

ADVANCED ENERGY CODES PROGRAM: KNOWLEDGE SURVEY PROCESS EVALUATION

Final

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Notice

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1 Introduction

The Energy Conservation Construction Code of New York State (ECCCNYS, or the “Energy Code”) is a minimum building standard for energy efficiency that applies to commercial and residential buildings across the state. To increase compliance with the Energy Code and to reduce New York’s energy consumption, approximately 60 percent of which is attributable to buildings, the New York State Energy Research and Development Authority (NYSERDA) provides a range of training and support services through the Codes initiative of its Advanced Energy Codes and Standards program.¹ Most recently, these trainings have focused on preparing municipal code officials, design professionals, and members of the construction trades for forthcoming updates to the Energy Code that will incorporate the 2015 International Energy Conservation Code (IECC) and ASHRAE 90.1-2013. These updates will take effect in New York State on October 3, 2016.²

NYSERDA has contracted with multiple training contractors, including Newport Ventures (Newport) and the Urban Green Council (UGC), to develop and conduct a portfolio of approximately 16 training courses on the updates to the Energy Code, and has dedicated \$4 million of funding to support these trainings during the 2012-2016 period. The trainings offered by Newport and UGC target three distinct audiences – code officials, design professionals, and members of the construction trades – and cover both commercial and residential buildings.

The primary goal of this process evaluation is to evaluate reactions to training and learning among participants in the NYSERDA Energy Code trainings led by Newport and UGC, focusing on the subset of courses offered between April 2015 and June 2016. A secondary goal is to gather trainee feedback on the value and quality of course offering to inform future course improvements. Evaluation objectives and methods are summarized in Table 1-1. Additional detail on methods is provided in Section 3.

¹ The Advanced Energy Codes and Standards program also contributes to the development of appliance and equipment standards through its Standards initiative. See: NYSERDA. Operating Plan for Technology and Market Development Programs (2012–2016). Second Revision, February 15, 2013.

² U.S. Department of Energy. "Building Energy Code Program: New York." Building Energy Codes Program. May 22, 2016. Accessed August 12, 2016, at: <https://www.energycodes.gov/adoption/states/new-york>.

Table 1-1. Summary of Objectives and Methods

Objective	Purpose	Method	
		Pre-/Post- Training Survey	Interviews with NYSERDA, Training Contractors
Evaluate trainees' reactions to the training program	Assess trainees' satisfaction with and the value of the training program	✓	
Measure the change in trainees' level of knowledge of the Energy Code following training	Assess training quality	✓	✓
Determine whether trainees plan to enact changes as a result of training	Assess the extent to which trainings may increase code compliance	✓	✓
Examine perceptions of training's effectiveness at increasing code compliance	Assess the extent to which trainings may increase code compliance, and inform improvements to NYSERDA's Energy Code initiative		✓
Solicit suggestions for other activities that trainees think would be effective at increasing code compliance	Inform improvements to NYSERDA's Energy Code initiative	✓	✓

2 Results, Findings, and Recommendations

The following sections present the results, findings, and recommendations of this evaluation. First, Section 2.1 provides an overview of training participation, including a comparison to the previous round of Energy Code trainings conducted in 2011. Sections 2.2 through 2.6 discuss results related to each of the five evaluation objectives, based on trainee surveys and interviews with NYSERDA program staff and training contractors. Section 2.7 discusses other key findings beyond the original evaluation objectives. Finally, Section 2.8 offers recommendations for NYSERDA to consider when developing or implementing future trainings.

2.1 Overview of Training and Survey Participation

Course records indicate that 2,275 attendees took one of four NYSERDA-sponsored Energy Code trainings during the study period. These trainings included two four-hour courses led by Newport, Building Science (hereafter, Newport-Building Science) and Commercial Codes (Newport-Commercial), and two eight-hour courses led by UGC, Conquering Code-Commercial (UGC-Commercial) and Conquering Code-Residential (UGC-Residential). As part of each course, trainees were asked to complete both pre- and post-training surveys. After accounting for blank or otherwise unusable surveys, 1,959 completed surveys were available for analysis, representing 86 percent of attendees. Table 2-1 summarizes training and survey participation.

Table 2-1. Overview of Training and Survey Participation

Training Contractor	Number of Attendees	Total Surveys for Analysis	Percent of Attendees with Usable Surveys
Newport	1,435	1,136	79%
UGC	840	823	98%
Total	2,275	1,959	86%

The target training audience varied by course. For example, the UGC trainings were generally geared towards architects and designers, while the Newport trainings were geared towards code officials and, particularly for the Building Science course, members of the construction trades. Participants were asked in the pre-training survey to identify their primary occupation; their responses are summarized in Table 2-2. As expected, the UGC courses were dominated by architects/designers, and the Newport courses were dominated by code officials; however, the Newport courses also included a higher percentage of architects/designers and engineers than expected.³ Participation by members of the construction trades was low for all courses, although slightly higher for Newport-Building Science. Interviews with two NYSERDA program staff members and five training contractors (three from UGC and two from Newport) indicated that this result was not entirely surprising; members of the construction trades, unlike

³ Some participants may belong to more than one audience group (e.g., design professionals currently working as code officials). The survey asked participants for their primary occupation only, and therefore may not capture the true distribution of expertise.

code officials, architects, and engineers, are not required to take training for continuing education and may be less receptive to classroom-style learning than design professionals. In addition, members of the construction trades may be unable to attend daytime trainings during construction season. Nevertheless, several training contractors suggested that they would like to see a greater mix of audiences in each course to encourage knowledge-sharing and collaboration. Increasing participation by members of the construction trades remains a key challenge.

Table 2-2. Audience Groups by Course

Audience Group	Newport - Building Science	Newport - Commercial	UGC - Commercial	UGC - Residential	Total
Architect/Designer	10%	15%	57%	88%	34%
Code Official/Inspector	72%	64%	3%	0%	40%
Construction Trades	6%	4%	3%	3%	4%
Engineer	4%	9%	29%	6%	15%
Other	7%	6%	7%	3%	6%
No Answer	1%	1%	1%	0%	1%
Total	100%	100%	100%	100%	100%

Of the 1,959 participants included in this analysis, 332 wrote in primary occupations that they considered “Other.” After reviewing their responses, many of which simply provided more detailed descriptions than the survey asked for, IEC recategorized 131 as “Code Official/Inspector,” 43 as “Construction Trades,” 42 as “Architect/Designer,” and three as “Engineer.” In addition, thirteen participants selected “Energy Rate/Auditor” as their primary occupation, but because of the small number of responses in the category, IEC recategorized them as “Other.” Table 2-3 provides additional detail on the occupations of all individuals included in IEC’s “Other” category. Many of these responses were vague or could not be meaningfully grouped and are thus best categorized as “Miscellaneous.” The Miscellaneous responses include, for example, “retired,” “representative,” “private,” and “consultant.”

Table 2-3. Occupations Categorized as “Other”

Occupation Categorization	Count	Occupations Within “Other” Category	Count
Other	126	Miscellaneous	44
		Municipal/State Agencies	28
		Facility Manager	25
		Environmental Specialist	13
		Energy Rater/Auditor	9
		Sales/Manufacturing Representative	7

Compared to 2011 participation data for a subset of NYSERDA’s previous round of trainings, which occurred from June 2010 through March 2013 and were funded through the American Reinvestment and Recovery Act of 2009 (ARRA), the current trainings included a higher percentage of architects/designers and code officials/inspectors. The percentage of engineers participating in the trainings was unchanged

between the two rounds. The current round included a lower percentage of construction trade professionals. These results are presented in Table 2-4.

Table 2-4. Current versus Previous Training Participation

Occupation Category (Current Training)	Occupation Category (Previous Training)	Current Training (2015-2016)	Previous Training (2011) ⁴
Architect/Designer	Architect	34%	21%
Code Official/Inspector	Code Official	40%	35%
	Third-Party Inspector		
Construction Trades	Builder	4%	9%
	General Contractor		
	HVAC Contractor		
	Electrician		
Engineer	Engineer	15%	15%
Other	Other	6%	20%
	HERS Rater		
No Answer		1%	

Overall, most participants in the current round of trainings (61 percent) indicated that they work on both residential and commercial buildings. An additional 30 percent indicated that they work exclusively on commercial buildings, and the remaining nine percent indicated that they work exclusively on residential buildings. This split is likely due in part to the fact that two of the four courses included in this evaluation were specific to the commercial code, while only one course was specific to the residential code. This distribution generally applied to most audience groups, with the exception of engineers. Of the engineers that attended the trainings, 60 percent indicated that they work exclusively on commercial buildings, while 40 percent indicated that they work on both residential and commercial buildings.

The survey also asked trainees about the perceived ease of implementation and importance of the Energy Code in their jobs to understand their attitudes toward the Energy Code. Across occupations, most participants were neutral as to the ease of implementing and enforcing the provisions of the Energy Code; this result was similar for all courses. Most participants also indicated that the Energy Code plays an important role in their work; this result, too, was similar across all occupations and courses. Five percent of code officials, however, indicated that the Energy Code is not important in their work, compared to zero percent of the other audience groups. Although not asked explicitly about this figure, NYSERDA program staff and training contractors emphasized in interviews that code officials are responsible for enforcing nine different building codes, of which the Energy Code takes relatively low priority. This may help explain why a small number of participants believed the Energy Code was not important to their work.

⁴ Participation in the ARRA trainings was calculated as the sum of the number of respondents to the Wave 1 Pre-Training survey, which was conducted online at the time of registration, and the Wave 2 survey, which was conducted at the training course, similar to the survey developed for the T&MD trainings. For more detail on the ARRA trainings and survey methodology, see: NYSERDA. NYSERDA American Reinvestment and Recovery Act 2012 Impact Evaluation Report: State Energy Programs. April 30, 2012.

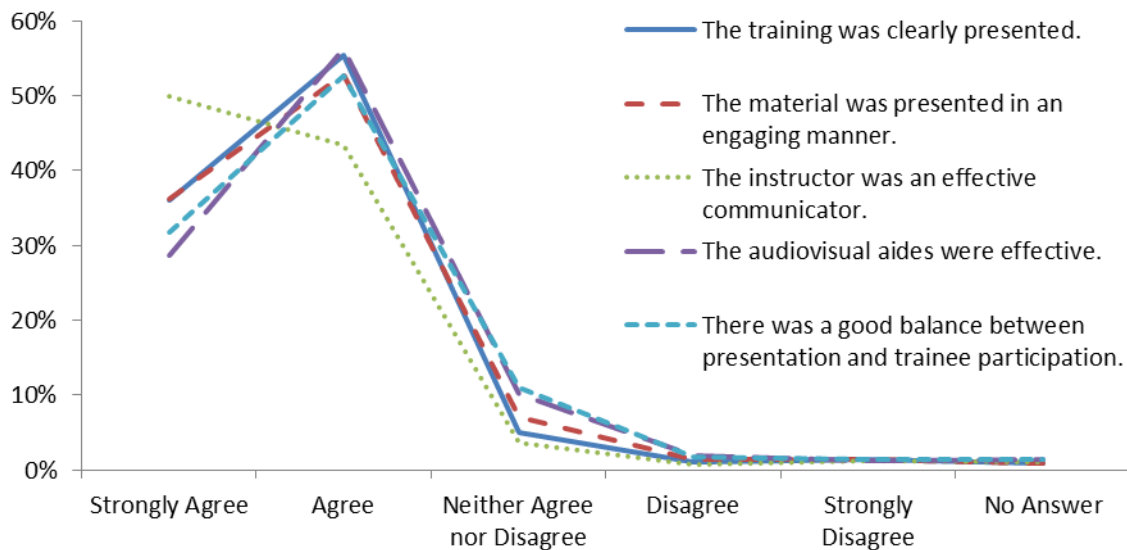
2.2 Trainee Reactions and Satisfaction

Evaluation Questions: How did trainees react to the training program? How satisfied are the trainees with the training?

Based on analysis of the post-training survey data, trainees were satisfied with all aspects of the training, and results were similar for all courses. Most trainees “agreed” or “strongly agreed” with the following statements, as illustrated in Figure 2-1:

- The training was clearly presented. (36 percent “strongly agree,” 55 percent “agree”)
- The material was presented in an engaging manner. (36 percent “strongly agree,” 53 percent “agree”)
- The instructor was an effective communicator. (50 percent “strongly agree,” 43 percent “agree”)
- The audiovisual aides were effective. (29 percent “strongly agree,” 56 percent “agree”)
- There was a good balance between presentation and trainee participation. (32 percent “strongly agree,” 53 percent “agree”)

Figure 2-1. Trainee Satisfaction

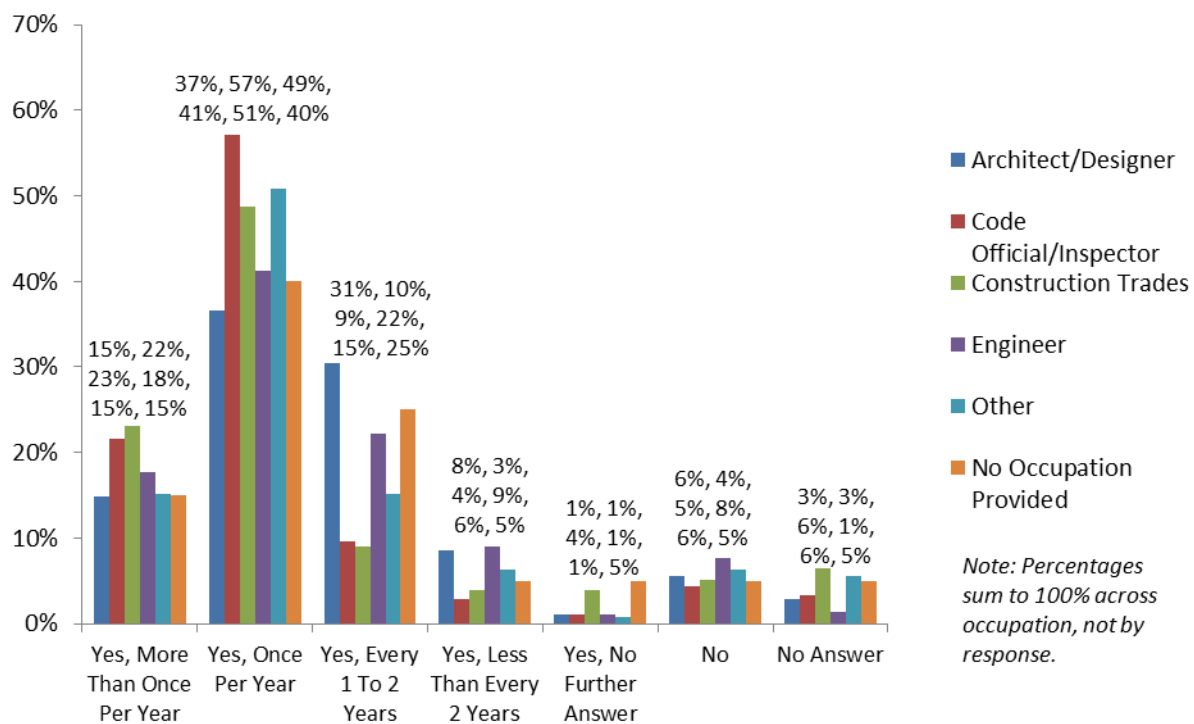


The statement “the instructor was an effective communicator” showed the strongest agreement, with 50 percent of trainees selecting “strongly agree.” Agreement with this statement was highest for the UGC-Commercial course, for which 56 percent of trainees selected “strongly agree.” The statements “the audiovisual aides were effective” and “there was a good balance between presentation and trainee participation” had slightly lower results than the other statements, but still had a very high percent of trainees that selected “agree” or “strongly agree” (85 percent and 84 percent, respectively). Additionally, most trainees (65 percent) were “very satisfied” with the ease of enrolling in training.

Trainees were also satisfied with the topics covered in the trainings. Most (73 percent) did not recommend covering additional topics as part of the training they attended. Of these, 31 percent stated that the training was complete as-is; 31 percent stated that there was no time to cover additional topics; and 11 percent stated that the training was both complete and lacked time to cover additional topics.

Most trainees (88 percent) indicated they would recommend the training to a colleague. Nearly all trainees (91 percent) also plan to take Energy Code training again in the future, as illustrated in Figure 2-2. Most trainees (65 percent) reported that they planned to participate at least once per year. Code officials/inspectors and members of the construction trades planned to take training most frequently, with 79 percent and 72 percent, respectively, planning to participate once or more than once per year. This response is unsurprising for code officials, who are required to take 24 hours of approved continuing education courses each year to maintain their certification.⁵ Architects and engineers are required to take 36 hours of continuing education courses every three years.⁶ Members of the construction trades, however, are not required to take any continuing education and had low participation overall, making their intended frequency of training a surprise.

Figure 2-2. Trainee Plans for Future Training



Only 22 percent of survey respondents answered the question "do you have any additional feedback to help improve this training?" and many of the responses included positive comments. Trainees provided 96 general positive comments such as "very helpful" and "thank you," and 66 positive comments on the training contractor such as "the presenter was well informed" and "excellent teacher"; these categories accounted for 20 percent and 14 percent of all comments received, respectively. The two most common

⁵ New York State Department of State, Division of Code Enforcement & Administration. "Educational Services Training Overview." Accessed September 9, 2016, at: http://www.dos.ny.gov/dcea/edu_train_overview.html.

⁶ AIA New York. "Continuing Education." 2016. Accessed September 9, 2016, at: <http://aiany.aiany.org/index.php?section=continuing-education-xx>; and New York State Education Department Office of the Professions. "Continuing Education: Professional Engineering & Land Surveying." April 14, 2016. Accessed September 9, 2016, at: <http://www.op.nysed.gov/prof/pels/peceques.htm>.

categories of improvements to the training suggested by trainees were changes to course materials (83 comments, or 18 percent) and additional courses or content (70 comments, or 15 percent). However, many of the comments about changes to course materials were requests for copies of the presentation slides and other resources. For additional courses or content, many trainees indicated the training was too general and lacked depth. Other areas of feedback include:⁷

- Changes to course format (36 comments; eight percent)
- Extension of training time (33 comments; seven percent)
- Content to streamline (21 comments; four percent)
- Reduction of training time (3 comments; one percent)
- Other—e.g., requests for food and coffee, and comments on the location and room (38 comments; eight percent)

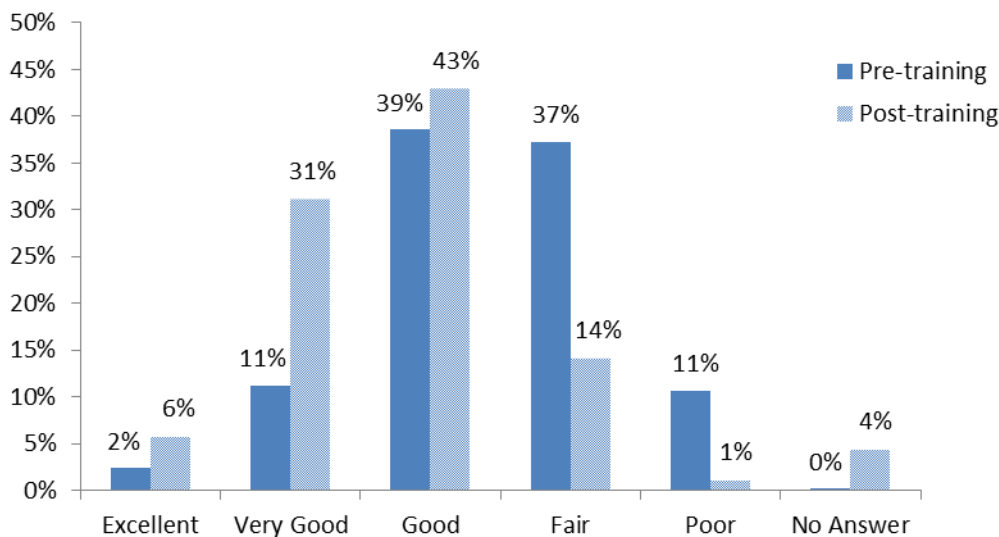
Additional detail on the coded responses to this question is provided in Appendix C.

2.3 Trainee Learning and Level of Knowledge

Evaluation Questions: What did the trainees learn? What was their level of knowledge before and after the training?

Trainees reported that their understanding of the Energy Code overall, as well as of specific provisions, increased after the training. This result was similar for all courses. Figure 2-3 shows trainees’ overall understanding of the code before and after training. Most trainees indicated that their understanding of the code was “good” or “fair” before the training (76 percent), while most trainees indicated that their understanding was “very good” or “good” after the training (74 percent).

Figure 2-3. Trainee Understanding of the Energy Code



⁷ Some trainee responses received more than one code. Therefore, the sum of the responses is greater than the number of trainees who answered the question.

The survey also included questions about trainees’ understanding of particular provisions covered in each course. These questions showed similar results as the question about overall understanding. Table 2-5 shows the average change in understanding across provisions by course, indicating whether trainee understanding decreased, stayed the same, or increased, and by how many “steps” understanding increased (i.e., a change from “fair” to “very good” is two steps). The UGC courses appear to have been more effective based on the extent to which participants’ understanding improved: specifically, seven percent of trainees in each UGC course indicated that their understanding increased by three steps, compared to two percent for the Newport courses. Additionally, 23 and 24 percent of trainees in each of the UGC courses, respectively, indicated that their understanding increased by two steps, compared to 11 and 13 percent for the Newport courses. According to NYSERDA program staff, this result may be related to the specific audience groups targeted by each contractor. UGC’s courses are aimed at architects and engineers, who may be more receptive to classroom-style learning than the code officials and members of the construction trades predominately taught by Newport. Another explanation for the difference in learning, which program staff did not mention, is that UGC’s courses involved full-day, eight-hour sessions while Newport’s courses were four-hour, half-day sessions. The additional time available for training could be expected to result in a greater increase in trainees’ level of knowledge. Finally, one NYSERDA program staff member also noted that UGC has a formal process for curriculum development that includes the solicitation of suggestions from instructors and industry professionals; this structured approach may have improved the quality of UGC’s training courses.

Of the specific provisions evaluated, participants in the UGC-Residential course showed greater increases in understanding of “duct and envelope testing” than all other provisions. Contractors agreed that this was likely the result of spending more time discussing this provision, which is a new requirement under the October 2016 code. A detailed breakout of survey results by provision is included in Appendix B.

Table 2-5. Average Change in Trainee Understanding of Particular Provisions

Course	Change In Understanding Of Particular Provisions From Pre- To Post-Training Survey (Average Across Provisions)					
	Decreased	Stayed the Same	Increased 1 Step	Increased 2 Steps	Increased 3 Steps	Increased 4 Steps
Newport – Building Science	5%	38%	39%	13%	2%	0%
Newport – Commercial	7%	41%	35%	11%	2%	0%
UGC – Commercial	4%	24%	38%	24%	7%	1%
UGC – Residential	6%	25%	37%	23%	7%	2%

Despite the increase in understanding, few trainees reported an “excellent” understanding of the Energy Code or of particular provisions after the training.⁸ This is consistent with the introductory nature of the trainings, and was not surprising to any of the five contractors or two NYSERDA program staff members interviewed. Additionally, in some cases, participants indicated that their level of understanding stayed

⁸ IEc examined whether the results for particular audience groups differed between residential and commercial provisions (approximated by course focus) but found no clear trends.

the same or decreased. The contractors agreed that this was not surprising, and might be the result of trainees realizing after training that they didn't understand the code as well as they had previously thought.

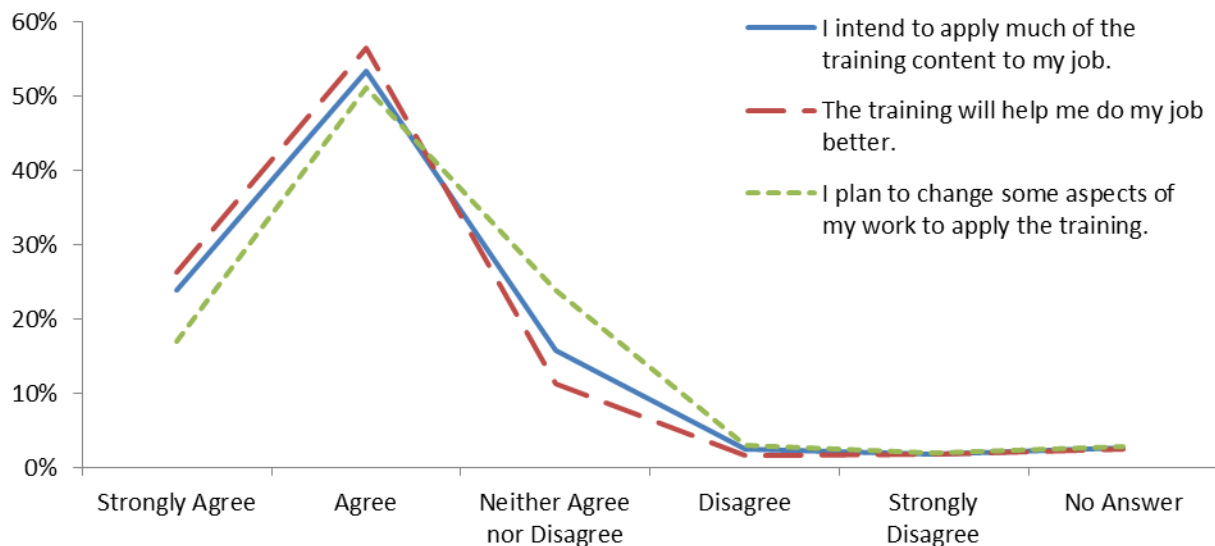
The interviewees also noted several provisions that trainees are likely to struggle with in practice. NYSERDA program staff indicated that, based on reports from field support contractors and hotline calls, the building science provisions (e.g., air barriers, air sealing) tend to be most challenging to implement. Three training contractors also indicated that specific building science provisions (building envelope, HVAC, and the forthcoming blower door test) are likely to be most challenging. Training contractors further noted that people tend to struggle with understanding exceptions, prescriptive requirements, and the administrative requirements for documentation.

2.4 Trainees' Plans to Enact Changes

Evaluation Question: What changes do trainees plan to enact as a result of the training?

Trainees generally indicated that they intend to make changes to how they do their jobs as a result of the training; this result was similar for all courses. As illustrated in Figure 2-4, most trainees agreed that they intend to apply much of the training content to their job (53 percent "agree," 24 percent "strongly agree"); that the training will help them do their job better (57 percent "agree," 26 percent "strongly agree"); and that they plan to change some aspects of their work to apply the training (51 percent "agree," 17 percent "strongly agree").

Figure 2-4. Participant Plans to Apply Training



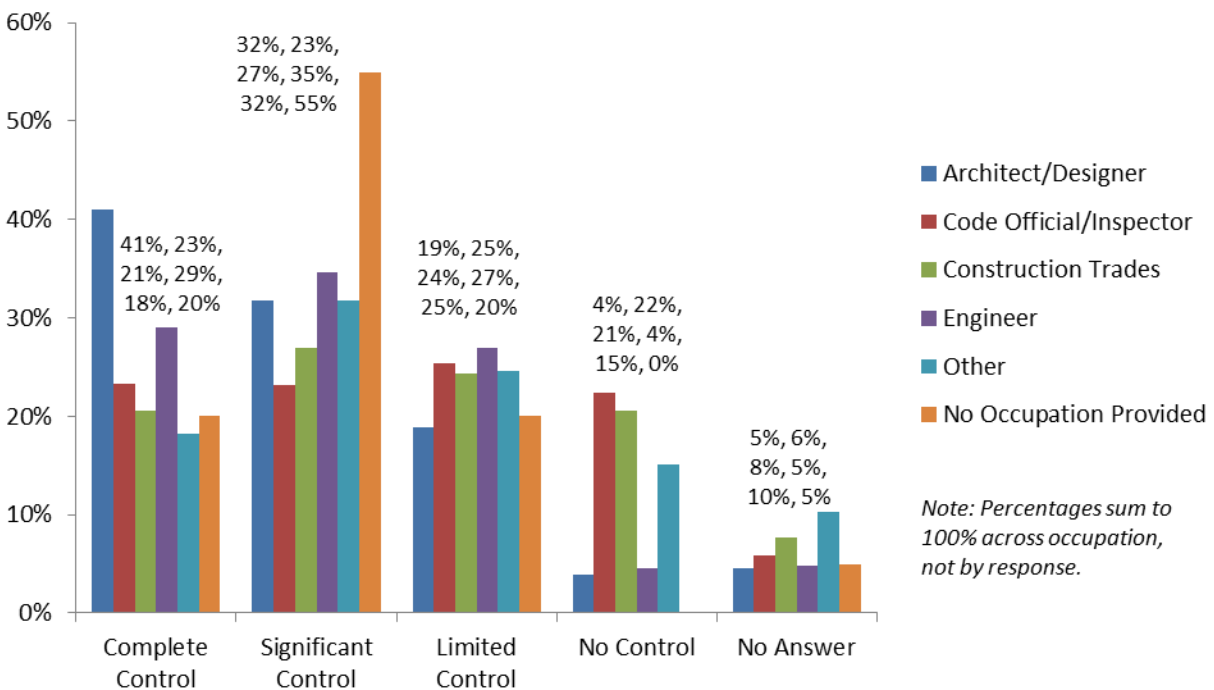
While trainees indicated that they plan to make changes, there was variation among audience groups as to the amount of control they have in making those changes. This result is illustrated in Figure 2-5.

Architects/designers generally replied that they have significant or complete control over making changes (73 percent); in contrast, nearly half of all code officials/inspectors replied that they have limited to no

control over making changes (47 percent). Program staff and training contractors were not surprised by this, and offered possible explanations:

- Code officials tend to be understaffed and overburdened as a result of having to enforce nine different building codes, of which the Energy Code is only one. This is particularly true in rural areas where one code official may serve multiple jurisdictions. Code officials may not have the resources necessary to make changes to enforcement.
- Code officials may be under pressure to support economic development from the elected officials who employ them. Code officials may be unwilling to delay construction for stringent enforcement of the Energy Code.

Figure 2-5. Participant Control to Make Changes



2.5 Effectiveness of Training at Increasing Compliance

Evaluation Question: Do instructors think that training is an effective way to increase code compliance?

Rather than asking this question of trainees, IEC asked training contractors and NYSERDA program staff, who might have a deeper understanding of training effectiveness and code compliance over time. All seven interviewees agreed that trainings are an important part of increasing code compliance, for reasons including that training may be the only exposure participants have to energy efficiency. Other comments from the interviewees included:

- From contractors:
 - Trainings are particularly important for spreading awareness of code updates.
 - The culture surrounding energy efficiency is changing. Because design professionals often learn from older mentors, they may not be learning about energy efficiency.

- In-person trainings that mix audience groups are the best way to encourage communication between code officials, design professionals, and members of the construction trades.
- From NYSERDA program staff:
 - Trainings likely have a larger cumulative impact than other program activities such as municipal support services because of the number of code officials reached through the trainings.

Three interviewees also emphasized that it is difficult to know whether and to what extent trainees retain and apply information from the trainings. A follow-on survey could help determine the extent to which trainees are applying information from the trainings to their jobs.

2.6 Other Activities for Increasing Compliance

Evaluation Question: What other activities do trainees think would be effective at increasing code compliance?

Approximately 20 percent of trainees offered suggestions for other training or support services to increase code compliance. Most of these suggestions focused on the trainings and were similar to the course feedback described in Section 2.2. The most common suggestions were related to:

- **Training methods and format** – Of 425 suggestions offered by trainees, 115 called for changes to training methods or format. Within these comments, 28 were requests for greater use of case studies and sample projects; the remaining 87 focused on other changes such as extending training time or offering trade-specific trainings.
- **More detailed training content** – 68 trainees requested more detailed content in the trainings. For example, trainees asked for information on NYC-specific requirements, additional detail on HVAC requirements, and additional detail on documentation requirements.
- **Training tools** – 67 comments focused on changes to training tools, including providing free copies of the Energy Code and copies of the presentation slides.

Trainees also provided suggestions for new or different building science content (59 comments), commercial content (23 comments), residential content (22 comments), other training topics, such as new code updates and provisions for existing buildings (55 comments), and other services, such as plan review workshops and incentives for designers who exceed code requirements (16 comments).

These findings varied slightly by course. In the Newport-Building Science course, building science content suggestions and other training topics followed training methods and format as the most common suggestions. In the Newport-Commercial course, building science content suggestions were more common than requests for detailed content. The breakdown of suggestions by course is shown in Table 2-6.

Findings also differed slightly by audience group. Among construction professionals and engineers, for example, the most common suggestions included building science content and other training topics. A breakout by audience group is included in Appendix C.

Table 2-6. Suggestions for Other Training and Support Services

Comment Category	Total		Newport – Building Science		Newport - Commercial		UGC - Commercial		UGC – Residential	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Training Methods and Format	115	24%	15	18%	38	25%	56	27%	6	20%
• Case Studies/ Examples	87	18%	15	18%	32	21%	37	18%	3	10%
• Other	28	6%	0	0%	6	4%	19	9%	3	10%
More Detailed Content	68	14%	10	14%	19	17%	36	7%	3	3%
Training Tools	67	14%	7	8%	15	10%	36	17%	9	30%
Building Science Content	59	12%	13	15%	23	15%	20	9%	3	10%
Other Training Topics	55	12%	13	15%	13	9%	27	13%	2	7%
Commercial Content	23	5%	7	8%	5	3%	8	4%	3	10%
Residential Content	22	5%	3	4%	7	5%	10	5%	2	7%
Other Activities	16	3%	5	6%	6	4%	4	2%	1	3%
Total	425	100%	73	100%	126	100%	197	100%	29	100%

Training contractors echoed trainee’s top suggestions. Three of the five contractors interviewed suggested exploring changes to training format, including breaking up UGC’s eight-hour course into two days, offering short courses limited to Energy Code updates, and offering private, small-group trainings to encourage more candid discussion. As one contractor pointed out, “Builders are not comfortable having a competitor in the room and asking questions about compliance. They don’t want to show that they are behind or might be doing something incorrectly.”

Other suggestions offered by the contractors included:

- Three contractors from Newport and UGC emphasized the importance of mixing audience groups (e.g., builders, code officials, architects) to facilitate knowledge-sharing and collaboration.
- Two contractors noted that not providing handouts, code books, and other resources to trainees decreases the effectiveness of the trainings.
- One contractor suggested that detailed trainings could be a natural follow-on to the current introductory courses.

2.7 Other Findings

In the interviews with training contractors and NYSERDA program staff, IEc also asked for insights into the training's effectiveness at meeting program objectives and challenges with training development and implementation. These findings are discussed below.

2.7.1 Training Objectives

The Advanced Energy Codes Program Theory and Logic Model and T&MD Operating Plan define the objectives related to the trainings as follows:⁹

- Develop 12 to 16 new or expanded code training modules;
- Train 15,000 individuals on code requirements;
- Develop or update educational or other tools to help support code compliance;
- Create more knowledgeable code official and design/construction communities;
- Increase code compliance toward the goal of 90% compliance by 2017;
- Construct more energy efficient buildings through compliance; and
- Achieve cumulative annual energy savings: 631 GWh of electricity, 129 MW of peak demand, and 4.921 million MMBtu of fossil fuel.

When asked how they would define the objectives of the training courses, the interviewees generally cited two key goals:

1. To help participants understand what is required by the Energy Code (in particular, the new code taking effect in October 2016), why the requirements exist, and how to comply; and
2. To highlight frequent compliance issues and point trainees to additional resources.

One NYSERDA staff member also noted that the trainings are designed to incorporate real-world scenarios to aid in understanding, and to be applicable to four specific audiences: code officials, designers, members of the construction trades, and energy specialists. These goals are consistent with but generally shorter-term in focus than those in the Logic Model and Operating Plan.

All seven interviewees were satisfied that the trainings as currently designed meet these objectives, and cited positive feedback from trainees as support. Neither NYSERDA program staff member recommended changing the long-term objectives.

2.7.2 Training Implementation

Both NYSERDA program staff members were satisfied with the overall quality of the training courses. When asked about the most beneficial aspects of the trainings, interviewees provided a variety of responses:

⁹ NYSERDA. Advanced Codes and Standards Final Initiative Level Logic Model Report. Prepared by Research Into Action. July 2013; and NYSERDA. 2013b. Operating Plan for Technology and Market Development Programs (2012–2016). Second Revision, February 15, 2013.

- Changes forthcoming in the new code—suggested by one Newport contractor.
- Real-world examples (e.g., hypothetical building plans) and actionable information—suggested by one NYSERDA program staff member and one UGC contractor.
- Trade-specific trainings, especially for the construction trades—suggested by one NYSERDA program staff member.
- Visual, textual, and verbal examples designed to accommodate a range of learning styles—suggested by one Newport contractor.
- Information on compliance paths—suggested by one UGC contractor.
- The introductory focus of the course, because most participants come in with very little understanding of the Energy Code—suggested by one UGC contractor.

The training contractors noted several key challenges with implementation, however. These included:

- **Engaging diverse audiences**, particularly participants from the construction trades who may not be as receptive to classroom-style learning as design professionals. NYSERDA is aware that participation by the construction trades remains low and has identified a number of strategies to increase participation. Some of these strategies have been implemented already; others are still in the planning phase. These strategies include:
 - Soliciting feedback on course design from focus groups;
 - Offering webinars as an alternative to in-person courses;
 - Offering participants perks for attending, such as lunch and takeaways; and
 - Developing a “green builder” designation for individuals completing a certain number of courses.

Additionally, one contractor noted that advertising the trainings to members of the construction trades can be difficult because local building departments do not always track contractors applying for building permits. As a result, training contractors have limited ability to advertise directly to members of the construction trades.

- **Clarifying dense material.** Several interviewees cited the dense, cumbersome nature of the Energy Code as a challenge to increasing trainees’ understanding. One training contractor noted that the lack of handouts made it difficult to effectively communicate complicated issues to participants. This contractor suggested that increasing the use of diagrams and visual aids could help clarify the “legalese” of the code book.
- **Using course time effectively**—in particular, deciding which information to emphasize in the short course. All five contractors noted that, because the content is so dense, it is impossible to cover all the information in the Energy Code in the time available, whether four hours or eight. Two contractors, one each from Newport and UGC, stated that they would appreciate more flexibility to adapt the standard training presentation to their individual teaching styles and the background of the specific audience present, rather than stick exactly to the curriculum approved by NYSERDA. One UGC contractor also identified the one-day format as a particular challenge, noting that it can be difficult to hold trainees’ attention for eight hours.

Contractors offered the following suggestions to address these challenges:

- Add in field work components, if possible;
- Experiment with different class formats (e.g., for UGC courses, split the training into two four-hour days; offer a shorter “updates only” course; offer advanced topic-specific trainings);
- Keep class sizes small (approximately 20-30 people) to facilitate discussion; and
- Provide trainees with handouts and other resources, including an online repository of code explanations, “how to” guidance, and compliance tools.

NYSERDA program staff were satisfied with the trainings and had no suggestions for improving either the curriculum or implementation.

2.8 Conclusions and Recommendations

Overall, the current round of NYSERDA Energy Code trainings has been very successful. Trainees have reported that their understanding of the Energy Code increased after training, and they have been satisfied with the training content and instructors. Additionally, NYSERDA program staff and training contractors indicated that the trainings are meeting their objectives.

While the trainings have largely been successful, IEc offers four recommendations for future trainings:

- 1. Build on introductory trainings by incorporating additional topics into existing trainings or adding courses that go into greater depth regarding specific elements of the code and code compliance (e.g., NYC-specific requirements, HVAC provisions, requirements for existing buildings).**

When asked about other training or support services to increase code compliance and for any additional feedback about the trainings, trainees responded similarly, with suggestions for additional training and more detailed training. Trainees suggested additional training topics such as requirements for existing buildings, energy modeling, and renewable energy installations. Trainees also requested more detailed training content, including information on NYC-specific requirements, additional detail on HVAC requirements, and additional detail on documentation requirements, among others.

Notably, few trainees reported an excellent understanding of the code after training, which contractors attributed to the introductory nature of the trainings. One training contractor noted that more detailed content could be a natural follow-on to the current round of introductory trainings. To further increase knowledge of and compliance with the Energy Code in the design and construction communities, NYSERDA should therefore consider offering courses that go into greater detail regarding specific elements of the code and code compliance. According to NYSERDA program staff, a small number of topic-specific courses are already in development, including a course on mechanical provisions and courses on residential and commercial best practices for field inspection and plan review.

- 2. Consider changes to training exercises and materials (e.g., case studies, handouts, and other resources) and class format.**

Trainees also requested changes to training exercises, materials, and class format. Specifically, these requests included the incorporation of real-world examples, sample projects, and case studies in the trainings, as well as offering alternative class formats, such as short refresher courses or small-group

trainings. Trainees also frequently requested copies of the presentation slides, free copies of the Energy Code, and access to other tools and resources. Training instructors noted that limited access of participants to handouts, code books, and other resources decreases the effectiveness of the trainings.

NYSERDA program staff indicated that, to address some of these concerns, both Newport and UGC are developing handbooks for training participants that will be used following the release of the October 2016 code updates. Additionally, NYSERDA is developing four Energy Code manuals, geared toward code officials and design professionals, that will include checklists and other interactive documents. Three of these manuals will be available online, and the fourth will be provided to municipal code enforcement offices. The manuals Although access to these materials should alleviate many of trainees' concerns, training contractors should also consider providing a web link for participants to download at least the training slides. NYSERDA may also consider experimenting with training formats, as discussed below.

3. Focus on increasing participation by the construction trades.

Engaging members of the construction trades remains a key challenge for training contractors. Some trainees requested trade-specific trainings, which one NYSERDA program staff member noted can be particularly helpful for engaging members of the construction trades.

NYSERDA is aware that participation from the construction trades remains low and has identified a number of strategies to increase participation. Some of these strategies have been implemented already; others are still in the planning phase. These strategies include:

- Soliciting feedback on course design from focus groups;
- Offering webinars as an alternative to in-person courses;
- Offering participants perks for attending, such as lunch and takeaways; and
- Developing a “green builder” designation for individuals completing a certain number of courses.

IEc recommends continuing to implement these strategies, while at the same time considering whether offering some trade-specific trainings might increase participation by members of the construction trades in the short term. According to NYSERDA program staff, NYSERDA intends to work with training contractors to develop a total of five trade-focused training courses over the next two years, and to advertise these trainings through the New York State Builders Association, with the goal of more effectively engaging the construction trades.

4. Follow up with trainees to determine whether they have applied knowledge from the trainings to their jobs.

Trainees generally indicated that they intend to make changes to how they do their jobs as a result of the training. However, NYSERDA program staff and the training contractors noted several provisions that trainees are likely to struggle with in practice. Additionally, they emphasized that it is hard to know whether and to what extent participants retain and apply information from the trainings. Follow-on surveys could help determine the extent to which participants are applying information from the trainings to their jobs. This would be especially useful for code officials, who reported limited to no control over making needed changes. The information from these surveys would also provide context for the results of any future code compliance studies.

3 Methods

The primary data source for this evaluation is a survey of trainees who attended NYSERDA Energy Code training. In addition, IEC conducted in-depth interviews with NYSERDA program staff and training contractors.

3.1 Trainee Survey

With subcontractor APPRISE, IEC surveyed Energy Code training attendees. The survey population consisted of all trainees who attended one of the four NYSERDA Energy Code training courses run by contractors UGC and Newport from April 2015 to June 2016. These courses consisted of 89 training sessions, of which 56 were full-day sessions led by UGC and 33 were half-day sessions led by Newport, as shown in Table 3-1. The survey was designed primarily to evaluate reactions and learning among participants, and secondly to gather trainee feedback on the value and quality of course offerings.

Table 3-1. Number of Sessions by Course

Course	Number of Sessions
Newport – Building Science	12
Newport – Commercial	21
UGC – Commercial	44
UGC – Residential	12

Each survey included two parts: a pre-training and a post-training survey. The survey was a paper survey formatted to be read by optical scan technology, distributed to trainees directly before and after the training sessions. The short pre-training survey (approximately five minutes in length) collected demographic information and established a baseline understanding of the trainees' knowledge of key Energy Code elements prior to taking the training. The post-training survey (approximately five to 10 minutes in length) was designed to gauge trainees' satisfaction with the training session and assess changes in their knowledge regarding the Energy Code and their intentions to apply the knowledge to their jobs. The survey was the same for each course except for two questions that asked about understanding of particular provisions that were tailored to each course. The survey instrument is included in Appendix A.

Following survey development, APPRISE attended two Newport-Building Science sessions in May 2015 to test the survey, observe its administration, and solicit feedback from trainees. Based on the feedback received and review of the completed surveys, IEC made clarifying edits to two questions. APPRISE also developed a script for the instructors to read before administering the survey to ensure consistency across courses and to minimize common errors, such as trainees not using pens compatible with the optical scan technology or not filling in the response bubbles completely.

Upon receiving survey results from APPRISE, IEC analyzed the responses to multiple-choice questions to identify the most common responses by course and/or audience group. For open-ended questions, IEC conducted a formal coding analysis of responses to identify the most common responses.

Table 3-2 summarizes participation in the trainings and the survey. For UGC, these represent actual values. For Newport, their initial trainings in April 2015 occurred before the optical scan survey was developed, and the pre- and post-training surveys were not paired. These pre- and post-training surveys were matched by NYSERDA based on handwriting; a high number of surveys could not be matched and were therefore unusable. Additionally, the number of attendees at those trainings was not tracked; IEc estimated the number of attendees based on the response rate for the later Newport trainings.

Overall, approximately 2,275 attendees attended the UGC and Newport trainings between April 2015 and June 2016. The survey yielded a high response rate (88 percent) overall, with 82 percent of Newport trainees and 98 percent of UGC trainees submitting surveys. Of those 2,002 surveys, 43 were blank or otherwise unusable, leaving 1,959 completed surveys for analysis. Because this analysis compares pre- and post-training survey results, surveys were considered unusable if the trainee submitted only one or the other survey, or if the survey was illegible.

Table 3-2. Training and Survey Participation

Training Contractor	Number of Attendees	Number of Surveys	Response Rate	Number of Blank or Unusable Surveys	Total Surveys for Analysis
Newport	1,435	1,179	82%	43	1,136
UGC	840	823	98%	0	823
Total	2,275	2,002	88%	43	1,959

3.2 In-Depth Interviews

IEc conducted in-depth interviews with two NYSERDA program staff members and five training contractors (three UGC staff members and two Newport staff members). The training contractors interviewed included the primary contact at each Newport and UGC, and the instructors who taught the highest number of courses for each company during the study period. For Newport, the primary contact was also an instructor; thus four of the five contractors interviewed were training instructors.

IEc developed formal interview guides for these interviews, included as Appendix D. The guides varied between groups of interviewees but focused on the same topics: training objectives, training implementation, and preliminary results. The questions on training objectives and implementation were generally not specific to any of the evaluation questions; rather, they were intended to gather background information on the trainings themselves. The training implementation questions for the contractors asked whether training is an effective way to increase code compliance, to answer evaluation question 4 (see Table 1-1). The questions on preliminary results included questions about the results of the survey, specifically about participation by various audience groups, trainee knowledge (evaluation question 2) and trainee plans to apply training (evaluation question 3). All interviews were conducted over the phone and lasted approximately 45 minutes on average. All interviewees were provided the opportunity to review interview questions in advance of the interview. IEc conducted a qualitative analysis of the interview responses, rather than a formal coding analysis, due to the small number of interviews.

4 References

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