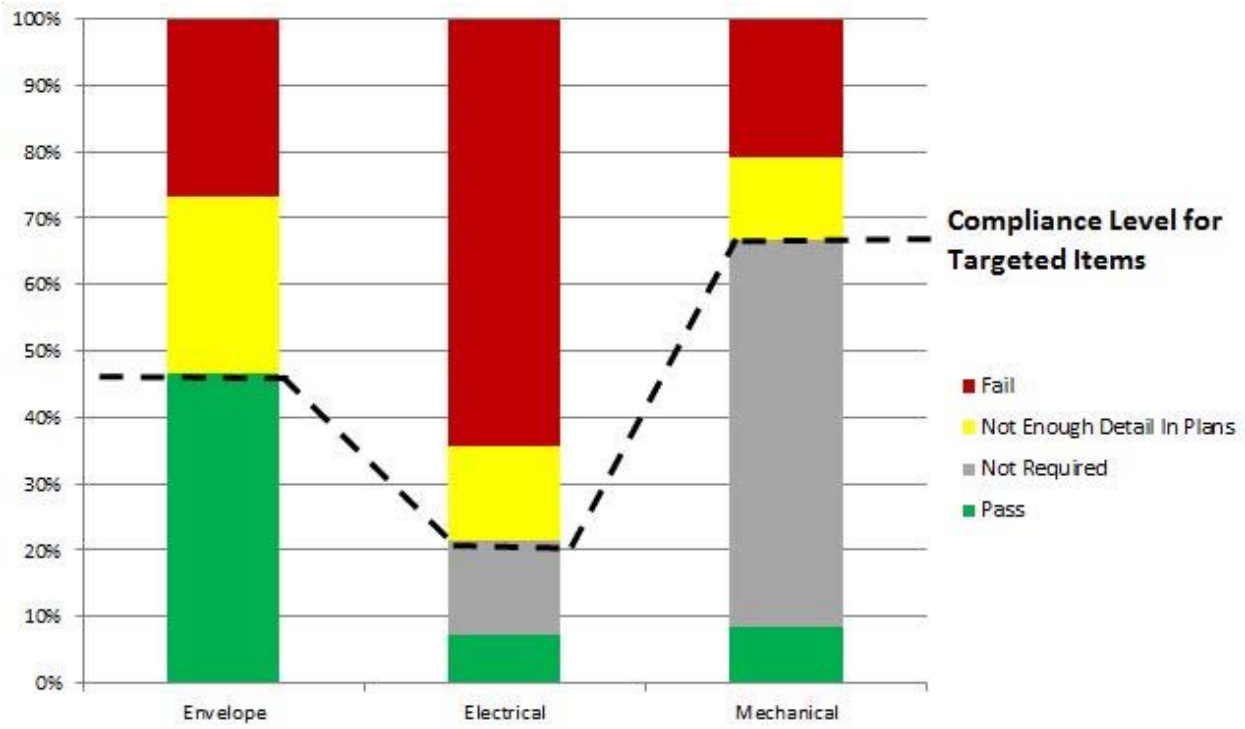

Figure 4. Variation in targeted item compliance by building system type

Conclusions

While it is too early in the pilot to draw objective conclusions about program energy savings and/or cost-effectiveness, initial results suggest promise for the two pilot approaches to achieve energy savings through increased commercial energy code compliance. A common theme among these two approaches is targeting a limited set of energy code line items and building types in order to maximize the cost-effectiveness and energy impact with a reasonable level of conservation program funding. Primary factors for the selection of specific energy code line-items were energy impact and expected levels of non-compliance, while secondary factors were prevalence within the building types addressed by the first pilot program approach and practicality of being able to address cost-effectively in a production level program. The first program approach primarily provides technical support to design teams while they work on the design of a specific project that fits within one of four small building categories targeted by the pilot program. This support is in the form of an energy code "cheat sheet" with 22 items and review of preliminary designs prior to their completion. Project teams are given a modest financial incentive to clearly show compliance with these 22 items The second program approach provides third party review assistance to city code officials while they review larger, more complex projects.

Pilot program delivery is still in the early stages. Neither city partnerships nor the use of a building project tracking data service have consistently provided leads for specific small building projects at the appropriate time for early design support of design teams. However, the pilot program found that close partnerships with cities has led to a rate of sign up above expectations for third-party reviews of design at the time of permit application. While recruitment of projects to receive design team support started out slowly, ongoing conversations with a number of designers eventually led to the commitment of participation for a number of projects. Very early results from large project reviews have found compliance with about half of the energy code line-items targeted by the pilot program. About 30 percent of the targeted line-items were not required for the initial buildings due to system types and sizes. If these items are excluded so the percentage of line-items passing the requirements is looked at as a percentage of the requirements for these specific projects, the compliance rate is 27 percent. Overall compliance is lowest in lighting and other electrical requirements, and highest in envelope requirements, even though a failure to objectively specify thermal performance requirements for key items is common. Many of the mechanical system line-item requirements did not apply to these specific buildings, although these requirements are expected to be much more common in other building types.

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