

Process Evaluation of the Building Energy Code Compliance Program

June 2012 through May 2013

Prepared for:
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Executive Summary

This report presents the results of the process evaluation of the Building Energy Code Compliance Program offered by the Illinois Department of Commerce and Economic Opportunity (DCEO). This report presents results for electric program year four and natural gas program year one (EPY5/GPY2), which is defined as the period from June 2012 through May 2013.

The main features of the approach used for the evaluation are as follows:

- Data for the study were collected through review of program materials including course instructional materials, course evaluations, and tracking data supplied by the implementation contractor.
- Focus group discussions were held with training attendees.
- Interviews were completed with staff members from DCEO and their implementation partner.
- Literature on code compliance issues and programs to support code compliance was reviewed.

The Building Energy Code Compliance Program plays an important role in improving Illinois statewide compliance with the energy code. The program engages in a number of activities to support compliance with the code. During the EPY5/GPY2, the training and technical interpretations were the primary support services and were the focus of this evaluation effort. However, the program also engages in a broader range of activities including the promotion of awareness of the building energy code, consultations with builders and code enforcement officials, and presentations to utility trade ally network workshops.

The following conclusions were developed from analysis of focus group discussions, staff interviews, documentation review, and relevant literature:

- **Program Seeks to Address Multiple Barriers to Code Compliance:** Previous studies of code compliance, focus group discussions with training attendees, and interviews with program staff suggest that there are a number of barriers that prevent full compliance with the building energy code in Illinois. In general, these barriers stem from insufficient knowledge among code enforcement officials and building professionals, the costs of complying and enforcement, a lack of demand from consumers for compliance, and a lack of political will to enforce the code in some jurisdictions.

The Building Energy Code Compliance Program addresses these barriers through the program activities that occurred during EPY5/GPY2 as well as through more recent developments. Arguably the program is best developed for addressing knowledge gaps among builders and code enforcement materials. The building energy code training provided through the Building Energy Code Compliance Program is one of the key services that

address these gaps. Training participants report that it is useful and valuable for improving code compliance. Moreover, the program has been proactive in developing additional coursework to address areas where insufficient knowledge is contributing to code noncompliance. For example, during EPY5/GPY2, the program initiated a new course on residential HVAC system design, and a course addressing commercial building compliance was recently launched.

In addition to the training courses provided, program staff members engage in a number of outreach activities to inform various stakeholders of the new code requirements. The DCEO website also contains links to guides published by the U.S. Department of Energy that address specific aspects of building compliance, such as HVAC systems and lighting.

Recent program developments seek to address other barriers to code compliance. Barriers to the enforcement of the code are being addressed through a pilot program that trains third party inspectors to certify building compliance. This training is coupled with the availability of rebates to builders for the additional cost of having the inspection performed. This strategy has been applied by code compliance support programs in other states and is worth further development.

The program also seeks to improve code compliance by creating greater market demand for energy efficient construction. Currently, the training offered through the program is open to anyone, including consumers, real estate agents, home appraisers, and others that may have a role in incorporating energy efficiency into the value of a building. Attendance by these types of individuals may increase demand for code compliance through their greater understanding of how the code impacts a building's energy consumption. However, a review of course attendees suggests that relatively few of these types of individuals attended the course during EPY5/GPY2. Moreover, the current course material may not be well suited to them as it addresses technical specifics of meeting code requirements. More recently, program staff has been developing a new training program targeting realtors and home appraisers. The goal of this program is to enable these professionals to adequately assess the efficiency of a home so that it can be factored into the home's value, in turn increasing the market demand for compliant buildings.

Overall, the Building Codes Compliance Program provides a range of services that address the known reasons for building energy code compliance. However the services that address knowledge deficiency barriers to compliance are particularly robust relative to the services that address other known barriers. The program is currently evolving to more extensively address issues related to a lack of enforcement and weak market pressure for compliance.

- **Increased Participation in Training Courses and Technical Interpretations:** The number of training attendees during EPY5/GPY2 exceeded the program's target of 1,200 attendees by more than 400. In total, 1,196 individuals attended the IECC training, up from 866 in the prior program year. Additionally, a new course on HVAC design for residential applications was attended by 437 individuals, and the number of technical interpretations provided during EPY5/GPY2 increased from 174 in the prior program year to 387. The increases in attendance and the number of technical interpretations indicate increasing demand for

information about the Illinois Energy Conservation Code. The higher demand may be driven, in part, by the new code requirements that went into effect in January 2013.

- **Good Communication and Strong Working Relationship between DCEO and Implementer:** DCEO's program staff indicated that a good working relationship exists between DCEO and International Energy Conservation Consultants (IECC, LLC), the program's implementation partner. IECC, LLC provides useful reporting in addition to meeting mandatory reporting requirements. The two parties have regular meetings, and interviewed staff members reported that communication has been sufficient.
- **Program Marketing:** The support services provided through the building codes program are primarily promoted through attendance at various events and through professional groups. On request, program staff members give presentations on building codes to professional associations and to building departments in jurisdictions around the state. They discuss the history of the building energy codes progression in the state and what services DCEO provides. The program also conducts targeted outreach to members of trade ally networks, code enforcement chapters, the Association of Illinois Electric Cooperatives, the American Institute of Architects, the Association of Illinois Engineers, and the Illinois ASHRAE chapters. Overall the promotional efforts for the training seem adequate given that the attendance targets were exceeded during the program year.
- **Participants Satisfied with Training Courses:** Responses to training evaluations and focus group discussions indicate that the participants in the training courses were highly satisfied with the course content, materials, and instructors. However, focus group participants did discuss a few areas for potential improvement. A number of participants commented that the courses provided a lot of information in a relatively short time, which made it challenging to fully understand all of the information presented. However, the challenge of assimilating all of the information presented was offset, somewhat, by the course materials (e.g., hard copies of the PowerPoint presentation and other handouts) that could be reviewed at a later time. In addition to the amount of information presented, some concerns were raised about the relevance of the course content. Depending on their perspective, focus group participants suggested that there was not enough information presented on specific topics related to their professional discipline or particular applications, or alternatively that too much time was spent addressing narrow, technically specific questions raised by other participants. Similarly, participants indicated that there was either too little, or too much, coverage of commercial applications as opposed to residential applications. These comments suggest that there is a greater need for information and materials that are more narrowly tailored to specific aspects of the energy code. One final issue that was raised by some participants was that on occasion too much time was spent addressing basic questions raised by individuals who had no knowledge of construction or energy management.
- **Participants Highly Value DCEO's Building Codes Support:** Course evaluations and focus group responses highlight the value of the IECC and HVAC courses to participants. A large majority of participants indicated on their course evaluations that the course was both useful and needed. Additionally, more than 90% of participants agreed or strongly agreed

that the course was worth their time and effort. Focus group participants also emphasized that the course provided useful information and were able to identify a variety of ways it has impacted their work. Although focus group participants noted that they utilize multiple resources to aid their code compliance, the general assessment was that there was not a resource that was comparable to the DCEO courses.

Overall, the code compliance enhancement services provided during EPY5/GPY2 and those in development are comprehensive and comparable to the range of approaches taken in other states. Moreover, training participants found the training to be useful and effective. The following recommendations are offered for DCEO's consideration in their further development of the program:

- **Consider Offering an Online Version of the Course:** Providing an online version of the course will increase the availability of the course to a broader audience at a relatively low cost. Making the course available online would also provide individuals who attend the course in-person an opportunity to review the material at a later date. The format of an online course could range from a simple recording of a classroom course accompanied by the course slides to a more interactive format. However, there are trade-offs to consider, as an online course may provide broader access but the material may not be as well understood without the interactive component present in a classroom course.
- **Promote and Develop Supplemental Materials:** Focus group participants indicated that guides and other resources that were tailored to specific applications (e.g., HVAC, building envelope, or lighting) would be beneficial. However, currently the DCEO codes website links to guides developed by the U.S. Department of Energy. Because such guides are already available, it may be more important for the program to promote these existing guides rather than to develop new ones. Further research could determine the level of awareness and perceived usefulness of these guides among building professionals in Illinois.

In addition to the development of these guides, focus groups participants also suggested that checklists detailing how to achieve code compliance would be helpful. Another potential resource that may be of use is a frequently asked question guide. This guide could be developed based on frequent questions raised during the training or through the technical support process.

- **Continue to Seek Ways to Support Enforcement Effort:** Uneven enforcement of the building energy codes appears to be a key barrier to code compliance. While the training and technical support provided through the Building Energy Codes Compliance Program may indirectly enhance enforcement through increased awareness of the code, other more direct approaches may be more effective. The new effort to train third party inspectors, and provide rebates to cover the costs of inspections, is one promising way of providing support for code enforcement. If successful, the expansion of this program may make significant contributions to statewide code compliance. Program staff should continue to seek and develop ways to increase enforcement by reducing barriers to enforcement. Approaches that have been suggested include providing assistance to help streamline the code enforcement process, fund

the purchase of diagnostic equipment needed to assess compliance, and facilitate communication among relevant stakeholders.

- **Increase Consumer Outreach:** Program staff noted that one way to enhance compliance with the building code is to create greater market demand for buildings that meet energy code requirements. Consequently, statewide compliance may be improved if more efforts are made to promote the value of code compliance to consumers. The program currently provides a consumer guide and a consumer checklist for assessing code compliance. Additional materials that could be developed include educational materials on the energy cost savings associated with complying with the code and online videos demonstrating the use of the checklist. These materials could be distributed or promoted through building departments or by utilities operating in Illinois.

1. Introduction

This report presents the findings of ADM Associates' process evaluation of the Building Energy Code Compliance Program offered by the Illinois Department of Commerce and Economic Opportunity (DCEO). This report presents results for electric program year four and natural gas program year two (EPY5/GPY2), which is defined as the period from June 2012 through May 2013.

1.1 Description of Program

In January 2013, a new version of the Illinois Energy Conservation Code went into effect. The current energy code for residential and commercial buildings is based on the 2012 International Energy Conservation Code (IECC) and American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) Standard 90.1, 2010. The energy code is applicable statewide but compliance is enforced by local jurisdictions. Under Illinois state law, jurisdictions are permitted to adopt their own energy codes, but these must be at least as stringent as the statewide code. Local jurisdictions that do not regulate energy efficient building standards are not required to adopt and enforce the code. However, buildings constructed in jurisdictions that do not regulate the building energy efficiency are subject to the statewide code.

The Building Energy Code Compliance Program was developed to improve building compliance with the Illinois Energy Conservation Code and to ensure that the state meets the 90% compliance rate by 2017 as required by the U.S. Department of Energy under the 2009 American Recovery and Reinvestment Act (ARRA). The program consists of a variety of activities intended to improve Illinois compliance with building energy code including training, technical interpretations of the code, and other forms of support. During EPY5/GPY2, two training courses were provided through the Building Energy Code Compliance Program. These courses were the International Energy Conservation Code Applications for Illinois (IECC) course that had been offered in prior years, and a new course on designing HVAC systems for residential buildings (HVAC). Records received from DCEO's implementation partner, International Energy Conservation Consultants, LLC, indicate that during the program year 1,195 individuals attended the IECC course and 447 individuals attended the HVAC course. Additionally, 387 technical interpretations of the building code were made during the June 1, 2012 through May 31, 2013 period. In addition to these services, other forms of support provided during the program year include presentations at utility trade ally workshops, consultation services with home builders such as advisement on building plans, consultation services with municipalities such as assistance with plan reviews, and assistance with implementation of new energy efficiency requirements.

International Energy Conservation Consultants, LLC, in coordination with DCEO, implements the Building Energy Code Compliance Program. International Energy Conservation Consultants develops the training curriculum, delivers the instruction, administers the delivery of the training,

and provides technical interpretations of the building code. The program is jointly marketed by International Energy Conservation Consultants and DCEO staff.

1.2 Organization of Report

This report on the process evaluation of the Building Energy Code Compliance Program is organized as follows:

- Chapter 2 presents and discusses the methods used for and results obtained from the process evaluation of the program.
- Chapter 3 presents the conclusions and recommendations from the process evaluation.
- Appendix A provides a copy of the focus group guide for International Energy Conservation Code Applications for Illinois Attendees.
- Appendix B provides a copy of the focus group guide for Right-Sized HVAC Design Attendees.

2. Process Evaluation

This chapter presents the results of the process evaluation of the Building Energy Code Compliance Program activity during EPY5/GPY2, which is defined as the period from June 2012 through May 2013. The purpose of the process evaluation is to examine program operations and results throughout the program year, and to identify potential program improvements that may prospectively increase program efficiency or effectiveness in terms of participation and satisfaction levels.

Key research questions to be addressed by this evaluation of EPY5/GPY2 activity include:

- What are the barriers to code compliance?
- Are the range of services provided adequately addressing the reasons for noncompliance with the code?
- Are the courses provided and delivered in a way that adds value to the participants?
- Are the participants satisfied with the knowledge gained?

The chapter begins with a summary of data collection activities, followed by a description of the program and the rationale for offering it to improve code compliance. This discussion is followed by findings from course evaluations and focus group discussions with course attendees. Finally, conclusions, recommendations, and other findings from the process evaluation are presented.

2.1 Summary of Primary Data Collection and Document Review

Focus group discussions with groups of attendees in the IECC and HVAC courses are the primary data source for understanding the training participant perspective. The focus groups provide in-depth participant feedback and insight regarding participant experiences with the training courses, the impact the courses has had on their work, and alternative sources for information on the building codes. In total, 40 course attendees participated in the focus groups. Interviews with program staff provide insight into how the program developed, who it's intended to reach, and challenges faced.

ADM reviewed program-related documentation and literature, which included the program description, course materials, course evaluation forms, and program activity tracking data. Program documentation provides information on program activities.

2.2 Noncompliance with the Energy Code

Energy efficiency codes and standards are intended to improve the efficiency of new construction and major rehabilitation projects by requiring the incorporation of energy efficient technologies and design features. However, studies have documented that many buildings do not comply with the applicable energy efficiency codes. For example, studies of code compliance

performed in Maine, Massachusetts, and Vermont have found compliance rates ranging from 16% to 70%.¹

Buildings that do not fully comply with the energy code may consume more energy than fully compliant buildings. The “lost” savings that result from noncompliance can arise from a variety of building components. A study completed by the New York State Energy Research and Development Authority (NYSERDA) found that in residential buildings the components accounting for the largest share of lost energy savings due to noncompliance were basement wall construction, which accounted for 53% of the lost savings, and walls, which accounted for 10% of the lost savings. In commercial buildings, noncompliance in energy recovery and cooling efficiency accounted for 60% of the lost energy savings, and interior lighting efficiency and control noncompliance accounted for 23% of the lost savings.²

Energy code noncompliance has also been documented in Illinois. In 2011, a study of code compliance in Illinois was performed using the checklist methodology developed by the U.S. Department of Energy’s Pacific Northwest National Laboratory (PNNL). This study found a compliance rate of 87% for a sample of residential new construction projects in participating jurisdictions and 79% in a sample of buildings in non-participating jurisdictions (those that have not adopted the building codes despite the statewide requirement).³ A compliance rate was not calculated for commercial new construction projects because time limitations prevented the researchers from collecting a valid sample of commercial projects.

The Illinois compliance study also identified common patterns of noncompliance with the 2009 International Energy Conservation Code that was in effect at the time of the study. The areas of noncompliance identified for residential buildings include:

- “Right sizing” of HVAC systems;
- Insulation and weather-resistant protection of basement walls and slab foundations;
- Installations of ducts in exterior walls;
- Software use for compliance assessment;
- Fenestration and door labels that do not address air leakage limitations.

Patterns of noncompliance identified for commercial facilities include:

- Finding lighting controls for exterior lighting with 10-hour back-up batteries;
- “Right sizing” of HVAC systems;

¹ Elencave, I. (2012). *Utility Programs and Building Energy Codes*. Midwest Energy Efficiency Alliance. Chicago, IL.

² Harper, B., L., Badger, J.C., Reed, G., & Wirtshafter, R. (2012). *Improved Code Enforcement: A Powerful Policy Tool—Lessons Learned from New York State*. Proceedings of the 2012 ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: American Council for an Energy Efficient Economy.

³ Association of Professional Energy Consultants, Inc. (2011). *Measuring the Baseline Compliance Rate for Residential and Non-residential Buildings in Illinois against the 2009 International Energy Conservation Code*.

- Fenestration and door labels that do not address air leakage limitations.

Studies of code compliance have identified a variety of reasons why buildings do not fully comply with energy codes.⁴ The barriers to noncompliance identified include the following:

- Insufficient financial and personnel resources for code enforcement;
- A low priority placed on energy codes as opposed to codes that affect safety and structural integrity;
- Enforcement officials lack of knowledge of the building codes;
- Insufficient demand from consumers for code compliant buildings;
- Building professionals lack of understanding code requirements and how to comply with them;
- Frequent changes to codes that undermine stakeholders ability and willingness to remain current with the requirements; and
- The cost of compliance to builders and consumers.

The Building Energy Code Compliance Program is intended to improve compliance with the building energy code by addressing these barriers. The following sections discuss the technical assistance and codes compliance training provided through the program.

2.3 Technical Assistance

The Building Energy Code Compliance Program provides technical assistance to building professionals regarding the interpretation of the building code. Through this service, building professionals can receive assistance with code interpretations by telephone, email, or face-to-face consultations.

During EPY5/GPY2, 387 technical assistance consultations were provided. Nearly three-quarters of the consultations were provided by letter or email and approximately 13% of the consultations were conducted by telephone. The remainder of the consultations was in the form of in-person meetings or a combination of telephone, letter or email, and in-person meetings.

2.4 Codes Compliance Training Courses

A key component of DCEO's Building Energy Code Compliance Program is the training provided to enforcement officials, building design and construction professionals, and other stakeholders. During the EPY5/GPY2 program year, DCEO sponsored two building codes

⁴ Williams, A., Vine, S. P., Sturges, A., & Rosenquist, G. (2013). *The Cost of Enforcing Building Energy Codes: Phase I*. Lawrence Berkeley National Laboratory. Berkeley, CA.
Elnecave, I. (2012). *Utility Programs and Building Energy Codes*. Midwest Energy Efficiency Alliance. Chicago, IL.

training courses: the International Energy Conservation Code Applications for Illinois course and a course focused on residential HVAC system design.

2.4.1 International Energy Conservation Code Applications for Illinois

The International Energy Conservation Code Applications for Illinois (IECC) training session is divided into two components that focus on residential and commercial applications of the code, respectively. Each of the training components is designed to have 3.5 hours of instruction. The residential component of the IECC course addresses a variety of topics including an overview of the code requirements and their administration and enforcement, a brief discussion of general definitions and design conditions, and then a more in-depth discussion of residential provisions. Topics covered during the more in-depth discussion include compliance methods for insulation and fenestration, air leakage and sealing, building mechanical systems, and methods for assessing and documenting compliance.

The topics addressed in the commercial component include the applicability of the code to new construction and existing buildings in Illinois and Chicago, building thermal envelope systems, lighting and power systems, and mechanical systems. The discussion of building systems covers specific provisions of the code as well as methods for documenting and assessing compliance.

2.4.2 Right-Sized HVAC Design

The HVAC course focuses on the design of residential HVAC systems that comply with the current energy code. This course was added for the first time during the EPY5/GPY2 program year to address common questions raised in the building codes course as well as compliance issues identified in a study of baseline building code compliance in Illinois. The course provides 6.5 hours of instruction and is designed to be “hands-on” and involves performing calculations required HVAC system code compliance.

2.5 Building Energy Codes Training Participant Profile

EPY5/GPY2 participants in the IECC and HVAC training courses represented a variety of professions. Attendees from the professions that comprise the largest share of attendees for the two courses are displayed in Figure 2-1. The courses were most heavily attended by professionals whose work is directly impacted by the building code, that is,

- Architects;
- Engineers;
- Building officials, plan reviewers, and field inspectors,
- Builders and general contractors;
- HVAC contractors; and
- Building performance contractors, building performance raters and consultants.

Individuals from various other professions including lighting designers, academics, and planners also attended the courses.

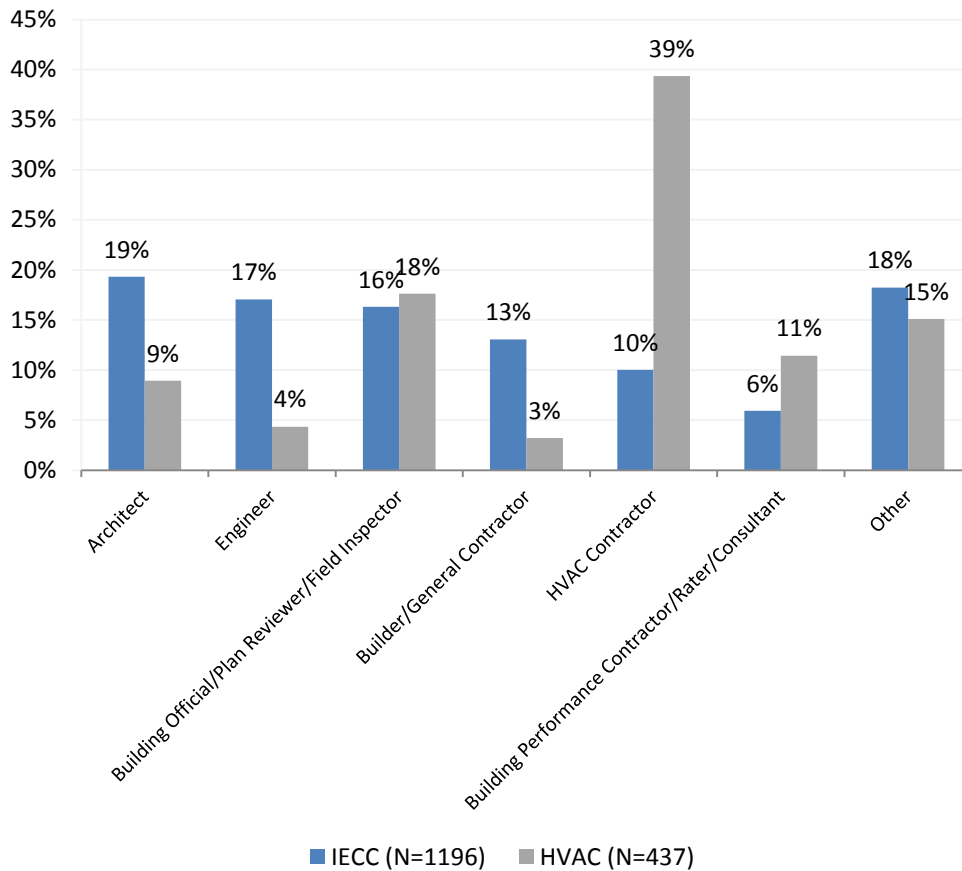


Figure 2-1 Participant Line of Work

2.6 Training Evaluation Surveys

ADM reviewed the course evaluation forms completed by participants in the IECC and HVAC courses. Participants used these forms to rate the course content, instruction, the training site, and their overall satisfaction. Section 2.6.1 summarizes the findings from the IECC course. Findings for the HVAC course are summarized in section 2.6.2.

2.6.1 IECC Course Evaluations

Overall, participants provided favorable assessments of the course content. As shown in Table 2-1, 97% of respondents agreed that the course was useful and provided needed information. Most participants indicated that the course materials were organized and informative. Somewhat smaller shares agreed that the course was relevant to their level of experience or that it was focused on their job skills. A few of these participants indicated that they would prefer if the course covered either commercial or residential code applications rather than covering both areas.

Table 2-1 Ratings of IECC Course Content

<i>Element of Course Content</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>n</i>
Course content provided useful and needed information.	-	-	3%	51%	45%	490
Course content was relevant to my level of experience.	-	1%	10%	51%	37%	490
Course content was relevant and focused on participant job skills.	-	-	13%	49%	37%	489
Course materials were organized and informative.	-	1%	4%	45%	50%	490

Ratings of course IECC course instruction were also generally favorable. Respondents were most likely to agree that the instructor was knowledgeable, prepared and organized, and that the instructor encouraged and responded to questions. Fewer of the respondents agreed that the instructor communicated clearly or that group discussions were effectively facilitated, although a large majority did agree with this. Issues that were raised by a few of the participants included that the material was presented too quickly, that the materials presented were out of date, that terms and abbreviations were used without being defined, and that there was too little group discussion. However, overall, most ratings of the course instruction were favorable and these comments represented the minority of respondents.

Table 2-2 Ratings of IECC Course Instruction

<i>Element of Course Instruction</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>n*</i>
Instructor demonstrated knowledge of the subject matter.	-	-	4%	31%	66%	998
Instructor was prepared and organized.	-	3%	4%	34%	59%	998
Instructor clearly communicated concepts and ideas.	1%	2%	8%	35%	55%	998
Instructor facilitated group discussions effectively, and related well to course participants.	-	1%	15%	37%	47%	998
Instructor encouraged and responded to participant questions.	-	0%	7%	37%	56%	998

**Ratings were provided for more than one instructor for many of the courses held.*

The ratings for the training site are shown in Table 2-3. Ratings of the training site were lower than the ratings of other aspects of the IECC course. In particular, 15% of respondents did not agree that the training site was comfortable and promoted learning. Most of the comments made related to the discomfort of the training site indicated that the space was too small and uncomfortably warm. A few other issues noted were that some participants had difficulty reading the screen and that the microphone had some issues.

Table 2-3 Ratings of IECC Training Site

<i>Element of Training Site</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>n</i>
The training site was conveniently located.	-	4%	14%	32%	50%	431
The training site was comfortable and promoted learning.	4%	11%	10%	36%	39%	431
Computers and audio/visual equipment operated properly.	1%	6%	14%	39%	41%	431

Overall, participants were satisfied with the course. As shown in Table 2-4, 90% or more of the respondents indicated that the course met their expectations, was worth their time and effort, and that they would recommend it to others.

Table 2-4 Ratings of IECC Course Satisfaction

<i>Overall Course Satisfaction</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>n</i>
This course met my expectations.	-	1%	5%	49%	45%	429
This course was worth my time and effort.	-	1%	8%	40%	50%	429
I would recommend this course to others.	-	1%	5%	44%	50%	402

Several respondents provided suggestions for improving the course. The most common suggestions were to separate residential and commercial courses, or that either the residential or commercial section should be shorter.

2.6.2 HVAC Course Evaluations

Overall, participants provided favorable assessments of the course content. As shown in Table 2-1, 96% of respondents stated that the course was useful and provided needed information. Most participants indicated that the course materials were organized and informative. Somewhat smaller shares agreed that the course was relevant to their level of experience or that it was focused on their job skills. Some comments pertaining to the course content, each made by one participant, included that the session was too detailed, that it was not for the beginner, that it went too fast, and that there was not enough practical application.

Table 2-5 Ratings of HVAC Course Content

<i>Element of Course Content</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>n</i>
Course content provided useful and needed information.	-	1%	3%	37%	59%	159
Course content was relevant to my level of experience.	-	1%	11%	45%	43%	159
Course content was relevant and focused on participant job skills.	1%	1%	7%	42%	50%	159
Course materials were organized and informative.	-	1%	4%	36%	60%	159

Table 2-6 displays respondents' ratings of the course instruction. Ratings of the course instruction were generally very favorable. Nearly all respondents indicated that the instructor demonstrated knowledge of the subject matter, was prepared and organized, clearly

communicated concepts and ideas, facilitated group discussions effectively, and encouraged participant to ask questions.

Table 2-6 Ratings of HVAC Course Instruction

<i>Element of Course Instruction</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>n</i>
Instructor demonstrated knowledge of the subject matter.	-	-	1%	17%	82%	159
Instructor was prepared and organized.	-	-	2%	21%	77%	159
Instructor clearly communicated concepts and ideas.	-	1%	1%	25%	74%	159
Instructor facilitated group discussions effectively, and related well to course participants.	-	-	3%	23%	74%	159
Instructor encouraged and responded to participant questions.	-	-	-	16%	84%	159

As shown in Table 2-7, most participants were satisfied with the training site. Respondents were least likely to agree that the site was conveniently located and most likely to agree that the site was comfortable and promoted learning.

Table 2-7 Ratings of HVAC Training Site

<i>Element of Training Site</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>n</i>
The training site was conveniently located.	1%	3%	9%	37%	50%	119
The training site was comfortable and promoted learning.	-	-	1%	38%	61%	119
Computers and audio/visual equipment operated properly.	-	2%	3%	32%	63%	119

Ratings of the overall satisfaction were generally high. Ninety-five percent or more of respondents indicated that the course met their expectations, was worth their time and effort, and that they would recommend it to others.

Table 2-8 Ratings of HVAC Course Satisfaction

<i>Overall Course Satisfaction</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>n</i>
This course met my expectations.	-	-	4%	39%	57%	118
This course was worth my time and effort.	-	1%	3%	36%	61%	118
I would recommend this course to others.	-	-	3%	33%	64%	118

2.7 Training Participant Focus Groups

A series of online focus groups were held exploring participants' experience with and evaluation of the International Energy Conservation Code Applications for Illinois (IECC) and Right-Size HVAC Design (HVAC) courses. Five focus groups were held with attendees of the IECC course. Each group was held with members of a different professional group: architects, contractors/builders, engineers, inspectors/reviewers, and performance raters. Two focus groups

were held with HVAC training participants. These groups were held with HVAC contractors and inspectors.

Table 2-9 Numbers of Focus Group Participants for Each Profession

<i>Participant Profession</i>	<i>Number of Participants</i>
<i>IECC Course</i>	
Architects	8
Contractors/Builders	5
Engineers	7
Inspectors/Reviewers	7
Performance Raters	6
<i>HVAC Course</i>	
Contractors/Builders	3
Inspectors	4

2.7.1 Code Compliance Issues

Participants were asked to discuss reasons why new construction and rehabilitation projects do not comply with Illinois' energy code. A variety of reasons were cited by participants, but four stood out as particularly common:

- **Ignorance of and Confusion Regarding the Codes:** Many builders and subcontractors are reportedly unaware of the new code. Furthermore, the code that went into effect in January is not only new, but has far more rigorous energy efficiency requirements than the previous code. As one participant described, the new code requirements represent “a big jump in the technical expectations for the project team” (Architect). Several participants noted that there is sometimes a perceived conflict between different codes and standards, for example between IECC and ASHRAE requirements or between energy codes and fire codes. Confusion also exists regarding the specific code requirements for different situations, for example, what the building envelope requirements are for different building types. Participants also expressed a lack of certainty about what code requirements applied to full rehabilitation or partial remodeling projects as compared to new construction projects. Some participants stated that commercial builders are more familiar and comfortable with code compliance, but others argued that this is true for residential and not commercial buildings. Another issue appears to be that it is very difficult to correctly follow the “performance path” for meeting code requirements and that many individuals do not know how to perform simulations, which is largely an issue for architects and engineers.

A specific compliance issue cited by those in the HVAC groups as well as some others is that many contractors do not understand the current codes and principles underlying duct and system sizing. Reportedly they often install oversized HVAC systems and ducts.

- **Lack of Code Enforcement:** All groups agreed that non-enforcement is a major barrier to code compliance, and that nobody holds ultimate authority to enforce codes. Many municipalities explicitly refuse to recognize or enforce the state code – e.g., “our Council won’t allow it to be enforced” (Contractor). There is, reportedly, an extremely confusing

patchwork of authorities who do or do not enforce codes, so that one site may strictly enforce while another municipality a mile away does not. Additionally, sometimes individual inspectors do not enforce the code or do so arbitrarily. This may be a function of their ignorance of the code requirements or a lack of focus on energy code enforcement.

Another issue related to the lack of enforcement is that architects or engineers may specify compliant elements but contractors and subcontractors may not follow those specifications, and there is often no authority that will make them do so.

- **Cost of Compliance:** Meeting updated energy codes adds to construction cost, which leads to a variety of compliance issues. Residential builders and buyers commonly balk at the increased cost and reportedly some builders and even builder associations pressure municipalities not to enforce the code. As stated by one contractor, “Large tract home builders don’t want to bear the extra cost... they may threaten to build somewhere else if the municipality makes them follow code.” Commercial construction is reportedly more likely to take the costs of code compliance into account as a cost of doing business – although not necessarily when it comes to HVAC systems. Another issue is that there are always builders, contractors, and subcontractors who are willing to ignore or skirt the codes, allowing them to offer lower prices than those who follow code. Such contractors are reportedly very common in Illinois, particularly in the HVAC sector. Residential owners are reportedly easy targets contractors who offer lower prices for noncompliant work. Owners typically do not know or appreciate the codes, or their rationale, and therefore typically hire the lowest bidder. Reportedly, some contractors try to exploit the system to save money and increase profits. The inspectors who had attended the HVAC course discussed tricks used by builders and HVAC contractors to circumvent the codes and the counter-measures used by inspectors. They also noted that some municipalities operate “on the honor system,” or allow testers to validate themselves, creating numerous opportunities for noncompliance.
- **Scarcity of Blower Door Test Providers:** Several groups specifically noted that, in many areas of Illinois, there are not enough certified blower door testers. That scarcity contributes to noncompliance.

2.7.2 Rationale for Taking the Course

Participants typically took the course to bring them up-to-date with the current Illinois energy code, if only so that they can guide and advise clients. Some in management positions have not only taken the course themselves but have sent their staff to the DCEO course.

I wanted to learn about the energy codes... get up to speed. (Architect)

It was one of the only ways to get simple answers to sometimes complicated questions about the new code. (Architect)

[I wanted to] Help our builders. (Engineer)

[To] Help my clients understand the code and what they need to do. (Rater)

For the learning experience... local inspectors attend the course, I wanted to keep up with what they're wanting. (HVAC Contractor)

Several practical factors also influenced participants' decisions to attend. One was that the course was free, so that their only investment was time. Another is that many could get CEU credit for taking the course (from the Building Performance Institute, for example), which helps them maintain their status or certifications. However, at least some participants in every group did not know that CEUs are available from taking the course, or were uncertain whether the organizations to which they belong would accept these CEUs. A final factor mentioned was convenience. The course was offered at a variety of times in a variety of locations around the state, which provided adequate opportunities for them to attend.

2.7.3 DCEO Course Content

Virtually all study participants expressed satisfaction with the course, indicating that they were very satisfied or satisfied with it, even if they had some complaints about the specifics.

Course attendees were generally quite satisfied with the content. Participants from each discipline tended to have its own focus on what is most important to cover, and were largely satisfied in that regard. For example, architects mentioned that they appreciated having the instructor compare the IECC and ASHRAE. Contractors/Builders (attending either the general or HVAC courses) liked the practical explanation of the code and the guidance the course provided them.

It was nice to have a class with someone who was willing to go out on a limb and explain the code and how it actually applies. (Contractor)

Participants liked the PowerPoint presentation used in their course, commonly noting that they took copious notes on the copy that was handed out and that they continue to refer to it. They also liked the videos and animations used, the practical examples provided, and the other handouts (e.g., the IECC Codebook).

Attendees' primary complaints about the course content were the large amount of information presented in the short time and the relative amount of time and content devoted to residential versus commercial.

Group members often commented that the course tried to cover too much in too little time. Some individuals reported that the information they needed and wanted to know was not always covered adequately, particularly as some fellow attendees shifted the discussion into technical areas of personal interest or took up time arguing with the instructor.

A large proportion of focus group participants recommend extending the length of the course to two to three days in order to allow more time to cover the material and to allow participants to learn and internalize it. The handouts, principally the PowerPoint slides and the codebook or manual provided, however, enabled many to overcome this issue by providing a take-home resource they can consult at their leisure.

Many study participants specialize or focus predominantly on either commercial or residential construction, and noted that their particular class gave too little time to whichever was more relevant to them. Different course sessions reportedly differed greatly with respect to the amount of time given to these two foci – some were apparently dedicated to residential issues, others gave more time and emphasis to commercial. It appears that those with a commercial focus seemed most likely to raise issues about balance, widely reporting that too much time was spent on residential topics. This last group includes several HVAC course attendees, despite the explicitly residential focus of the course.

Similarly, as different architects, engineers, and contractors/builders tend to specialize in different aspects of construction work (e.g., envelope specialists, rehabilitation/renovation vs. new construction, HVAC vs. lighting or insulation specialists), many stated that their particular needs and interests were not completely addressed. A few study participants complained that the blueprints used in their class were hard to understand or that others in their class could not read blueprints and took up too much course time getting assistance from the instructors. Finally, many in the non-inspector groups reported that more municipal/enforcement officials should attend and provide insight regarding what they need or expect at a practical level.

HVAC course attendees found the information very useful. The way in which one calculates duct and system sizes has changed dramatically over the years, and the course helped to bring them up to speed on current thinking, calculations, and methods. A few explained that the course was somewhat lacking with respect to keeping up with the current state of the art in HVAC systems, for example, high efficiency furnaces and air conditioning systems and ductless systems.

2.7.4 DCEO Course Delivery and Instructors

Despite their high overall satisfaction, study participants expressed some criticisms regarding course delivery. As noted above, one issue raised by participants was that too much content was being crammed into the one-day courses, and another issue was that the relative emphasis on residential and commercial was improperly balanced.

Some participants reported that the delivery included too much lecture, preferring more interaction between the instructor and attendees and among attendees. A number also would have preferred more practical examples and hands-on exercises (e.g., using gauges, pressure testing HVAC systems). Lastly, some criticized parts of the classes as being too in-depth, others for being too basic. Attendees mentioned that some instructors focused too much on technical questions raised by those with advanced knowledge, or conversely, that instructors spent too much time answering questions from participants who lacked basic knowledge about construction and energy management

They threw unnecessary stuff at us. Let's get straight to the point! (HVAC Course, Inspector)

Despite such minor criticisms, the instructors contributed greatly to attendees' satisfaction with the IECC and HVAC courses. Participants noted that there was usually a team of at least two instructors, each covering different areas (e.g., commercial and residential). Study participants

were very positive about most of their instructors, although a few were criticized as “flat,” working out of the book, and/or not being able to bring in real-world examples to help students understand how principles are applied. One instructor was repeatedly praised by both IECC and HVAC course attendees for having a high level of knowledge, and effective presentation style. Participants also frequently mentioned the instructors willingness to help and to advise course attendees even long after they took the course.

2.7.5 Impact of the Course

The great majority of participants in all groups indicated that they made changes in their work as a result of attending the courses. With the exception of a few who claim that they were already doing what the new code directs, most saw practical impact. Virtually all participants reported that they better understand the new code and how to apply it in practice, share it with peers and subordinates, and make changes in their practices to maximize energy efficiency and meet the new requirements. Some architects stated that the course helped them with respect to “the building envelope aspects of the prescriptive route”. Some other attendees developed checklists based on the course which they use themselves and share with their colleagues and subordinates. Some additional examples of changes in work behavior that were noted by participants from the different professional groups are as follows:

- Architects reported aligning projects with the new code, providing more detailed requirements, upgrading insulation for roofs, and changing the design of new homes from 2 x 4 to 2 x 6 construction.
- Most contractors reported that they were already fairly aware of and following the new requirements but that they did make some small changes as a result of training. Some also discussed resistance from builders, lenders, realtors, and buyers to code compliance.
- Engineers primarily reported that the course helped them understand the new requirements (e.g., lighting controls and energy recovery, insulation, ventilation, energy recovery ventilation requirements) and that they were creating energy code checklists to be submitted for approval.
- Inspectors reported adding more qualifying notes in plan reviews and having a better understanding of how to handle commercial and residential additions.
- Raters reported providing air sealing and spray foam packages to help HVAC contractors pass the duct leakage tests and informing builders about what the code is and making builders aware that they can recognize noncompliant work.

HVAC course participants report that the information and tools provided in the course enabled them to better perform load calculations and determine how to select the right heating or AC system and duct sizes for different types of buildings. They found the information on blower door testing very helpful, if only because it enabled them to better understand the process and ensure that it is done correctly. Some changes noted by attendees of the HVAC course were:

- Inspectors reported a better understanding of proper duct design and sizing that allowed them to better enforce the code.

- Contractors reported that they were changing duct sizing to follow new code requirements. Contractors were particularly frustrated by jurisdictions that do not follow the code and noted that they were at risk of losing their jobs if they followed the code requirements.

2.7.6 Alternative Resources

Study participants were unable to identify any resources that were truly comparable to the codes training sponsored by DCEO. As one performance rater put it, the IECC course is the “the only game in town.” However, participants did cite various other resources that are useful for ensuring code compliance. These resources include the following:

- A few participants noted that local ASHRAE groups can be very helpful.
- Equipment manufacturers and vendors sometimes offer useful training, but it is generally limited to their specific products.
- Specific industry associations are also helpful regarding topics relevant to their discipline or focus.
- RESNET® and the Building Performance Institute were favorably mentioned by contractors.
- The Department of Energy reportedly produces a “fantastic” chart comparing new and old code version, as well as IECC vs. ASHRAE.
- A few raters find Energy Star information and organizations valuable.
- Some HVAC students noted that the Home Energy Rating System (HERS) preceded the current code and provided good background for them. They also praised Air Conditioning Contractors of America (ACCA) courses.

2.7.7 Recommended Course Improvements

The groups almost universally recommended “unpacking” the courses a bit with regard to information density. Many suggested making the IECC and HVAC courses either two or three days long to allow for a somewhat less frenetic pace and more consistent coverage of all topics in greater depth. However, a few disagreed with this suggestion, noting that it would be impractical for them or their staff to take much more time away from work to attend courses.

As previously noted, many participants critiqued the relative balance of time and content devoted to the commercial and residential sides of energy efficiency. Additionally, participants often specialize in a specific area (e.g., building envelope, lighting, insulation, HVAC) and would like more specific and detailed instruction on how to meet the new code’s requirements relative to that technical area. Those with a different focus do not need or want to go into such depth on areas that are, at best, of peripheral relevance or interest to them. However, some of the more experienced and knowledgeable group participants cautioned against losing the “big picture,” arguing that today’s building science conceptualizes buildings as inter-connected systems of disparate elements, each contributing to the whole.

One suggested compromise was to begin the course (or each segment of the course) with an overview of the whole code and how different elements interrelate, and then offering different

tracks (modules, or possibly breakout sessions) for those with different substantive interests. At minimum, some suggested offering two versions of both IECC and HVAC courses. One would focus on commercial but also provide an overview of residential, and the other would focus on residential but provide an overview of commercial. Other group members cautioned that all attendees need to learn how the various disciplines and parts of the whole fit together, so that too exclusive a focus on “their” specialty would be counter-productive.

Other suggestions included offering basic and advanced courses and/or supplementary courses. Preferred options included webinars or self-paced asynchronous online courses, regarding specific topics, disciplines, and applications. Many were excited when others in the group described the working checklists (detailing step-by-step how to achieve code compliance through the different routes) that they have developed based on the course and suggested that something of the sort be provided to attendees.

As noted, several group members called for more hands-on course elements. Others complained that some of those in their course sessions seemed to have no background or interest in the building trades or building science, as if they had just “come in off the street.” These attendees were perceived to have wasted a lot of course time and instructor attention, suggesting need for more rigorous screening of attendees. Lastly, many in the architect, engineer, builder/contractor, and rater focus groups wanted more inspectors and/or evaluation officials to participate in their classes. They explained that such individuals might be able to provide specific guidance on what they are looking for and how to meet those expectations given the many complex situations one encounters in the real world.

2.7.8 Value of DCEO’s Code Compliance Support

Most group members agreed that DCEO’s support and courses have a direct, positive impact on code compliance in Illinois. A few stated that many contractors and others will keep doing whatever they are going to do regardless, so that DCEO’s impact and importance are less than they might be. Many believe that non-enforcement is the greatest barrier to statewide code compliance. Participants were universally positive about the courses they have attended but without any central authority enforcing the codes (and requiring municipalities to do so) they believe that DCEO’s impact is only modest. It should be noted, however, that focus group participants were generally quite knowledgeable about energy issues and believed in the importance of the energy code. It is possible that other course attendees who did not participate in the focus groups are not as focused on energy issues and may ascribe greater importance to the course.

A few focus group participants suggested that formal certification for their discipline in energy management, in addition to requiring that only certified architects, engineers, builders, contractors be permitted to operate in the state would have a dramatically positive impact. At minimum, some call for certification or course attendance to be marketed to the public as well as the building trades, teaching others what to look for and why. They believe that this would help mitigate the problem where contractors offer low bids for non-compliant work and are able to take business away from those who follow the code and create additional enforcement needs.

2.8 Program Operations Perspective

This section summarizes the core findings of interviews that were conducted with the Building Energy Code Compliance program staff.

In order to gather information regarding the operational efficiency and program delivery process, in-depth interviews were conducted with key DCEO and program implementation staff at International Energy Conservation Consultants, LLC.

International Energy Conservation Consultants, LLC, in coordination with DCEO, implements the Building Energy Code Compliance Program. International Energy Conservation Consultants develops the training curriculum, delivers the instruction, administers the delivery of the training, and provides technical interpretations of the building code. The program is jointly marketed by International Energy Conservation Consultants and DCEO staff.

Respondents discussed their perspective on program structure, operations, and marketing. The key findings from these discussions are summarized below.

- **Targeted Outreach used to Promote Program:** The program engages in a wide number of targeted outreach activities to promote the code support services provided through the Building Energy Code Compliance Program. The groups targeted by this outreach include trade ally networks, Code Enforcement Chapters around the state, the Association of Illinois Electric Cooperatives, the Illinois component of the American Institute of Architects, Association of Illinois Engineers, and the Illinois ASHRAE chapters.

Program staff's assessment is that the program is well marketed and they point to the high level of attendance in the courses as evidence of this.

- **Broad Array of Support Services Provided through the Program:** In addition to the primary training and phone and email technical interpretations provided through the program, Building Energy Code Compliance Program provides a variety of other forms of support for building code compliance. These other forms of support include presentations at utility trade ally workshops, consultation services with home builders such as advisement on building plans, consultation services with municipalities such as assistance with plan reviews, and assistance with implementation of new energy efficiency requirements.
- **Offered Training on Right-Sizing HVAC Systems this Year:** A course on right-sizing residential HVAC systems was offered for the first time during PY5. The course was added in response to the types of questions that were asked by students in the IECC Applications for Illinois course, as well as findings from a study of baseline compliance that indicated that HVAC contractors were not calculating heating and cooling loads. Because of these issues and the new code ventilation requirements, program staff determined that there was a large need to provide additional education to contractors and code inspectors on HVAC compliance. The goal of the course was to prepare the building community for what information will be asked for by code inspectors and simultaneously prepare code inspectors for what information they will need to be collecting.

- **Various Factors Contribute to Noncompliance:** Program staff identified a number of factors contributing to building code noncompliance. These factors include a lack of understanding of current code requirements, resistance by builders to additional costs associated with code compliance, and a lack of political will at the state and local jurisdictions levels. Regarding the last point, program staff noted that code enforcement officials have tended to place a greater priority on non-energy aspects of the building codes and that some jurisdictions view the energy code requirements as an unfunded mandate.

An underlying issue to the resistance to complying with the building code is that the code has gone through, and continues to go through, a number of iterations resulting in a changing set of requirements. The rapid changes may serve to undermine the will of members of the building industry to remain current in their knowledge of the code. However, program staff emphasized that these changes are not too fast for the building industry but that the changes are faster than what they are used to.

- **Code Support Training Aims to Improve Compliance through Multiple Mechanisms:** Program staff made reference to various ways the training offered through the Building Energy Code Compliance Program helps to improve Illinois compliance with the energy efficiency code. The primary mechanism is through providing information about the energy code requirements, which keeps various parties informed of the recent and ongoing changes to the energy code. Moreover, over the years, building designers, builders, federal policy makers, and code enforcement officials have not made the energy code a priority. As a result, other priorities such as building safety have taken precedence over energy efficiency in the building industry. Consequently, a second function of the code support services provided through the program is to make the importance of the energy code and efficiency more salient for the building community.

The program also seeks to train realtors and home appraisers to inform them of the energy code requirements. The purpose of this is to enable these professionals to adequately assess the efficiency of a home so that this value can be priced into the home. The accurate valuing of buildings efficiency should increase market pressures for increased code compliance. Builders who are concerned about the additional costs of code compliance may be more willing to comply if they perceived that it is valued in the market.

Lastly, by providing support services to municipalities and code enforcement officials, program staff hopes to change the perception that the code requirements are an unfunded mandate.

- **New Support Services:** The Building Energy Code Compliance Program is offering additional training and support services to help improve code compliance. One of the services is a pilot program to train individuals to perform third party inspections. These inspectors can then be hired directly by builders to certify building compliance. Builders can submit the invoice for the third party inspection and certification of code compliance for a rebate of up to \$400 to cover the inspection cost. Additionally, jurisdictions who want to enforce the code can raise the permitting fee by \$300, the full cost of which can be rebated to builders through the program.

The program is also developing a curriculum to target realtors and appraisers so that they are better informed of the code requirements and can accurately value compliance with energy code in their appraisals and price listings.

3. Conclusions and Recommendations

The Building Codes and Standards Program is playing an important role in helping the State of Illinois achieve higher levels of compliance with the energy efficiency building code. Participants in the training and recipients of technical assistance were generally satisfied and found the information to be useful.

3.1 Key Conclusions

The following conclusions were developed from analysis of focus group discussions, staff interviews, documentation review, and relevant literature:

The following conclusions were developed from analysis of focus group discussions, staff interviews, documentation review, and relevant literature:

- **Program Seeks to Address Multiple Barriers to Code Compliance:** Previous studies of code compliance, focus group discussions with training attendees, and interviews with program staff suggest that there are a number of barriers that prevent full compliance with the building energy code in Illinois. In general, these barriers stem from insufficient knowledge among code enforcement officials and building professionals, the costs of complying and enforcement, a lack of demand from consumers for compliance, and a lack of political will to enforce the code in some jurisdictions.

The Building Energy Code Compliance Program addresses these barriers through the program activities that occurred during EPY5/GPY2 as well as through more recent developments. Arguably the program is best developed for addressing knowledge gaps among builders and code enforcement materials. The building energy code training provided through the Building Energy Code Compliance Program is one of the key services that address these gaps. Training participants report that it is useful and valuable for improving code compliance. Moreover, the program has been proactive in developing additional coursework to address areas where insufficient knowledge is contributing to code noncompliance. For example, during EPY5/GPY2, the program initiated a new course on residential HVAC system design, and a course addressing commercial building compliance was recently launched.

In addition to the training courses provided, program staff members engage in a number of outreach activities to inform various stakeholders of the new code requirements. The DCEO website also contains links to guides published by the U.S. Department of Energy that address specific aspects of building compliance, such as HVAC systems and lighting.

Recent program developments seek to address other barriers to code compliance. Barriers to the enforcement of the code are being addressed through a pilot program that trains third party inspectors to certify building compliance. This training is coupled with the availability of rebates to builders for the additional cost of having the inspection performed. This strategy

has been applied by code compliance support programs in other states and is worth further development.

The program also seeks to improve code compliance by creating greater market demand for energy efficient construction. Currently, the training offered through the program is open to anyone, including consumers, real estate agents, home appraisers, and others that may have a role in incorporating energy efficiency into the value of a building. Attendance by these types of individuals may increase demand for code compliance through their greater understanding of how the code impacts a building's energy consumption. However, a review of course attendees suggests that relatively few of these types of individuals attended the course during EPY5/GPY2. Moreover, the current course material may not be well suited to them as it addresses technical specifics of meeting code requirements. More recently, program staff has been developing a new training program targeting realtors and home appraisers. The goal of this program is to enable these professionals to adequately assess the efficiency of a home so that it can be factored into the home's value, in turn increasing the market demand for compliant buildings.

Overall, the Building Codes Compliance Program provides a range of services that address the known reasons for building energy code compliance. However the services that address knowledge deficiency barriers to compliance are particularly robust relative to the services that address other known barriers. The program is currently evolving to more extensively address issues related to a lack of enforcement and weak market pressure for compliance.

- **Increased Participation in Training Courses and Technical Interpretations:** The number of training attendees during EPY5/GPY2 exceeded the program's target of 1,200 attendees by more than 400. In total, 1,196 individuals attended the IECC training, up from 866 in the prior program year. Additionally, a new course on HVAC design for residential applications was attended by 437 individuals, and the number of technical interpretations provided during EPY5/GPY2 increased from 174 in the prior program year to 387. The increases in attendance and the number of technical interpretations indicate increasing demand for information about the Illinois Energy Conservation Code. The higher demand may be driven, in part, by the new code requirements that went into effect in January 2013.
- **Good Communication and Strong Working Relationship between DCEO and Implementer:** DCEO's program staff indicated that a good working relationship exists between DCEO and International Energy Conservation Consultants (IECC, LLC), the program's implementation partner. IECC, LLC provides useful reporting in addition to meeting mandatory reporting requirements. The two parties have regular meetings, and interviewed staff members reported that communication has been sufficient.
- **Program Marketing:** The support services provided through the building codes program are primarily promoted through attendance at various events and through professional groups. On request, program staff members give presentations on building codes to professional associations and to building departments in jurisdictions around the state. They discuss the history of the building energy codes progression in the state and what services DCEO provides. The program also conducts targeted outreach to members of trade ally networks,

code enforcement chapters, the Association of Illinois Electric Cooperatives, the American Institute of Architects, the Association of Illinois Engineers, and the Illinois ASHRAE chapters. Overall the promotional efforts for the training seem adequate given that the attendance targets were exceeded during the program year.

- **Participants Satisfied with Training Courses:** Responses to training evaluations and focus group discussions indicate that the participants in the training courses were highly satisfied with the course content, materials, and instructors. However, focus group participants did discuss a few areas for potential improvement. A number of participants commented that the courses provided a lot of information in a relatively short time, which made it challenging to fully understand all of the information presented. However, the challenge of assimilating all of the information presented was offset, somewhat, by the course materials (e.g., hard copies of the PowerPoint presentation and other handouts) that could be reviewed at a later time. In addition to the amount of information presented, some concerns were raised about the relevance of the course content. Depending on their perspective, focus group participants suggested that there was not enough information presented on specific topics related to their professional discipline or particular applications, or alternatively that too much time was spent addressing narrow, technically specific questions raised by other participants. Similarly, participants indicated that there was either too little, or too much, coverage of commercial applications as opposed to residential applications. These comments suggest that there is a greater need for information and materials that are more narrowly tailored to specific aspects of the energy code. One final issue that was raised by some participants was that on occasion too much time was spent addressing basic questions raised by individuals who had no knowledge of construction or energy management.
- **Participants Highly Value DCEO's Building Codes Support:** Course evaluations and focus group responses highlight the value of the IECC and HVAC courses to participants. A large majority of participants indicated on their course evaluations that the course was both useful and needed. Additionally, more than 90% of participants agreed or strongly agreed that the course was worth their time and effort. Focus group participants also emphasized that the course provided useful information and were able to identify a variety of ways it has impacted their work. Although focus group participants noted that they utilize multiple resources to aid their code compliance, the general assessment was that there was not a resource that was comparable to the DCEO courses.

3.2 Program Recommendations

Overall, the code compliance enhancement services provided during EPY5/GPY2 and those in development are comprehensive and comparable to the range of approaches taken in other states. Moreover, training participants found the training to be useful and effective. The following recommendations are offered for DCEO's consideration in their further development of the program:

- **Consider Offering an Online Version of the Course:** Providing an online version of the course will increase the availability of the course to a broader audience at a relatively low

cost. Making the course available online would also provide individuals who attend the course in-person an opportunity to review the material at a later date. The format of an online course could range from a simple recording of a classroom course accompanied by the course slides to a more interactive format. However, there are trade-offs to consider, as an online course may provide broader access but the material may not be as well understood without the interactive component present in a classroom course.

- **Promote and Develop Supplemental Materials:** Focus group participants indicated that guides and other resources that were tailored to specific applications (e.g., HVAC, building envelope, or lighting) would be beneficial. However, currently the DCEO codes website links to guides developed by the U.S. Department of Energy. Because such guides are already available, it may be more important for the program to promote these existing guides rather than to develop new ones. Further research could determine the level of awareness and perceived usefulness of these guides among building professionals in Illinois.

In addition to the development of these guides, focus groups participants also suggested that checklists detailing how to achieve code compliance would be helpful. Another potential resource that may be of use is a frequently asked question guide. This guide could be developed based on frequent questions raised during the training or through the technical support process.

- **Continue to Seek Ways to Support Enforcement Effort:** Uneven enforcement of the building energy codes appears to be a key barrier to code compliance. While the training and technical support provided through the Building Energy Codes Compliance Program may indirectly enhance enforcement through increased awareness of the code, other more direct approaches may be more effective. The new effort to train third party inspectors, and provide rebates to cover the costs of inspections, is one promising way of providing support for code enforcement. If successful, the expansion of this program may make significant contributions to statewide code compliance. Program staff should continue to seek and develop ways to increase enforcement by reducing barriers to enforcement. Approaches that have been suggested include providing assistance to help streamline the code enforcement process, fund the purchase of diagnostic equipment needed to assess compliance, and facilitate communication among relevant stakeholders.
- **Increase Consumer Outreach:** Program staff noted that one way to enhance compliance with the building code is to create greater market demand for buildings that meet energy code requirements. Consequently, statewide compliance may be improved if more efforts are made to promote the value of code compliance to consumers. The program currently provides a consumer guide and a consumer checklist for assessing code compliance. Additional materials that could be developed include educational materials on the energy cost savings associated with complying with the code and online videos demonstrating the use of the checklist. These materials could be distributed or promoted through building departments or by utilities operating in Illinois.

Appendix A: Focus Group Guide for International Energy Conservation Code Applications for Illinois Training Attendees

INTRODUCTION AND ORIENTATION (5 Min)

1. Description of Blackstone Group
2. Explanation of purpose of project -- to get your candid feedback on the DCEO course on International Energy Conservation Code Applications for Illinois now that some time has passed since you attended it.
3. Disclosure of recording, observers, etc.
4. Description of (IQ)² and marketing research process
 - 4A. The only “wrong” answer is not saying what you really think
 - 4B. As for all groups, try to speak one at a time and not “talk over” one another
 - 4C. Explain that they can use the “chat” box to communicate at any time, such as when somebody else is speaking, to answer a question, to provide more detail, to tell us what they are thinking and how they are feeling about what we are discussing
 - 4D. Urge them to use the “chat” box frequently but to rely primarily on talking as the primary means of discussion in this session
5. Introduction of respondents
 - 5A. Tell us about their firm and position
 - 5B. When and where did they attend the DCEO course on International Energy Conservation Code Applications for Illinois?
6. Tell them that this course is the main topic of this group and that whenever we refer to the “conservation code course” that is shorthand for this specific DCEO course.

BUILDING ENERGY CONSERVATION CODES (15 min)

Purpose: to warm up the group and get their input on code noncompliance and the reasons for that.

1. [KEYBOARD EXERCISE] Please use the Chat Box to keyboard in your brief response to the question, “What are the more common ways in which residential and commercial buildings today do not comply with the building energy conservation code?”
 - 1A. Facilitate discussion (specific responses, similarities/differences in what was listed, etc.)
2. What factors explain the lack of compliance?
 - 2A. Probe for more
 - 2B. Facilitate discussion

3. How similar or different are the reasons for noncompliance for residential vs. commercial buildings?
 - 3A. Facilitate discussion.
4. How similar or different are the reasons for noncompliance for new construction vs. rehabilitation projects?
 - 4A. Facilitate discussion

THE INTERNATIONAL ENERGY CONSERVATION CODE APPLICATIONS FOR ILLINOIS COURSE (30 min)

Purpose: To get specific feedback on the course.

1. Why did you decide to participate in the DCEO conservation code course?
 - 1A. Probe for more
 - 1B. Facilitate brief group discussion to draw out underlying/as-yet unspoken reasons, ascertain patterns, etc.
2. [KEYBOARD EXERCISE] What were you hoping to learn from the course?
 - 2A. Facilitate brief discussion to draw out additional reasons, etc.
 - 2B. Explore any patterns with group members.
3. [POLL] Please complete the poll shown on the lower left of your screen.
 - 3A. How satisfied are you with the DCEO conservation code course you attended? (SCALE FROM “EXTREMELY SATISFIED” TO “NOT AT ALL SATISFIED”)
 - 3B. Probe why they rated satisfaction as they did – what does their rating mean?
 - 3C. Facilitate discussion of responses/patterns.
4. How well was the course content delivered?
 - 4A. Open-ended responses
 - 4B. How clearly did the instructors explain the content?
 - Probe responses and underlying “whys”
 - 4C. How helpful were the course materials for understanding the course content?
 - Probe responses and underlying “whys”
 - 4D. [KEYBOARD EXERCISE] What could have been improved about the delivery of the course content?
 - Brief discussion of responses, patterns, “whys”
5. Do they feel that the course topics were addressed in sufficient depth?
 - 5A. Open-ended response
 - 5B. Probe for examples, why they said what they did
 - 5C. Recommendations for future courses with respect to depth?
6. What, if any, topics were not covered that you feel should have been covered?
 - 6A. Facilitate brief discussion
 - 6B. Ask for any additional thoughts or suggestions regarding course content that would make the course more valuable for those in positions/roles like theirs

6C. [KEYBOARD EXERCISE] Ask group members to keyboard in their person wish list of the top 1-5 additional topics to cover

1) Facilitate discussion to explore commonalities, probe areas of difference

7. How effective do they feel their DCEO conservation codes course was with respect to addressing the lack of building energy code compliance and the various reasons people may cite for non-compliance?

8. [KEYBOARD EXERCISE] What was the single most valuable thing you learned from the course?

8A. Facilitate group discussion on patterns, similarities, differences

8B. Probe the underlying “whys”

IMPACT OF THE COURSE (15 min)

Purpose: To understand the impact of the course for building professionals

1. What, if any, impact did the DCEO energy conservation code course and its content have for you and your work?

1A. Facilitate group discussion

2. [POLL] As a result of the course, did you make any changes in your work to improve code compliance [YES/NO]

2A. Briefly discuss patterns

2B. [KEYBOARD EXERCISE] Ask those who said they made changes as a result of the course to keyboard in what those changes have been, giving specific examples.

- Probe changes made, again drawing out any other specific examples.

2C. If any group members indicate they have not made any such changes, probe why not.

OTHER RESOURCES (10 min)

Purpose: To understand other resources used by Illinois building professionals and their value relative to the DCEO course

1. What other resources do you use to understand building energy codes and compliance issues?

2. [POLL] How valuable is the DCEO energy codes course compared to other resources that you are at least somewhat familiar with? [MUCH MORE VALUABLE/ SOMEWHAT MORE VALUABLE, ABOUT THE SAME, SOMEWHAT LESS VALUABLE, MUCH LESS VALUABLE]

2A. Discuss results (patterns, whys, etc.)

3. How do these other resources compare to the DCEO energy conservation code course that you took?

3A. How much overlap is there in the content/information provided?

WRAP UP (10 min)

Purpose: To get summary feedback regarding the DCEO course, its value, and what else DCEO can do to facilitate building energy conservation

1. [POLL] If DCEO did not provide the conservation code support that they provide, do you think that compliance rates in Illinois would [DECREASE, STAY THE SAME, INCREASE]
 - 1A. Share and discuss results
 - 1B. Probe why they “voted” as they did.

2. [POLL] Having discussed everything we did, please indicate your answer to the bottom-line question, “How important do you think the DCEO course is to improving building energy conservation code compliance rates in Illinois?” [EXTREMELY IMPORTANT to NOT AT ALL IMPORTANT]
 - 2A. Share and probe responses, getting at the “whys”

3. Finally, do you feel that there are any other ways that DCEO could support building professionals to help improve statewide code compliance?
 - 3A. Facilitate brief discussion

THANK AND DISMISS GROUP

Appendix B: Focus Group Guide for Right-Sized HVAC Design Training Attendees

INTRODUCTION AND ORIENTATION (5 Min)

7. Description of Blackstone Group
8. Explanation of purpose of project -- to get your candid feedback on the DCEO Residential HVAC course now that some time has passed since you attended it
9. Disclosure of recording, observers, etc.
10. Description of (IQ)² and marketing research process
 - 4A. The only “wrong” answer is not saying what you really think
 - 4B. As for all groups, try to speak one at a time and not “talk over” one another
 - 4C. Explain that they can use the “chat” box to communicate at any time, such as when somebody else is speaking, to answer a question, to provide more detail, to tell us what they are thinking and how they are feeling about what we are discussing
 - 4D. Urge them to use the “chat” box frequently but to rely primarily on talking as the primary means of discussion in this session
11. Introduction of respondents
 - 5A. Tell us about their firm and position
 - 5B. When and where did they attend the DCEO HVAC course?
12. Tell them that this course is the main topic of this group and that whenever we refer to the “HVAC course.”

HVAC SYSTEM COMPLIANCE WITH THE BUILDING ENERGY CONSERVATION CODES (15 min)

Purpose: to warm up the group and get their input on HVAC code noncompliance and the reasons for that.

5. (KEYBOARD EXERCISE) Please use the Chat Box to keyboard in your brief response to the question, “What are the more common ways in which residential building HVAC systems today do not comply with the building energy conservation code?”
 - 1A. Facilitate discussion (specific responses, similarities/differences in what was listed, etc.)
6. What factors explain the lack of compliance?
 - 2A. Probe for more
 - 2B. Facilitate discussion
7. How similar or different are the reasons for noncompliance for new construction vs. rehabilitation projects?

3A. Facilitate discussion

THE HVAC COURSE (30 min)

Purpose: To get specific feedback on the course.

9. Why did you decide to participate in the DCEO HVAC course?
 - 1A. Probe for more
 - 1B. Facilitate brief group discussion to draw out underlying/as-yet unspoken reasons, ascertain patterns, etc.

10. (KEYBOARD EXERCISE) What were you hoping to learn from the course?
 - 2A. Facilitate brief discussion to draw out additional reasons, etc.
 - 2B. Explore any patterns with group members.

11. (POLL) Please complete the poll shown on the lower left of your screen.
 - 3A. How satisfied are you with the DCEO HVAC course you attended? (SCALE FROM “EXTREMELY SATISFIED” TO “NOT AT ALL SATISFIED”)
 - 3B. Probe why they rated satisfaction as they did – what does their rating mean?
 - 3C. Facilitate discussion of responses/patterns.

12. How well was the course content delivered?
 - 4A. Open-ended responses
 - 4B. Overall relevance and real-world usefulness of the example problems worked on?
 - 4C. Relevance and real-world usefulness of components:
 - Calculating HVAC load
 - Troubleshooting system design problems
 - Selecting furnaces and AC units
 - Designing air distribution and duct systems
 - 4D. How clearly did the instructors explain the content?
 - Probe responses and underlying “whys”
 - 4E. How helpful were the course materials for understanding the course content?
 - Probe responses and underlying “whys”
 - 4F. [KEYBOARD EXERCISE] What could have been improved about the delivery of the course content?
 - Brief discussion of responses, patterns, “whys”

13. Do they feel that the course topics were addressed in sufficient depth?
 - 5A. Open-ended response
 - 5B. Probe for examples, why they said what they did
 - 5C. Recommendations for future courses with respect to depth?

14. What, if any, topics were not covered that you feel should have been covered?
 - 6A. Facilitate brief discussion
 - 6B. Ask for any additional thoughts or suggestions regarding course content that would make the course more valuable for those in positions/roles like theirs

6C. [KEYBOARD EXERCISE] Ask group members to keyboard in their person wish list of the top 1-5 additional topics to cover

- Facilitate discussion to explore commonalities, probe areas of difference

15. How effective do they feel their DCEO HVAC course was with respect to addressing the lack of building energy code compliance and the various reasons people may cite for non-compliance?

16. [KEYBOARD EXERCISE] What was the single most valuable thing you learned from the course?

8A. Facilitate group discussion on patterns, similarities, differences

8B. Probe the underlying “whys”

IMPACT OF THE COURSE (15 min)

Purpose: To understand the impact of the course for building professionals

3. What, if any, impact did the DCEO HVAC course and its content have for you and your work?

1A. Facilitate group discussion

4. [POLL] As a result of the course, did you make any changes in your work to improve HVAC compliance [YES/NO]

2A. Briefly discuss patterns

2B. Probe as needed re:

- Impact on performing load calculations
- Designing and troubleshooting systems
- Equipment selection

2C. [KEYBOARD EXERCISE] Ask those who said they made changes as a result of the course to keyboard in what those changes have been, giving specific examples.

- Probe changes made, again drawing out any other specific examples.

2D. If any group members indicate they have not made any such changes, probe why not.

OTHER RESOURCES (10 min)

Purpose: To understand other resources used by Illinois building professionals and their value relative to the DCEO course

4. What other resources do you use to understand HVAC building energy codes and compliance issues?

5. [POLL] How valuable is the DCEO HVAC course compared to other resources that you are at least somewhat familiar with? [MUCH MORE VALUABLE/ SOMEWHAT MORE VALUABLE, ABOUT THE SAME, SOMEWHAT LESS VALUABLE, MUCH LESS VALUABLE]

2A. Discuss results (patterns, whys, etc.)

6. How do these other resources compare to the DCEO HVAC course that you took?

3A. How much overlap is there in the content/information provided?

WRAP UP (10 min)

Purpose: To get summary feedback regarding the DCEO course, its value, and what else DCEO can do to facilitate building energy conservation

4. [POLL] If DCEO did not provide the HVAC support that they provide, do you think that residential HVAC system code compliance rates in Illinois would [DECREASE, STAY THE SAME, INCREASE]
 - a. Share and discuss results
 - b. Probe why they “voted” as they did.
5. [POLL] Having discussed everything we did, please indicate your answer to the bottom-line question, “How important do you think the DCEO course is to improving HVAC systems code compliance rates in Illinois?” [EXTREMELY IMPORTANT to NOT AT ALL IMPORTANT]
 - a. Share and probe responses, getting at the “whys”
6. Finally, do you feel that there are any other ways that DCEO could support building professionals to help improve statewide HVAC code compliance?
 - a. Facilitate brief discussion

THANK AND DISMISS GROUP