Codes Market Progress Evaluation Report #2

Market Progress Evaluation Report

PREPARED BY

Quantec

REPORT #E08-184
APRIL 11, 2008

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EFFICIENCY
ALLIANCE

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Final Report

NEEA Codes and Standards Support Project: MPER # 2

Prepared for:
Northwest Energy Efficiency Alliance

April 11, 2008

Raising the bar in analytics™

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Executive Summary

Since 1997, the Northwest Energy Efficiency Alliance (NEEA) has supported energy code activities in the Northwest states through the Codes and Standards Support Project, principally by funding staff positions or organizations responsible for code adoption and education. This second Market Progress Evaluation Report (MPER #2) documents the progress made toward key objectives of NEEA's Codes and Standard Support Project from 2005 to 2007. This MPER also reviews the project's challenges and provides recommendations for future project implementation.

Project Progress to Key Objectives

#1 Encourage the adoption of uniform and easily interpreted energy codes in the Northwest. NEEA met nearly all targeted key code change objectives over the last three years. Idaho adopted the 2006 IECC (with amendments), and Montana expects to adopt the 2006 IECC in summer 2008. Washington and Oregon both adopted codes required U-0.35 residential windows along with other provisions. Codes contractors continue to work within the legislative process to achieve clarity in code language, so codes can be interpreted easily.

#2 Develop an energy "reach" code for the region that can serve as a guideline for regional and state code adoptions for the next five to seven years. The NEEA contractor, along with the Northwest Best Technical Advisory Group, developed a "reach" code that established code adoption goals 15% more stringent, on average, than existing codes while remaining politically and technically practical and cost-effective. NEEA successfully developed the reach codes called *Northwest Best*, available to any jurisdiction developing code language.

#3 Increase compliance with energy codes where compliance is below 85%, and maintain it at current levels where it is at or above 85%; compliance rates will be measured by periodic regional new construction baseline surveys. Quantec conducted a code compliance analysis, reviewing a prior NEEA-funded residential study and, using the study's data, generating compliance distributions by state, housing type, and component. Using compliance rates within 10% of code, the analysis shows that average overall compliance rates range from 78% to 91% across three states and two housing types.

#4 Increase the stringency of Northwest and national energy codes with a target of a 15% overall increase in efficiency by 2010. A key finding from interviews with NEEA energy code contractors, state and local energy codes officials, and other energy codes market actors is that nearly all stated a 15% increase in energy efficiency is possible in the next code cycle (2010 to 2012, depending on the state). Oregon, in July 2008, adopted a residential code that is 15% more stringent than its predecessor.

#5 Successfully adopt cost-effective, performance-based code change proposals. About 75% of codes contractors and over 50% of stakeholders interviewed supported testing-based performance requirements in the energy code. Proponents and opponents stated testing-based performance requirements need an infrastructure, appropriate funding, and independent third-

party implementers who can support a performance testing infrastructure. It appears performance-based code change proposals can be successful as long as funding and infrastructure are well defined.

Conclusions and Recommendations

Conclusion 1 - Progress to Goals: The Codes and Standards Project has been largely successful in accomplishing its key objectives and progressing towards its goals.

> ***Recommendation 1:*** NEEA should continue to pursue the current set of Codes and Standards Project activities, such as encouraging the adoption of uniform and easily interpreted energy codes in the Northwest, and continuing to increase code stringency with successive code cycles. NEEA staff also should continue codes-related advocacy efforts at state, regional, and national levels.

Conclusion 2 – Logic Model: Unlike other NEEA-funded initiatives, this project does not have a logic model or documentation describing the relationship among staff, contractors, stakeholders and market actors with regard to expected short and long-term outcomes.

> ***Recommendation 2:*** NEEA should create a logic model around which they can plan project implementation efforts.

Conclusion 3 – Code Compliance: Although the region has reached an 85% level of compliance overall, there is room for improvement.

> ***Recommendation 3:*** NEEA should continue to provide outreach to designers and builders, as well as to codes contractors. NEEA should continue to support multi-dimensional education and training that provides classroom and field training, and a tiered approach with introductory and specialized sessions tailored to varying levels of code complexity across states and within jurisdictions. NEEA should also conduct additional field studies to confirm state/housing type/building components identified with low compliance, and focus training efforts to raise compliance in these areas.

Conclusion 4 – Performance Based Testing: The majority of codes contractors and stakeholders interviewed supported testing-based performance requirements in the energy code.

> ***Recommendation 4:*** NEEA should retain its key objective of adopting cost-effective, performance-based code change proposals and pursuing commissioning and performance-based testing.

Conclusion 5 – NEEA's Influence on Code Adoption: Based on responses from NEEA staff and contractors, state agencies, and other market actors with and without NEEA funding, Quantec could find no reason to change the attribution levels (which ranged from 40% in Montana to 70% in Idaho) offered by Summit Blue in their 2006 study.

> ***Recommendation 5:*** NEEA should continue to use the attribution levels suggested by Summit Blue.

1. Introduction

Codes and Standards Support Project Overview

Since 1997, the Northwest Energy Efficiency Alliance (NEEA) has supported energy code activities in the Northwest states, principally by funding staff positions or organizations responsible for code adoption and education. NEEA has also established contracts with eight energy code development and enforcement organizations, including three different entities in Washington State, two each in Idaho and Montana, and the Oregon Office of Energy. The overarching goals of NEEA's work are: (1) encourage the adoption of more stringent residential and nonresidential energy codes; and (2) provide the necessary implementation support infrastructure, including technical support and training/education, for those in the inspection/enforcement and design/construction community. NEEA's focus on energy code adoption has broadened from support of state efforts to fostering successful proposals that update national model energy codes, and developing of a "reach" code (15% more stringent than existing codes) that works as a guideline for Northwest regional and national energy codes.

More stringent energy codes lock into place improvements in energy-efficiency technologies and building techniques and practices. Additionally, more stringent codes and code support activities also set the stage for the introduction and acceptance of higher efficiency buildings and equipment. For example, utility and other voluntary energy-efficiency programs often introduce technologies that are more efficient and practices. After this introduction into the marketplace, these technologies and practices are more easily codified or standardized.

In this project's theory, energy codes produce a shift in the average efficiency of the market by disallowing efficiency less than that mandated by the code. This influences market actors most affected by first costs and likely to be least efficient in the "normal" market. This can produce significant savings even when code minimums are set at average market efficiency. Energy codes provide two important benefits:

- Energy codes eliminate the possibility of backsliding to less efficient practices.
- They provide a minimum efficiency standard as the basis for future code upgrades.

Energy codes continue to evolve and will continue to be an important part of the energy equation in the Northwest. This evolution creates opportunities for strategic intervention that can increase stringency as well as compliance.[1] In 1998, NEEA developed a long-term strategy to guide its actions in addressing code intervention opportunities.[2] The resulting NEEA Energy Codes and Standards Support Project is not a program per se, but rather is composed of activities designed to influence the energy efficiency of new buildings and new equipment, thus transforming the market.

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[1] NEEA Energy Code Support Project Description, June 2005.

[2] Heschong Mahone Group. A Long-Term Strategy for Energy Code Support in the Northwest, report #98-009, April 1998. The full report is on the NEEA website < http://www.nwalliance.org/>.

Documents providing useful and descriptive background on the Code Support Project include the 1998 Long Term Strategy, the 2004 report prepared by Optimal Energy,[3] along with NEEA's 2005 project description. The 2004 report provides limited organizational charts by state that depict the roles of various entities involved with energy codes. NEEA has not developed a logic model for this Project. There is no visual representation of a conceptual or theoretical framework depicting the complex relationships within and between the entities and players involved in energy code adoption, enforcement, and compliance activities. A logic model and framework identifying the players and relationships could assist with quantifying energy savings attributable to Project activities.

Energy Code Support Project Funding

NEEA's goals for the 2006–2008 period focused on increasing stringency and raising compliance with both residential and non-residential codes. During this period, NEEA continued to provide code support, encourage adoption of more uniform and easily interpreted codes in the Northwest, and explore a "reach" code in the region. NEEA groups its funding into four categories:

1. **Adoption**, including the creation of new code proposals at the state level and support of the political process through which code adoption occurs.

2. **Implementation and Compliance**, including a broad range of education and training efforts (e.g., classroom training for building officials, architects, and builders; design assistance for architects; and developing training manuals and reference materials) and infrastructure activities (e.g., maintaining staff at the state agencies responsible for the day-to-day work of supporting the energy code).

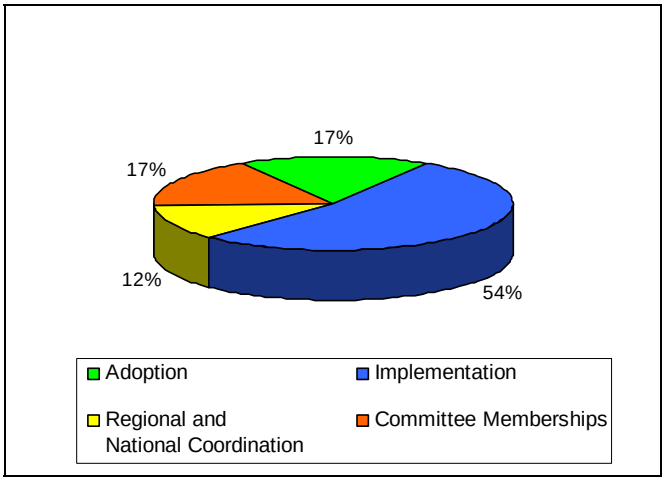
3. **Regional and National Efforts**, including activities of value to all states, that may lead to more uniform energy codes. To date, much of the current national effort aims to revise the International Energy Conservation Code (IECC) and International Residential Code (IRC) to make these more compatible with the Oregon and Washington state codes.

4. **Committee Memberships**, including participation in several national committees of such organizations such as the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), the National Fire Protection Association (NFPA), and the National Fenestration Rating Council (NFRC).

Figure 1 illustrates how NEEA expended funds in 2006. NEEA allocated about half the funding (54%) to implementation and compliance activities, 17% to adoption-related activities, 17% to staffing committee memberships, and 12% to support regional and national energy codes efforts.

[3] Optimal Energy, Inc. Documentation of the Northwest Energy Efficiency Alliance Efforts to Support Energy Codes and Participate in the Federal Standards Setting Process. April 2004. The full report is on the NEEA website < http://www.nwalliance.org/>.

Figure 1. NEEA Funding for Energy Codes and Standards—2006



Source: Data provided by NEEA, December 2007.

Long-Term Goals and Key Objectives

Since MPER #1, completed in July 2005, the NEEA Codes and Standards Support Project has continued to provide valuable funding for staff who provide an infrastructure of code support activities. As NEEA notes, *code improvements only occur as the result of direct, sustained action by efficiency advocates and even then only when there is a favorable conjunction of an economically viable technical advance and a political opportunity.*[4] Long-Term Goals of the Codes and Standards Support Project include:

- ***Ensure codes continue to increase in stringency and to incorporate all cost-effective measures.***
- ***Raise compliance rates for both residential and non-residential codes.***
- ***Build and maintain support for energy codes***

Key Codes and Standards Support Project objectives defined by NEEA:

- ***Encourage the adoption of uniform and easily interpreted energy codes in the Northwest.***
- ***Develop an energy "reach" code for the region that can serve as a guideline for regional and state code adoptions for the next five to seven years.***
- ***Increase compliance with energy codes where compliance is below 85%, and maintain it at current levels where it is at or above 85%; compliance rates will be measured by periodic regional new construction baseline surveys.***

[4] Source: NEEA Energy Code Support Project Description, June 2005.

- ***Increase the stringency of Northwest and national energy codes with a target of a 15% overall increase in efficiency by 2010.***

- ***Successfully adopt cost-effective, performance-based code change proposals.***

Energy Codes Activities and Trainings Summary

Code contractors provide a variety of valuable services in support of each state's current and future energy codes. General code support activities include:

- Telephone support and technical assistance for code-related issues
- Help with completion of code and tax forms
- Placement of informational brochures in public areas
- Informational packet mailings; and outreach to regional contractors.
- On-site inspections in an effort to gauge compliance.

In addition, NEEA code contractors coordinate training sessions offered throughout the year cover a variety of energy-related topics, depending on the code cycle. These sessions are capable of reaching diverse audiences. In 2006, architects, building owners, engineers, building contractors, inspectors, plans examiners, and specialty contractors attended training sessions. In 2006, for example, Montana trained 296 people in six classes, on-site builder training, and in-office visits. Washington was the only state to offer code change-related training in 2007 because of the code cycle timing. Chapter 9 of this report assesses the Webinar training sessions conducted for 191 participants.

MPER #1 Conclusions and Recommendations

MPER #1 reported that, overall, NEEA's Codes and Standards activities are serving a valuable purpose and in, many cases, targeted services would not receive sufficient funding without NEEA. Specifically, NEEA provided effective education, technical, and code adoption support. Satisfaction with training was good in all states, including staff knowledge, format effectiveness, and usefulness of handouts.

Based on collected data and subsequent analysis, Quantec made four primary recommendations in MPER #1, as follows. NEEA follow-up to recommendations, as found in data collected through this analysis, is also listed below, in italics.

#1 The Codes and Support Program should develop a contract-tracking database. *Some NEEA contractors retain a database listing participants by program.*

#2 The program should specifically address training for builders and sub-contractors and explore means to improve awareness and knowledge for these market actors. *Training continues to improve awareness in the building community.*

#3 Further, Quantec recommended NEEA continue to support a multi-dimensional training format that provides classroom and onsite, in-the-field training, and a more tiered approach, with some sessions framed as introductory and some as more specialized and technical in nature,

tailored to address varying levels of code complexity. *Conducted to some extent; this remains a recommendation.*

#4 Finally, Quantec recommended that NEEA work to improve the navigability and content of code-related websites for each state. *Some work completed in this area.*

2. Evaluation Methodology

Evaluation Summary

In early 2004, NEEA documented its efforts to support energy codes and to participate in the federal standards setting process from the time it began offering code support in 1997 through 2003.[5] That report summarized NEEA's role within state, regional, and federal level energy code support activities. It also provided a regional history of energy code support and provided useful charts, by state, showing the relationships between various entities in their roles providing energy code support for their state. The Optimal Energy report also provided background useful to understand the basics about regional energy codes adoption processes.

In 2004, NEEA engaged Quantec and its subcontractor, Optimal Energy, to evaluate NEEA's efforts to support energy codes and its participation in the federal energy standards process. In July 2005, Quantec completed the Evaluation of Energy Code Activities (MPER #1).[6] The majority of research conducted for that report occurred in the fall of 2004. For the 2006–2007 period, NEEA contracted with Quantec to conduct the following major activities:

- Project Update
- Assessment of Project Goals and Objectives
- Web Site Assessment
- Training/Technical Support Surveys
- Target Audience Surveys
- Code Compliance Analysis

During the 2006–2007 period, Quantec delivered three interim memos to NEEA that focused on the activities listed above. These included a memo dated September 27, 2006, titled *Results of Interviews with Energy Code Implementers*, and a memo dated May 15, 2007, titled *Energy Codes Support Services Evaluation-Target Audience Survey*. Quantec delivered the *Code Compliance Analysis Results* memo October 18, 2007.

MPER #2 Data Collection Activities

The evaluation of NEEA's Energy Code Support Project for the final MPER examining the 2006–2007 program activities included the following key evaluation objectives:

- Document recent code changes in each state. This entailed re-interviewing NEEA staff and energy code contractors for project updates.

[5] Optimal Energy, Inc., Documentation of the Northwest Energy Efficiency NEEA Efforts to Support Energy Codes and Participate in the Federal Standards Setting Process, April 2004

[6] Quantec, LLC. Evaluation of Energy Code Activities, July 2005.

- Assess Project Goals and Objectives through asking questions in the energy code contractor and stakeholder interviews about energy code stringency, compliance, enforcement, performance based codes, and national level activities.

- Assess perception of NEEA/other actors' influence on bringing about code changes. Questions were included in the energy code contractor and stakeholder interviews to gauge the level of influence NEEA funding had on adoption of energy code changes.

- Determine the status of *Northwest Best*. Questions about *Northwest Best* were included in code contractor and stakeholder interviews.

- Evaluate Washington's training activities. The timing of code changes in Washington meant training activities occurred in 2007, in time to survey participants of the Webinar training.

- Code Compliance Review and Analysis included review of the residential construction baseline analysis conducted by RLW Analytics.

Table 1 summarizes the evaluation survey activities, followed by a discussion of the role each activity played in this evaluation. We designed the survey sample of codes contractors and stakeholders to include representation from each state. In addition to identifying respondents by state, we identified respondents as those with and without financial assistance from NEEA. Our intent was to include a broad perspective on energy code activities, including those who may be opponents of stringent energy codes.

In addition to assessing the Projects goals and objectives, we also designed interviews to explore the perception of activities at the national level and perceptions about *Northwest Best*. To that end, some respondents answered questions from more than one survey instrument. We completed 38 interviews with 31 people.

Table 1. Summary of Data Collection Activities

Data Collection Activity	Sample Pool	Completed Interviews	Method of Collection	Sample Source
Interview NEEA staff, code contractors	15	11	In person and phone	Census of NEEA energy code contractors and staff involved with codes support
Interview energy code market actors and stakeholders	49	20	Phone	Seed list from NEEA and MPER #1 recommendations; additional sample referred by respondents
Interview Washington's Webinar training attendees	191	65	Phone	Census of Webinar participants who registered
Target Audience Surveys	7438	526	Phone	NEEA and InfoUSA lists of building professionals

3. Energy Code Change Update

Status of Energy Codes in the Four Northwest States

Each Northwest state has a different energy code, and each state conducts its own energy code adoption and support activities. Adoption of energy codes is the province of state or local entities. Oregon and Washington have state-promulgated codes; Idaho has adopted and Montana will soon adopt the 2006 IECC. Idaho adopts all codes locally (city and county) and therefore has a minimal state infrastructure relative to the other states. Enforcement of energy codes is the responsibility of local building jurisdictions, whose officials must review plans, then inspect buildings to ensure compliance.[7] Table 2 shows the party responsible for adopting codes in each state and organizations that provide various supporting activities. Appendix J provides additional information about the energy code process and code status by state.

Table 2. State Code Summary

State	Adopting Agency	Support Organization(s)
Oregon	Oregon Building Codes Division	Oregon Department of Energy
Washington	Washington State Building Code Council	WSU Energy Program; NW Energy Efficiency Council
Idaho	Local jurisdictions	Idaho Division of Building Safety; Association of Idaho Cities
Montana	Montana Department of Labor and Industry	Montana Department of Environmental Quality

Source: NEEA Energy Code Support Project Description, June 2005

Code improvements have occurred with the continued participation and involvement of the energy codes contractors in the code adoption process. This is possible with NEEA's financial support, ensuring technical and economic analyses supporting code changes are available when political opportunities arise. Since MPER #1 (July 2005), Idaho and Washington have adopted energy code changes. Oregon and Montana will adopt energy code changes in 2008. Major changes in codes by state include:

- ***Idaho***: In March 2004, with passage of House Bill 756, Idaho progressively updated energy codes to meet the 2003 IECC.[8] The most recent change in Idaho upgraded the 2003 IECC to the 2006 IECC. Idaho expects 10%–15% reductions in energy use for residential new construction, and 5% reductions in non-residential new construction. In the residential sector, the code increased R-values in floor insulation over crawlspaces and in unvented crawlspace walls, window U-factors changed from .37 to .35 with

[7] An exception to this is in certain rural areas of Montana where builders are allowed to self-certify compliance with the energy code. Source: NEEA Energy Code Support Project Description, June 2005.

[8] Although the IECC is the prevailing code in Idaho, the following codes are also referenced: the IRC, which may be used as an alternate path for residential applications; ASHRAE 90.1 - 2001 with Addendum G, which may be used as an alternate commercial path; and the International Mechanical Code and International Fuel Gas Code, which both have some relevance to energy.

unlimited glazing, and the code made trade-off changes with 2x4 walls. In the nonresidential sector, changes included requiring heat recovery for exhaust systems over 5000 cfm, SHGC reduction to 0.4 for factory assembled glazing, and a glazing U-factor of 0.35. There were also changes in economizers and reductions in lighting power densities.

The National Association of Homebuilders fully supports the 2006 residential energy code. The residential sector allows unlimited glass when efficient windows are used. The 2006 IECC also increases commercial building lighting efficiency, heat recovery, and equipment standards.

- ***Montana***: In September 2004, Montana adopted the 2003 IECC with Montana Amendments, effective December 2004, making it Montana's first statewide energy code for all building types. The Montana Department of Labor and Industry expects to adopt the 2006 IECC in March or April 2008. The major changes from the 2003 to the 2006 IECC include reduction from three chapters to one (200 pages to 50).
- ***Oregon***: Oregon updated both the residential and nonresidential energy codes in 2003. In February 2006, Governor Kulongoski issued an *Action Plan for Energy* calling for an effective program to achieve energy independence. This kind of support from the Governor's office helped advance Oregon energy codes. Oregon has two separate building codes: Oregon Structural Specialty Code (OSSC) and Oregon One and Two-Family Dwelling Code. Oregon adopts and amends the parent document to each of these codes. Energy conservation requirements are contained in Chapter 13 of the Oregon Structural Specialty Code and Appendix E of the Oregon One and Two-Family Dwelling Code. Oregon updated the OCCS text, effective April 1, 2007, based on the IBC. Oregon adopts energy codes along with all other codes. Oregon approved a new Residential Code in January 2008, effective April 1, 2008. The new Code is 15 percent more efficient than the prior code, maintains clear prescriptive standards, and allows builders some flexibility. Several building envelope requirements are upgraded and four new required category measures are added to the prescriptive standards. Additionally, builders must choose one of nine energy efficiency options.
- ***Washington***: In November 2004, the Washington State Building Code Council adopted a number of changes to the Washington State Energy Code effective July 2005. Washington most recently adopted the 2006 Washington State Energy Code, effective July 2007. With the 2006 WSEC, Washington expects reductions in energy use for residential new construction by more than 7%. Significant changes in the residential sector include, among others: improvement in the building envelope, the UA trade-off method improved the target wall U-factors, increased R-value in single-rafter vaults, and a requirement for high-efficiency lighting outdoors. In the commercial sector, significant changes included reductions in lighting power densities by more than 40% in manufacturing, and, in several other large non-residential spaces, the code added requirements for controls for specific mechanical systems. The code made significant modifications to the commissioning section to improve enforceability. Minimum building envelope requirements for semi-heated spaces are more stringent.

4. NEEA's Influence on Energy Code Development and Adoption

In a prior NEEA study[9] contractors assessed energy savings related to codes and standards efforts and attributed savings to the NEEA Codes and Standards Project. Summit Blue developed a range of attribution percentages for each state and recommended a value for calculating net savings. The recommended value was applied to regional gross energy savings numbers (by state) to develop estimates of non-residential savings attributable to NEEA efforts through 2005. Table 3 presents the study's range of savings and recommended attribution levels by state.

Table 3. Attribution of Savings to Alliance Efforts by State

	Low-End	Recommended	High-End
Idaho	50%	70%	90%
Montana	20%	40%	60%
Oregon	60%	75%	90%
Washington	30%	40%	50%

Source: *Review of Energy Savings Related to Codes and Standards Efforts.* Page 2. Table ES1.

Quantec's interviews with energy codes contractors, local and state codes officials, and other market actors regarding organizations or entities influencing energy code adoption and influential persons or entities specializing in major building components were unprompted open-ended questions, asked without providing answer option categories. For each response, we counted each mention of an entity influential in the codes process. We coded each mention as one "comment" and is listed in the tables below under the "Number of comments" column.

For each state, Quantec found no evidence to dispute the Summit Blue estimates of savings attributable to NEEA's efforts. We arrive at this conclusion for two reasons. First, we derived simple estimates of NEEA's influence by counting the number of times various entities are mentioned in response to open ended questions regarding organizations that influenced code adoption in each state. These questions asked respondents to name influential actors. The percentages of comments referring to entities directly and indirectly funded by NEEA are similar to the attribution levels recommended by Summit Blue, and support the Summit Blue estimates. Second, organizations perceived to be opposed to the adoption of more stringent energy codes consistently cited NEEA or NEEA-funded entities when asked to name organizations that influenced the code adoption process in each state. These responses are included in the counts of the number of comments in the four tables above. Responses to the open-ended questions included references specifically to NEEA most often. For these reasons, Quantec concludes that it is reasonable for NEEA to continue to use attribution levels recommended by Summit Blue.

The next four tables summarize the responses into comments about entities (1) directly funded by NEEA, (2) indirectly funded via funding staff to participate in committees such as ASHRAE and IECC, and (3) no funding from NEEA. Appendix B lists the entities named by the codes

[9] Summit Blue, *Review of Energy Savings Related to Codes and Standards Efforts*, April, 2006.

officials and market actors and funding status from NEEA. Appendix K provides a detailed discussion of the methodology Quantec used to assess NEEA's influence on state energy codes.

Table 4. Idaho Summary of Entities Influential in the Codes Process

Idaho **Summary of Comments about** Entities Engaged in Adopting and Enforcing More Stringent Energy Codes			
	Entity	Number of comments	Percent of comments
Direct funding from NEEA	NEEA, Association of Idaho Cities	22	46%
Indirect funding via committee participation	International Code Conference/ICC chapters	6	13%
No funding	Other entities	20	42%
		48	

Table 5. Montana Summary of Entities Influential in the Codes Process

Montana **Summary of Comments about** Entities Engaged in Adopting and Enforcing More Stringent Energy Codes			
	Entity	Number of comments	Percent of comments
Direct funding from NEEA	NEEA, MT DEQ	3	43%
No funding	Other entities	4	57%
	Total	7	

Table 6. Oregon Summary of Entities Influential in the Codes Process

Oregon **Summary of Comments about** Entities Engaged in Adopting and Enforcing More Stringent Energy Codes			
	Entity	Number of comments	Percent of comments
Direct funding from NEEA	NEEA, ODOE	13	59%
Indirect funding via committee participation	ASHRAE	2	9%
No funding	Other entities	7	32%
	Total	22	

Table 7.Washington Summary of Entities Influential in the Codes Process

Washington **Summary of Comments about** Entities Engaged in Adopting and Enforcing More Stringent Energy Codes			
	Entity	Number of comments	Percent of comments
Direct funding from NEEA	NEEA, NWECG	5	19%
Indirect funding via committee participation	ASHRAE	5	19%
No funding	Other entities	16	62%
	Total	26	

5. NEEA Staff and Codes Contractor Interviews

NEEA Codes Contractor Interview Objectives

Quantec conducted interviews with NEEA staff and NEEA-funded energy codes contractors to document code-related activities, and assess perceptions regarding energy code stringency, compliance, and enforcement. We also documented perceptions about the Northwest Energy Codes Group (NWECG) at the national level and perceptions about *Northwest Best*.

Quantec interviewed two NEEA staff and nine NEEA-funded energy codes contractors, including three contractors from Idaho and two from Washington, Oregon, and Montana. MPER #1 interviews provided the interview seed list, subsequently reviewed by NEEA. After review, NEEA provided additional subject suggestions. Quantec conducted the telephone interviews in November 2007. Table 8 offers the sample disposition. Responses to questions about *Northwest Best* are included in Chapter 7.

Table 8. NEEA Codes Contractor Sample Disposition

Survey Group	Sample Pool	Number Contacted	Target	Completed Surveys
NEEA Code Contractors	13	13	8 (2 from each state)	9 total 2 each from Washington, Oregon, Montana; 3 from Idaho
NEEA Staff	2	2	2	2

Key Findings from NEEA Energy Codes Contractors Interviews

Finding 1: Potential exists to increase code stringency in both the residential and non-residential sectors.

While each state uses a different cycle to adopt energy codes, codes contractors think that by the next code cycle (2010 or 2012), it is realistic and possible to achieve 10%–30% improvement over the existing code.. Contractors stated a 15%–30% increase in stringency (i.e., improvement in energy efficiency) is not a technical issue in that buildings will still look the same and have the same components (Table 9). However, after that, respondents stated the next 30% increase in efficiency would require additional changes to processes and building technique. In the residential sector, for example, controlling infiltration will depend not just on measures but also on building techniques (e.g., modular wall systems with air sealing). Respondents stated energy codes would need to include testing-based performance requirements to increase stringency; visual inspections alone cannot test compliance with, for example, correct installation and operation of infiltration measures and controls. To reduce consumption by 50%–60%, all the end uses will need to be included (i.e., water heating, HVAC, lighting, and plug loads). Through this project, NEEA-funded contractors have been intimately involved in identifying areas in the code with potential for energy savings and influential in moving codes forward. With the current

national and international focus on global warming, momentum could carry codes and the building industry more swiftly toward the net zero goal of the 2030 Challenge.[10]

Table 9. Energy Code Stringency Increase Possible by 2015

Increase in stringency	Residential (n=7)	Non-Residential (n=7)
10% stringency increase by 2010	1	
15%-20% stringency increase by 2010	2	1
30% stringency increase by 2010	2	6
30% stringency increase by 2012	1	1
15% stringency increase by 2015	1	
30% stringency increase by 2015	2	1
50% stringency increase by 2015		3

Question: How much more stringent would you like the residential and non-residential energy code to be by 2010? By 2015? Respondents could provide different answers for 2010 and 2015. Two respondents did not offer specific estimates for increases in energy code stringency.

Finding 2: Opportunity for additional energy savings through codes exists in specific measures, compliance path options, and systemic changes.

Contractors stated code adoption activities should focus next on specific measures, including shell improvements, lighting, glazing, and HVAC, as shown in Table 10. Compliance path options, such as third-party performance testing and integrated design techniques, hold promise. Systemic changes to code compliance and enforcement, such as increasing the number of available code inspectors so that inspectors can spend more time on energy measures, changing inspection procedures also present opportunities for added energy savings. Respondents also suggested focusing on quality construction, that is, ensuring builders correctly install measures, e.g., insulation, air sealing, and advanced framing techniques.

Table 10. Areas Ready for Energy Code Changes

Theme (n=9)	Count
Specific measures including shell requirements, glazing, lighting, furnaces, ducts	18
Compliance path options, performance based codes, commissioning	4
Education, training, support, integrated design	3
Need code technicians, changes in inspection procedures, focus on correct measure installation (referred to by contractors as quality construction)	2
Pull from national level	1
Total comments	29

Question: What areas of the energy code are most ready (in terms of awareness and general knowledge) for improvement in the near future? (Where would you focus next on code adoption activities?)

[10] Architecture 2030 issued *The 2030 Challenge* asking the global architecture and building community to adopt targets to reduce *global* greenhouse gas (GHG) emissions in order to avoid catastrophic climate change. <http://www.architecture2030.org/2030_challenge/index.html>

Finding 3: Energy code compliance is low in several areas.

Contractors pointed to several areas with low energy code compliance, including lighting and controls in all four states. Other areas included HVAC, ducts, and air sealing. All respondents stated energy codes are not uniformly enforced. Lack of resources, including staffing and field time, is the primary reason. Respondents stated code officials do not give energy codes the same priority as health, life, and safety codes.

At various points in the interview, the NEEA contractors discussed the need for third-party independent energy code inspectors. They most often referenced the third-party Special Plans Examiner and Inspector of the 1990s NW Utility Code Group, stating this model could work in the current market. Respondents stated utilities could provide various types of financial support for training or support to offset the cost of a third party Special Plans Examiner and Inspector.

Finding 4: Nearly all contractors support testing-based performance codes.

About 75% of codes contractors supported testing-based performance requirements as a means to address poor installation quality and code compliance, noted above. Current infrastructure and processes for NW ENERGY STAR® Homes certification provide a model. (Table 11)

Table 11. Preference for Including Testing-Based Requirements in the Code

Preference (n=8)	Count
Yes, possibly	4
Yes, definitely	1
Yes, but lacking necessary infrastructure	1
No, it is not reasonable	2
Total	8

Question: The energy code currently does not measure whether the equipment or materials used in construction perform the way they are supposed to. Do you think it is reasonable to put testing-based requirements in the energy code?

Finding 5: NEEA's Project influenced energy code adoption.

In open-ended questions, Quantec asked the NEEA codes contractors to name factors influential in the evolution of energy codes. Seven of nine respondents discussed changes in energy codes brought about by legislative action and proactive leadership. Another three commented that NEEA's funding allowed staffing of various code related committees where participation could make a difference and push code adoption. Influential organizations named included, for example, the NWECG, the Association of Washington Cities, ODOE and NEEA. In addition, contractors noted the influence of the high cost of energy and the national push for greener buildings, sustainability, and the focus on climate change will make it easier to increase energy efficiency and adopt more stringent energy codes in the future.

6. State and Local Energy Codes Officials Interviews

Codes Officials Interview Objectives

Previous evaluation efforts of NEEA's energy codes and standards support services have included interviews with some of the key actors working with energy code adoption. Most often, the respondents were involved in one of the codes advocacy efforts supported by NEEA or had some other ties to NEEA. In this series of interviews, we wanted to broaden the pool to include people who did not have ties to NEEA and/or were not particularly supportive of more stringent energy codes. None of the people interviewed receive funding from NEEA nor have direct ties to NEEA.

Altogether, we interviewed 17 Northwest state and local energy codes professionals and market actors, including five from Idaho, and four from each of the other states: Washington, Oregon, and Montana. Table 12 shows the sample disposition.

Table 12. State and Local Energy Code Officials Sample Disposition

Survey Group	Sample Pool	Number Contacted	Target	Completed Surveys
Local and State Code Officials	13	13	8 (2 from each state)	9 total 2 each from Washington, Oregon, Montana; 3 from Idaho
Referrals from Officials interviewed	24	7	4 (1 from each state)	4 total 1 each from Washington, Oregon, Montana, Idaho
Referrals from NEEA energy code contractors	12	7	4 (1 from each state)	4 total 1 each from Washington, Oregon, Montana, Idaho

Below are key findings, followed by interview questions and discussions of results. Responses to questions about *Northwest Best* from these market actors are included in Chapter 7.

Key Findings from Codes Officials and Market Actor Interviews

Finding 1: Potential exists to improve the stringency of energy codes in both the residential and non-residential sectors.

An overwhelming majority (13 of 17) of local and state officials and stakeholders advocated for continuous improvement of the energy codes. Four respondents believed the energy codes were already stringent enough, and the focus should be on ensuring compliance and preserving energy efficiencies already gained. Respondents stated 10%–50% improvement by the next code cycle is possible. Table 13 shows perceived increase in stringency the respondents thought possible within the next code cycle.

Table 13. Energy Code Increase in Stringency Possible

Future Energy Code (n=10)	Count
10%-20% stringency increase by next code cycle	3
30% stringency increase by next code cycle	2
30% stringency increase by 2012	1
50% or more stringency increase by 2012	2
20% stringency increase by 2020	1
Meet/stay current with national/federal codes	4
IECC by 2009	3
Lighting will be addressed in residential & non-residential	2
Performance based codes/density based codes	2
Keep up with technology/technological developments	2
Get people to comply with existing code/Difficult to enforce current code	2
Net zero by 2030; support 2030 Challenge	1
Total comments	24

Question: What is your long-term vision of the energy code? How much more stringent do you think the residential and non-residential energy code should be or could be by 2010? By 2015? Multiple responses allowed.

Finding 2: Opportunity for additional energy savings through codes exists in specific measures, compliance path options, and systemic changes.

Table 14 shows respondents stated that changes could be made to the current code for specific measures, compliance path options, and systematic changes. Sixteen references to specific measures and systems ready for code changes included the building envelope and lighting systems (four comments each). Three wanted duct systems addressed in residential and non-residential energy codes. Others referenced advanced framing techniques, higher-efficiency mechanical systems, better residential windows, and plug load (one mention each).

Table 14. Areas Ready for Energy Code Changes

Theme (n=17)	Frequency
Specific measures	16
Compliance path options	7
Systematic changes	8
Total comments	31

Question: What areas of the energy code would you most like to see changed? (Where will you focus next on code adoption activities?) Multiple responses allowed

Finding 3: Energy code compliance is low in several areas.

Stakeholders pointed to several areas with low energy code compliance, including lighting and controls, air sealing, and HVAC. Several respondents noted there were no areas where compliance with code was low. Interviewers asked respondents for suggestions to improve compliance. Four themes emerged, including training, resources, performance-based testing, and

mandating adoption of a state energy code. As shown in Table 15, the majority of comments (15 of 23) centered on efforts focused on where the current code could improve compliance. These efforts include training, adoption of an energy code, and adding resources. The remaining comments (8 of 23) looked forward, suggesting new approaches to improving compliance, including, for example, performance-based testing, new technologies, and incentives.

Table 15. Methods to Improve Code Compliance

Method to improve code compliance (n=11)	Count
Training, education, and outreach efforts	9
Commissioning, performance-based testing, or HERS inspectors	6
Resources, funding, and staffing	3
Adopt most current code; plan review & certification; extend codes to rural areas	3
Incentives for energy efficiency upgrades; be responsive to technology	2
Total comments	23

Question: What do you think can be done to improve energy code compliance? Multiple responses allowed

Respondents were nearly equally split in their perceptions that codes are and are not uniformly enforced. In Idaho and Oregon, more people stated codes were not uniformly enforced. In Montana and Washington, more respondents stated codes were uniformly enforced.

Finding 4: More than half of NEEA's contractors support testing-based performance codes.

As Table 16 shows, over half of the stakeholders (9 of 17, 53%) supported the inclusion of testing-based or performance requirements and commissioning in energy codes. Six (35%) opposed performance-based codes, and two (12%) were undecided.

Table 16. Preference for Including Testing-Based Requirements in the Code

Testing-based requirements (n=17)	Count
Yes, support	9
No, oppose	6
Undecided	2
Total	17

Question: The energy code currently does not measure whether the equipment or materials used in construction perform the way they are supposed to. Do you think it is reasonable to put testing-based requirements in the energy code?

A third-party independent testing infrastructure and associated funding were the barriers most often named by both the proponents and opponents of performance-based testing. Again, some offered current infrastructure and processes for NW ENERGY STAR® Homes certification as a model. One opponent said performance-based testing should not be a blanket policy, but that testing is a tool used to examine issues that have surfaced. Only one respondent said Boise, ID, is working to adopt NW ENERGY STAR® Homes program standards with the performance-based testing. Six respondents stated performance-based testing is under consideration or discussion in

their state. Several noted that jurisdictions are using performance-based testing on a voluntary basis.

Finding 5: NEEA's Project influenced energy code adoption.

In open-ended questions, we asked the local codes officials and other stakeholders to name factors influential in the evolution of energy codes. Respondents crediting influence to advocates and to energy-efficiency programs mentioned DOE, BPA, NEEA, the Association of Idaho Cities, ASHRAE, the NW ENERGY STAR® Homes program, and Super Good Cents as well as utility programs and special interest groups in general. Other respondents gave credit to manufacturers of building materials and to technological advances. Respondents included the high cost of energy, the combined works of advocacy groups, utilities, legislative action, and public awareness stemming from the energy crisis are factors influencing the evolution of energy codes. The most effective strategies used to influence energy-code adoption activities include collaboration, outreach, and participation in industry groups, technical advisory groups, and grassroots campaigns. Simple diligence and reliance on accurate data supporting claims are also important strategies. Overall, responses from these market actors, with and without direct funding from NEEA, stated NEEA and their efforts were influential in the code adoption process. By state, responses support estimates put forward in a 2006 study by contractor Summit Blue. Chapter 4 and Appendix K provide additional detail.

7. Northwest Best

Northwest Best Interview Objectives

NEEA contracted with Ecotope to develop a model energy code, uniting the best current provisions from the existing energy codes of the four Northwest states and their local jurisdictions. This model code was named the *Best of the Region* and served as the baseline for a proposed "reach code," which Ecotope designed to be a 15% improvement over the *Best of the Region* base. Ecotope utilized the results of a non-residential code comparison they conducted for the Northwest Power & Conservation Council and NW ENERGY STAR® Homes work as the starting point in developing the regional base code. In addition, California's Title 24, the IECC, the Building America™ program, and the ASHRAE Advanced Building Guidelines served as a source for comparisons and sample code language.

The intention of interview questions surrounding *Northwest Best* was twofold: (1) establish familiarity with *Northwest Best*; and (2) learn more about the objectives, outcomes, and process of developing *Northwest Best*. To answer these questions, we divided respondents into two groups. The first group of respondents was asked about their overall familiarity with *Northwest Best* and their perceptions of the model code included state and local energy codes officials, NEEA staff and Energy Code contractors, and other stakeholders. The second group was involved in developing *Northwest Best* through participation in the *Northwest Best* Technical Working Group (TWG), and included representatives from the Northwest Power and Conservation Council, NEEA staff, and NEEA contractors. We asked this group more in-depth questions. Appendix E includes additional questions and discussion not presented in this chapter.

Key Findings about Northwest Best

Finding 1: *Northwest Best* provided a coherent road map to future efficiency improvements, improving the region's *Best* by 15%.

Those familiar with *Northwest Best* stated it was a good effort and a useful process that identified the strengths of each state code. Most respondents understood the intent was to provide information and examples for future energy code development and changes, and that it provided a laundry list of opportunities. Table 17 shows respondents' general comments.

All respondents with an awareness of *Northwest Best* had a shared understanding of *Northwest Best*'*s* two primary objectives and accomplishments. Respondents reported the TWG identified the *Best of the Region* in energy codes. The Project's goal was not to produce a regional code meant for adoption across all four states, but to develop code language that any federal, state, or local jurisdiction could use, with the knowledge that any single element was 15% better than the best the region had to offer. *Northwest Best* pushed the envelope in codes, forcing serious consideration of not only prescriptive code but also performance-based practices.

Table 17. General Opinion of *Northwest Best*

Perception (n=12)	Number of responses
Good effort and/or useful process	5
Stakeholders can get ideas from it	5
It is a roadmap to increase efficiency by 15%; provides laundry list of opportunities	3
Looking into using it	1
Don't think it will work	1
No economic analysis	1
Unsure of being used	1
Total Comments	17

Question Group 1: What is your general opinion about Northwest Best? Have you ever used Northwest Best? Group 2: What was the objective, or overall concept, behind developing Northwest Best? Multiple responses allowed

Finding 2: *Northwest Best* had application in state and regional code language, and sets a new benchmark. Those outside the immediate process have not used *Northwest Best.*

One member of the TWG stated the Power and Conservation Council used the *Best of the Region* to help formulate recommendations for the Fifth Power Plan Model Conservation Standards (MCS). Others stated they thought Washington, Oregon, and Idaho used *Northwest Best* to draft code change submittals. Four said they were thinking of using it or had passed it on to others, and one noted he used it when talking about above-code standards to jurisdictions. One stated he was looking into incorporating elements into their state's commercial code. Respondents who were not part of the TWG all said they were not currently using the *Northwest Best* reach codes.

Respondents also noted the industry is moving fast, and some codes may already supersede *Northwest Best*. Some respondents expect energy code stringency to be 15% above *Northwest Best* within two years and 30% above in five years. Another respondent noted that with Oregon's Governor pushing for better than current codes, the *Best of the Region* and *Northwest Best* may soon be dated. One respondent stated ASHRAE and IECC may make another round of improvements beyond *Northwest Best,* and states may model codes after ASHRAE 90.1-2001 levels and 2006 IECC. Others noted additional organizations and movements are underway to improve building energy efficiency, including ASHRAE *Advanced Energy Design Guides*, *The 2030 Challenge*, the US Green Building Council with LEED buildings, and New Building Institute's *Getting to Fifty*.

Since members of the TWG and others aware of *Northwest Best* are also active within organizations such as ASHRAE and IECC, it is likely *Northwest Best* has played a role in code development within these organizations, as well as the states as noted above. In short, *Northwest Best* sets a Northwest benchmark, can help to bring buildings into mainstream compliance, and can act as a stepping-stone to address carbon footprints and global warming.

8. National Activities

Northwest Energy Codes Group Interview Objectives

NEEA provides financial support for activities of the Northwest Energy Codes Group (NWECG), which is primarily comprised of NEEA code contractors from the eight organizations funded by NEEA. The NWECG created a regional strategy to influence energy code adoption. The NWECG develops and submits code change proposals to the IECC Committee. Two states, Idaho and Montana, adopted the 2006 IECC. Regardless of whether a state has adopted the IECC, the national model code is the reference whenever local code changes occur. As such, setting a high level of efficiency in the IECC is important as a benchmark. Two goals define NWECG's work: (1) to create an energy code format that states can easily adopt; and (2) to achieve high-quality minimum requirements.

Respondents included two NEEA staff, one person from the Northwest Power and Conservation Council, and four members of the NWECG, including one independent consultant, one local codes official, and two NEEA energy codes contractors. Appendix F includes questions and discussion.

Key Findings about National Level Activities

Finding 1: The NWECG has successfully influenced code change at the national level.

Table 18. NWECG Successes

Response (n=7)	NEEA Codes Contractors & Staff	Other Market Actors	Total
Submit commercial and/or residential code changes (28 last August)	3		3
NWECG gets invited to meetings of other regional and national stakeholder groups (to build alliances, share information, and assist other groups)	1	1	2
Submitted 9 amendments to 2005 IECC hearings	1		1
NWECG top 1 or 3 in authorship/proponents of energy code		1	1
Successful modification of IECC recessed-can light code in last session		1	1
Pressure on states to adopt unified set of model codes to keep state and national code closely aligned	1		1
NWECG filled void created when Natl Bldr Inst changed leadership	1		1
Provides help to other groups (writing code language)	1		1

Question: Can you give examples of specific areas where you think the NWECG has been successful or influential?

Finding 2: The NWECG has contributed to energy code adoption at the national level.

NEEA contractors contribute to code development at the national level as active members of other energy code committees, including, for example, ASHRAE, NFPA, NFRC, and IRC. Their work contributes to the overall increase in energy efficiency and stringency of these standards.

As invited participants to other energy codes stakeholder groups, the NWECG can build alliances, share information, and assist other groups. Respondents report coordinated efforts both push and pull the state and national codes, increasing compatibility between the national IECC codes and Oregon and Washington state codes. Idaho and Montana adopted the 2006 IECC. The Northwest benefits from NWECG involvement with national level activities. The NWECG can leverage NW energy efficiency interests through energy code adoption at the national level.

Finding 3: The NWECG can increase influence by reaching out, building relationships, and by staying involved at the national level.

Three respondents made suggestions to increase NWECG influence and success, shown in Table 19. Suggestions included working with "green" groups and working with those with other perspectives, who do not have "green" in their name. NWECG can increase influence and success by reaching out, building relationships, and recognition with IECC stakeholder groups, and by staying involved at the national level.

Table 19. Suggestions to Increase NWECG Influence

Response (n=3)	Count
More discussion with cohorts outside the region and peer groups	3
Get more involved with national groups	2
NWECG is working in the right direction	2
More discussion with "green" groups	1
Look at codes from other perspectives, i.e., groups without "green" or "energy" in the title	1
Deal less with those already committed	1
Get overall game plan and stick with it	1
Pick a couple of big things and work on them	1
Remain independent	1

Question: How do you think the NWECG can increase its influence and success?

9. Energy Codes Webinar Training Survey

Webinar Training Survey Objectives

In Washington, the Non-Residential Energy Code (NREC) changes were effective July 1, 2007. Washington, through the Northwest Energy Efficiency Council (NEEC) and NEEA funding, offered a free Webinar series to provide an overview of requirements of the new code changes. The Webinars included three, one-hour training modules, including Envelope (6/13/2007), Mechanical Systems (6/26/2007), and Lighting (2/28/2007). These training sessions were the first time Washington used an interactive Webinar format that allowed participants to ask questions of the presenter.

Quantec designed the survey sample to be a statistically significant representation of all Webinar participants. Surveys ascertained whether participants were satisfied with the Webinar format and how well it worked in each of the three training sessions. Quantec outsourced the survey administration to RDD, which conducted surveys in September and October 2007. Appendix G presents objectives, methodology, and all survey questions and responses.

Key Findings from Webinar Training Participant Surveys

Finding 1: Knowledge about energy codes increased after attending Webinar training.

The majority (90% of participants) stated their knowledge of the Washington energy code increased because of the training they attended. Only about 10% stated there was no change.

Table 20. Knowledge about Energy Codes Before and After Trainings

Pre-Training	Post-Training	Total	Percent
Not very knowledgeable	Significantly improved	1	2%
	Somewhat improved	2	3%
Somewhat knowledgeable	No change	3	5%
	Significantly improved	7	11%
	Somewhat improved	26	40%
Very knowledgeable	No change	4	6%
	Significantly improved	4	6%
	Somewhat improved	18	28%
Total		65	100%

Questions: How would you rate your knowledge of the Washington energy code before the training(s) that you attended? As a result of the training, how would you say your knowledge of the building energy code has changed?

Table 20 compares participant perceptions of their own level of knowledge before and after the Webinar training to measure the self-reported change in awareness among respondents. Approximately 50% of participants who indicated being somewhat knowledgeable of energy codes stated their knowledge somewhat improved or significantly improved from attending the training. Additionally, nearly 35% of those participants who indicated being very knowledgeable

of Washington energy codes indicated either their knowledge somewhat improved or significantly improved post-training.

Finding 2: Participants applied information gained during the Webinar training to professional practice.

Quantec asked participants if and how training participants had applied information in the four months that elapsed since the training. Table 21 reveals that nearly 90% of participants in each Webinar, in some capacity, applied information received in the training to their professional practices. The most common applications included plan review and code updates, which together comprised nearly 50% of responses for each Webinar. Those who did not apply the information said it was not applicable to their profession.

Table 21. Did the Respondent Apply Webinar Information in Professional Practices?

	Lighting (n=53)		Mechanical (n=53)		Envelope (n=52)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	47	89%	45	85%	49	92%
No	6	11%	8	15%	3	6%
Total	53	100%	53	100%	52	98%

Question: Did you apply any of the information that you received from [lighting/mechanical/envelope] training to your professional practices?

Finding 3: The majority were satisfied with the training and stated they prefer Webinar training to in-person training.

The majority, 95% of participants stated they were *satisfied* or *very satisfied* with the Webinar training overall. Less than 5% of participants in the mechanical and lighting trainings expressed indifference. It is important to note no participant provided a rating of 1 or 2, which would indicate overall dissatisfaction. As Table 22 shows, the majority of participants, 62%–68%, stated the Webinar format worked better than in-person training sessions, largely because it is more convenient and efficient.

Table 22. Preference for Webinar versus In-Person Training

	Lighting (n=53)		Mechanical (n=53)		Envelope (n=52)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
In-person is better	11	21%	13	25%	13	25%
Webinar is better	36	68%	33	62%	34	65%
Same	6	11%	7	13%	5	10%
Total	53	100%	53	100%	52	100%

Question: Overall, does the webinar format or does an in-person format work better for the training?

When asked whether they preferred to receive in-person or Webinar training in the future, the majority of participants, 64%–73% depending on the session, preferred Webinar training in the future. Approximately 28%–36% prefer in-person training, shown in Table 23. While the distribution of responses for the lighting and envelope trainings were most similar (both nearly

75% in favor of Webinar trainings over in-person), responses for the mechanical section indicated slightly more preference for in-person training (about 10% more than in other trainings).

Table 23. Future Preference for Webinar or In-Person Training

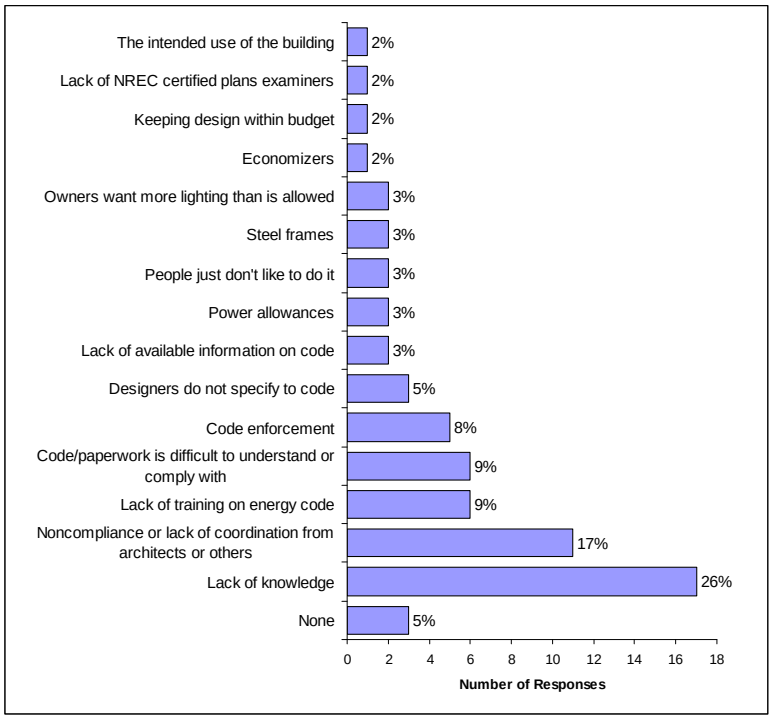
	Lighting (n=53)		Mechanical (n=53)		Envelope (n=52)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
In-Person	15	28%	19	36%	14	27%
Webinar	38	72%	34	64%	38	73%
Total	53	100%	53	100%	52	100%

Question: In the future, would you prefer to receive in-person training or webinar training?

Finding 4: The largest barrier to code compliance is lack of knowledge.

Quantec asked survey respondents if they perceived barriers to energy code compliance. Responses are summarized in Figure 2. The most significant obstacle to compliance with energy codes was a lack of knowledge or training on the energy code (combined 35%). The 26% who cited lack of knowledge referred to the lack of knowledge of code officials, industry professionals, homeowners, or lack of knowledge about energy code and code updates generally. Almost 20% of respondents indicated lack of knowledge and coordination between architects and others was one of the biggest obstacles to the energy codes.

Figure 2. Biggest Obstacles in Energy Code Compliance



Question: In your opinion, what is (are) the biggest obstacle(s) to compliance with the energy code?

10. Target Audience Surveys

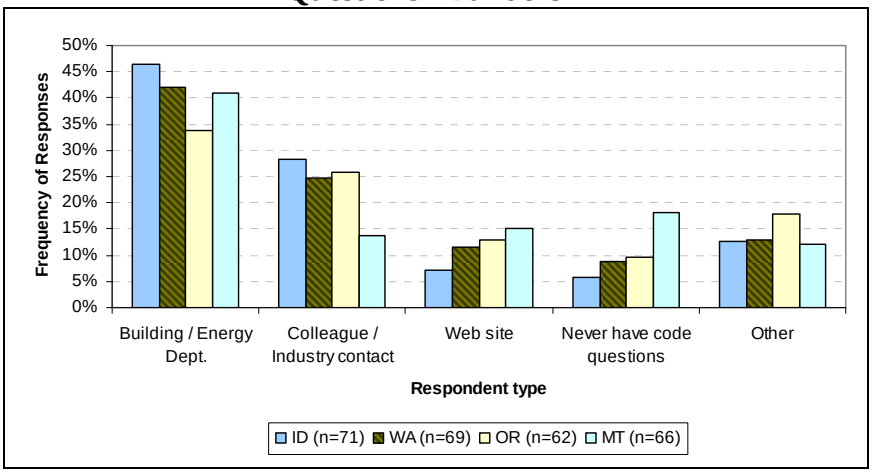
Target Audience Survey Objectives

Quantec conducted a survey geared specifically toward designers and builders to determine: (1) how effectively services are targeting this segment; and (2) which outreach methods are most likely to reach this group. This survey collected information about where Northwest building professionals turn when they need help with energy codes and to gauge their awareness levels of NEEA-sponsored code support activities. These activities include training, technical support, and Web sites. Quantec conducted the Target Audience Surveys in the first quarter 2007. A stand-alone memo discussing results was prepared for NEEA in May 2007. This chapter presents key findings from the results memo. Appendix H includes all survey questions and responses.

Key Findings from Target Audience Surveys

Finding 1: Builders turn most often to their building or energy department for energy code questions.

Figure 3. Resources Used to Answer Energy Code Questions - Builders



Question: Where do building professionals in the Northwest go when they have a question on the energy code?

One of the key questions addressed through this survey was: *"Where do building professionals in the Northwest go when they have a question on the energy code?"* In unprompted responses, builders most commonly stated they turned to their building/energy department,[11] followed by speaking with colleagues. Figure 3 presents responses by builders in each state.[12] These trends

[11] Category included: inspectors; city; state; building department; county; local authority; state/federal authority; utility/energy organization.

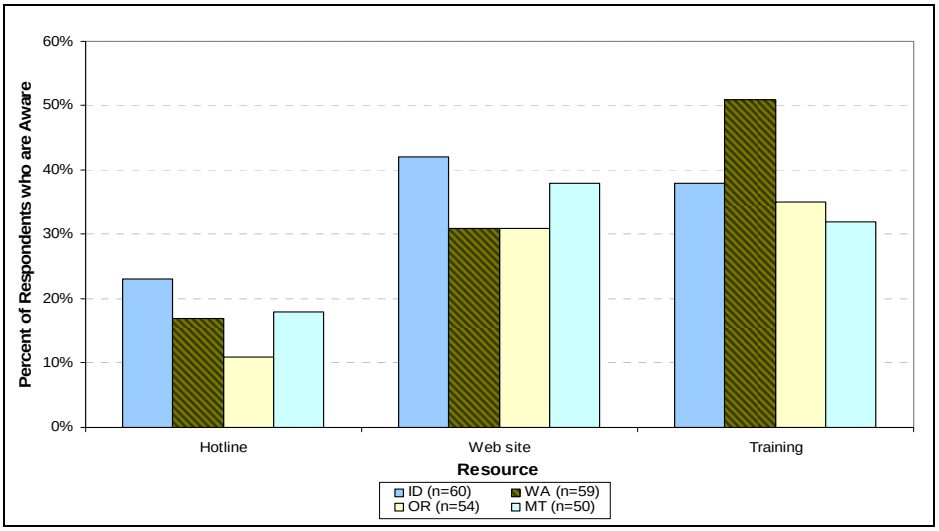
[12] "Other" included: technical support hotline; training; books, code books, manuals; Home Builders Association; ENERGY STAR®; supplier.

were similar among each of the professions across all states. Appendix H presents additional figures and discussions of other market actors.

Finding 2: Many market actors are not aware of available resources, including training, Web sites, and hotlines.

We asked respondents who did not indicate utilization of the training, Web site, and technical support hotline resources specifically about their awareness of these services to determine whether they were simply choosing not to use these services. While we generally found underutilization of these services, in many cases the subgroups were unaware these resources were available. Of the three services available, builders from all states were most aware of training opportunities, as shown in Figure 4. Less than half the builders and designers knew about training activities. A third or fewer knew about Web sites, and less than a quarter knew about the hotlines.

Figure 4. Awareness of Energy Codes Support Resources – Builders



Question: Are you aware that there is: A technical support hotline in your state for energy code questions? A website in your state for energy code questions? Training available on the energy code?

Finding 3: Builders and designers called for more information and prefer outreach by direct mail.

The surveys examined respondents' preferred methods of contact to provide pertinent code information (training events, code changes, updates, etc.). For builders, the overwhelming contact choice was direct mail and, to a lesser extent, e-mail. For designers, direct mail was still the leading preference, followed more closely by e-mail. Overall, when asked about the need for additional services, there was a call for more information in general. Consistently, respondents preferred to receive this information via mailings or e-mail, followed by conferences and meetings. There were also several comments about improvements to Web site content.

11. Energy Codes Compliance Analysis

Energy Codes Compliance Analysis Objectives

RLW Analytics conducted a prior study for NEEA that examined the characteristics of new dwellings built in 2004 and 2005 in the Pacific Northwest.[13] Data collected in that effort also provided NEEA the ability to gauge, at a high level, code compliance levels by state, multifamily and single-family home types, and component. RLW drew the data exclusively from occupied homes.

Quantec's tasks for the code compliance analysis included a review and replication of the prior study. Quantec also conducted additional analyses to generate compliance distributions by housing component, house type, and state.

Quantec created a weighted component/overall building compliance rate summary on three levels:

- State and home type level
- State level incorporating all home types
- All states combined at the home type level

Appendix I presents the methodology and includes the code compliance distributions and discussions. It also includes the compliance results based on strict adherence to energy codes.

Key Findings about Code Compliance Rates

Finding 1: Compliance rates average 85% overall. Rates vary from 37% to 94%, depending on the state, housing type, and component combination.

Table 24 presents compliance rates wherein measures were within +/-10% of code. Quantec did not base the 10% figure on any scientific criterion; rather, it is merely an indicator showing how close some homes may be to meeting the code, and it likely compensates for any measurement error at the site. Additionally, if the level of insulation is at code at the time of construction and initial inspection, it is not surprising insulation levels may appear slightly below code a year or two after construction, when investigators originally took field measurements for this analysis.[14]

It should also be noted that because a home can use either the performance or prescriptive path, specific measures may be below code when using the performance path, but the building could

[13] RLW, *Single-Family Residential New Construction Characteristics and Practices Study*, 4/2007. <http://www.nwNEEA.org/research/reports/168.pdf>

[14] For example, cellulose insulation may compact some after initial installation. According to the Cellulose Insulation Manufacturers Association: "Open blow cellulose installations do lose R-value as the material settles, however such installations provide 'bonus R-value' until they reach settled density." <http://www.cellulose.org/pdf/cellulose_bulletins/tech_bulletin1.pdf>

still meet code overall. This may be another reason why the analysis found some low compliance rates at the component level.

Increasing the tolerance for acceptable code compliance to 10% below code allows some additional sites to meet the "pass code" criteria. The compliance rates improve significantly, particularly for Idaho single-family homes. The wall compliance rate across all states increases from 67% to 91%. Idaho multifamily still has a very low compliance rate (37%).

Again, with the exception of Oregon multifamily homes, windows code compliance rates are over 75%. In contrast to the strict code, although the windows in Oregon are poor, the overall homes are still within 10% of code. For Idaho, the low compliance rates (under 50%) are primarily due to poor wall u-values.

Table 24. Compliance Rate Summary (within 10% of code)

State	Home type	n	Windows[15]	Wall	Floor	Roof	Overall
Idaho	Multifamily	28	74%	60%	40%	50%	37%
Idaho	Single Family	39	90%	57%	20%	25%	86%
Oregon	Multifamily	44	42%	100%	78%	81%	78%
Oregon	Single Family	114	85%	98%	83%	96%	94%
Washington	Multifamily	81	78%	92%	87%	95%	84%
Washington	Single Family	88	92%	97%	69%	97%	91%
Idaho	All	67	82%	58%	26%	36%	62%
Oregon	All	158	72%	98%	82%	92%	89%
Washington	All	169	86%	95%	74%	96%	88%
All	Multifamily	153	67%	89%	80%	83%	75%
All	Single Family	241	88%	93%	72%	89%	92%
All	All	394	80%	91%	74%	87%	85%

In summary, where we consider compliance rates acceptable when they fall within 10% of code, overall compliance rates across the three states and two housing types range from 78% to 91%. Idaho multifamily still has a very low compliance rate of 37%. Considering all states and housing types together, compliance rates are 85% overall.

Code Compliance Distributions

We created weighted state and home-type charts of the percent difference from code to the building as reported, for each building component and for the building overall. The distributions by state and housing type are included in Appendix I. Distributions summarize code compliance distributions at the various component levels for each state and home type combination.[16] The reader can compare distributions in the figures to the estimates in Appendix I, Table 104, and Table 24 above.

[15] Note that, since the inspection occurred after occupation, the NFRC labels were no longer attached. Inspectors used low-e detectors.

[16] Note that due to the placement of the x-axis slightly below the 0 line; some of the values very close to 0 may actually be slightly negative, and hence not to code. Also due to rounding, some of the percentiles may be off by 1%.

12. Estimating Energy Savings from Energy Codes

Estimating Non-residential Energy Savings from Code Changes

NEEA has contracted with Mike D. Kennedy to estimate energy savings from non-residential code changes. The results of Mr. Kennedy's analysis will be available in June 2008. The following is a description of the work plan to develop these estimates.

In quantifying savings from code changes, NEEA contractors first review the current code alongside code in place at the time of the 2005 Regional Energy Code Savings Estimate. NEEA contractors classify the changes by technology, building type, or other appropriate categories, thus estimating gas and electric savings.

In running the analysis, NEEA contractors use prototypes with matching characteristics from Core Based Statistical Analysis data collection. NEEA contractors improve this basic model by incorporating information from current non-residential characteristics studies and making changes to improve small and large office analyses to remediate flaws identified in previous modeling. Once Baseline characteristics are established, NEEA contractors create a building type/HVAC matrix for future planning. This permits NEEA contractors to create adjustments to the prototype mix and establish the most accurate weighting of data.

Once contractors create the model, they utilize Council-produced growth projections to 2025 to calculate energy savings. They calculate savings estimates at the state level, and explicitly report all assumptions regarding the percentage of the building stock used to formulate the projected savings. In addition, NEEA contractors describe how code changes were selected, what buildings are affected, the process to extrapolate to the overall building stock, and the basis for estimating future years' growth and, hence, savings.

Estimating Residential Energy Savings from Code Changes

NEEA uses the same framework as the Northwest Power and Conservation Council to analyze potential energy savings from residential new construction. SEEM, a building-energy simulation tool, is used to model energy efficiencies in new construction in the Northwest. NEEA analyzes savings for specific measures and adjusts savings for various combinations of heating systems, housing types, and climate zones across the region. Efficiency changes from the base case to the Northwest code case are weighted by population statistics for each combination of heat type, housing type, and climate zone. Savings are projected forward, forecasted using housing start data. NEEA modifies the data inputs over time using the actual number of units listed in housing start data.

Contractors recently used this method to estimate savings projected with the 2008 proposed Oregon code changes. NEEA expects current savings estimates from residential sector code changes will be included in the 2009 NEEA annual savings report.

13. Conclusions and Recommendations

Project Organization

Many state, local, and national organizations are involved in the Energy Codes Support Project. Each state has its own processes to initiate, adopt, and support energy codes. NEEA has not developed a comprehensive table or Gantt-type chart showing the people and organizations involved and their functions and relationship to each other. Similarly, NEEA has not prepared a logic model illustrating the Project theory. A logic model will show Project activities, outputs, and outcomes of the activities, and short, intermediate, and long-term Project goals realized from Project outcomes. A logic model and Gantt chart are useful tools to understand the complex relationships between and among stakeholders. Newcomers (and perhaps veterans) to the arena of energy codes and standards will be well served by the road map these tools can provide. We recommend NEEA develop a logic model. We also recommend NEEA update and expand the state organizational charts, and develop additional charts depicting the market actors, entities, and relationships of regional and national energy codes market actors.

Code Development and Adoption

Northwest Best: One of NEEA's short-term goals was to develop an energy "reach" code for the region that can serve as a guideline for regional and state code adoptions for the next five to seven years. Charged by NEEA to develop a "reach code," NEEA-funded contractors and other members of the Technical Working Group identified the *Best of the Region* among the state energy codes. The *Best of the Region* is a model energy code identifying the best (most energy efficient) provisions from the existing energy codes of the four Northwest states and their local jurisdictions. The *Northwest Best* "reach code" then improved the *Best of the Region* by 15%, which means any entity adopting this framework can advance energy efficiency. Interview respondents report that *Northwest Best* provides a coherent road map to future efficiency improvements through code language that any state can utilize. NEEA codes contractors reported three states used *Northwest Best* to develop code language. However, survey respondents not involved with the TWG reported that, to their knowledge, *Northwest Best* is not being used. Respondents report energy code changes are happening more quickly than expected, and that *Northwest Best* has counterparts in increasing energy efficiency, such as Advanced Homes and NW ENERGY STAR® Homes in the residential sector and ASHRAE 189, LEED and green building standards in the commercial sector.

Based on our interviews with NEEA contractors and other stakeholders, Quantec finds NEEA contractors successfully met their goal to develop a "reach code" with the *Best of the Region* and *Northwest Best.* Quantec concludes that *Northwest Best* is a powerful tool and offers a clear means to push the energy code to new levels, forcing serious consideration of not only stringent prescriptive code but also performance-based practices. *Northwest Best* sets a new benchmark as codes around the region come more in sync with each other, and can help bring buildings into mainstream compliance, serving as a stepping-stone to address carbon footprints and global warming. The *Northwest Best* document is publicly available and code developers and advocates can glean provisions to improve their codes.

Quantec recommends those developing code language utilize provisions in *Northwest Best* whenever appropriate. Through their committee work, NEEA-funded contractors and others in the Technical Working Group should make the document known to members of other regional and national committees and alliances developing code language.

State and Regional Efforts: NEEA efforts have moved code adoption and increases in code stringency forward, as seen in state energy code updates, meeting a short-term goal to encourage the adoption of uniform and easily interpreted energy codes in the Northwest and increase stringency by 15% by 2010. There is potential to gain energy savings through additional code improvements. Over the course of this study's interviews, NEEA codes contractors and the majority of state and local officials and stakeholders advocated for continuous improvement in energy code stringency. Overall, most stated a 15%–30% increase in stringency is possible in the residential sector, and 30%–50% is possible in the non-residential sector by the next code cycle or 2015. Most agreed the next increment of 15%–30% increase in stringency (i.e., improvement in energy efficiency) is not a technical issue in that buildings will still look the same and have the same components. However, after that, the next 30% increase in efficiency will require additional changes to processes and building techniques. Others stated that with serious focus on global warming, momentum could carry codes and the building industry swiftly toward the net zero goal of the 2030 Challenge.

To increase code stringency, NEEA codes contractors and the majority of state and local officials and stakeholders largely agreed code development efforts should focus next on specific measures, compliance path options (including performance-based testing) and systemic changes, such as simplifying code language. Measures include lighting and controls, residential shell improvements (including advanced framing and insulation), duct and air sealing, overall HVAC efficiency, and technology developments in general. Both groups stated construction quality needed attention.

National level: NEEA funding enables energy code contractors' activities at the national level. Contractors report they are involved as committee members in the Northwest Energy Codes Group (NWECG). Market actors at the national level perceive the NWECG as well organized and well positioned as a moderate actor. The NWECG submits code change proposals to the IECC based on experience in the Northwest, including nine amendments submitted to the March 2005 IECC hearings, and 28 code change proposals submitted in August 2007, a significant effort. NEEA contractors are also members of other energy code committees, including ASHRAE, NFPA, NFRC, and IRC. Their work contributes to the overall increase in energy efficiency and stringency of these standards. Coordinated efforts both push and pull the state and national codes, increasing compatibility between the national IECC codes and Oregon and Washington state codes.

In terms of code development and adoption, Quantec recommends NEEA continue funding staffers working at the various state, regional, and national levels. We recommend NEEA continue to fund staff involved in committees that develop and promote code changes. Coordination between state and national code adoption is important because it builds consistency and synchronized improvements in energy codes. Idaho and Montana have or will adopt the 2006 IECC. We recommend these market actors examine the suggestions of their peers—the

interview respondents—regarding the specific measures and areas for focus noted above and in the appendices.

Performance-based Codes

About 75% of the codes contractors and over half of the stakeholders interviewed supported testing-based performance requirements in the energy code. Proponents and opponents stated testing-based performance requirements need an infrastructure, appropriate funding, and independent third-party implementers. While states have not adopted residential performance-based codes, respondents repeatedly referenced the required performance testing in the voluntary Home Performance with NW ENERGY STAR® Homes program and the associated infrastructure already developed to support this testing. Several also suggested utility funding, special inspectors, and third-party implementers could support a performance-testing infrastructure. Further, respondents acknowledged building energy efficiency is at the edge of building construction technology, that is, improving building energy efficiency requires increasingly sophisticated changes in construction and measurement techniques. While builders can make changes to construction practices, for example, bringing ductwork inside the heated shell, respondents stated increased energy efficiency would likely require building simulation and performance testing. Oregon is exploring performance-based testing for the next code change cycle in three years.

In the commercial sector, respondents report it is critical to install and commission control systems and ensure proper programming, function, and performance. Buildings need to be managed and operated to close the gap between constructing an efficient building and operating it efficiently. Respondents stated they are concerned staff turnover, for example, can lead to less-than-optimal efficiency performance. A number of respondents advocated for energy density based codes (kWh/sq. ft.). The challenge is to adopt effective and enforceable code. Washington, for example, has adopted commercial sector commissioning and made significant modifications to improve enforceability in the last code change cycle.

Interview respondents report performance-based testing is an area where voluntary programs can build the infrastructure needed for successful code adoption. Respondents' comments show performance-based code change proposals can be successful with funding and infrastructure in place. Quantec recommend NEEA-funded contractors coordinate with those involved with the infrastructure of the voluntary NW ENERGY STAR® Homes program, continuing the dialogue and building the testing & certification infrastructure needed to support performance-based codes.

Quantec recommends NEEA retain its key objective of adopting cost-effective, performance-based code change proposals and pursuing commissioning and performance-based testing as a means to improve compliance and the quality of measure installation. We recommend NEEA build on the infrastructure of existing voluntary programs and continue to work with state and national code advocates.

Code Compliance

Quantec's compliance analysis only looked at the major building components of floors, walls, windows, roofs, and overall UA values. Analysis shows, when we consider compliance rates acceptable within +/- 10% of code for given measures and consider all states and residential housing types together, overall compliance rates are 85%. The analysis indicates multifamily building compliance rates are generally low at 75%. Single-family buildings showed 92% overall compliance.

The majority of energy codes contractors and stakeholders interviewed stated, based on their experience, that an 85% rate of compliance with the energy code was a reasonable estimate for their jurisdiction or state. Codes contractors and stakeholders pointed to several areas with low energy code compliance, including lighting and controls in all four states. Other areas included HVAC, ducts, and air sealing. Contractors and market actors referenced two things linked to code compliance. First is the actual code language: code developers must write language so users can understand and implement it. Second, code compliance is linked to code adoption and field enforcement. Jurisdictions must adopt the language; building officials must enforce the code. Contractors and stakeholders stated training, additional resources, commissioning, and performance-based testing improve compliance by addressing language, implementation, and enforcement issues.

About 66% of survey respondents participating in the Washington Webinar training stated it is easy or somewhat easy to ensure compliance with energy codes, but about 33% stated it is somewhat difficult. The most significant obstacle to energy code compliance is lack of knowledge and training on the code. Respondents also stated lack of coordination between the building and codes communities was another obstacle to complying with energy codes.

Quantec's analysis of the field data concludes an 85% compliance rate overall indicates room for improvement, specifically in individual components and states. Quantec recommends NEEA conduct additional field verification and measurement to confirm the low compliance rates found in various state housing-type component combinations in the compliance analysis. Confirmation of low compliance could warrant additional code support efforts; we recommend NEEA add code related training with confirmation of low compliance.

As noted by respondents of three surveys, training clearly is a component critical to successful compliance. We recommend NEEA expand training levels offered, particularly in specific regions, building types, and technologies where data suggest compliance falls below 85%.

Code Enforcement

NEEA-funded energy code contractors interviewed generally noted energy codes are not uniformly enforced. Lack of resources, including staffing and field time, is the primary reason. The NEEA energy code contractors stated energy codes do not receive the same priority as health, life, and safety codes.

Another survey group—state and local officials and other market actors—were nearly equally split in their perceptions that codes are and are not uniformly enforced. In Idaho and Oregon,

more people stated jurisdictions did not uniformly enforce the codes, though in Montana and Washington, more respondents stated codes were uniformly enforced.

Respondents reported building code staff turnover is an issue propelling the need for ongoing training. Priorities of building code staff who place more emphasis on life, health, and safety issues also add to this need. In addition, respondents reported code language complexity made some codes difficult to understand by both those complying with codes and those enforcing them.

Overall, the majority of respondents stated codes are not uniformly enforced. Although NEEA has no legal authority to promote enforcement, continued training may increase compliance rates and, by extension, overall code enforcement. We also recommend NEEA continue work toward simplified and easily understood code language.

Outreach and Training

The continued relevance of and need for education and training recurred throughout the interviews. Target audience surveys suggest that most often, builders and designers in all states look to their building departments when they have questions regarding the energy code. Builders also frequently consult with colleagues or industry contacts, while designers either look to colleagues or Web sites for energy code help. However, there is low awareness of support services for energy codes among the Northwest building community. Less than 50% of builders and designers knew about training activities. Thirty percent or fewer knew about Web sites, and less than 25% knew about the hotlines.

The target audience surveys found particularly low awareness of technical support hotlines as they examined respondents' preferred methods of contact to provide pertinent code information (training events, code changes, updates, etc.). For builders, the overwhelming contact choice was direct mail and, to a lesser extent, e-mail. For designers, direct mail was still the leading preference, followed more closely by e-mail. Overall, when asked about the need for additional services, there was a call for more information in general. Consistently, respondents preferred to receive this information via mailings or e-mail, followed by conferences and meetings. There were also several comments about improvements to web site content.

Based on findings from the target audience surveys, Quantec recommends NEEA take steps to increase builders' and designers' awareness of energy code services. We recommend NEEA staff contact the building community through direct mail, followed by e-mail. Mailings should provide information about training activities and other related services supporting energy codes.

The majority of survey respondents participating in the Washington Webinar code training, which covered lighting, mechanical, and envelope energy codes, stated the Webinar format worked better than in-person training sessions, largely because it proved more convenient and efficient. Webinar training is the preferred format for future training, although approximately 28%–36% (depending on the topic) prefer in-person training. Participants appreciated options in training formats.

Interviewed codes officials stated that code officials continue to develop and offer training, improving the training tools to increase effectiveness. Quantec recommends NEEA offer additional lighting, mechanical, and envelope energy code training using both in-person and the Webinar format to extend limited resources. We recommend additional outreach to and training of the building community and codes officials. We also recommend emphasis be placed on building coordination between the building community and codes community.

Role of Utilities and Third Party Inspectors

Eighty-five percent of the NEEA energy codes contractors interviewed stated utilities could play a role supporting energy code activities. Respondents suggested utilities could provide various types of financial and in-kind support, such as training facilities and funding third-party special plans inspectors. Others referenced utility-sponsored programs that encourage early adopters and above-code efforts.

Several respondents reported utilities funded compliance inspections in the past, referencing, for example, the 1990s NW Utility Code Group. The program outsourced code compliance inspections and plans examination to state-certified independent parties. Respondents stated support exists for this type of program, but permit fees alone cannot support the program.

We recommend NEEA actively explore avenues to work with utilities to build their involvement and support for energy code-related activities. Quantec notes California utilities, for example, are actively involved with codes and standards, and engage in activities to support code upgrades of the Title 20 Appliance Efficiency Standards and Title 24 Building Energy Efficiency Standards. Involving utilities in this manner could advance the Project's goals to increase stringency 15% by 2010 or the next code cycle.

Quantec also recommends NEEA maintain its long-term strategy to pilot third-party plans examiner programs based on the experience gained with Washington's Special Plans Examiner/Inspector program in the 1990s. We recommend NEEA explore utility involvement to assist with this program's funding. Involving utilities could advance the short- and long-term goals to adopt performance-based codes.

NEEA's Influence on Energy Code Development and Adoption

Attributing achieved energy savings to NEEA's efforts through the Codes and Standards Project is nontrivial. A full-scale attribution study was outside the scope of this project. To estimate net savings attributable to the NEEA Codes and Standards Project in this MPER, we compared interview data to results of a prior study conducted for NEEA by Summit Blue (*Review of Energy Savings Related to Codes and Standards Efforts*, April, 2006) that assessed NEEA's influence on codes and standards efforts. We derived simple estimates of NEEA's influence by counting the number of times respondents mentioned various entities that influenced code adoption in each state. Overall and for each state, Quantec found no evidence to dispute the Summit Blue estimates of savings attributable to NEEA's efforts. Quantec recommends that NEEA consider alternative attribution models and a comprehensive compliance analysis.

Appendix A: Interview List

Table 25. Interview List

Respondent	State	Organization	Title	Funding Relationship*
Ken Baker	ID	Association of ID cities	AIC Subcontractor	Direct Funding
David Cohan	OR	NEEA	Project Manager	Direct Funding
Craig Conner	WA	International Code Council: Building Quality	Principal	No Funding Relationship
David Cook	MT	MT Building Standards Program	Program Manager	No Funding Relationship
Dennis Davis	ID	City of Nampa, ID Building Office	Director of Building Safety	No Funding Relationship
Reginald Fuller	ID	City of ID Falls, ID Building Office	Building Code Official	No Funding Relationship
Charlie Grist	OR	Northwest Power and Conservation Council	Senior Analyst	No Funding Relationship
Jeff Harris	OR	NEEA	Senior Manager	Direct Funding
Ken Harward	ID	Association of ID Cities	Executive Director	Direct Funding
John Hogan	WA	City of Seattle Building Dept.	Code Official	No Funding Relationship
Dan Hunter	ID	Canyon County, ID Building Office	Building Code Official	No Funding Relationship
Jeff Jenkins	MT	MT Building Code Officials	Plans Examiner	No Funding Relationship
John Karasaki	OR	PGE	Energy Specialist	No Funding Relationship (Utility)
Joe Kunz	ID	Association of ID Builders	Government Affairs Director	No Funding Relationship
Victoria Lincoln	WA	Association of WA Cities	Municipal Policy Associate	Indirect Funding
Mark Long	OR	OR Building Code Council	Administrator	No Funding Relationship
Eric Makela	ID	Britt/Makela Group	Principal	Direct Funding
Pat McBride	WA	GMS Architectural Group	Principal	No Funding Relationship
Mike McCourt	MT	Public Sector Solutions, Johnson Controls	Account Executive	No (current) Funding Relationship
Steve Meismer	MT	MT Building Code Officials	Plans Examiner	No Funding Relationship
Betty Merrill	OR	OR Department of Energy	Manager of Building Technical Section	Direct Funding
Chuck Murray	WA	WA State University Energy Office	Energy Specialist	Indirect Funding
John Neff	WA	WA State Building Code Council	Chairman	No Funding Relationship
Rod Olsen	OR	Eugene Water and Electric Board	Energy Management Specialist	No Funding Relationship (Utility)
Stan Price	WA	Putnam Price Group	Partner	Direct Funding
Byron Roberts	MT	MT Building Industry Association	Director	No Funding Relationship
Michael Rosenberg	OR	OR Department of Energy	Energy Analyst	Direct Funding
Alan Seymour	OR	OR Department of Energy	Energy Specialist	Direct Funding
Mac Sheldon	OR	Demilec (USA) LLC	Technical Representative	No Funding Relationship
Shelly Strand	WA	Ecotope	Program Manager	Indirect Funding
Ingo Stroup	ID	Building Energy; E-Star ID, Inc	Performance Specialist/Rater	Direct Funding
Paul Tschida	MT	MT Department of Environmental Quality	Energy Education Specialist	Direct Funding

*Source: NEEA

Direct Funding identifies individuals who receive money from the budget of NEEA's Codes and Standards Support Project.

Indirect Funding identifies individuals whose employers receive money from NEEA project budgets other than that of the Codes and Standards Support Project.

No Funding Relationship identifies individuals that have received no financial consideration from NEEA during the time period under evaluation.

Appendix B: Influential Market Actors

Both the interview with NEEA energy codes contractors and the interview with local and state energy code officials and other stakeholders asked respondents to name entities or individuals who were influential in the evolution of energy codes and energy code adoption activities. These were open-ended unprompted questions. Respondents named both proponents and opponents of more stringent energy codes. The tables below summarize comments sorted into two groups, i.e., the NEEA codes contractors who receive direct funding from NEEA, and the codes officials and market actors with no direct funding from NEEA. Both groups named NEEA as the most influential entity, along with building industry associations.

Table 26. Influential Entities Listed by NEEA-funded Contractors

Influential Entity	Number of Comments
NEEA	9
Home Builder Association	7
Legislative action	7
Association of ID Cities	5
Division of Bldg Safety	5
ASHRAE	3
International Code Conference/ICC chapters	3
ID Association of Building Officials	3
Industry, windows	3
Realtors Association	3
City of Seattle	2
CTED--Comm Trade & Economic Development	2
GAMA	2
Industry, insulation	2
National codes	2
ODOE	2
WA Building Industry Assoc	2
AIA	1
Association of WA Cities	1
BCA	1
Disabled advocates	1
Industry, in general	1
Legislators	1
MT Building Industry Assoc	1
NFPA	1
NWECG	1
Structures Board	1
TAG	1
Total comments	73 comments

Source: NEEA Codes contractor interviews, N=11. Multiple responses allowed.

Table 27. Influential Entities Listed by Market Actors with No Direct Funding from NEEA

Influential Entity	Number of Comments
NEEA	17
Building Industry Association	6
BPA	5
Building Contractors Association	5
ODOE	5
Building Officials	4
International Code Conference/ICC chapters	4
Manufacturers	4
ASHRAE	3
Assoc ID cities	3
Governor's office	3
ID State Energy Bureau	3
AGC	2
AIA	2
BOMA (for existing bldgs)	1
Building Code Advisory Council	1
City of Seattle	1
Code Bureau	1
Energy Star	1
Environmental groups	1
ESCOs	1
Government in general	1
Home Builders Associations	1
IES local chapters (lighting)	1
Legislative mandates	1
Local Associations	1
Low-income groups	1
Mechanical Engineers	1
MT Dept Environmental Quality	1
MT Dept of Labor	1
MT Dept of Natural Resources	1
NAHB	1
Realtors Association	1
Seattle City Light	1
Total comments	86 comments

Source: Code officials and market actor interviews. N=17. Multiple responses allowed.

Appendix C: NEEA Codes Contractors Interview Responses

This Appendix includes questions and responses to interview questions asked the NEEA codes contractors. Summary findings are included in Chapter 5.

NEEA Staff, Code Contractors, Market Actors Interview Methodology

As shown in Table 28 Quantec conducted five interviews that focused on NEEA efforts at the national level through the NWECG and another seven interviews that focused on the status of *Northwest Best*. Quantec conducted 11 interviews with NEEA staff and funded energy code contractors, including two NEEA staff, three Idaho energy code contractors, and two energy code contractors from each of the states of Washington, Oregon, and Montana. We conducted an additional 20 interviews with state and local codes officials and other energy codes stakeholders and market actors.

Table 28 below shows the number of interviews conducted for each survey type and the number of respondents with and without financial support from NEEA. Respondents could participate in more than one interview group. We included respondents who did not receive direct financial support from NEEA, including, for example, representatives from insulation or window manufacturing companies active at the national level. The sample included some who might not support more stringent energy codes, so we could develop a broad picture of energy code support. Appendix A lists those interviewed and their financial relationship with NEEA.

Table 28. Summary of Respondents by Interview Type

Interview Type	Number of Completes	Number of respondents with and without direct financial support from NEEA	
		With	Without
National Involvement (4 stakeholder groups)	5	3	2
Northwest Best (4 stakeholder groups)	7	5	2
NEEA Staff	2	2	
NEEA Codes Contractors (3 from Idaho, 2 from each state of Washington, Oregon, Montana)	9	8	1
Local and State Officials (3 from Idaho, 2 from each state of Washington, Oregon, Montana)	9	1	8
Energy Codes Market Actors (2 from each state)	8	1	7

The sample included a seed list developed from MPER #1 interviews. After review, NEEA provided additional suggestions for survey groups. We asked respondents to suggest other market actors who were influential in energy code activities. We added these individuals to the sample pool, and contacted them to complete the sample frame.

Quantec developed interviews to document code-related activities and assess perceptions about energy code stringency, compliance, and enforcement. We developed interviews to assess the influence of NEEA and other market actors in bringing about code changes. We were also interested in documenting the perception of the NWECG at the national level and determining how widely *Northwest Best* is known.

The interview with NEEA codes contractors and staff included questions on the following topics:

- Respondents' role in energy code efforts
- Perceptions about energy code stringency
- Perceptions about energy code compliance
- Perceptions about energy code enforcement
- Assessment of market actor influences on bringing about code changes
- Perceptions about performance-based codes
- Knowledge and perception of *Northwest Best*
- Perceptions about the role of utilities in codes activities

Roles

Question 1. What role do you and your organization play in energy code adoption?

Table 29. Energy Code Contractor Roles

Roles (n=11)	Count
Code research; codes submittal; technical support	12
NECC/EC	3
Bldg Codes Dept	2
Tech Advisory Group	1
State Energy Dept	1
PPC	1
IECC	1
Total	18

Multiple responses allowed.

Question 2. What is your role?

Table 30. Energy Codes Contractor Activities

Activities (n=11)	Count
Training; support; tech assistance	7
Politics; legislative committee	7
Codes development	4
Research	2
Testify	1
Total	21

Multiple responses allowed.

Perceptions about Energy Code Stringency

Interviewers asked respondents several questions regarding their perceptions of energy code stringency.

Question 4. How much more stringent would you like the residential and non-residential energy code to be by 2010? By 2015?

NEEA codes contractors stated a 15%–30% increase in stringency is possible in the residential sector and a 30%–50% increase in the non-residential sector by 2015.

Table 31. Energy Code Increase in Stringency Possible by 2015

Residential (n=7)	Count
10% stringency increase by 2010	1
15%-20% stringency increase by 2010	2
30% stringency increase by 2010	2
30% stringency increase by 2012	1
15% stringency increase by 2015	1
30% stringency increase by 2015	2
Non-Residential (n=7)	**Count**
15% stringency increase by 2010	1
30% stringency increase by 2010	6
30% stringency increase by 2015	1
50% stringency increase by 2015	3

Respondents could provide different answers for 2010 and 2015. Two respondents did not offer specific estimates for increases in energy code stringency.

Respondents suggested increases in stringency they think can be realistically achieved. While each state uses a different cycle to adopt energy codes, codes contractors think that by the next code cycle (2010 or 2012), it is realistic and possible to achieve 10%–30% improvement over the existing code and bring codes in line with ASHRAE. Contractors stated a 15%–30% increase in stringency (i.e., improvement in energy efficiency) is not a technical issue in that buildings will still look the same and have the same components. However, after that, the next 30% increase in efficiency will require additional changes to processes and building technique. In the residential sector, for example, controlling infiltration will depend not just on measures but also by building techniques (e.g., modular wall systems with air sealing). To reduce consumption by 50%–60%, all the end uses will need to be included (i.e., water heating, HVAC, lighting, and plug loads). With a serious focus on global warming, momentum could carry codes and the building industry swiftly toward the net zero goal of the 2030 Challenge.

Perceptions about Energy Code Compliance

Question 6. What areas of the energy code are most ready (in terms of awareness and general knowledge) for improvement in the near future? (Where would you focus next on code adoption activities?)

Table 32. Areas Ready for Energy Code Changes

Theme (n=9)	Count
Specific measures	18
Compliance path options, performance based codes, commissioning	4
Education, training, support, integrated design	3
Need code technicians, changes in inspection procedures, focus on quality construction	2
Pull from national level	1
Total comments	29

Multiple responses allowed

Table 33. Measures Ready for Focus in Next Code Cycle

Non-residential (n=9)	Count
Shell requirements	2
Glazing	2
Technological developments	2
Progress in lighting and daylighting control integration, e.g., dimmable fluorescent ballast, e.g. T5 technology is there but no code impetus to push people to implement	1
HVAC; air handlers; utilizing more natural ventilation	1
Residential (n=9)	**Count**
Shell improvements, 2x6 construction & improved insulation	5
Residential lighting	2
Energy efficient furnaces (90% minimum)	2
Bring ducts inside, not just in the attic.	1

Multiple responses allowed

Interviewers asked the energy code contractors which areas of the energy code were most ready for near-term improvement. We grouped the contractors' responses into four themes. Eighteen comments referenced specific measures, and another four referenced the need for compliance path options, performance based codes, and commissioning. Three also discussed the need for education, and two stated a need for more code technicians and a focus on quality construction.

Table 34. Areas with Potential, Not Currently Addressed

Focus (n=9)	Count
Residential lighting	6
Non-residential lighting	5
Plug loads not in the scope of the code	3
Performance-approach for both residential and commercial	2
Increase efficiency of major appliances; influence manufacturers	2
Cap allowable exterior lighting loads	1
Require ducts installed in conditioned spaces	1
Establish computer and server rooms operating cooling requirements	1
Establish fees for large, inefficient vacation homes	1
Focus on process loads to maintain temperature and humidity	1
Glazing	1
Introduce other technologies (e.g., air-to-air heat exchangers)	1
Increase customer awareness	1
Require integrated design process in the commercial sector	1
Make code easier to understand and apply	1

Multiple responses allowed

Contractors stated there was room for improvement in both residential and non-residential sectors. Specific measures referenced for non-residential sector improvement included: shell and glazing requirements (four comments); lighting and controls (one comment); technology developments in general; and HVAC (one comment). In the residential sector, the areas most ready for energy code improvements are: construction and insulation (five comments);HVAC (two comments); ducts (one comment); and lighting (two comments). A number of comments referred to growing public awareness and focus on sustainable and green building, which could enable more swift code changes.

In the residential sector, contractors elaborated on the efficiency of HVAC systems and bringing components of the duct system inside the heated space, not just inside the attic. Two stated a 10%–15% or even 20% reduction in energy use could be realized by moving ducts inside. One noted bringing ducts inside is more than just a "tweak" of the codes, which has a cost, and builders will need to change their standard construction techniques. With the addition of energy-efficient or NW ENERGY STAR® Homes equivalent furnaces and heat pumps, one respondent stated efficiency could be improved 30%. Another person noted 90% efficient furnaces are cost-effective.

Contractors stated changes in residential lighting proposed at the national level appear to have a good chance of passing. More efficient wall systems and insulation as well as glazing are areas ready for code changes. Respondents recognized, however, that 2x6 wall systems can only hold so much insulation; the focus on efficiency needs to include quality installation and perhaps performance testing.

One respondent stated the non-residential sector depends more on improving technology than does the residential sector. While advances in lighting technologies have occurred, there is no

code impetus to push installation. Additional work is needed in HVAC, air handlers and mechanical system efficiency, natural ventilation, shell improvements, and glazing. One noted commercial glazing U-values lag behind residential and need to be improved. Some noted non-residential code changes track federal standards and ASHRAE 90.1. One noted ASHRAE is taking it seriously, and NEEA should focus less on ASHRAE.

In addition to specific measure improvements achievable through codes, respondents discussed non-residential commissioning and residential performance testing. Respondents referred to two timelines, the first being the work of codes and resulting energy-efficient building and the second being verification, which occurs after codes have done their job. Commissioning and performance testing addresses the quality of construction and installation of measures. One noted performance testing could occur prior to building occupation. One also discussed integrated design in non-residential buildings, noting both progress and the potential to make a big difference.

Others noted improvements in installation quality are possible. Respondents also commented contractors needed training to build it right, and that, once trained, they will continue correct building techniques. One respondent recommended economic consequences for incorrect (i.e., energy inefficient) construction and measure installation. For example, inspectors could red-tag insulation not cut and fit properly around receptacles and other objects in stud bays.

Regarding training, one respondent said he had noticed redundancy in the training, and attendance dropped as a result.

Respondents stated room exists to build synergies between voluntary programs and code enforcement. One respondent referred to the relationship between a Eugene utility, EWEB, and the building department, whereby the building department waived the need for their own home inspections for EWEB's Super Good Cents program participants.

Question 7. Is there anywhere else where energy can be saved, where the energy code is not focusing?

When asked if there were areas energy codes were not currently addressing but which could produce energy savings, respondents most commonly referenced both residential (six comments) and non-residential lighting (five) in addition to one suggestion to cap the allowable amount of exterior lighting. Some contractors referenced lighting code changes occurring at the national level and to language recently submitted to IECC.

Three respondents discussed plug loads and major appliances, and noted appliance and plug load efficiency is a national issue and manufacturing standards are involved.

Respondents stated the code could address performance testing, commissioning, and integrated design. Regarding performance testing, respondents stated the need for infrastructure and pointed to the example of NW ENERGY STAR® Homes that has the infrastructure to support required performance testing. While still in its infancy, this infrastructure serves as a model; the model is expandable to work in a larger arena. At the same time, one respondent said that it is not a very big leap from duct testing to whole house testing. Both offer metrics for performance testing.

One respondent stated non-residential commissioning, that is, post-occupancy compliance requirements could open the door to a significant area that is not included in ongoing operations. There is little precedence for post-occupancy inspections except for fire code compliance.

Some respondents stated clear language will lead to codes that are easily understood and implementable. Lastly, one respondent discussed the issues with Federal pre-emption in the National Appliance Energy Code that governs appliances, and setting, e.g., minimum efficiency on water heaters. State codes may not require higher efficiency. Higher efficiency equipment is allowable if compliance options include the Federal requirement.

Table 35. Areas with Potential, Not Currently Addressed

Focus (n=9)	Count
Residential lighting	6
Non-residential lighting	5
Plug loads not in the scope of the code	3
Performance-approach for both residential and commercial	2
Increase efficiency of major appliances; influence manufacturers	2
Cap allowable exterior lighting loads	1
Require ducts installed in conditioned spaces	1
Establish computer and server rooms operating cooling requirements	1
Establish fees for large, inefficient vacation homes	1
Focus on process loads to maintain temperature and humidity	1
Glazing	1
Introduce other technologies (e.g., air-to-air heat exchangers)	1
Increase customer awareness	1
Require integrated design process in the commercial sector	1
Make code easier to understand and apply	1

Multiple responses allowed

Question 8. Do you know what areas of the energy code have low compliance in your state?

The NEEA energy code contractors interviewed replied to several questions about compliance with energy codes. When asked if they knew which areas of the code had low compliance, one respondent noted there are two things linked to code compliance: the words in the code and the field enforcement and adoption. One noted it takes two to three years for behavior to change after adoption of a code change. Virtually all respondents stated that energy codes are not on par with life, health, and safety codes. This is highly driven by code enforcement staffing and time restraints. One stated that plan reviewers look for energy code compliance, but, in the field, lack of time per inspection limits field inspection for energy code-related issues. A respondent stated that field inspectors have upwards of 20 inspections to complete per day, plus drive time, and as a result needed to triage. Inspectors may spend less time with contractors known to produce good work.

Table 36. Areas of Low Code Compliance by Residential and Non-residential Sector

Non-residential (n=9)	Count
Lighting & controls	7
Slab on grade insulation	2
Glazing	2
Envelope	1
Economizers	1
Residential (n=9)	**Count**
Duct-leakage control; duct sealing	3
Air sealing	2
Properly sizing furnaces	1
Stop crawl space venting	1

Multiple responses allowed

Table 37. Areas of Low Compliance by State

Area	WA (n=2)	ID (n=3)	OR (n=2)	MT (n=2)	Total (n=9)
Lighting & controls	1	2	1	3	7
Slab on grade insulation	1			1	2
Glazing	2				2
Duct-leakage control; duct sealing		1		1	2
Air sealing				2	2
Envelope	1				1
Properly sizing furnaces				1	1
Stop crawl space venting				1	1
Economizers		1			1
Residential outside city limits				1	1
Residential entire code	1				1
Total comments	6	4	1	10	21

Multiple responses allowed

In the non-residential sector, respondents cited lighting and controls most often as areas with low compliance. There are numerous issues associated with lighting in construction and inspection. For example, the respondent explained that architects might not follow through with their construction projects. There are many design-build firms where the project goes to bid. An electrical engineer may draw the lighting plan or defer decisions until later. Builders can submit plans later for an electrical permit, and submit lighting plans after that. Even with a lighting design, contractors can install fixtures that look similar to those specified, but which use more energy. Opportunities to improve the process include tightening rules for deferred submittals, so the completed project meets code.

In addition, jurisdictions may split permitting responsibilities for the same structure. For example, the city may permit the building (including electrical), but the county permit the lighting. Plans could be approved that meet code. However, the inspector may be focusing on structural issues and does not look at lighting fixtures because they do not have time or it is out of scope. In short, builders are exceeding lighting requirements specifying watts/square foot.

Respondents stated other non-residential areas with low compliance include envelope, slab on grade insulation, and glazing. In the residential sector, respondents listed duct leakage control, properly sized furnaces, air sealing, and crawl space venting. One noted that daylighting and economizers are weak in commercial codes.

Duct sealing can be addressed by incenting the sealing or bringing the ducts inside. Regarding air sealing, one respondent said the code is not doing a good enough job describing areas requiring air sealing. One noted HVAC design and sizing are difficult, and they are currently working with jurisdictions. It is especially difficult in rural areas, where residential construction occurs outside of city limits and is the responsibility of the state to look at the health and safety of the building, but where there is no real attention to or enforcement of energy codes.

Perceptions about Energy Code Enforcement

Question 9. How do you know when compliance with energy codes is high or low?

We asked the respondents how they knew when compliance is low. One noted that they know where the challenges are, but they were not involved with compliance. Contractors largely know about compliance issues through anecdotal data, talking with inspectors and hearing about compliance issues. Some work in the field and can observe inspectors' work. They also rely on internal or external studies. Four cited baseline studies by Ecotope and NEEA. Others referenced a Montana Building Codes Department survey. Respondents who responded all stated energy codes are not uniformly enforced. The primary reasons are lack of resources, including workers and field time.

Table 38. Means for Knowing Compliance is Low

Means (n=11)	Count
Inspection; Talk to inspectors	4
NEEA report; Ecotope report; regional survey	4
Plan review	2
DEQ compliance service	1
Internal survey	1
Total comments	12

Multiple responses allowed.

Table 39. Additional Comments on Low Compliance

Comments (n=11)	Count
Lots of education issues	3
Simplify codes to make the easier to enforce	1
Not optimistic about performance based testing - Efficiency gains at what cost?	1
Need performance-testing	1
Advocate for third-party inspections	1
Total comments	12

Multiple responses allowed.

Respondents discussed several areas mentioned in the baseline studies. These included residential duct leakage, lighting, and economizers. Regarding economizers, one stated that the economizer is not functioning correctly if it not verified after installation. Some units installed are small enough so that it does not to meet requirements for system performance testing. However, he expressed concerns that economizers can fail and performance testing should occur.

One reason given for duct leakage that is out of compliance is that the code compliance relies on visual inspection and the code inspector cannot visually check duct sealing. Duct leakage studies suggested bringing ducts inside the envelope. If ducts were inside the heated envelope, inspectors could at least do visual check. In addition, this could alleviate the need for performance based testing. This respondent also suggested looking to California and Title 24. There, even if contractors simply replace HVAC, they are required to check that the distribution system is airtight. In a retrofit setting, this allows additional savings captured through codes.

One respondent discussed improving compliance training fundamentals and technical assistance. In addition, respondents report political will and support at the local level could ensure compliance with energy codes since these are not the life, health, and safety codes. Respondents suggested third party resources could provide energy code plans examination and inspection. This will take buy-in and coordination with the Association of Building Codes Officials. Several respondents discussed third party inspectors, Special Plans Examiners and Inspectors, and referenced the Washington model that was in place in 1994 but dismantled in 2001. This respondent reported there is still a list of certified inspectors posted on WABO website but there have been no new entrants added in the last 5 years since no jurisdictions are encouraging use of special plans examiners.

Question 10. Limited information suggests regional energy code compliance is approximately 85% on average. Does this number sound reasonable for your state?

Table 40. Reasonableness of 85% Compliance Estimate

Reasonable Estimate (n=9)	Count
Yes, reasonable	5
No, less	3
Yes, actually higher	1
Total	9

We asked the energy code contractors for their opinion about regional energy code compliance. We also asked if an 85% compliance figure sounded reasonable. Table 40 and Table 41 (by State) show that five stated the number was reasonable, and one thought it was actually higher. Three respondents stated 85% compliance rate was too high. One suggested that 85% seems low and that if the code is reasonably simple, it can work consistently and over time, it should stabilize. In places, it should be near 90-95%.

Table 41. Reasonableness of 85% Compliance Estimate By State

Reasonable Estimate by State (n=9)	ID	MT	WA	OR	Total
Yes, reasonable	2	1	0	2	5
No, less	1	1	0	1	3
Yes, actually higher	0	0	1	0	1

Additional comments referenced quality of construction. Respondents stated that while the building might meet code, the quality of the installation of energy efficiency measures is not as good as it could be, and therefore, energy savings are not optimized.

Question 11. What do you think can be done to improve energy code compliance?

Table 42. Activities Toward Improving Energy Code Compliance

Activities (n=9)	Count
Need established 3rd party inspection system to handle energy code	3
Simplify code language	2
Talk to enforcement people	1
Resolve city limit issue - rural exception to energy codes	1
Pilot a 1-page checklist with good and bad photos, in English and Spanish	1
More training equals better compliance	1
Educate the building contractors - Big issue is quality of installation.	1
Consolidate funds for training to one entity - thereby reducing redundant admin expense	1
Need more manpower - there is not enough budget	1
Total comments	12

Multiple responses allowed

When asked what can be done to improve code compliance, contractors talked about educating building contractors, through classroom training and being in the field talking to enforcement people. (Table 42) Contractors commented that they have been providing training to the jurisdictions. While NEEA can offer training to plans reviewers and inspectors, the jurisdiction may be low on staff time and resources, and may not have the labor to spend time on energy codes plan reviews.

Overall, contractors stated that more training resulted in better compliance, and that they need compliance tools. One respondent suggested that NEEA funnel training dollars to one entity, since training is repetitive and packaged, to reduce administrative charges from multiple entities. In this way, more money will be available to spur creative efforts.

Installation quality is an issue. One contractor suggested one-page check lists with photos, to show good and bad quality installations. Again, respondents discussed the possibility of using a third party inspection system for energy codes, acknowledging it could be a complicated process. Respondents referenced both the past system using Special Plans Examiners in WA and the current infrastructure and process for NW ENERGY STAR® Homes certification. One person noted that buildings with LEED certification go to the front of the line for permitting. Simplifying the energy code language could also enhance compliance.

Question 12. How important are NEEA sponsored training programs to energy code compliance? Do you think compliance rates would be higher, lower or the same without the training programs? Are we doing enough training? What could be done to improve them?

Table 43. NEEA Energy Code Training

Training Issue (n=9)	Count
Compliance would be lower without NEEA trainings	10
Need to diversify training opportunities and strategies to keep fresh and embed training in work	6
Need more money to do more training and more people to provide training.	4
Need to expand training to others, beyond just building officials	4
Need to target training to builders	2
Preferably training would start a year before the code comes into effect.	1
Need training targeted at lighting	1
Sell training to field as a marketing tool	1
Advocate more frequent refresher trainings	1
Don't need training until code change	1
Need more incentive programs to improve compliance	1
Total comments	32

Multiple responses allowed.

When asked about the importance of NEEA sponsored training programs to energy code compliance, all respondents stated compliance would be lower without NEEA, as shown in Table 43. Respondents reported that contractors' training and a presence in the field has made a difference in compliance rates. Based on years of experience, one noted the need for several 'layers' of training. Training should not be restricted to building officials, but that technical training goes hand-in-hand for others in the energy trades, building subcontractors, architects and others. Another noted training is a marketing tool to differentiate builders in market, where training is equivalent to high quality.

Remaining proactive, fielding questions and getting out into the field has made a difference in compliance. One suggested visiting jurisdictions that do not call with energy codes questions. Respondents suggested collaborating with new audiences such as the builders associations and building suppliers, in addition to targeting home buying customers and consumers to educate them about energy efficiency options and to stimulate awareness and demand.

NEEA has made a significant contribution to improving energy codes compliance through training and related activities. Since states do not or cannot fund energy code related activities NEEA funding is critical and instrumental in states' ability to offer training. Contractors noted they could only do what they have the funding to do. Contractors report that funding is adequate for current activities and there should be no reduction in funding. One suggested improving efficiencies by reducing duplicative administrative overhead. Additional funding could enable contractors more physical presence in the field, more training, and an ability to reach more jurisdictions.

Question 13. Are energy codes uniformly enforced in your state?

As shown in Table 44, all respondents reported that energy codes are not uniformly enforced. Respondents described the barriers to uniform energy code enforcement. The issues cited most often included time/manpower issues and inclination. City and county official, and building departments must provide support from the top down. Jurisdictions vary in their respective enforcement and attention given to various aspects of the code. Some may be more stringent than others; perhaps they have the resources or are just more zealous. One noted it depended on whether the building is inside or outside the city limits. Another stated there is no mechanism for an enforcement program or system at state or local levels.

Table 44. Uniform Energy Code Enforcement

Barriers to enforcement	WA (n=2)	ID (n=3)	OR (n=2)	MT (n=2)	Total (n=9)
Not uniformly enforced	2	3	2	2	9
Some jurisdictions are more stringent than others		2	2	1	5
Lack of manpower	1	2	2	1	6
Lack of money	1	2	2	1	6
Lack of time	1	1	1		3
Lack of priority; need to be seen the same as life, health, safety codes		2			2
Codes are not enforced outside city limits or jurisdictions				2	2
Third party inspectors needed	1	1			2
Lack specific expertise, e.g., mechanical provision option size and duct design		1			1
"Home rule" state		1			1
Turn over in the industry		1			1
Need collaboration with jurisdictions	1				1
Total comments	7	16	9	7	39

Multiple responses allowed

Some respondents referenced and advocated for the NW ENERGY STAR® Homes performance tests in association with third-party inspectors and higher efficiency, tighter ducts. An Idaho city is conducting a pilot project that includes leakage tests and performance testing in homes to examine construction quality issues.

Question 14. What are the barriers to energy code enforcement?

When asked about barriers to energy code enforcement, respondents reiterated earlier comments, indicating time, workers, and attitudes are barriers to uniform enforcement of energy codes. Others stated that energy codes are not equal to health, life, and safety codes.

Respondents noted that the complicated codes support the need for a special plans examiner. Neither the permit seeker nor building/inspection department can bear the full cost. Other funding will defray costs of a special plans examiner program. Collaboration with utilities may support a special plans examiner program.

Others noted that codes do not apply outside of the city limits. Another stated that Idaho is a "home-rule" state, adopting but not enforcing energy codes.

Factors Influencing Energy Code Evolution

Question 15. What are the major factors (in your opinion) that have influenced the evolution of the energy codes adopted in your state?

Table 45. Factors Influencing Evolution of Energy Codes Adoption

Factor (n=9)	Count
Legislative action (e.g. Legislators passed the first energy code in 2002: 2000 IECC; DOE put energy code in place; proactive leadership by state governments)	7
Escalation in energy costs	3
NEEA funding to staff committees	3
Public and private utility activities	2
NWECG, Association of Washington Cities	1
Committee on Trade and Economic Development (CTED)	1
Successful demonstration programs highlighting energy efficiency	1
Consumer demand for better products	1
Total comments	19

Multiple responses allowed

In Idaho, the 1986 codes were the residential standard until 2002, when legislators passed the first energy code: the 2000 IECC. This was possible with NEEA funding to staff codes committees where participation could make a difference. Public pressure, demands for better products, rising energy costs and increasing utility bills are also factors influencing the evolution of energy code adoption. Another respondent noted that in the early 1980s BPA provided money and staffing, technical support, demonstration projects, and training to demonstrate the true cost and value of energy efficiency.

In Washington, proactive leadership by state and county governments, and by cities such as Seattle, influenced the evolution of the energy codes. Stakeholder and constituency groups' constant involvement and participation on committees pushed code adoption. These groups include, for example, the NWECG and the Association of Washington Cities. Respondents stated energy prices may make a big difference, and that the national push for greener buildings, sustainability, and the focus on climate change will make it easier to pass more stringent energy codes in the future.

In Oregon, respondents stated the evolution in codes adoption started with the 1974 oil embargo, when the Oregon Department of Energy (DOE) put an energy code into place. DOE and NEEA funding enabled national standards to move forward. The positive, collaborative relationship with the Home Builders Association and people on the Structures Board made a difference. Continuous meetings were instrumental in developing the collaborative relationship.

Montana respondents stated legislative action and increases in energy costs influenced the evolution of the energy codes adopted in their state.

Question 16. What have specific individuals, trade associations, manufacturers or organizations been influential in energy code adoption activities?

Question 17. If so, why do you feel that individual or organization had a strong influence in your state?

Question 18. What have been the most effective strategies used by this individual/group?

In response to these three questions, the codes contractors interviewed listed individuals, trade associations, manufacturers, or organizations influential as either proponents or opponents in energy code adoption activities. As shown in Appendix B, NEEA and ASHRAE played an influential role in energy code adoption activities, and perceived as progressive people who are consistent and clear. Various state homebuilders associations are included on the list, typically as opponents to more stringent energy codes. However, most noted that over time, through regular collaboration, organizations have become supportive of energy codes.

Question 19. What are the major challenges to adopting more stringent energy codes?

Table 46. Challenges to Energy Code Adoption

Challenge (n=11)	Count
Perception that codes increase cost	8
Pricing homeowners out of the American dream - buying a house	6
Gaining stakeholder/industry acceptance that incremental cost of EE measures is insignificant considering lifetime cost savings	3
Complexity of compliance and code due to frequent changes	2
Effectively demonstrate savings of new technologies	1
Technical opposition	1
Political fight	1
Education of codes and standards to stakeholders	1
Demonstrate that EC are economic development to community leaders	1
Education for the jurisdictions	1
Effective defense of oppositions legislative action	1
Total comments	26

Multiple responses allowed.

When asked to name the major challenges to adopting more stringent energy code, respondents discussed cost most often (8 comments). There were a number of comments that builders feel the incremental cost to comply with energy codes "takes money out of their pockets" and price homeowners out of the American dream. To address this barrier it is important to make sure that people are educated and know what the adoption of standards means, and show community leaders this is economic development.

One respondent noted it all starts as a political fight. Then it becomes a technical fight. Another noted they are getting to the point where we can implement new or emerging technologies, but they need to demonstrate savings where the technology is not proven.

One challenge is the perception that codes change too often and there is reticence to continued change because it increases cost and complexity of compliance.

Performance Based Codes

Question 20. The energy code compliance process currently does not measure whether the equipment or materials used in construction perform the way they are supposed to. Do you think it is reasonable to put testing-based requirements in the energy code? An example would be determining whether air infiltration in a home is below a code-specified level by requiring a blower door test.

Over the course of the interview, codes contractors responded to a variety of questions by discussing the need for performance-based testing. We also asked respondents specifically if they thought it reasonable to put testing-based requirements in the energy code. Six of eight respondents stated it is within reason to include performance-based testing in codes. One person stated it is possible to increase efficiency 30% beyond code with performance testing. Barriers included the current lack of infrastructure, including training and certification for testers.

One respondent stated performance testing should not be included in codes, and above-code programs should used it.. At the same time, he stated integrated building design could lead to more energy-efficient buildings, even without the goal to increase energy efficiency.

There was also a difference in opinion regarding application of performance-based testing to residential and non-residential buildings. One noted it is an order of magnitude more complicated in commercial buildings, adding complexity in the system or building component subsystems. Overall, whole building performance testing is different from single measure performance testing. Respondents stated that, when we reach the outer edge of performance, perhaps we should provide whole building energy budgets.

More than one respondent stated the ultimate goal is a net-zero building, where at the end of one year, the meter reads zero. One respondent stated the AIA is examining the use of building energy budgets and using code requirements to meet the 2030 Challenge,

Respondents reported that in the residential sector, NW ENERGY STAR® Homes requirements call for performance testing for duct leakage, providing support and an infrastructure for performance-based testing. This type of requirement can be included in code language, but an accompanying larger infrastructure must also developed. This program is an example of a symbiotic relationship between voluntary programs and codes. Respondents suggested that to bring performance testing into codes, leading with a voluntary program would show the value to the customer and develop the infrastructure. In this way, the service and infrastructure will be available, and moving toward code change will be easier.

Question 21. Is work being done in your state to encourage or adopt performance or testing-based energy codes? (Who is working on that? What are they doing)

Table 47. Work Being Done on Performance-Based Codes

Work (n=11)	Count
No work is being done	5
Residential ENERGY STAR® program only	4
Previously attempted - unsuccessful	1
Performance testing is being discussed as an option for energy code.	1
Lacking necessary education to make performance testing feasible	1
Total	12

Codes contractors made several comments regarding performance-based codes. Several noted that they would like to see it in code. One noted that they find issues commissioning all of state buildings; the facility operator can always override code or turnover reverses advances made by commissioning. Another stated that advocates are not pushing performance-based codes, but that NW ENERGY STAR® Homes require duct testing so there are people who are certified. Oregon is talking about performance testing and may propose performance testing 3 years from now, in the next code cycle. A respondent noted that codes bring up the bottom, and that the infrastructure must be in place to put a new code in place.

Question 22. How could NEEA improve its energy code support efforts?

Table 48. Improving Code Support Efforts

Efforts (n=11)	Count
More money - continue funding	5
Continue collaboration	4
Great job so far - continue current efforts	3
Expand organization efforts with utilities	1
Evaluation has been helpful	1
Need additional processes	1
More staff	1
More training	1
Offer and facilitate more sharing of information and best practices between states.	1
Take active role in allocation of funding and demand results for investment.	1
Total	19

Northwest Best

Question 23. I'd like to ask a couple of questions about Northwest Best. Northwest Best refers to a best-practice goal for NW energy codes. Have you heard about Northwest Best?

Responses are tabulated under the Northwest Best Appendix.

Potential Role of Utilities in Energy Code Support

Question 24. NEEA is thinking of developing a strategy to encourage utilities to engage in energy codes. What role or roles do you think they would be most effective in?

Table 49. Support for Utility Role in Codes Support

Do utilities have a role (n=9)	Count
Utilities could have a role	8
Don't support a utility role	1
Total	9

When asked if utilities had a role in the adoption or support of energy codes, nearly all, eight of nine respondents, stated there was a role utilities could play, Table 49. Only one did not support a role for utilities. However, there were varying opinions about the role utilities could play. Several stated utilities could become involved after passing energy codes, in the implementation process. Respondents felt utilities were less likely to be involved in the adoption process because it could place them in a difficult position with some of their customers. However, they cited examples of utilities working in concert with other efforts supporting energy efficiency. For example, rebate and incentive programs support new technologies or performance-based testing. These activities lay the infrastructure needed for future codes adopted or introduce the market to technologies that later ease code adoption efforts. Respondents stated utilities could provide training facilities or financial support for training or to offset the cost of a third-party Special Plans Examiner and Inspector,. Several reported utilities funded compliance inspections in the past, referencing the 1990s NW Utility Code Group.

Summary of Key Findings from NEEA Code Contractors Interviews

- NEEA codes contractors stated a 15%-30% increase in stringency is possible in the residential sector and 30%-50% in the non-residential sector by 2015. Contractors stated a 15%-30% increase in stringency (i.e., improvement in energy efficiency) is not a technical issue in that buildings will still look the same and have the same components. However, after that, the next 30% increase in efficiency will require additional changes to processes and building techniques. Others stated that, with a serious focus on global warming, momentum could carry codes and the building industry swiftly toward the net zero goal of the 2030 Challenge.

- Contractors stated code adoption activities should focus next on specific measures, compliance path options, and systemic changes. Specific measures referenced for non-residential sector improvement included shell and glazing requirements, lighting and controls, technology developments in general, and HVAC. In the residential sector, the areas most ready for energy code improvements are shell improvements, including construction and insulation, HVAC, ducts, and lighting. Respondents referred to two timelines. The first timeline refers to the work of codes and the resulting energy-efficient building, and the second timeline includes verification, occurring after codes have done their jobs. Commissioning and performance testing both occur on the second timeline and address the quality of construction and measure installation, and building efficiency performance.

- Contractors pointed to several areas with low energy code compliance, including lighting and controls in all four states. Other areas included HVAC, ducts, and air sealing.

Montana received the most comments. There appear to be two things linked to code compliance (that is, specific words in the code): adoption and field enforcement.

- All respondents stated energy codes are not uniformly enforced. Lack of resources, including work force and field time, are the primary reasons. Respondents stated code officials do not give energy codes the same priority as health, life, and safety codes.

- Legislative action, the high cost of energy, and NEEA's funding that staffs' participation in codes committees are factors influencing the adoption of energy codes. Stakeholder and constituency groups' constant involvement and participation on committees pushed code adoption. In addition, contractors noted the national push for greener buildings, sustainability, and the focus on climate change will make it easier to increase energy efficiency and adopt more stringent energy codes in the future.

- Industry associations, codes-related organizations, and government entities are groups that influence energy code adoption activities. Respondents noted that over time, through regular collaboration, organizations once opposed to energy codes have become supportive.

- About 75% of the codes contractors supported testing-based performance requirements in the energy code. Barriers included lack of funding and a current lack of an infrastructure. NW ENERGY STAR® Homes requirements calling for performance testing for duct leakage provide support and an infrastructure for performance-based testing. Respondents stated the program is a good model and an example of a symbiotic relationship between voluntary programs and codes.

- The majority of respondents stated utilities could play a role once states adopt energy codes. Utilities could provide various types of support, including funding third-party special plans inspectors. Several reported that utilities funded compliance inspections in the past, referencing, for example, the 1990s NW Utility Code Group.

Appendix D: Code Officials and Market Actors Interview Responses

This Appendix includes questions and responses to survey questions for the local and state energy code officials and other market actors. Summary findings are included in Chapter 6.

The interview sample pool included a seed list developed from MPER #1 interviews. After review, NEEA provided additional suggestions for survey groups. Quantec asked respondents to suggest other market actors who were influential in energy code activities. We added these individuals to the sample pool, and contacted them to complete the sample frame. Respondents included representatives from each state, including five from Idaho and four from each of the other three states.

The interviews documented code-related activities and assessed perceptions regarding energy code stringency, compliance, and enforcement. Interviews also assessed the influence of NEEA and other market actors in bringing about code changes.

The interview included questions on the following topics:

- Respondents' role in energy code efforts
- Perceptions about energy code stringency
- Perceptions about energy code compliance
- Perceptions about energy code enforcement
- Assessment of market actor influence on bringing about code changes
- Perceptions about performance based codes
- Knowledge and perception of *Northwest Best*

Roles

In order to gauge respondents' experience level with energy codes, we asked them about their roles and familiarity with the energy code.

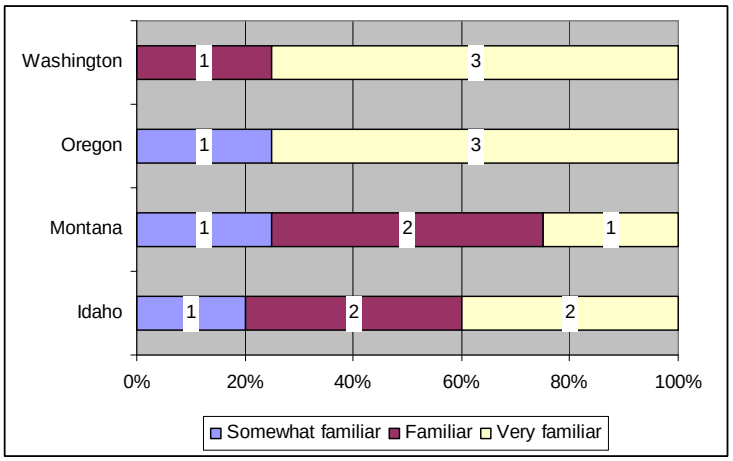
Question 1. What role does your organization play in code adoption?

The respondents displayed a wide array of roles and responsibilities regarding energy code adoption. Six respondents said their role was to adopt the energy code whenever it is changed. Four respondents were primarily involved in an advisory capacity or provided testimony to various committees on state, local and national levels, one of which recommends building above the current energy code for new construction. One respondent was involved in developing ordinances that are sent to the mayor, one respondent oversaw the local provisions as there was no state-wide adoption in the state, and one respondent was a member of the code council and followed what they do closely.

Question 2. How familiar are you with the energy code adoption process? What is the role of your organization in this process? (What are your duties?)

We asked how familiar they are with the energy code process. As shown in Figure 5 below, a majority of respondents, 9 of 17, claimed to be "very familiar" with the energy code adoption process, five of 17 were "familiar" with the energy code adoption process, and three of 17 were "somewhat familiar" with the energy code adoption process.

Figure 5. Familiarity with Energy Codes

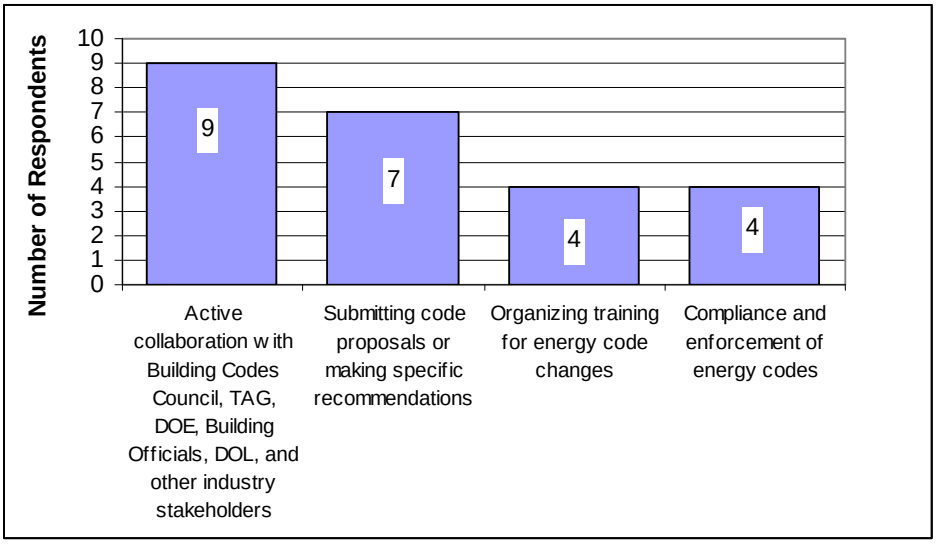


When asked about respondents' specific role with energy codes, two respondents advocated for energy code adoption with legislature. Three respondents were involved in actually commenting on, amending, and writing the energy code. Two respondents were association representatives and acted as liaisons between local officials and associations, one respondent was the Director of the Building Code Officials. One respondent was the Chair of the Building Code Council, one respondent was the Program Manager for the Building Standards Program, one respondent dealt primarily with compliance issues, one respondent was a building scientist and primarily provided research findings to stakeholders.

Question 3. What sort of activities related to energy codes were you personally involved in over the last 18 months (since about May 2006)?

As shown in Figure 6, 9 of the 17 respondents were involved in active collaboration with Building Codes Council, TAG, ODOE, Building Officials, DOL, and other industry stakeholders. Seven of the respondents were involved in energy code adoption by submitting code proposals or making specific recommendations. Four respondents were involved in organizing training for energy code changes. Four respondents were directly involved in compliance and enforcement of energy codes. One respondent attended the Energy Conference, one respondent was part of the LEED resolution, one respondent sponsored a bill that adopted the energy code, and one respondent had no direct involvement in energy codes over the last 18 months, but was responsible for drafting chapter 13 of the most recent energy code cycle.

Figure 6. Code Related Activities of Respondents



Question 4. What is your long-term vision of the energy code? How much more stringent do you think the residential and non-residential energy code should be or could be by 2010? By 2015?

Table 50. Long Term Vision for Energy Code

Future Energy Code (n=17)	Count
Does not need to be more stringent	4
Continuous improvement	13
Total comments	17

Overall, respondents expect continuous improvement in the stringency of energy codes by keeping current with national codes, including adoption of the 2009 IECC, as seen in Table 51. Four respondents stated codes should keep current with national or federal codes. Three stated they were working toward adoption of IECC codes in 2009. Several offered specific quantitative expectations for upcoming energy code cycles for both residential and non-residential sectors. By the next code cycle, respondents thought the code would be 10%-20%, 15%, or 30% more stringent. Two stated the code could be 50% and even 70% more stringent.

Two respondents envisioned the energy code responding to technological advancements. One of these respondents advocated discussing how to adopt supplemental codes between cycles if significant technological innovation and developments merit it.

Table 51. Energy Code Increase in Stringency Possible

Future Energy Code (n=10)	Count
10%-20% stringency increase by next code cycle	3
30% stringency increase by next code cycle	2
30% stringency increase by 2012	1
50% or more stringency increase by 2012	2
20% stringency increase by 2020	1
Meet/stay current with national/federal codes	4
IECC by 2009	3
Lighting will be addressed in residential & non-residential	2
Performance based codes/density based codes	2
Keep up with technology/technological developments	2
Get people to comply with existing code/Difficult to enforce current code	2
Net zero by 2030; support 2030 Challenge	1
Total comments	24

Question 5. If not by 2010 or 2015, what do you think is the right time-frame and what is a reasonable goal to increase energy code stringency?

Five of the 17 respondents questioned whether increasing stringency of the energy code made sense at all, primarily given current issues of non-compliance in their area and throughout the region. These respondents did not offer a specific timeframe for a reasonable increase in energy code stringency, but rather called for attention to current issues of non-compliance. One respondent said the goal should be to craft attainable energy codes, considering cost. One respondent recommended continuous review and assessment of the energy code and that milestones are not needed.

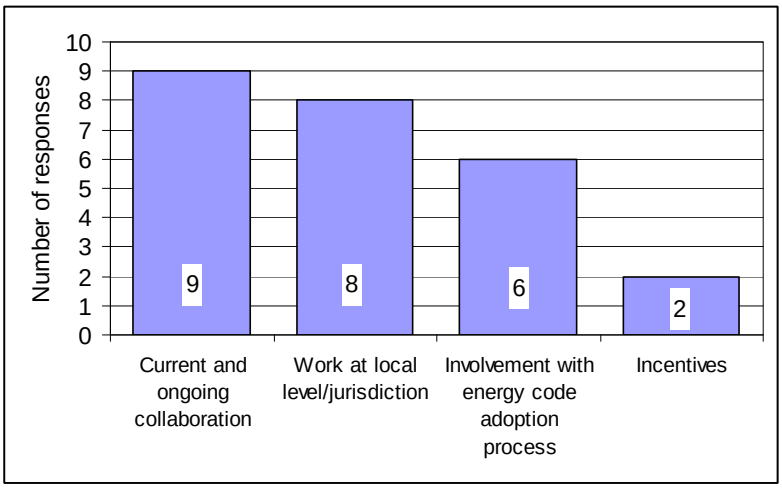
Question 6. What activities are currently being pursued to increase the adoption of more stringent energy codes?

Figure 7 shows the top four activities undertaken to increase adoption of codes, including collaboration with stakeholders, and advocating code adoption in their local jurisdictions. Nine respondents discussed current and ongoing collaboration with the DOE, universities, climate change groups, TAG, and seeking public input as powerful strategies for increasing the adoption of more stringent energy codes. Eight respondents work with their local jurisdictions to advocate for or adopt codes, and to enforce compliance. Six respondents indicated their involvement with the energy code adoption process was their primary activity for bolstering the adoption of more stringent energy codes.

Three respondents individually mentioned they were respectively researching manufacturer's technological developments, closely following the NHB Green Standard program, and encouraging demonstrations of above code projects to show that it above code buildings are a

reality today and can be built economically. Two respondents pushed for incentive programs to facilitate the adoption of more stringent energy codes. One of these respondents suggested incentive programs should better align with current or updated energy code goals to allow for residential or non-residential owners and builders to comply with more stringent energy codes, and the other advocated for simple, fixed-rate incentives that didn't require complex administrative efforts to receive.

Figure 7. Top Activities to Increase Energy Code Adoption



Question 7. What areas of the energy code would you most like to see changed? (Where will you focus next on code adoption activities?)

We asked respondents to list the areas of the energy code that needed to be changed. Specific measures and systems requiring more attention received 16 references. Four of these respondents mentioned the building envelope, and four mentioned lighting systems needed the most attention in future adoption activities. Three respondents wanted duct systems addressed more diligently in residential and non-residential energy codes. Others referenced advanced framing techniques, higher-efficiency mechanical systems, better residential windows, and plug load (one mention each).

Table 52. Areas Ready for Energy Code Changes

Theme (n=17)	Frequency
Specific measures	16
Compliance path options	7
Systematic changes	8
Total comments	31

Multiple responses allowed

Respondents stated the non-residential energy code could improve controls and economizers. The residential energy code could become more stringent by addressing advanced framing techniques and higher-efficiency mechanical equipment. One respondent called for diligent exploration of new, more efficient technologies and noted that the energy code needs to be more

responsive to such developments. Lastly, one respondent pushed for consideration of performance-based testing for air infiltration.

Eight respondents called for systemic changes to the residential and non-residential energy code. For instance, four highlighted the overall need to simplify the energy code. They claimed simplicity was the key to appropriately applying the code and ensuring better compliance. Two respondents did not like using Res-Check or Com-Check, and called for a simplified approach to gauging compliance. One respondent said that energy and mechanical codes needed to be better coordinated, and another respondent called for more collaboration with ASHRAE.

Six respondents wanted the energy code modified to be more flexible and use the prescriptive path for compliance. For example, five of these respondents advocated changing the energy code to allow multiple options to achieve an efficiency standard.

Question 8. Is there anywhere else where energy could be saved that the energy code has not focused on?

Three of 17 respondents claimed the residential energy code is stringent enough and the potential for additional energy savings was exhausted. Two respondents claimed that residential buildings are tight enough, and that adding mechanical ventilation introduces an energy penalty and potentially other health hazards. Furthermore, one respondent believed that if the residential energy code were any more stringent, it would adversely affect the cost of the home, thereby making the cost prohibitive to first-time homebuyers.

Two respondents offered that lighting is an area where energy codes could focus to generate more energy savings, especially as lighting technologies continues to advance. One respondent pointed to HVAC sizing and design as an area that could still achieve energy savings. One respondent mentioned solar orientation as a strategy that could achieve considerable energy savings.

One respondent highlighted the need to address commercial equipment, such as computers and other office equipment. One respondent wanted the non-residential energy code to address refrigeration and cooking equipment. Similarly, one respondent claimed there was dramatic energy saving potential among public works projects that currently do not fall under the non-residential code, including wastewater treatment facilities and hospitals.

Lastly, individual respondents recommended energy codes need to stay abreast of technological developments that impact energy conservation, developing and supporting incentive programs for energy efficient technology, specifically directing training to those that maintain newer, more energy efficient equipment, and expanding the energy code to cover all forms of energy, not just electrical.

Table 53. Measures Ready for Focus in Next Code Cycle

Theme (n=17)	Count
No suggestions	5
Lighting: commercial, residential, highway	3
Homes already too tight: focus on materials that don't outgas; focus on education to avoid energy penalty with mechanical ventilation	2
Expand to apply to all forms of energy, not just electricity	2
Computers and office equipment	1
HVAC sizing and design	1
Non-residential refrigeration, cooking, hospital labs	1
Develop incentive programs to support gaps in energy code, including gas	1
Wastewater treatment and hospitals	1
Solar orientation	1
Technological development and standards	1
Focus on housing affordability: energy code can't be changed at this point without affecting cost	1
Direct training to maintenance of energy efficient equipment	1
Total comments	21

Multiple responses allowed

Question 9. Is there an area of the energy code about which you are most concerned?

Four of 17 respondents claimed they were currently not concerned about any aspect of the residential or non-residential energy code. Two respondents wanted to channel efforts towards continuing to improve and expand energy code training and training directed at those building structures as well as installing and maintaining measures. Two respondents called attention to the complexity of the energy code and advocated again for simpler energy codes. Two respondents advised making energy codes more responsive to the industry and technological developments that improve energy efficiency. One of these respondents noted there is a noticeable lack of attention and priority given to energy code compliance during inspections, and one suggested that the energy code needs to be more flexible in order to allow more architectural freedom and creativity.

Regarding specific measures the code addresses, three respondents pointed to a lack of stringency around controls, duct systems, and crawl spaces respectively. Another respondent reported being concerned with the lack of performance-based air infiltration procedures. Lastly, one respondent was concerned about the lack of energy codes for retrofitting existing homes.

Question 10. Earlier you noted that you [were/were not] involved with energy code compliance. Is this correct? Could you tell me which elements of compliance you work with, for example, design inspection or plans review, building inspection, something else?

Eleven of the 17 respondents were involved with energy code compliance. Eight of these respondents indicated they were personally involved in plans review, seven were involved in design inspection, and six were involved in building inspection. Five of the respondents were not directly involved in energy code compliance.

Question 11. We are interested in the process your jurisdiction uses to fully enforce the code. Can you tell me about that?

Two major themes surfaced when we asked respondents about their process for enforcing the energy code. Eight of the eleven respondents referenced the enforcement process as reviewing plans, offering permits, gaining compliance paths using Res-Check or Com-Check, and conducting energy inspections during construction.

Three respondents described energy code enforcement primarily as a training issue. One respondent offered that they engage in one-on-one training with contractors. One respondent indicated training should be directed to the sub-fields involved in building homes and non-residential facilities.

Question 12. What do you think motivates you or your team to do a good plan review for energy code compliance?

We asked the codes officials and stakeholders what motivates them or their team to conduct good plan reviews for energy code compliance. Four respondents commented that they and their team were trained and very dedicated, and their philosophy was to educate. Another noted they have an energy conscious community, and this was a good way to avoid building another power plant. Another respondent said they were motivated to be a good shepherd and lead by example. One respondent said a good plan review identifies problems before they manifest in the field, and it is easier to catch issues on paper ahead of time. Another four respondents claimed it was simply part of their job.

Question 13. Do you know what areas of the energy code have low compliance in your area/state?

Several stakeholders stated there were no problems or areas of low compliance. One stated jurisdictions are used to inspecting building envelopes and, generally, this has the best compliance statewide. One stated Washington is starting to require commercial commissioning, which will improve compliance. Another stakeholder stated they require every set of plans demonstrate compliance; so there is no low compliance. Another stated the non-residential sector compliance has been consistent with latest code.

Three of the 11 respondents working in the area of energy code compliance claimed there were no issues of low compliance in their jurisdictions; however, one still cited areas most commonly red-tagged. The remaining nine respondents provided specific examples of low compliance, as shown in Table 54 and Table 55. In the non-residential sector, two respondents cited commercial lighting and controls. Others listed HVAC, mechanical reviews, and one called for training on design heat load calculations to improve compliance. In the residential sector, two stated low energy code compliance with air sealing. Respondents attributed air leakage to misalignment of insulation. One said some were manipulating Res-Check to justify 2x4 framing. Others identified duct design and glazing, and one respondent said they lacked authority to enforce codes.

Table 54. Areas of Low Code Compliance by Residential and Non-residential Sector

Non-residential (n=9)	Count
Lighting & controls	2
Design heat load calculations	1
HVAC	1
Mechanical review	1
Residential (n=9)	**Count**
Air sealing	2
Glazing	1
Envelope	1
Duct design	1
Lack of authority to enforce	1

Multiple responses allowed

Table 55 shows most comments were about compliance in Idaho. Oregon respondents did not cite areas of low compliance, and Washington respondents provided only one comment.

Table 55. Areas of Low Compliance by State

Area	WA (n=3)	ID (n=4)	OR (n=1)	MT (n=3)	Total (n=11)
Lighting & controls		1		1	2
Glazing		1			1
Duct design		1			1
HVAC		1			1
Air sealing		1		1	2
Envelope		1			1
Lack of authority to enforce				1	1
Design heat load calculations		1			1
Mechanical review	1				1
No problem areas	1		1	1	3
Total comments	2	7	1	4	14

Multiple responses allowed

Question 14. How do you know when compliance is high or low?

Of the eleven respondents interviewed who were involved in energy code compliance, four respondents offered that the volume of complaints or correction notices was the best indicator of compliance in their respective areas. Two respondents also indicated that the building inspection was the best time to gauge compliance. Two respondents who work in states that do not have a statewide mandate to adopt energy codes mentioned the number of jurisdictions which have adopted the code is the best indicator of compliance in their area.

Two respondents who conduct plans review said the results of Res-Check and Com-Check are the best indicators of compliance. One respondent claimed they relied on a "gut feeling," one respondent indicated conducting plans review is the best tool for gauging compliance, and one respondent relied on researching code compliance studies to determine compliance rates.

Question 15. Limited information suggests regional energy code compliance is approximately 85% on average. Does this number sound reasonable for your area/state?

Table 56. Reasonableness of 85% Compliance Rate Estimate

Reasonable Estimate (n=16)	Count
No, less	1
Yes, reasonable	10
Residential is higher and commercial is lower	1
Don't know	4
Total	16

We asked respondents if an 85% energy code compliance rate sounded reasonable. Ten respondents said that 85% compliance was a reasonable estimate in their area, with three of the ten respondents indicating compliance varied by jurisdiction, and one stating non-residential compliance was much lower than 85%. One respondent claimed 85% was not reasonable and was too high. Responses by state are provided in Table 57.

Table 57. Reasonableness of 85% Compliance Rate Estimate By State

Reasonable Estimate (n=16)	ID	MT	WA	OR	Total
No, less	1	0	0	0	1
Yes, reasonable	4	3	1	2	10
Residential is higher and commercial is lower	0	0	1	0	1
Don't know	0	0	2	2	4

Question 16. What do you think can be done to improve energy code compliance?

As shown in Table 58, nine of the respondents noted the best strategy to improve compliance is supporting training, education, and outreach efforts. More specifically, five of these respondents suggested non-residential training directed to installation contractors, maintenance workers, and building owners. One respondent advocated for continuous training efforts.

Table 58. Methods to Improve Code Compliance

Method to improve code compliance (n=11)	Count
Training, education, and outreach efforts	9
Commissioning, performance-based testing, or HERS inspectors	6
Resources, funding, and staffing	3
Adopt most current code; plan review & certification; extend codes to rural areas	3
Incentives for energy efficiency upgrades; be responsive to technology	2
Total comments	23

Multiple responses allowed

Six respondents suggested commissioning, performance-based testing, special inspections, or using HERS inspectors could improve compliance with energy codes. Three respondents suggested compliance would improve if more resources, including staffing and funding, were available to conduct adequate compliance inspections, particularly in the non-residential sector, where the scope of the inspection is larger and more complex than in the residential sector.

One respondent said compliance would improve with the adoption of the most current energy code. Another noted that rural areas are not subject to an energy code. One suggested incentive programs for mechanical and energy-efficiency upgrades, particularly in the non-residential sector. One respondent stated the energy codes should be dynamic and responsive to technological improvements.

Overall, the majority of comments (15 of 23) centered on efforts focused on where the current code could improve compliance. These efforts include training, adoption of an energy code, and adding resources. The remaining comments (8 of 23) looked forward, suggesting new approaches to improving compliance, including, for example, performance-based testing, new technologies, and incentives.

Question 17. Can you tell me if there are additional resources you need to enforce the energy code?

We asked respondents if they needed additional resources to enforce codes. Three themes emerged: more training; additional funding and workers; and nothing, as shown in Table 59.

Table 59. Resources Needed to Enforce Code Compliance

Resources (n=13)	Count
Training, education, and outreach efforts	6
Resources, staffing and funding	3
Software tools for residential heat load calculations	1
No additional resources needed	4
Don't know	2
Total comments	16

Multiple responses allowed. Four not asked.

Six respondents stated training, education, and outreach were resources needed to enforce energy codes. More specifically, respondents cited training targeted to inspectors, designers, contractors, and architects. Similarly, one suggested stimulating customer awareness of energy-efficient equipment and payback to increase consumer demand.

Three respondents cited the need for more funding and staffing to enforce the energy code. One respondent requested heat-load calculation software for the residential sector. Four respondents claimed they did not need any additional resources. Two said they did not know which resources they needed.

Consistent with suggestions for methods to improve code compliance, respondents most often named training and education as the resource needed to enforce energy codes.

Perceptions about Energy Code Enforcement

Question 18. Do you know if the energy codes are uniformly enforced in your area? If not, explain.

Interviewers asked respondents if officials enforced energy codes uniformly in their jurisdictions. As shown in Table 60, eight said codes were uniformly enforced, seven said they were not, and two did not know.

Table 60. Perception about Uniform Code Enforcement

Uniform Enforcement (n=17)	Count
Yes, uniformly enforced	8
No, not uniformly enforced	7
Don't know	2
Total	17

Respondents who claimed that energy codes were not uniformly enforced mentioned enforcement varied primarily due to inconsistent interpretation of the energy codes (two comments), inferior or an absence of an energy codes in various areas (two), low priority of energy code compliance during inspections (two), and lack of awareness (two).

Table 61 breaks out responses by state, and shows that in Idaho and Oregon, more people stated codes were not uniformly enforced. In Montana and Washington, more respondents stated codes were uniformly enforced.

Table 61. Uniform Energy Code Enforcement

Enforced (n=17)	WA (n=4)	ID (n=5)	OR (n=4)	MT (n=4)	Total (n=17)
Uniformly enforced	3	2	1	2	8
Not uniformly enforced	1	3	2	1	7
Don't know			1	1	2
Total	4	5	4	4	17

Factors Influencing Evolution of Energy Code

Question 19. As a stakeholder in the NW new construction industry, or organization that interacts with this industry, what are the major factors (in your mind) that have influenced the evolution of the energy codes adopted in your state?

Respondents crediting influence to advocates and to energy-efficiency programs mentioned ODOE, BPA, NEEA, the Association of Idaho Cities, ASHRAE, the NW ENERGY STAR® Homes program, and Super Good Cents as well as utility programs and special interest groups in general. Other respondents gave credit to manufacturers of building materials and to technological advances.

Overall, economic factors, the fluctuating availability of energy, and awareness of the energy crisis received ten comments. Slightly more, 12 comments, attributed energy codes to legislative actions, advocacy groups, BPA, and utilities.

Table 62. Factors That Influenced Evolution of Energy Codes

Factors (n=17)	Count
High cost of energy and other economic factors	8
NEEA, ASHRAE, and other advocacy groups	5
Adoption of energy codes	3
BPA and utilities	2
Legislative action (e.g. Legislators passed the first energy code in 2002: 2000 IECC; DOE put energy code in place; Proactive leadership by state governments)	2
Public awareness from energy crisis	2
Fluctuating energy industry (due to weather, other factors)	1
Technology	1
Total comments	23

Multiple responses allowed

Table 62 shows that, of 17 respondents (making 23 comments), eight considered the high cost of energy and other economic factors to be most salient in influencing the evolution of energy codes in their respective states, and five listed NEEA, ASHRAE, and other advocacy groups. Others stated political will and legislative action were factors (two comments), BPA and utility energy efficiency programs (two comments), public awareness of the late 1970s and a nuclear power plant default (two comments), adoption of energy codes (three comments), technology (one comment), and the fluctuating energy industry (one comment).

Question 20. Have specific individuals, trade associations, manufacturers or organizations been influential in energy code adoption activities? If so, why do you feel that individual or organization had a strong influence on the in your state?

Codes officials and other stakeholders were asked if they could name specific individuals or organizations who had been influential in code adoption activities. A number of associations named included, for example, the Building Industry Association and the Building Contractors Association, ASHRAE, AIA, the AGC, and Realtors Associations. Others named NEEA and

Building Officials as well as the International Code Conference, Code Bureau, and the Building Code Advisory Council.

Government agencies and departments are also influential participants in code adoption activities. Three respondents credit the following with influencing the evolution of energy code: ODOE, the City of Seattle, the Department of Labor (DOL), the Idaho State Energy Bureau, and the Department of Natural Resources (DNR), BPA, local utilities, and ESCOs. Energy-efficiency incentive programs also influence adoption activities. Environmental groups and low-income advocacy groups are also influential. Appendix B lists the agencies and businesses respondents cited as influential in energy code adoption activities.

Question 22. What have been the most effective strategies used by this individual/group?

We asked respondents about the most effective strategies used to influence energy code adoption. Table 63 and ranks the responses most often listed by the stakeholders. At the top of the list are collaboration and outreach by and to other industry groups, followed by participation in Technical Advisory Groups, and lobbying or grassroots organizing.

Respondents discussed the strategies used by both opponents and proponents of energy codes. One respondent noted that advocates use collaboration and opponents use lobbying strategies to press their points. Other comments about opposition to energy codes included the perception that energy codes go too far too fast, and that no trade organizations support more stringent energy codes. This respondent supports energy codes that balance payback and affordability.

Table 63. Most Effective Strategies Used To Influence Energy Code Adoption

Most Effective Strategy (n=17)	Count
Industry collaboration/outreach	9
TAG participation	6
Lobbying/grassroots campaigns	6
Education/training	3
Incentives and rebates	3
Research/data support	2
Mandate	2
Financial support	2
Time and analysis	1
Technical help	1
Started own business	1
Participation in energy forums	1
Consulting	1
Amended Codes	1
Total comments	39

Multiple responses allowed

Question 23. The energy code currently does not measure whether the equipment or materials used in construction perform the way they are supposed to. Do you think it is reasonable to put testing-based requirements in the energy code? An example would be determining whether air infiltration in a home is below a code-specified level by requiring a blower door test.

Table 64. Preference for Including Testing-Based Requirements in the Code

Testing-based requirements (n=17)	Count
Yes, support	9
No, oppose	6
Undecided	2
Total	17

As Table 64 shows, over half of the stakeholders (9 of 17, 53%) supported the inclusion of testing-based or performance requirements and commissioning in energy codes. Six (35%) opposed performance-based codes, and two (12%) were undecided.

The current lack of funding and an infrastructure to conduct the testing is the barrier most often named by both the proponents and opponents of performance-based testing. Contractors noted funding beyond fees and permits is required to implement performance-based testing. Table 65 shows the qualifications added by respondents who supported testing-based codes. Three said testing requires appropriate funding, and a third party should implement the testing. One said performance-based testing should not be a blanket policy, but the testing is a tool that can examine issues that have surfaced.

Table 65. Comments from Opponents of Testing-Base Code Requirements

No, oppose: additional comments (n=6)	Count
Not without outside funding. Needs funding; costly to customer and jurisdiction	4
That's what energy codes are for	1
Useful for voluntary programs and to improve statistical research	1
Oppose residential; once have equipment, is pretty good	1
Total comments	7

Table 66 lists the comments made by respondents opposing performance-based testing within the energy code. Again, respondents stated it needed appropriate funding, should be implemented by an independent third party, and it is appropriate for commercial applications.

Table 66. Comments from Proponents of Testing-Base Code Requirements

Yes, support: additional comments (n=9)	Count
Not without appropriate funding	3
Implement with third party	1
Not use as blanket policy, but to point to issues	1
Yes, for commercial	1
Would advocate for commissioning or testing	1
Total comments	7

Question 24. Is work being done in your state to encourage or adopt testing-based energy code requirements? (Who is working on that? What are they doing?)

Table 67. Work Being Done on Performance Based Codes

Testing-based energy codes (n=15)	Count
Yes, work is being done	1
It is being considered and discussed	6
No	8
Total	15

Only one respondent said Boise, ID, is working to adopt NW ENERGY STAR® Homes program standard with the performance-based testing. Six respondents stated performance-based testing is under consideration or discussion in their state. Several noted that jurisdictions are using performance-based testing on a voluntary basis.

Table 68 shows the comments added by respondents who supported testing-based codes. Three said testing requires appropriate funding, and a third party should implement the testing. One said performance-based testing should not be a blanket policy, but the testing is a tool that can examine issues that have surfaced.

Table 68. Comments from Opponents of Testing-Base Code Requirements

No, oppose: additional comments (n=6)	Count
Not without appropriate funding. Needs funding; costly to customer and jurisdiction	4
That's what energy codes are for	1
Useful for voluntary programs and to improve statistical research	1
Oppose residential; once have equipment, is pretty good	1
Total comments	7

Table 69 lists the comments made by respondents opposing performance-based testing within the energy code. Again, respondents stated it needed appropriate funding, should be implemented by an independent third party, and it is appropriate for commercial applications.

Table 69. Comments from Proponents of Testing-Base Code Requirements

Yes, support: additional comments (n=9)	Count
Not without funding	3
Implement with third party	1
Not use as blanket policy, but to point to issues	1
Yes, for commercial	1
Would advocate for commissioning or testing	1
Total comments	7

Northwest Best

Question 25. I'd like to ask a couple of questions about Northwest Best. Northwest Best refers to a best-practice goal for NW energy codes. Have you heard about Northwest Best? What is your general opinion about Northwest Best? Have you ever used Northwest Best?

Responses are tabulated in the Northwest Best Appendix.

Stakeholder Participation

Question 27. Is there anything else that we have not yet talked about that you think would be helpful for us to know so that we can make recommendations regarding the energy codes process and providing support to building industry professionals?

Five respondents suggested that industry collaboration and training are factors crucial to improving the energy codes. They noted that programs need to demonstrate value of energy efficiency upgrades and that the entire burden of energy conservation should not rest with building codes and government.

One respondent said that a disconnect existed between homebuyers and homebuilders. While builders feel that energy efficiency upgrades will add additional cost to the price of a home, they stated energy efficiency options are not offered buyers at the time of purchase.

One respondent supported performance-based practices substantiated with sound engineering and verified by field-testing. Another noted training and outreach were factors driving energy efficiency. One stated that NEEA has been very good about providing full time staff, which properly supports these efforts. He also stated the largest responsibility falls on the homeowners and building owners.

Summary of Key Findings from Stakeholder Interviews

- The majority of state and local officials and stakeholders advocated continuous improvement in energy code stringency. Continuous improvement in the stringency of energy codes is expected by responding to technological advancements and keeping current with national codes, including adopting the 2009 IECC. Respondents stated 10%–50% improvement by the next code cycle is possible, with most stating a 30% increase was possible.

- Stakeholders stated code adoption activities should focus next on specific measures, compliance path options, and systemic changes such as simplifying code language. Specific measures referenced ducts and energy-efficient HVAC, advanced framing techniques, envelope and glazing improvements, lighting and controls, plug loads, and technology developments in general.

- Stakeholders pointed to several areas with low energy code compliance, including lighting and controls, air sealing, and HVAC. Idaho stakeholders provided the most comments. Several respondents noted there were no areas where compliance with the code was low.

- Additional resources needed to enforce the code include training, education and outreach, funding, and staffing. Responses were consistent with suggestions for methods to improve code compliance.

- Respondents are nearly equally split in their perceptions that codes are and are not uniformly enforced. In Idaho and Oregon, more people stated the codes were not

uniformly enforced. In Montana and Washington, more respondents stated codes were uniformly enforced.

- The high cost of energy, the combined works of advocacy groups, utilities, legislative action, and public awareness stemming from the energy crisis are factors influencing the evolution of energy codes.

- Industry associations, codes-related organizations, and government entities are influential energy code adoption activities.

- The most effective strategies used to influence energy-code adoption activities include collaboration, outreach, and participation in industry groups, technical advisory groups, and grassroots campaigns. Simple diligence and reliance on accurate data supporting claims are also important strategies.

- Over half the stakeholders (53%) supported inclusion of testing-based performance requirements in the energy code, and 35% oppose performance requirements in the energy code. Proponents and opponents stated testing-based performance requirements need an infrastructure, appropriate funding, and independent third-party implementers.

Appendix E: Northwest Best Interview Responses

This Appendix includes questions and responses to survey questions about Northwest Best. Summary findings are included in Chapter 7.

Northwest Best aimed to improve each component of the *Best of Region* base guideline by the maximum amount feasible, while remaining cost-effective. The target was to improve each component by at least 15%.[17] NEEA formed a Technical Working Group (TWG), including Ecotope and critical stakeholders from around the region. The TWG reviewers vetted input to develop the *Northwest Best* standard.

Northwest Best's "reach code" was intended to establish concrete code adoption alternatives, which are significantly beyond existing codes but still politically and technically practical. The intent was to serve as a guideline for both residential and non-residential state energy code adoptions for the next five to seven years. *Northwest Best* targeted a 15% increase in stringency from the toughest existing section of each state. In other words, if, among the four state codes, the residential window requirement is most stringent in Idaho, the reach code requirement would be based on Idaho plus 15%. For example, if the most stringent commercial envelope requirement is in Washington then the reach code requirement is based on Washington plus 15%. This logic applies for all sections of the code. The 15% figure is only a rough, overall target. Certain sections of the existing codes may have little room for improvement given common, existing technologies and practices; other sections may be able to improve by 20% or more.[18]

NEEA also charged Ecotope with conducting a cost-effectiveness analysis for each measure identified and included in *Northwest Best*. The *Best of the Region* and the *Northwest Best* standard are now completed projects. *Northwest Best* standards for residential and non-residential applications are available to any entity or jurisdiction to use.

Table 70 shows the distribution of the two groups of respondents. We asked Group One about their familiarity with *Northwest Best.* Group Two consisted of members of the *Northwest Best* TWG who received additional questions.

Table 70. *Northwest Best* Sample Disposition

Interview Group	Group One	Group Two
NEEA Staff and Energy Codes Contractors	7	5
State and Local Energy Codes Officials	8	1
Other Stakeholders and Market Actors	8	2
Total in Each Group	23	8

[17] NWBest Measures spreadsheet with Introduction, provided by NEEA.

[18] Statement of Work, Development of a Regional Energy "Reach" Code between the Northwest Energy Efficiency NEEA and Ecotope, Incorporated.

Group One: Stakeholder Familiarity and Perceptions

Question 1. Have you heard about *Northwest Best*? What is your general opinion about *Northwest Best*? Have you ever used *Northwest Best*?

Other than NEEA codes contractors, familiarity with *Northwest Best* among energy codes stakeholders was low. Table 71 shows the number of respondents who knew about *Northwest Best* as well as those who did not. All NEEA staff and energy codes contractors funded by NEEA were aware of *Northwest Best*. Of the eight state and local energy codes officials and other stakeholders interviewed, only two were aware of *Northwest Best.* Of the nine other energy codes stakeholders and market actors interviewed who were not involved in the development of *Northwest Best,* only three were aware of *Northwest Best*. This is not surprising, however, since state and local codes officials do not typically participate in the development of code language and activities prior to code adoption.

Table 71. Knowledge of *Northwest Best* in Group One

Interview Group	Knew of Northwest Best	Did not know of Northwest Best
NEEA Staff and Energy Codes Contractors (n=7)	7	
State and Local Energy Codes Officials (n=8)	2	6
Other Stakeholders and Market Actors (n=8)	2	6
Total	11	12

Question 2. What is your general opinion about Northwest Best? Have you ever used Northwest Best?

Those familiar with *Northwest Best* stated it was a good effort and a useful process that identified the strengths of each state code. Most respondents understood the intent was to provide information and examples for future energy code development and changes, and that it provided a laundry list of opportunities. Table 72 shows respondents' general comments.

Table 72. General Opinion of *Northwest Best* in Group One

Perception (n=12)	Number of responses
Good effort and/or useful process	5
Stakeholders can get ideas from it	5
It is a roadmap to increase efficiency by 15%; provides laundry list of opportunities	3
Looking into using it	1
Don't think it will work	1
No economic analysis	1
Unsure of being used	1
Total Comments	17

Multiple responses allowed

None of the respondents said they were actually using the *Northwest Best* reach codes. Four said they were thinking of using it/had passed it on to others, and one noted he used it when talking about above codes standards to jurisdictions. One stated he was looking into incorporating elements into the commercial code.

Group Two: Perceptions of Northwest Best Technical Working Group Members

Question 3. What was the objective, or overall concept, behind developing Northwest Best?

First, working group members looked at the four states for commonalities and differences, and found the "best of the best" in each area of the code (e.g., lighting, mechanical, shell measures, etc.). This process resulted in a *Best of the Region* document that mapped out code similarities and differences between the states. Second, the working group developed *Northwest Best* to provide a coherent road map to future efficiency improvements. *Northwest Best* recommended code that would improve efficiency by 15% over the *Best of the Region*, and offered code language that could continue to improve efficiency and code development at IECC and the local level. The working group modeled the document's code language after IECC language, albeit different from Washington and Oregon language, so anyone could use the model code with the understanding it would likely be "tweaked" by the states to fit their needs.

All but one respondent reported that *Northwest Best* did not include full economic modeling for cost effectiveness. Respondents noted that by virtue of including existing code in the *Best of the Region*, they assumed that code had already gone through economic and political screening. As one stated, the "proof was in the pudding" and the "pudding was the existing code."

Question 4. Who was supposed to use *Northwest Best*? Did they? How did they use it?

We asked the eight respondents who was supposed to use *Northwest Best*. They variously referenced the differences between the four Northwest states, the Power Council's Fifth Power Plan, and IECC. Only one respondent said he did not really know who was supposed to use *Northwest Best* or what it was supposed to do.

Regarding state energy codes, respondents noted the four states had diverged in their approach to adopting energy codes for some time. Idaho and Montana were using the IECC code models. Washington and Oregon were establishing their own state energy codes. As codes are coming closer together, *Northwest Best* offers insight into the best codes within the region and a means to go 15% beyond the best. Two respondents noted that Washington and Oregon were using *Northwest Best* in their submittals for code changes, with one including Idaho on that list. One respondent said *Northwest Best* offered assistance when working with IECC on the national level.

The Northwest Power and Conservation Council used the code to help formulate recommendations for MCS in the Fifth Power Plan. The Fifth Power Plan incorporated the less stringent set of codes, that is, the *Best of the Region* into the model standard.

Question 5. What was learned through the process of developing *Northwest Best*?

When we asked respondents what they learned in developing *Northwest Best*, they reported the process got everyone thinking, and it was an awareness builder. They also learned a lot through consensus building, and confirmed people care about saving energy. Respondents stated they learned what the region's base standard looked like, and what the median level and highest level of efficiency would be. *Northwest Best* was more like a benchmark showing what 15% better than code would look like.

One said that while there were some differences between states, the states' energy codes were not that different; the states had more in common than not. Two respondents noted that energy codes produce a little competition between Oregon and Washington, as neither wants to fall behind the other.

The working group also found that increasing energy efficiency 15% over current code pushed the edge of current technology and standard practice. Performance based codes will likely be needed as energy efficiency and code stringency are increased. With performance-based energy codes, computer simulation is required, but it permits a whole-building performance target (kWh/sq. ft.). One respondent pointed to California as the classic example where performance-based Title 24 is in effect, supported by a simulation-modeling infrastructure. Respondents noted that with simulation tools it is difficult to check all the inputs. Rather than investing infrastructure on computer modeling, the Northwest chose checklist codes based on market research that analyzed why codes worked or did not work. The intent was to capture the most activity with simple to implement codes.

Respondents stated *Northwest Best* is the point where the implementation checklist and best practices come together, and includes both prescriptive and performance-based codes. For example, in residential construction, 2x6 walls and advanced framing techniques are at the edge of prescriptive approach. In addition, although difficult, commissioning and control strategies will need promulgation into codes. In short, respondents stated increasing stringency by 15% would require implementation of performance-based practices.

One respondent stated the biggest energy advantage may be in lighting power densities and other code changes are really "pretty nichey." For example, *Northwest Best* includes demand control ventilation for smaller buildings currently outside the purview of codes. The respondent noted this is a small niche, and there are many provisions like this that do not offer large gains in one place.

Respondents also noted the industry is moving fast, and some codes may already supersede *Northwest Best*. Some respondents expect energy code stringency to be 15% above *Northwest Best* within two years and 30% above in five years. Another respondent noted that with Oregon's Governor pushing for better than current codes; the *Best of the Region* and *Northwest Best* may soon be dated. One respondent stated ASHRAE and IECC may make another round of improvements beyond *Northwest Best,* and states may model codes after ASHRAE and IECC. One person noted *Northwest Best* provides an historical context for tracking the evolution of code changes.

In short, Northwest Best sets a new benchmark, can help to bring buildings into mainstream compliance, and can act as a stepping-stone to address carbon footprints and global warming.

Question 6. What were the outcomes of *Northwest Best*? What other benefits have resulted from *Northwest Best*?

We asked respondents about the outcomes and benefits of *Northwest Best*. In addition to the items listed in the question above, respondents reported that *Northwest Best* is a good map to help remember where we are and take the next step. *Northwest Best* developed a set of tables

listing all code provisions by state. The tables get referenced often and are used to develop code that could be used on a state and national level.

The *Northwest Best* program manager reported that everything included in the proposed codes is cost effective, that is, they ran simulations and only included cost effective measures.

Respondents note that instituting more stringent code may have unintended consequences, as we do not have complete information about the measures and their different interactions.

Question 7. What barriers or potential barriers to *Northwest Best* have you encountered?

We asked respondents about the barriers or potential barriers to *Northwest Best* they had encountered. Two respondents reported that there were no barriers because *Northwest Best* was a voluntary standard. Others noted it is scary for some builders to go beyond code, or for contractors to do something different. Another noted that the barrier is lack of confidence regarding how measures will perform. For example, some say that air barriers have not proven cost effective.

Another challenge, not necessarily a barrier, is that as codes get tighter there will likely be tradeoffs. It is not obviously clear which are the best codes and what the interactions between provisions will produce. For example, lighting densities reductions lead to cooling load reductions but the heating load could increase, and, glass may not look as good with lower lighting densities. The respondent stated modeling will avoid unintended consequences.

One respondent noted that codes would go beyond *Northwest Best* within three years. Respondents report that energy code changes are happening quicker than expected, and that *Northwest Best* has counterparts in increasing energy efficiency, such as Advanced Homes and NW ENERGY STAR® Homes in the residential sector and ASHRAE 189, LEED and green building standards in the commercial sector.

Question 8. What role does *Northwest Best* play now?

Respondents noted energy standards and code changes are moving faster than expected. *Northwest Best* plays a role only where states are motivated, setting a new benchmark. One respondent noted that, with current emphasis on carbon footprints and global warming, *Northwest Best* is a good model. Another said that if we look at current standards and activities, such as Advanced Homes and NW ENERGY STAR® Homes in the residential sector and ASHRAE 189, LEED, and green building standards in the commercial sector, we might question whether to put any more money into *Northwest Best*. Another respondent said *Northwest Best* would help to bring more buildings into mainstream compliance; it closes loopholes.

Summary of Key Findings from Northwest Best Interviews

- Other than NEEA energy codes contractors (seven respondents in survey Group One), familiarity with *Northwest Best* among energy codes stakeholders was low, where 25% (4 of 16) of respondents report knowing about *Northwest Best*. Of those aware of *Northwest Best*, most understand it is a set of model codes that can be used to advance codes in their

- The 11 respondents not involved with the *Northwest Best* TWG but familiar with *Northwest Best* stated it was a good and useful process. However, no one in this group had used *Northwest Best*.

- *Northwest Best* identified the "*Best of the Region*" in energy codes, improved them by 15%, and provided a coherent road map to future efficiency improvements through code language any state can utilize. As codes around the region come more in sync with each other, *Northwest Best* is a powerful tool, and offers a clear means to push beyond the *Best of the Region*. Respondents from the *Northwest Best* TWG noted Washington, Oregon, and Idaho used *Northwest Best* in their code change submittals, and *Northwest Best* provided synergy with the Planning and Conservation Council's MCS in the Fifth Power Plan.

- *Northwest Best* pushed energy code to new levels, forcing serious consideration of not only stringent prescriptive code, but also performance-based practices.

- *Northwest Best* sets a new benchmark, can help to bring buildings into mainstream compliance, and can act as a stepping-stone addressing carbon footprints and global warming. Respondents report energy code changes are happening more quickly than expected, and *Northwest Best* has counterparts in increasing energy efficiency, such as Advanced Homes and NW ENERGY STAR® Homes in the residential sector, and ASHRAE 189, LEED and green building standards in the commercial sector.

Appendix F: Northwest Energy Codes Group Interview Responses

This Appendix includes questions and responses to interview questions asked about the Northwest Energy Codes Group and national level activities. Summary findings are included in Chapter 8.

Question 1. Describe your role with the Northwest Energy Codes Group.

When asked to describe their role with the Northwest Energy Codes Group, respondents reported being involved in writing model national codes and above-code standards, participating in the NECC/IC committees, the IECC committee, and were involved at the state level.

Respondents report that the reputation of the NWECG is very strong, and other market actors perceive the group as well organized, active and effective. Respondents thought that the NWECG was in a good position in the national sphere, positioned as a "moderate" within the efficiency camp but not with the "radicals."

Perceptions about the Northwest Energy Codes Group

Question 2. In terms of the IECC/IRC code adoption processes, how would you describe the reputation of the NWECG?

The NWECG is well organized and in good position as a moderate within the efficiency camp. They are a respected, active player, working for code change at the national level. By comparison, some view ACEEE as very aggressive and California is a bit "in their own world." Florida may have a national reputation, and Minnesota has a strong reputation.

Question 2B. Do you believe most people think the NWECG represents the entire NW?

The NWECG is most involved with writing national codes: that is, originating code changes. They are active and effective, especially in Washington and Oregon. When we inquired about the NWECG's reputation, respondents reported it is very strong and well organized, especially over the last two cycles. Respondents thought the NWECG is in a good position as a moderate within the efficiency camp but not with the radicals and is effective because of their reputation for moderation; they are "not the highest bar to jump over." By comparison, some view ACEEE as very aggressive and California is a bit "in their own world." Florida may have a national reputation, and Minnesota has a strong reputation. Respondents noted that NWECG spokesperson also represents Washington State University, and, as a result, he is viewed as less biased, more knowledgeable, and acting in the public interest. The NWECG probably does not represent all of the Northwest, as there are other industry groups not represented.

Question 3. Can you give examples of specific areas where you think the NWECG has been successful or influential?

Table 73. NWECG Successes

Response	Count
Submit commercial and/or residential code changes (28 last August)	3
NWECG gets invited to meetings of other regional and national stakeholder groups (to build alliances, share information, and assist other groups)	2
Submitted 9 amendments to 2005 IECC hearings	1
NWECG top 1 or 3 in authorship/proponents of energy code	1
Successful modification of IECC recessed-can light code in last session	1
Pressure on states to adopt unified set of model codes to keep state and national code closely aligned	1
NWECG filled void created when Natl Bldr Inst changed leadership	1
Provides help to other groups (writing code language)	1

Respondents listed several successes. The NWECG submitted nine amendments to the March 2005 IECC hearings, all based on Northwest code experience. The NWECG submitted 28 code change proposals in August 2007, a significant effort. One person noted the Northwest is either in the top one to three authors/proponents of energy codes changes. One respondent stated the NWECG was more influential with commercial code changes, particularly building energy, mechanical, and lighting issues. Another respondent stated that Chuck Murray, the NWECG's spokesperson, modified IECC recessed-can light code in the last cycle. Once approved, this will change the energy code at the national level.

Two respondents observed invitations extended to members of the NWECG to attend meetings of other energy codes stakeholder groups. This is important to build alliances, share information, and assist other groups.

Respondents offered a wide variety of suggestions for improvement, including working outside of their peer group, and looking at energy codes from other stakeholders' perspectives, and creating alliances with other regional groups. As one respondent noted, it is important to keep the state and national codes closely aligned; so the states adopting the IECC are not forced to adopt inefficient codes. Overall, the NWECG has matured to the level where they have the opportunity to and can influence energy code adoption at the national level and improve energy efficiency.

The NWECG submitted 28 code change proposals last August, which reportedly put the group in the top three authors/proponents of energy code changes. The NWECG is invited to stakeholder meetings around the country and has been an active player working for code change at the national level.

Question 4. How do you think the NWECG can increase its influence and success?

Table 74. Suggestions to Increase NWECG Influence

Response	Count
More discussion with cohorts outside the region and peer groups	3
Get more involved with national groups	2
NWECG is working in the right direction	2
More discussion with "green" groups	1
Look at codes from other perspectives, i.e., groups without "green" or "energy" in the title	1
Deal less with those already committed	1
Get overall game plan and stick with it	1
Pick a couple of big things and work on them	1
Remain independent	1

Several made suggestions to increase NWECG influence and success. As a whole, respondents recognized building relationships and recognition with the IECC and stakeholders takes time. All stated the group was moving in the right direction. One person thought more effort could be made to go outside of the peer group and look at energy codes from other perspectives (i.e., work with groups that don't have "energy" or "green" in their name). Others stated the group's effectiveness can be increased by reaching out to other energy code advocate groups at the regional or national level. While the NWECG wants to and should retain its independent voice, there can be synergies working with regional groups, such as the Northeast Energy Efficiency Partnership's Northeast Regional Building Energy Codes Project, the Southwest Energy Efficiency Project, and the Southeast Energy Efficiency NEEA, the DC based Energy Efficiency Codes Coalition and/or NEEA to Save Energy's Building Code Assistance Project.

One respondent also stated that to increase effectiveness, the NWECG should pick a couple of big things and work on them, and to stick to an overall game plan. Another respondent stated the key to success is to continue submitting code change proposals, testifying, and to continue weighing in on proposals.

Summary of Key Findings of the Northwest Energy Codes Group

- The NWECG is well organized and in a good position as a moderate within the efficiency camp. They are a respected, active player working for code change at the national level. The NWECG submitted nine amendments to the March 2005 IECC hearings, all based on Northwest code experience. In 2007, the NWECG submitted about 28 code change proposals. The IECC has approved some code proposals submitted by the NWECG.

- The NWECG has the opportunity to and can influence energy code adoption at the national level and improve energy efficiency. As invited participants to other energy codes stakeholder groups, the NWECG can build alliances, share information, and assist other groups.

- The NWECG has been effective in creating relationships necessary to push forward national code changes. NWECG can increase influence and success by reaching out,

building relationships and recognition with IECC stakeholder groups, and staying involved at the national level.

- NEEA contractors are also members of other energy code committees including: ASHRAE, NFPA, NFRC, and IRC. Their work contributes to the overall increase in energy efficiency and stringency of these standards. Coordinated efforts both push and pull state and national codes, increasing compatibility between the national IECC codes and Oregon and Washington state codes.

Appendix G:Webinar Training Survey Responses

This Appendix reports results of the Webinar Training Survey. Summary findings are included in Chapter 9.

The Northwest Energy Efficiency Council (NEEC) offered three Webinars at no cost to the participant in the areas of envelope, lighting, and mechanical systems. NEEC marketed the Webinars by sending a flyer electronically to a list of engineers, designers, and contractors who had contacted the Washington energy codes contractors for technical assistance in the past or who had some other previous contact with the codes contractors. NEEC sent the flyer to all jurisdictions statewide and posted on their websites. NEEC also posted the training flyer through other professional associations, such as ASHRAE.

Quantec designed surveys to ascertain whether participants were satisfied with the Webinar format and how well it worked in each of the three training sessions. The interviews covered the following topics, as appropriate to the training session attended (lighting, envelope, or mechanical systems):

- Respondent background
- Reasons for attending and not attending specific Webinars
- Satisfaction with each Webinar
- Assessment of training format and presentation
- Changes in practice after training
- Perceptions about energy code compliance and enforcement

Quantec designed the surveys and sample plan, and outsourced the administration to RDD. Quantec conducted surveys in September and October 2007. Since the Webinars occurred in June, conducting surveys three months later provided attendees with an opportunity to use the information and provided a window of time for attendees to assess the information's usefulness.

The following report summarizes the key survey responses and provides insight into meaningful trends in participant responses. The structure of this section follows the order of questions included in the survey instrument, with summary statistics listed for the survey data collected.

Sample Disposition

The Webinar participant list included 204 participants, with 191 having contact phone numbers. We proposed a sample plan based on 191 participants, 95/10 confidence and precision, and 64 completed surveys. At the interview's onset, we confirmed which Webinars the respondent attended. There was some difference between registration sheets and actual Webinars attended; 12 attended a different number or combination of sessions than recorded. For example, of the 12 attending different sessions than originally reported, there were four fewer attending three Webinar modules. A 90/10 confidence interval and level of precision with 98 participants (4 fewer than the 102 reported) attending all three modules required 40 completed surveys.

Table 75 shows the number of participants and the attendance summary by training module. According to the registration lists, 102 participants completed all three modules. There were also 35 participants attending only one module and 44 who attended two modules. Attaining a 90/10 confidence interval with 102 participants attending all three modules required 41 completed surveys. A 95/10 confidence interval required 64 completed surveys.

Table 75. Webinar Participant Summary

Cleaned List (with phone numbers)	
Total participants	191
Workshop Attendance	
6/13/2007 Envelope	138
6/26/2007 Mechanical Systems	158
6/28/2007 Lighting	143
Attendance Breakdown	
Attended Envelope and Mechanical	22
Attended Envelope and Lighting	6
Attended Mechanical and Lighting	16
Attended all three	102
Attended Envelope Only	8
Attended Mechanical Only	18
Attended Lighting Only	19

Quantec proposed a sample plan based on 95/10 and 64 completed surveys. Of the 64, we planned to draw 41 from the sample of 102 participants (achieving 90/10 within this group). We split the remaining sample between those who attended one module (target of 12 surveys) and those who attended two modules (target of 12 surveys).

We grouped participants according to their self-report and asked questions pertaining to the specific Webinars the respondent attended. We also used the self-report of Webinars attended to complete our interview sample frame.

Table 76. Number of Target and Completed Surveys

	Sample Pool	Target	Completed
1 Webinar	49	12	12
2 Webinars	45	12	13
3 Webinars	98	41	40
	191	65	65

Table 76 shows the sample pool, target number of interviews, and number of completed surveys. We made multiple calls to each participant on the contact list and finally exhausted the three-session Webinar strata, falling short by one survey. We exceeded the two-session Webinar target by one survey.

Overall, the survey sample evenly distributed the attendees across the three Webinars , with 80% of respondents attending the envelope Webinar and 82% attending the lighting and mechanical Webinars: Table 77.

Table 77. Webinar Attendance

Respondents Attending Webinars	Frequency	Percent
Envelope	52	80%
Mechanical	53	82%
Lighting	53	82%

Figure 8 shows the proportion of survey respondents participating in one, two, or all three Webinars. The majority of participants, 62%, attended all three of the Webinar trainings, per the sample design.

Figure 8. Number of Webinars Attended Per Participant

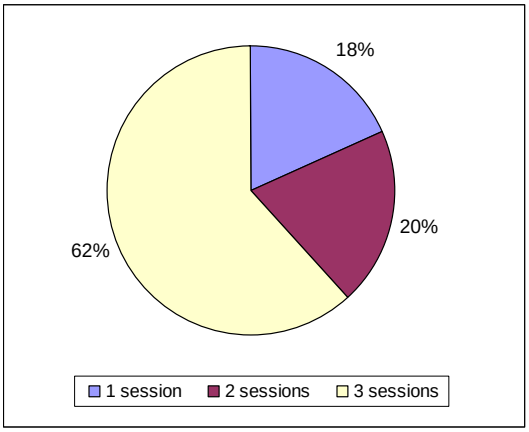
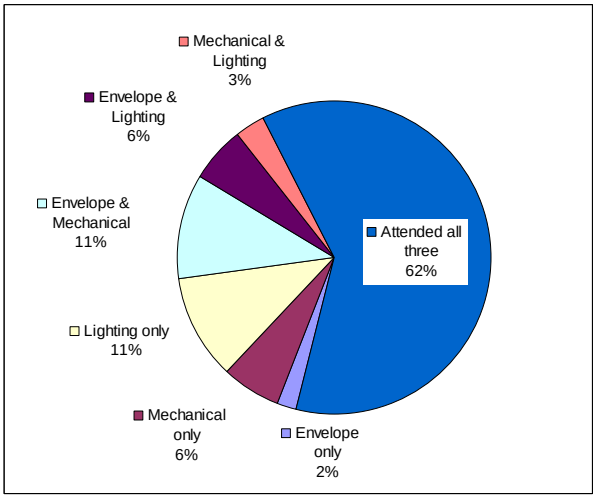


Figure 9 disaggregates participant attendance into the combinations of Webinar sessions attended. Again, 62% of participants attended all three sessions. Eighteen percent (18%) attended only one Webinar, including 11% who attended lighting, 6% who attended mechanical and 2% who attended envelope training. Of those attending two sessions (20% of participants), 11% attended envelope and mechanical, 6% attended envelope and lighting, and 3% attended mechanical and lighting Webinars.

Figure 9. Webinars Attended



Profile of Participants

The first set of questions were asked to develop a profile of the participants attending energy code training sessions delivered through this Webinar.

Question 1. Which of the following best describes your professional responsibilities?

Respondents were asked to name their professional responsibilities from a list, and asked to specify their profession if it had not been listed.

Table 78 shows 34% of respondents were plans inspectors, 29% were engineers, 15% architects and designers, 8% were both plans and field inspectors, and 5% were field inspectors. Grouping the plans and field inspectors together, 46% were public employees working with code compliance and enforcement. The remaining 54% are privately employed in fields that would typically produce the plans submitted for approval.

Table 78. Professional Responsibilities

Profession	Frequency	Percent
Design (plans) inspector	22	34%
Engineer	19	29%
Architect/Designer	10	15%
Both Field and Plans Inspector	5	8%
Field inspector	3	5%
Consultant	3	5%
Energy Analyst	1	2%
Manufacturer's Representative	1	2%
Salesman	1	2%
Total	65	100%

Table 79 shows the distribution of attendees' professions by Webinar. The distribution is very nearly the same across each of the Webinars.

Table 79. Professional Responsibilities by Webinar

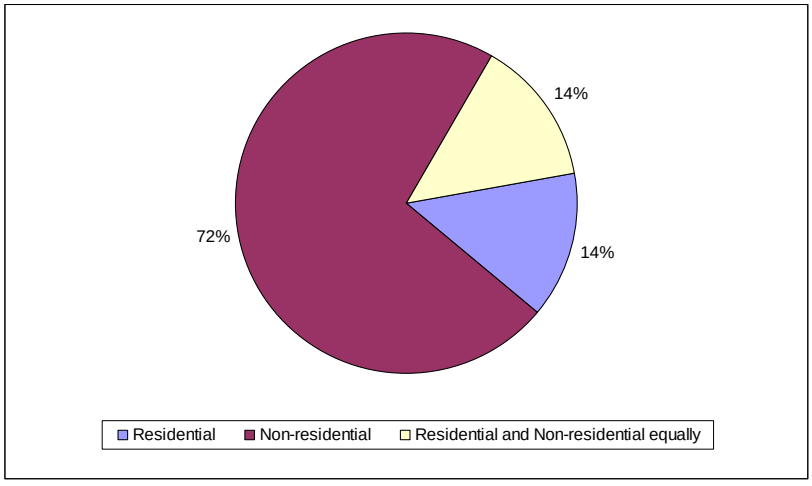
	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Design (plans) inspector	21	40%	18	34%	19	37%
Engineer	14	26%	15	28%	15	29%
Architect/Designer	7	13%	7	13%	6	12%
Both Field and Plans Inspector	4	8%	5	9%	4	8%
Consultant	3	6%	3	6%	3	6%
Field inspector	3	6%	2	4%	2	4%
Salesman	1	2%	1	2%	1	2%
Manufacturer's Representative			1	2%	1	2%
Energy Analyst			1	2%	1	2%
Total	53	100%	53	100%	52	100%

As shown in Table 79, responsibilities focused around design/plans inspection and engineering were consistently the highest percentages in the distribution for each Webinar. The table illustrates the key professional groups that attended the Webinar trainings on a whole. Professional responsibilities relating to architecture and design, as well as consulting, were also among the most frequent attendees.

Question 2. In what sector do you primarily work?

The Webinars covered non-residential code changes. We asked respondents which sector represented their primary focus. As seen in Figure 10, the majority of participants across Webinars (72% or 47 out of the 65 respondents) worked in the non-residential sector. These non-residential training sessions were also attended by 9 respondents (14%) whose primary focus was in the residential sector.

Figure 10. Sector of Primary Work of Participants



Webinar Attendance

Question 4. Why did you attend the lighting, envelope, and/or mechanical Webinar?

We asked respondents why they attended each of the Webinars. Respondents indicated that their jobs required them to attend a specific Webinar including 17%, 25%, and 21% for the envelope, mechanical, and lighting trainings respectively.

Table 80 highlights the specific reasons for attending each Webinar. Between 70% and 80% of respondents for each Webinar attended the sessions to keep up with current energy code requirements. The majority of other responses account for less than 2% of the distribution, often representing the "other" category of unique responses.

Table 80. Reasons for Attending Webinar Training

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
To keep current with new codes	40	75%	37	70%	43	83%
Additional training / to learn	4	8%	5	9%	2	4%
Technical skills development	1	2%	1	2%	3	6%
Area-specific work (mechanical design, lighting)	3	6%	5	9%		
Other	5	9%	5	9%	4	8%
Total	53	100%	53	100%	52	100%

Note: "Other" category is composed of unique responses of single individuals and includes responses in the following areas: inspection, collaboration with residential inspectors, CE credits, plan review, code changes in chapter 15, knowledge of the organizer of the Webinar, and general interest.

Question 5. Why did you choose not to attend the lighting, envelope, and/or mechanical Webinar?

For each of the sessions that the respondent did not attend, we asked why they did not attend. As seen in Table 81 the majority of respondents who did not participate in all three Webinar trainings indicated the additional session did not apply to their jobs.

Table 81. Reasons for Not Attending Other Webinars

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Didn't apply to my job	6	50%	7	58%	5	42%
Electrically-oriented	3	25%	1	8%	1	8%
Scheduling conflict			4	33%	3	25%
Already informed and current regarding codes	1	8%			2	17%
Was not aware of training	1	8%				
Work on projects in California	1	8%				
Don't know					1	8%
Total	12	100%	12	100%	12	100%

Question 7. Did you attend the training session(s) alone or as a group, with other professionals?

We were interesting in learning whether participants attended the Webinar alone or if they were part of a larger group. Table 82 indicates nearly half of the respondents, 48%, attended the trainings in groups. We asked participants attending as a group how many were in the group. As shown in Table 83, 90% were in groups of 2 to 8 people. Three attended in groups of 10 or more. Since we do not know who participated in each group and whether all members of the group registered for the training, we cannot know total number of participants within these groups.

Table 82. Group vs. Solo Attendance

(n=65)	Frequency	Percent
Alone	34	52%
With Group	31	48%
Total	65	100%

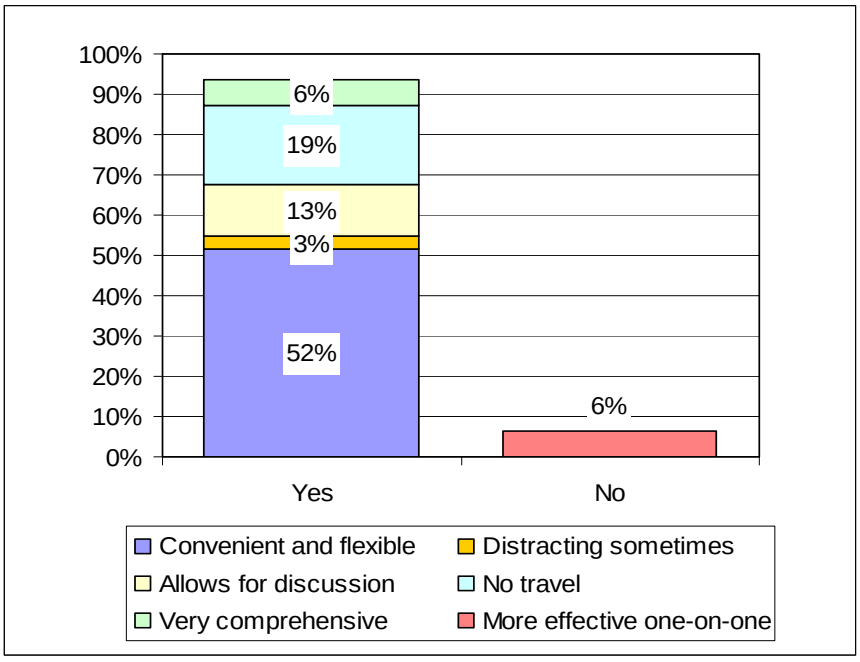
Table 83. Participant Group Sizes

Size of Group (n=31)	Frequency	Percent	Total Participants Indicated
3	9	29%	27
1	5	16%	5
5	4	13%	20
6	4	13%	24
4	3	10%	12
8	2	6%	16
10	1	3%	10
12	1	3%	12
15	1	3%	15
2	1	3%	2
Total	31	100%	116

Question 8. Do you think that the Webinar format is a good way to deliver training for group participation?

We asked the 31 respondents who participated in a group if the Webinar format was a good way to deliver training in a group setting.

Figure 11. Is the Webinar Format Good for Group Participation?

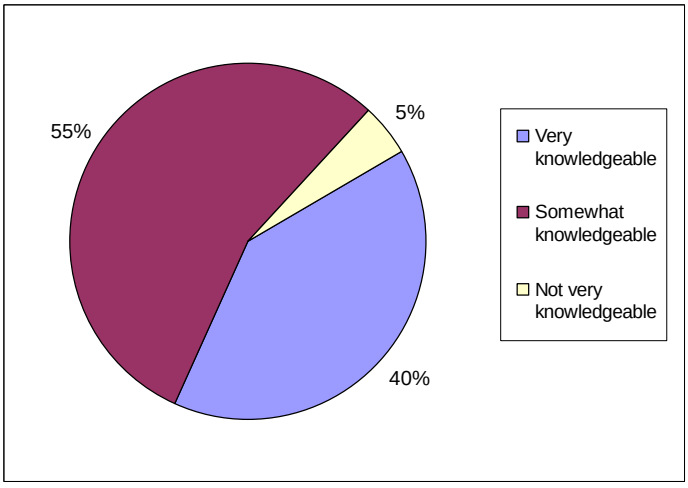


As shown in Figure 11, the majority of these 31 participants indicated that the Webinar format is a good way to deliver training in a group setting. Just over half of the respondents (52% or 16) said that the Webinar format was more flexible and convenient. The two respondents who thought that Webinar formats were not good for delivering training for group participation all cited one-to-one in-person training sessions are a more effective format.

Change in Knowledge

Question 9. How would you rate your knowledge of the Washington energy code before the training(s) that you attended?

Figure 12. Knowledge of Washington Energy Code before Training



Quantec asked all respondents how knowledgeable they were prior to the training. As illustrated in Figure 12 the majority of participants had at least some knowledge of Washington energy codes prior to the training, with approximately 40% of respondents noting they were "very knowledgeable."

Question 10. As a result of the web-based training, how would you say your knowledge of the building energy code has changed?

We asked participants if their knowledge improved with attendance at the training. As shown in Figure 13, approximately 70% of Webinar participants stated their knowledge of energy codes was somewhat improved from attending the trainings and nearly 20% of participants stated their knowledge significantly improved. Approximately 10% stated there was no gain from attending the Webinar training.

Figure 13. Knowledge of Washington Energy Codes Post-Training

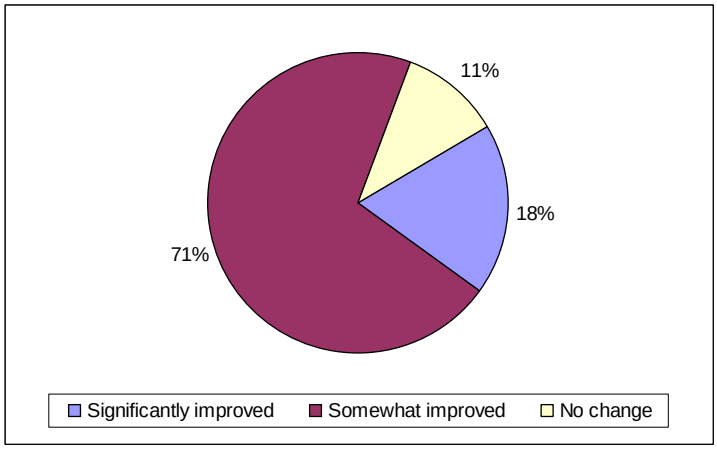


Table 84. Knowledge About Energy Codes Before and After Trainings

Pre-Training	Post-Training	Total	Percent
Not very knowledgeable	Significantly improved	1	2%
	Somewhat improved	2	3%
Somewhat knowledgeable	No change	3	5%
	Significantly improved	7	11%
	Somewhat improved	26	40%
Very knowledgeable	No change	4	6%
	Significantly improved	4	6%
	Somewhat improved	18	28%
Total		65	100%

Table 20 compares participant responses from before and after the Webinar training to measure the self-reported change in awareness among respondents. Approximately 50% of participants who indicated being somewhat knowledgeable of energy codes stated their knowledge somewhat improved or significantly improved from attending the training. Additionally, nearly 35% of those participants who indicated being very knowledgeable of Washington energy codes

indicated either their knowledge somewhat improved or significantly improved post-training. Only about 10% of participants stated there was no change in their knowledge of energy codes because of the Webinar trainings.

Questions 11-13. Did you apply any of the information that you received from [lighting/mechanical/envelope] training to your professional practices? Yes, In what way? No, Why not?

Quantec asked participants if, and how, they had applied any of the information in the four months elapsing since the training. Table 85 reveals that nearly 90% of participants in each Webinar, in some capacity, applied information received in the training to their professional practices.

Table 85. Did the Respondent Apply Webinar Information in Professional Practices?

	Lighting (n=53)		Mechanical (n=53)		Envelope (n=52)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	47	89%	45	85%	49	92%
No	6	11%	8	15%	3	6%
Total	53	100%	53	100%	52	98%

Table 86 presents the range of responses given by participants who applied information received in the training sessions in their professional practices. The most common applications included plan review and code updates, which together comprised nearly 50% of responses for each Webinar.

Table 86. Application of Information from Webinar Training

	Lighting (n=47)		Mechanical (n=45)		Envelope (n=49)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Plan review	15	33%	15	33%	12	24%
Code updates	9	20%	7	16%	12	24%
Generally	3	7%	5	11%	7	14%
Briefly in one area / limited extent	2	4%	2	4%	7	14%
Design	4	9%	2	4%	3	6%
Specific projects and tasks	2	4%	3	7%	1	2%
Preparing permits and forms	2	4%	3	7%		
Requirements review	4	9%	2	4%	3	6%
Guidelines for engineers	1	2%	2	4%		
No specifics			2	4%	2	4%
Other	3	7%	2	4%	2	4%
Total	45	100%	45	100%	49	100%

Note: "Other" category includes unique responses from single individuals and includes the following areas: inspections, commercial buildings, and administering Pacific Power projects.

Table 87 provides explanations of those respondents who did not apply information from the Webinar trainings. Approximately 50% of participants from the mechanical and 71% of participants from the lighting trainings indicated that they had not yet been able to apply the

information they learned. Participants also frequently cited that they did not apply information because it was not specific to their professional practice (38% for mechanical and 29% for lighting).

Table 87. Participant Comments Regarding Why They Have Not Applied Information from the Webinars

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Not Yet	4	67%	4	50%		
Not my area	2	33%	3	38%		
No issues have come up			1	13%	2	67%
There were no items in the Webinar that I hadn't already discovered in the codebook.					1	33%
Total	6	100%	8	100%	3	100%

Questions 11A-13A. Do you expect to utilize (or continue to utilize) that information in your professional practices in the near future?

Results in Table 88 show that nearly 90% of respondents expect to utilize or continue to utilize the information gained from the trainings in their professional practices. This percentage is consistent with the results in Table 85 which indicates 90% of participants had already employed this information in their profession practices. Only about 10% of the participants did not find the information useful, or did not think it pertained to them, and did not anticipate using it in the future.

Table 88. Expectations to Apply Webinar Information

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	52	89%	51	85%	51	92%
No	1	11%	2	15%	1	6%
Total	53	100%	53	100%	52	98%

As seen in Table 89, the most common response is that participants intend to apply the information to plan reviews. Code updates, general use, and design were also common responses across the three Webinars.

Table 89. Expected Information Applications

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Plan review	16	31%	9	18%	15	29%
Code Education / Updates	6	12%	8	16%	8	16%
Generally	7	14%	8	16%	3	6%
Design	4	8%	7	14%	1	2%
Project related / specific tasks	4	8%	4	8%	8	16%
Inspections / Code Enforcement	3	6%	3	6%	9	18%
Preparing permits and forms	2	4%	3	6%	2	4%
Other	6	12%	3	6%		
None (no comment)	3	6%	6	12%	5	10%
Total	51	100%	51	100%	51	100%

Note: "Other" category is composed of unique responses from single individuals and includes the following comments: commercial buildings, performing calculations correctly, insulating slab edges, guidelines for engineers, will utilize information when new code book comes out, lighting requirement review, and information will receive more focus in the future

Table 90. Reasons Participants Do Not Expect to Apply Information from Webinar in the Future

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
No need			2	67%		
Not my area	1	100%				
I will at some point			1	33%		
I have changed my focus					1	100%
Total	1	100%	3	100%	1	100%

Table 90 shows that the majority of respondents who did not expect to apply the information to their professions in the near future indicated that the information was not relevant to their areas of concentration.

Training Format and Presentation

The next series of questions queried participants about whether the Webinar or in-person training format worked better for them. The majority of participants stated the Webinar format worked better than in-person training sessions. About 25% of participants preferred in-person training.

Question 14. Would you recommend the Webinar training session to any professional colleague?

Figure 14. Recommendation of Webinar Training to Professional Colleagues

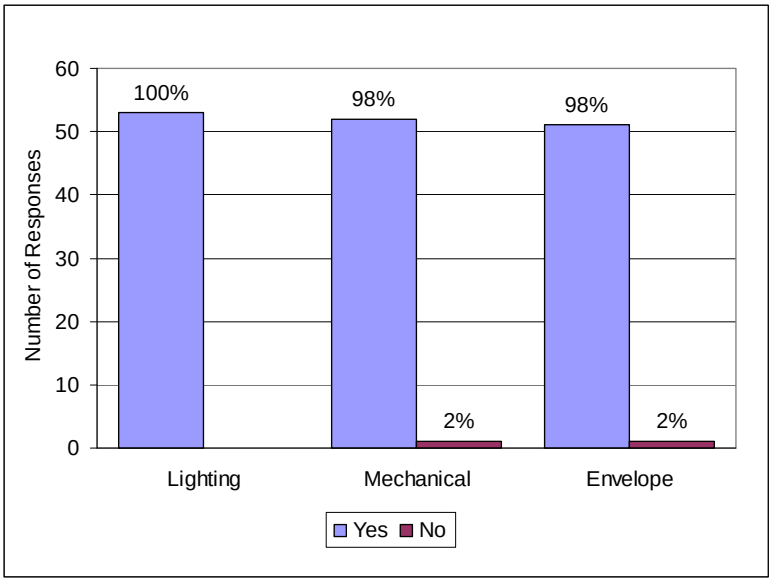


Figure 14 indicates an overwhelming majority of participants were willing to recommend the Webinar trainings to professional colleagues. The single respondent who did not recommend the training attended both mechanical and envelope Webinars and indicated that his professional colleagues were already knowledgeable on these topics.

Question 15. Was the Webinar training session sufficiently geared toward your area of specialization?

Table 91. Training Specialization to Participant Areas of Concentration

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	46	87%	50	94%	44	83%
No - Not my area	7	13%	2	4%	6	11%
No - Some of it was over my head.			1	2%		
No - It could have been a little more detailed					1	2%
No - Metal buildings seem to be a niche					1	2%
Total	53	100%	53	100%	52	98%

Between approximately 85% and 95% of respondents indicated the training sessions were sufficiently geared toward their areas of specialization. About 2% of participants in the envelope training felt there was not enough detail, while 2% of mechanical training attendees felt that some of the information was beyond their comprehension.

Question 16. Overall, does the webinar format or does an in-person format work better for the training?

Figure 15 and Figure 16 illustrate the range of comments from respondents preferring the Webinar and in-person training format, respectively. Those preferring the Webinar format often cited it was more convenient and inexpensive. There were also a few comments citing efficiency of being able to participate while in one's own office.

Figure 15. Comments of Participants Preferring Webinar Training Format

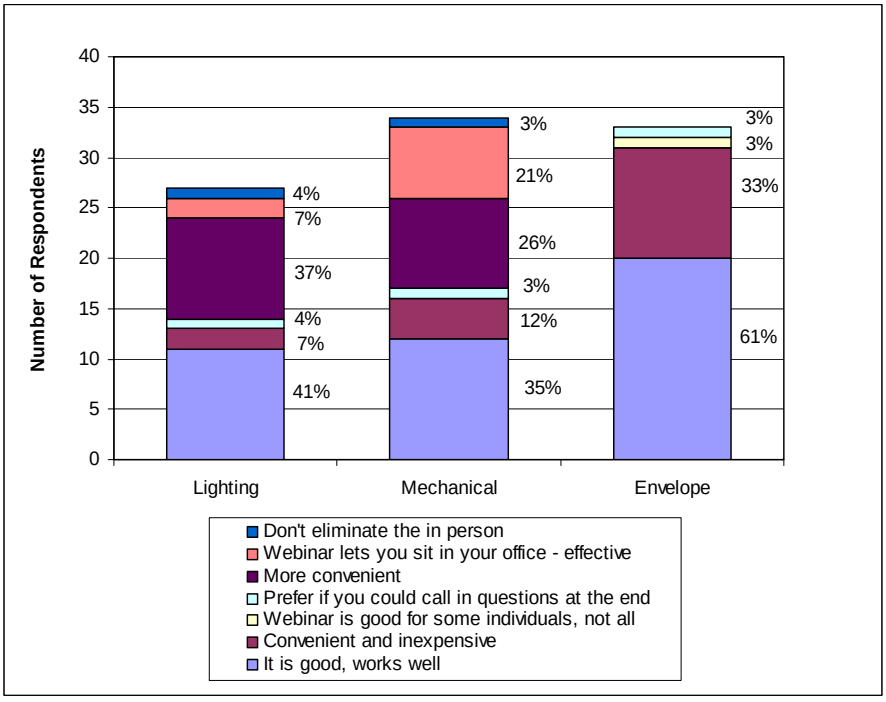
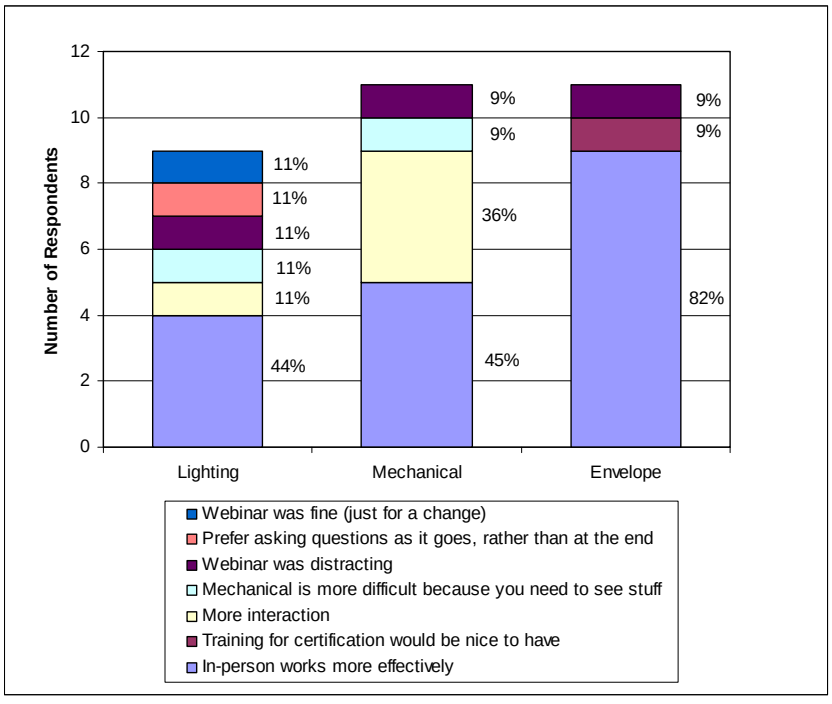


Table 92. Comments of Participants Preferring Webinar Training

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Convenience - no travel	29	76%	29	76%	31	78%
Webinar is more effective	2	5%	2	5%		
Enjoyed the Webinar training	1	3%	1	3%	1	3%
Prefer Webinar if it was the only choice	1	3%			1	3%
Depends on the material	1	3%				
Use of slides and images	1	3%				
Learn better through Webinar format			1	3%	1	3%
No need for it to be in-person			1	3%		
Would be difficult to do calculations in-person			1	3%		
Webinar would be fine					2	5%
No preference	3	8%	3	8%	4	10%
Total	38	100%	38	100%	40	100%

Participants preferring the in-person format commented on greater efficiency through this style of training, particularly noting the increased interaction as a positive feature.

Figure 16. Comments of Participants Preferring In-Person Training Format



Question 17. Was the webinar format more or less convenient for you to attend than in-person training?

Across all three Webinars, all but one respondent stated the Webinar format was more convenient. One person attending the lighting Webinar stated the Webinar was less convenient because they had problems logging on to the training and dealing with security settings. For the small minority then, the technical aspects of logging on and interaction via the Webinar proved an inconvenience.

Question 18. Were the materials provided through the training adequate?

Table 93. Adequacy of Webinar Training Materials

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	52	98%	50	94%	48	92%
No	1	2%	3	6%	4	8%
Total	53	100%	53	100%	52	100%

More than 90% of all participants indicated that the materials provided for the Webinar training were adequate. Respondents who stated the materials were inadequate stated there were not other materials other than on the screen, photographs of the mechanical equipment and a copy of the PowerPoint would be helpful.

Question 19. Was the length of the training session appropriate for the material?

We also asked respondents if the length of the Webinar was appropriate. Over 90% of participants felt that the Webinar trainings were of appropriate length for the material covered. Between 4% and 9% of participants felt that the sessions were not long enough to cover the training material.

Table 94. Length of Webinar Training

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	50	94%	48	91%	50	94%
No - too short	2	4%	5	9%	2	4%
No - too long	1	2%				
Total	53	100%	53	100%	52	98%

Question 20. In the future, would you prefer to receive in-person training or webinar training?

Table 95. Future Preference for Webinar or In-Person Training

	Lighting (n=53)		Mechanical (n=53)		Envelope (n=52)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
In-Person	15	28%	19	36%	14	27%
Webinar	38	72%	34	64%	38	73%
Total	53	100%	53	100%	52	100%

The majority of respondents preferring in-person training to the Webinar format did not indicate a reason, other than it being a preference. Other participants cited the preference of in-person interaction (which is a higher percentage for mechanical training participants) and the ability to ask and get questions answered more immediately. One respondent indicated difficulty focusing on the Webinar at the workplace because there were distractions from customers.

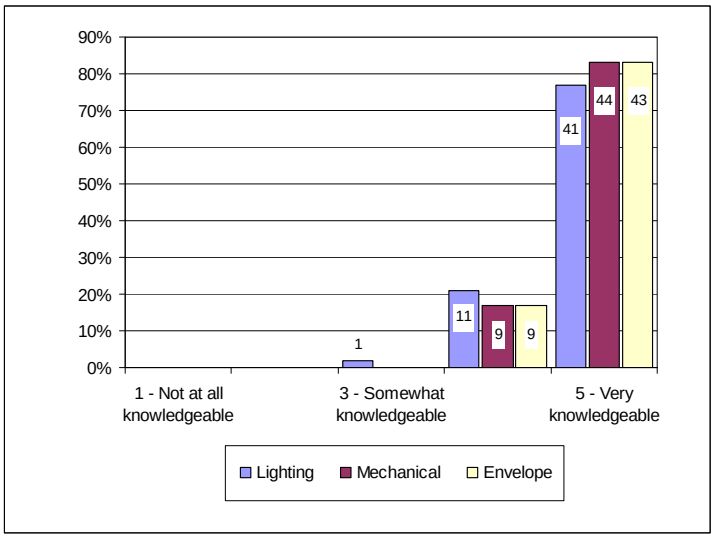
Over 75% of participants preferred Webinar trainings and cited the no-travel convenience. Additional responses referenced the effectiveness of the Webinar training; material was easier to learn in the Webinar format. One said while the Webinar format was preferred, it would depend on the material. Nearly 10% of respondents from each training session, who indicated an initial preference for the Webinar format, stated no preference when probed further to comment.

Table 96. Comments of Participants Preferring Webinar Training

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Convenience - no travel	29	76%	29	76%	31	78%
Webinar is more effective	2	5%	2	5%		
Enjoyed the Webinar training	1	3%	1	3%	1	3%
Prefer Webinar if it was the only choice	1	3%			1	3%
Depends on the material	1	3%				
Use of slides and images	1	3%				
Learn better through Webinar format			1	3%	1	3%
No need for it to be in-person			1	3%		
Would be difficult to do calculations in-person			1	3%		
Webinar would be fine					2	5%
No preference	3	8%	3	8%	4	10%
Total	38	100%	38	100%	40	100%

Question 21. On a scale of 1 to 5, with 1 being "Not at all knowledgeable" and 5 being "Very Knowledgeable," how would you rate the instructor?

Figure 17. Rating Knowledge of Webinar Instructor

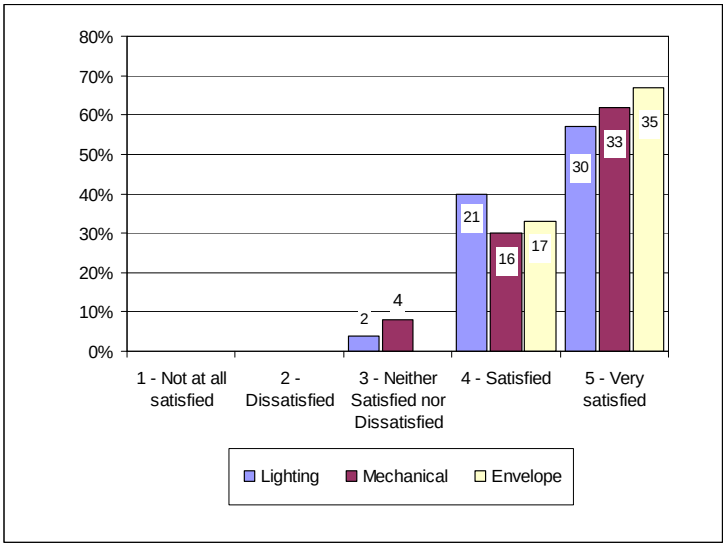


On a scale from 1 to 5, approximately 80% of participants rated their Webinar instructor as *very knowledgeable*. While responses for the envelope and mechanical trainings were similar, 2% of participants from the lighting Webinar rated their instructor as only *somewhat knowledgeable*. Overall, participants of the lighting training gave a slightly lower rating to their Webinar instructor. No participants provided ratings lower than *somewhat knowledgeable*.

Question 22. For each training received by the participant: On a scale of 1 to 5, with 1 being "Not at all satisfied" and 5 being "Very Satisfied," how would you rate the overall Webinar?

The majority of participants stated they were *satisfied* or *very satisfied* with the Webinar training overall. Less than 5% of participants in the mechanical and lighting trainings expressed indifference. It is important to note no participant provided a rating of 1 or 2, which would indicate an overall dissatisfaction.

Figure 18. Satisfaction Rating of Webinar Overall



We asked respondents several general questions about energy code compliance to gauge how difficult it is to ensure compliance with the energy codes and to examine the obstacles and difficulty related to code compliance.

Question 23. In your sector, how easy has it been for you to ensure compliance with the energy code?

Approximately 66% of participants indicated it was either *very easy* or *somewhat easy* to ensure compliance with energy codes in their sector. Another 32% indicated it was *somewhat difficult* to ensure compliance with these codes, and only 2% stated that compliance was *very difficult*.

Figure 19. Level of Difficulty Ensuring Energy Code Compliance

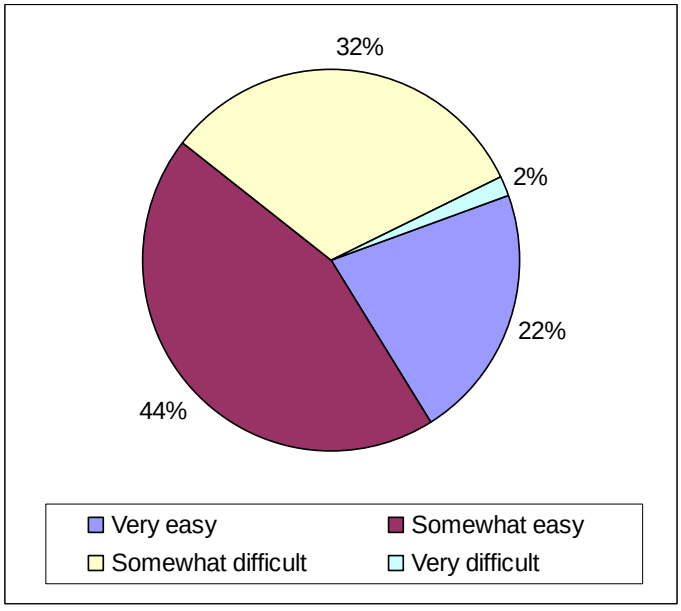


Table 97. Comparison of Professional Practice to Difficulty in Energy Code Compliance

	Very difficult		Somewhat difficult		Somewhat easy		Very easy	
Engineer	1	100%	7	33%	9	31%	2	14%
Design (plans) inspector			4	19%	11	38%	7	50%
Architect/Designer			5	24%	5	17%		
Both Field and Plans Inspector			2	10%	1	3%	2	14%
Consultant			2	10%	1	3%		
Field inspector			1	5%	2	7%		
Manufacturer's Representative							1	7%
Plans Examiner							1	7%
Salesman							1	7%
Grand Total	1	100%	21	100%	29	100%	14	100%

Figure 21 considers the reported difficulty of ensuring energy code compliance, as shown in Table 97, according to the respondents' areas of professional practice. Of respondents who indicated ensuring compliance with energy codes as somewhat difficult, engineers, architect/designers, and plans inspectors make up the largest proportion of responses (33%, 24%, and 19%, respectively).

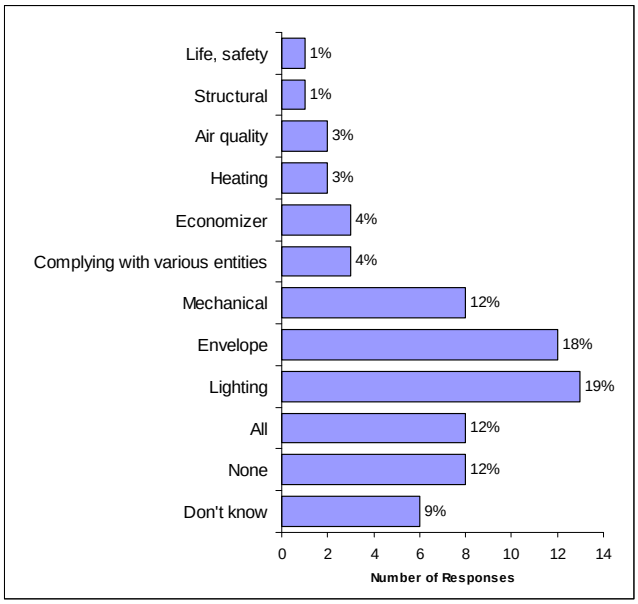
Question 24. In your opinion, what are the biggest obstacles to compliance with the energy code?

The most significant obstacle to compliance with energy codes was a lack of knowledge or training on the energy code (combined 35%). The 26% who cited lack of knowledge referred to the lack of knowledge of code officials, industry professionals, homeowners, or lack of knowledge about energy code and code updates generally. Almost 20% of respondents indicated noncompliance or lack of coordination between architects and others was one of the biggest obstacles in complying with the energy codes.

Question 25. In your sector, which areas of the code are the most difficult to comply with?

Responses included lighting (19%), mechanical (18%), and envelope (12%). Additionally, 12% of participants indicated that all areas were difficult, while 12% indicated they had no difficulties. Figure 20.

Figure 20. Difficult Areas of Code Compliance



Question 26. Please indicate how much you agree with each of the following statements, where 1 is "Strongly Disagree"; 5 is "Strongly Agree." We asked respondents four questions that focused on different aspects of the energy code.

Figure 21. Results for Questions 26A – 26D

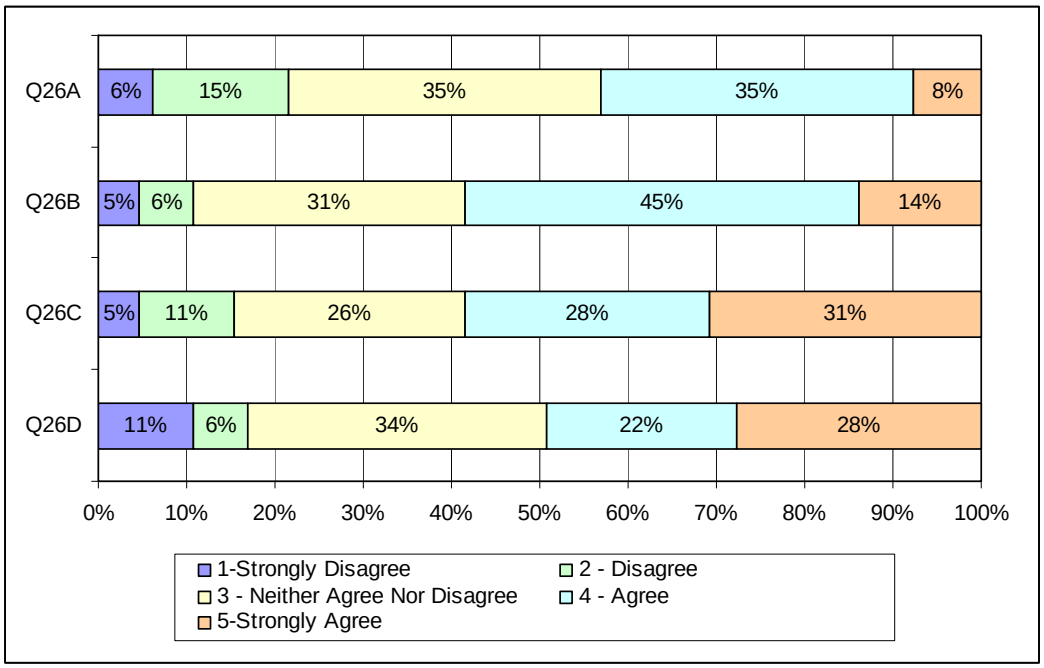


Figure 21 summarizes the participant responses for each of the following statements.

Question 26A - Building professionals are adequately informed about energy codes.

Approximately 45% of participants either *agreed* or *strongly agreed* with the statement that building professionals are adequately informed about energy codes. About 20% felt that building professionals are not adequately informed about energy codes. Over a third of participants *did not agree or disagree* with the statement.

Question 26B - Local Code Officials are knowledgeable of the energy code.

Approximately 60% of participants either *agreed* or *strongly agreed* with the statement that local code officials are knowledgeable of the energy codes. Around 10% of respondents either *disagreed* or *strongly disagreed* with the statement. Again, about a third of participants *did not agree or disagree* with the statement.

Question 26C - Energy codes are consistently enforced within my jurisdiction.

Approximately 60% of participants either *agreed* or *strongly agreed* with the statement that within the respondent's jurisdiction energy codes are consistently enforced. About 15% of respondents either *disagreed* or *strongly disagreed* with this statement. This indicates that there is a lack of code enforcement, either within a particular jurisdiction or within a specific area of the code (e.g. lighting, mechanical, and envelope).

Question 26D - There are advantages to working in certain parts of the state due to differing levels of energy code enforcement.

Approximately 50% of participants either *agreed* or *strongly agreed* with the statement that there are advantages in working in certain parts of the state due to differing levels of energy code enforcement. About 15% of respondents either *disagreed* or *strongly disagreed* with this statement.

In comparing the last two questions, Figure 21 shows that, for Q26C, 15% of respondents felt that energy codes were not consistently enforced in the participants' jurisdiction, and for Q26D, 15% indicated that there are not advantages of working in different parts of the state due to differing levels of enforcement. In looking at specific participant responses, it is interesting to note that these percentages consisted of different pools of respondents, and that there is not a correlation between inconsistency of enforcement and regional variation of enforcement. While some participants felt there is an inconsistency in code enforcement, they did not feel that there were advantages in working in different parts of the state due to variation in the level of enforcement.

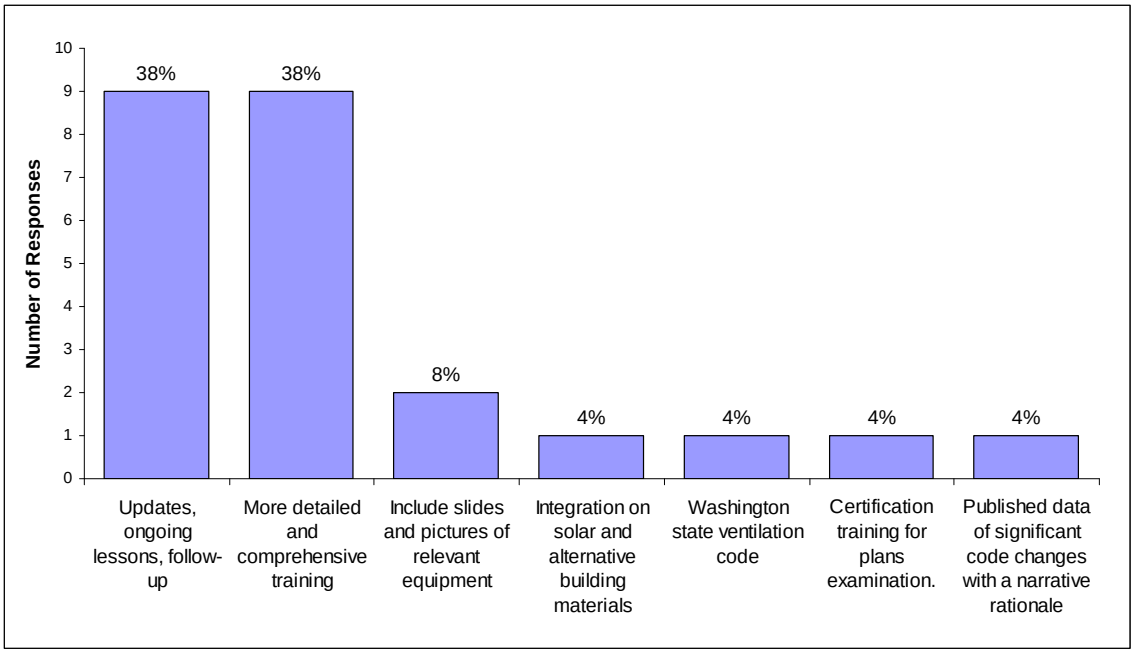
Question 27. Is there any additional energy code training that you would like to receive?

Table 98. Interest in Additional Energy Code Training

	Lighting		Mechanical		Envelope	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	22	42%	21	40%	21	40%
No	31	58%	32	60%	31	60%
Total	53	100%	53	100%	52	100%

As seen in Table 98, approximately 60% of participants in each Webinar training indicated that there was no additional code training they would like to receive. Of those interested in additional code training, nearly 40% cited continuing lessons, updates, and other ongoing trainings concerning energy codes (shown in Figure 22). Additionally, about 40% of respondents expressed interested in increased detail and more targeted trainings, focusing more on specific areas of the energy codes.

Figure 22. Areas of Specific Interest for Additional Training



Summary of Key Findings from Webinar Training Surveys

- The majority, 90% of participants, stated their knowledge of the Washington energy code increased because of attending the training. More specifically, respondents indicated their knowledge of building energy codes was either *very improved* (18%) or *somewhat improved* (71%) because of the Webinar training.

- About 90% of the participants have applied the information received in the three training sessions. The most common applications include plan review and code updates. For those who did not apply the information, the material was typically not relevant to their work, or no issue had been raised requiring use of the information.

- The majority of participants stated the Webinar format worked better than in-person training sessions, largely because it is more convenient and efficient. Webinar training is the preferred format for future training, although approximately 28%–36% prefer in-person training. Participants preferring the in-person format indicated a desire to have questions answered right away and appreciated training format options.

- The majority of participants stated they were "satisfied" or "very satisfied" with the Webinar trainings overall. Approximately 80% of participants rated their Webinar instructors "very knowledgeable."

- About 66% of respondents stated it was easy or somewhat easy to ensure compliance with energy codes, and about 33% stated it was somewhat difficult. The most significant obstacle to compliance with energy codes was lack of knowledge and training on the energy code (35%). Almost 20% of respondents indicated noncompliance or lack of coordination was another large obstacle to complying with the energy codes.

Appendix H: Target Audience Survey Responses

This Appendix includes the responses to interview questions asked in the Target Audience survey. Summary findings are included in Chapter 10.

Methodology and Sample Disposition

Quantec conducted the Target Audience Surveys in the first quarter of 2007, and a stand-alone memo discussing results was prepared for NEEA in May 2007. The results memo is included in this MPER.

NEEA provided a list of 4,215 builders for conducting these interviews. In addition to contact information, this list contained the number of building permits applied for by each company. Quantec removed those applying for a single building permit from the sample, as were contacts with missing or duplicate information, resulting in a list of 3,223 builders. To obtain contacts for the remaining subgroups, we selected a list of 3,867 building professionals based on SIC codes and purchased from InfoUSA, reviewed for business type, and we removed those that did not fall under the four subgroups. Table 99 shows the total number of contacts used for each state. Quantec randomized contact lists for each state before providing them to the survey firm.

Table 99. Survey Contacts by State

Idaho	Washington	Oregon	Montana
1,335	2,579	1,424	1,050

Because it was imperative to speak only with professionals who actually work with state energy codes, a screening process identified appropriate individuals within each business. We interviewed individuals who stated their work requires knowledge of the state energy code. Additionally, respondents verified the state where they completed the majority of their projects and confirmed their profession type.

In total, we surveyed 526 Northwest building industry professionals, categorized as one of four primary types: builders, designers, HVAC contractors, and "other" contractors who work with the energy code as part of their jobs. We asked these individuals:

- Where do they turn when they have energy code related questions?
- How familiar are they with their state energy code?
- How aware are they of the existing code support services?
- Which mechanisms are best for reaching them with information on education, technical support, and code updates?
- What suggestions, if any, can they provide for additional services that would better suit their needs?

Survey Demographics

Quantec designed their sampling plan to reach to a statistically significant sample of professionals from each of the subgroups – builders, designers, HVAC contractors and "other" contractors. However, due to a limited number of contacts within the InfoUSA lists for the specialty contractors, and the limited evaluation resources available for this task, statistical significance at a 90% confidence level (+ 10%) was not achievable within all profession types for all states. After discussing this issue with NEEA, we agreed that we would be most able to achieve 90% confidence level for the builders in each state, and for the designers in Oregon and Washington. Since builders were the group most in need of training and support in the previous evaluation[19], a focus on builders in this survey is appropriate; although a qualitative assessment of the smaller subgroups is offered whenever possible throughout this summary.

Table 100 presents the total number of interviews completed for each respondent type, as well as the number of completes needed to achieve 90/10 significance based on the sample population. Cells in purple indicate those groups with a statistically significant sample size.

Table 100. Demographics and Significance

	Idaho		Washington		Oregon		Montana	
	Completed	Sample needed for 90/10 confidence	Completed	Sample needed for 90/10 confidence	Completed	Sample needed for 90/10 confidence	Completed	Sample needed for 90/10 confidence
Builder	64	63	65	64	60	60	62	62
Designer	21	52	64	64	61	60	21	50
HVAC Contractor	14	46	15	58	21	54	20	49
Other Contractor	15	46	5	41	5	33	13	29

Although results from several of the subgroups are not statistically significant, we believe they still offer valuable anecdotal insights into the ways in which these professionals are gathering information about, and working with, the state energy codes. As such, the analysis presents results for the five significant categories, with additional insights gained from the remaining groups noted where appropriate.

Sector and Size of Survey Respondents

The InfoUSA contact list contained SIC codes that made it possible to stratify contacts by business type, but did not enable differentiation between sectors for each business. The resulting survey sample yielded a sector breakdown approximately equal to 70% residential, 10 % nonresidential, and 20% "equal in both sectors." Table 101 below displays the final sector distribution of the sample. Note that some respondents who described their primary sector as residential also worked to a lesser extent with commercial buildings.

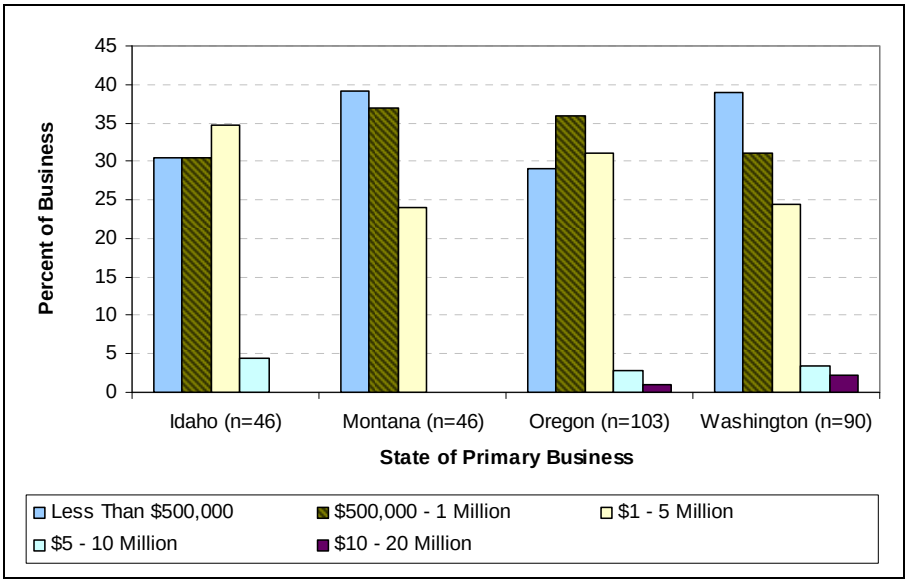
[19] MPER #1 – Evaluation of Energy Code Activities, Prepared by Quantec, LLC, July 8, 2005.

Table 101. Respondent Sector by State

	Idaho (n=114)	Washington (n=150)	Oregon (n=146)	Montana (n=116)
Residential	78%	66%	55%	72%
Non-Residential	7%	13%	19%	4%
Equally in Both	15%	21%	25%	23%

Survey respondents represented a range of business sizes, from annual sales of less than $500,000 to greater than $10 million. Sales data were available for 285 of the 526 businesses who completed the survey. Figure 23 below presents this information and includes all business types. The vast majority of businesses were below $5 million in annual sales, indicating that smaller businesses are the primary users.

Figure 23. Sales Volume (All Business Types)

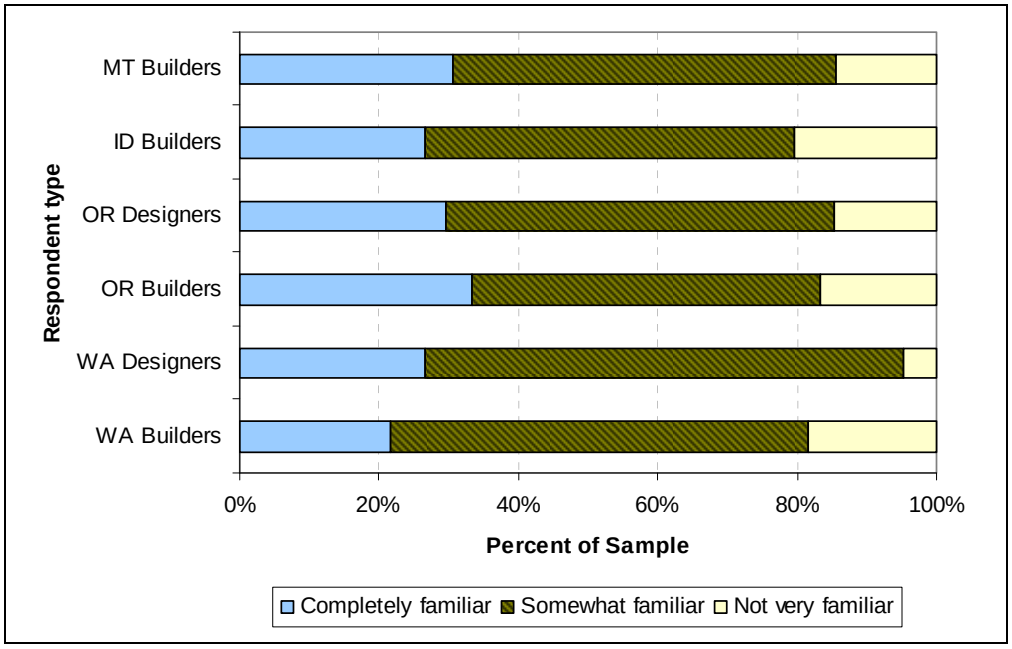


Findings from Target Audience Surveys

Familiarity and Experience with Energy Code Requirements

In order to gauge respondents' experience level with codes, we asked them to rate their familiarity with the energy code for their state. As shown in Figure 24 below, a majority of builders and designers stated either "completely familiar" or "somewhat familiar" with their state's requirements.

Figure 24. Familiarity With State Energy Codes



The remaining groups stated similarly, with most stating they were either "completely" or "somewhat" familiar with the code requirements. However, HVAC contractors in Montana and Idaho indicated a slightly lesser degree of familiarity with the code than their counterparts. For example, five of 14 HVAC contractors in Idaho and five of 20 in Montana said they were "not very familiar" with their state energy code.

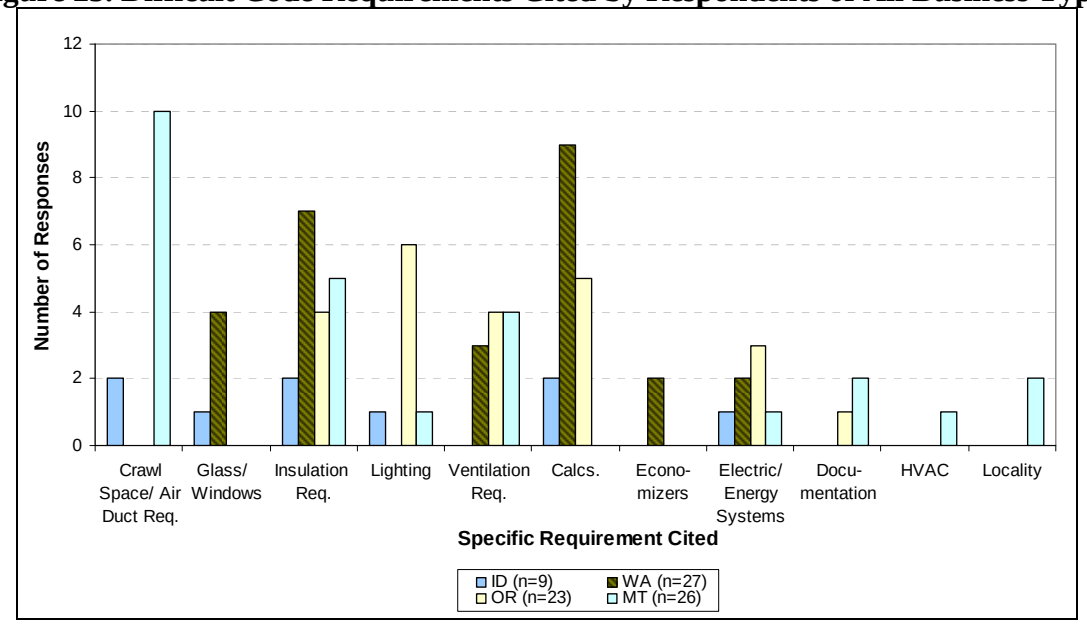
In general, we found that only a small minority (5% to 20% per state/category) were "not very familiar" with the energy code requirements in their respective states.

Perceived Difficulty of Energy Codes

When asked if areas of the energy code were difficult to comply with, most respondents stated there were not. Figure 25 presents responses for all business types in. Idaho reported the fewest number of difficulties (n=9), with an equal number of people reporting that working with crawl space air duct requirements, insulation requirements, or calculations was difficult. In Washington (n=27), the most frequently mentioned difficulty involved calculations, while respondents in Oregon (n=23) most frequently reported difficulties with lighting requirements. In Montana (n=26), difficulties with crawl space air duct requirements were reported most often.

In general, building professionals working with energy codes are largely familiar with their state code requirements, and the vast majority does not find compliance in any area particularly difficult.

Figure 25. Difficult Code Requirements Cited by Respondents of All Business Types



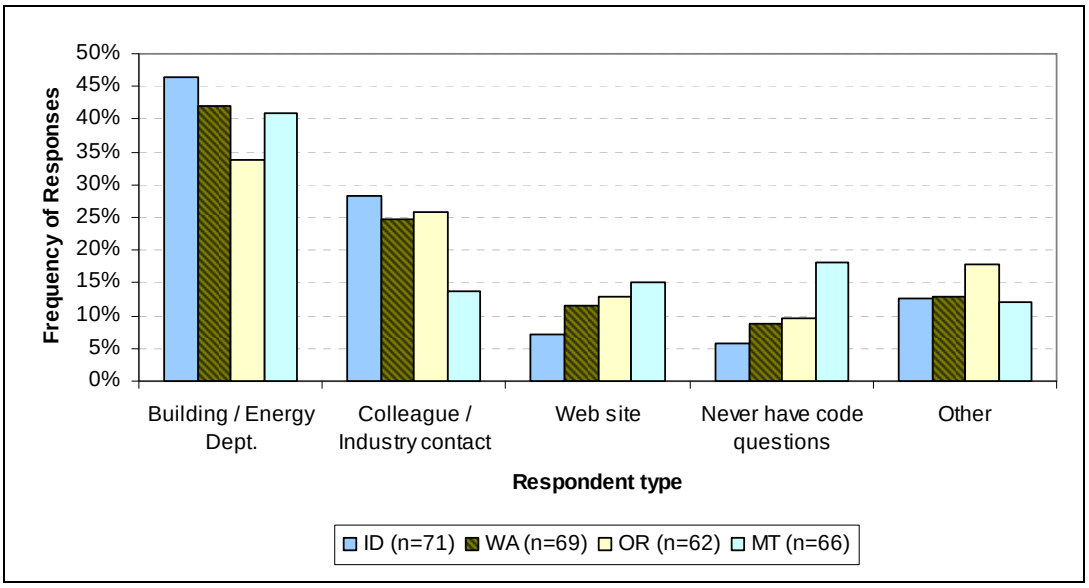
Resources Used To Answer Energy Code Questions

Where do building professionals in the Northwest go when they have a question on the energy code?

One of the key questions addressed through this survey was: "Where do building professionals in the Northwest go when they have a question on the energy code?" When asked this question directly, a variety of unprompted responses was provided by the builders in each state; most commonly, however, they stated they turned to their building/energy[20] department, followed by speaking with colleagues. For the builders, complete responses by state are presented in Figure 3. Note that some respondents identified multiple resources. An "other" category was included to capture responses that were small in number and unique to individual respondents. These included the following resources: Technical Support Hotline; Training; Books/Code books/Manuals; Home Builders Association; Conduct own research; ENERGY STAR®; Supplier; Utility.

[20] "Building/Energy department is a category of responses referring to a variety of governmental agencies and individuals, including: "inspectors," "city," "state," "building department," "county," "local authority," "state/federal authority," and others. The category also includes "utility/energy organization."

Figure 26. Resources Used to Answer Energy Code Questions - Builders



Designers in Oregon and Washington also cited several different sources for help with energy code questions, but again most often looked to their building or energy departments. Figure 27 presents the unprompted responses from Oregon and Washington designers; some respondents identified multiple resources. "Other" responses from these groups were reported as: Technical Support Hotline; Training; Home Builders Association; Conduct own research; ENERGY STAR®; Supplier; Utility.

Designers within the non-statistically significant groups reflected similar responses, as presented in Figure 28. As with the other groups, some respondents identified multiple resources. HVAC contractors and "other" contractors answered similarly to the statistically significant professions, with a tendency to turn to their building/energy departments with questions.

Figure 27. Resources Used to Answer Energy Code Questions – Designers (Washington and Oregon)

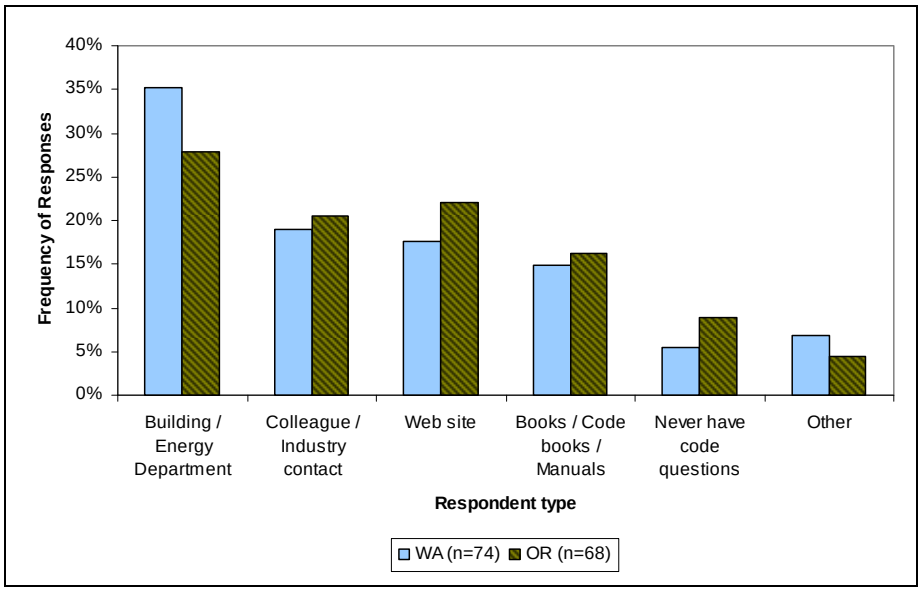
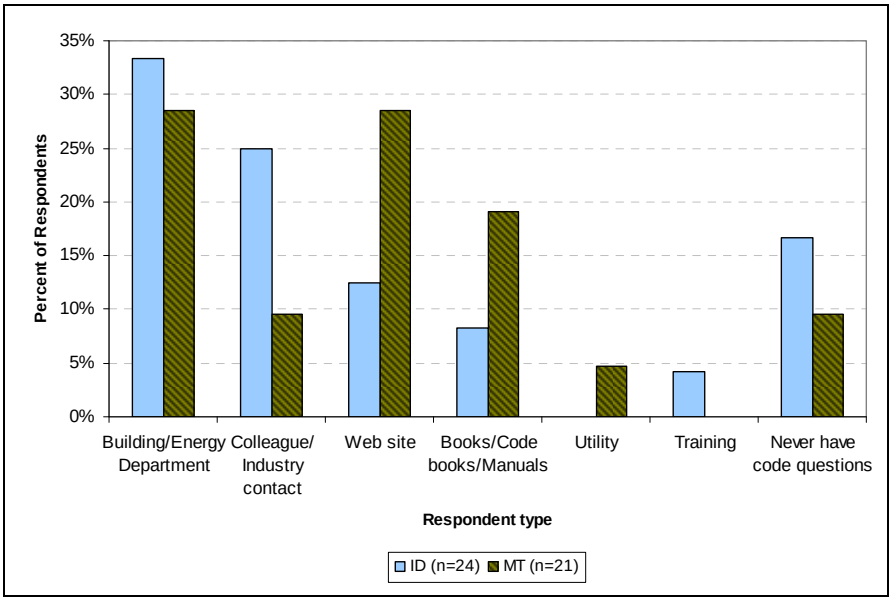
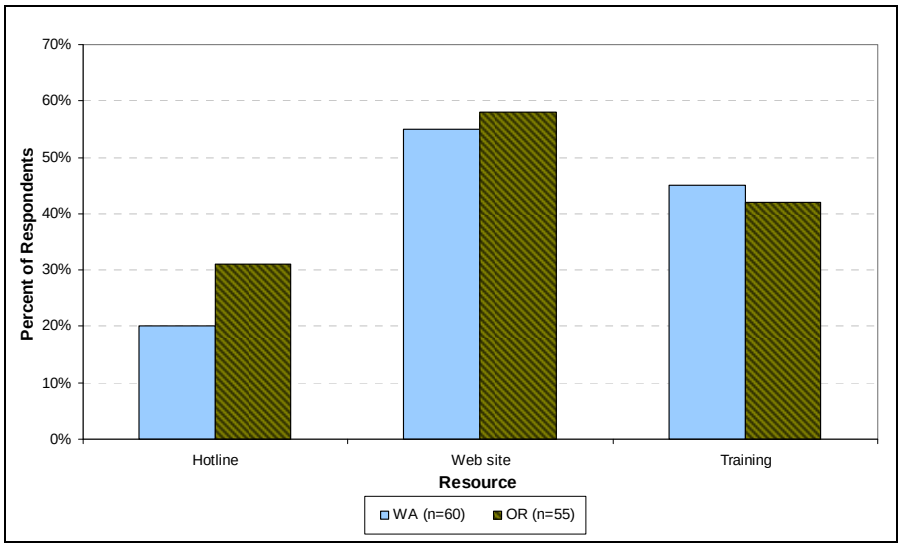


Figure 28. Resources Used to Answer Energy Code Questions – Designers (Idaho and Montana)



Designers from Washington and Oregon showed a slightly higher level of awareness of their state Web site, shown in Figure 29.

Figure 29. Awareness of Energy Codes Support Resources – Designers



In general, the remaining groups in each of the states were less aware of the available resources, as presented in Table 102. In Washington, Oregon and Montana, none of the "other" contractors questioned was aware of the hotline, while none of the "other" contractors in Washington knew about the Web site. Additionally, HVAC contractors in Montana reported that they were unaware of the technical support hotline.

Table 102. Awareness of Energy Codes Support Resources – Remaining Groups

		Hotline	Web site	Training
ID	Designer (n=17)	4	8	8
	HVAC Contractor (n=11)	2	2	3
	Other Contractor (n=14)	3	8	6
WA	HVAC Contractor (n=13)	2	7	5
	Other Contractor (n=4)	0	0	1
OR	HVAC Contractor (n=19)	3	11	6
	Other Contractor (n=4)	0	1	2
MT	Designer (n=19)	3	12	6
	HVAC Contractor (n=17)	0	6	6
	Other Contractor (n=10)	0	1	3

Respondents who did not indicate utilization of the training, Web site, and technical support hotline resources were also asked specifically about their awareness of these services to determine whether they were simply choosing not to use these services. While we generally found underutilization of these services, in many cases the subgroups were unaware these resources were available. Of the three services available, builders from all states were most aware of training opportunities, as shown in Figure 4. Respondents who identified these resources in the unprompted utilization questions are included here.

Suggested Improvements to Services

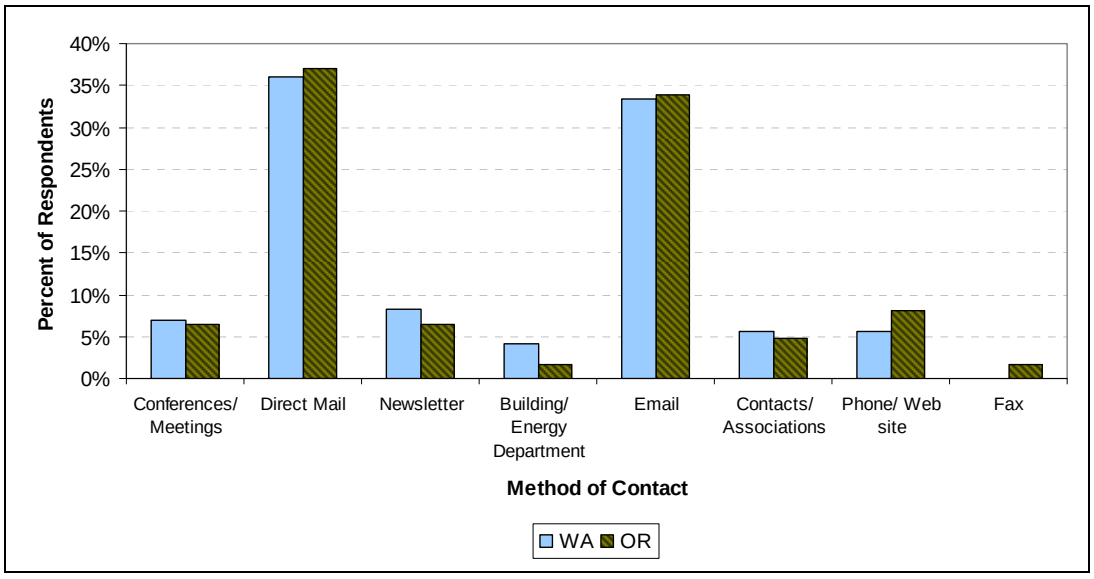
Respondents made very few overall suggestions, and most referred to Web site improvements. In Idaho, only two recommendations were made, both of which were requests for additional information to be provided on the Web site. Similarly, Washington respondents offered few recommendations; they were related to streamlining paperwork and improving the Web site. Four respondents from Oregon suggested Web site improvements, though the recommendations were limited; designers suggested that "financial assistance" and "a streamlined process for requesting and completing paperwork" would be helpful, while one HVAC contractor stated additional information would benefit the Web site. In Montana, one builder indicated standardized regulations and procedures would improve the Web site.

Reaching the Target Audience

When asked to identify the best way to receive information about energy code changes, training events, and technical support opportunities, builders from all states gave the greatest preference to contact through direct mail, followed by e-mail, as shown in Figure 30. Preferred Method of Contact for Distribution of Information - Builders

Designers in Washington and Oregon expressed similar preferences, as shown in Figure 31. Designers in Idaho and Montana echoed these preferences as well, as did HVAC and "other" contractors.

Figure 31. Preferred Method of Contact for Distribution of Information - Designers

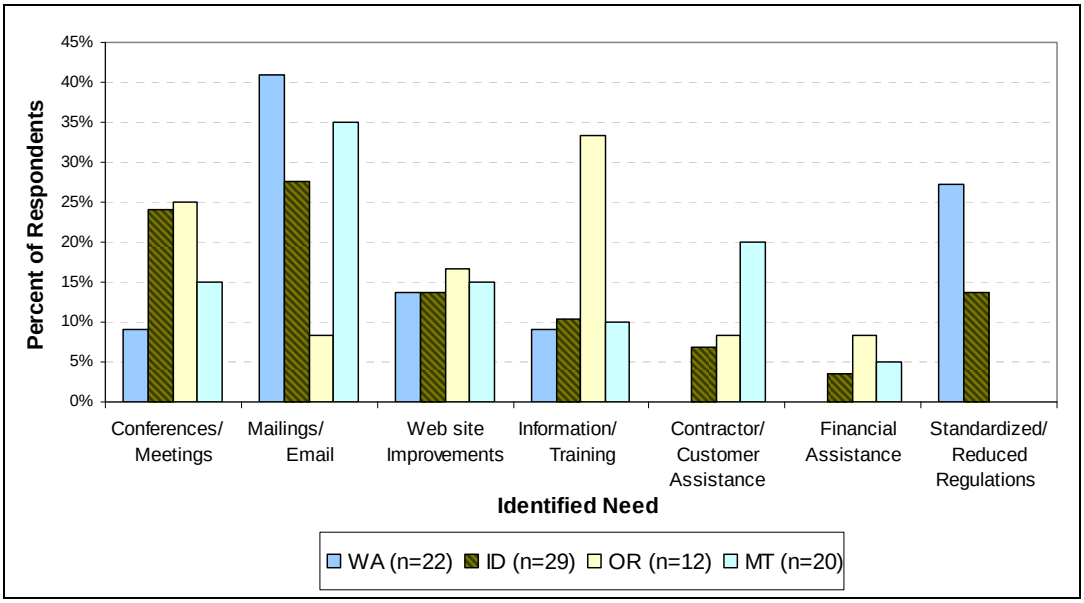


Need for Additional Services

To help target services toward identified needs of those working with energy codes, we asked respondents, "Can you think of any other services that [the state] could offer that would better address your needs?" Relatively few respondents (83 of 251, or 33%) provided suggestions for

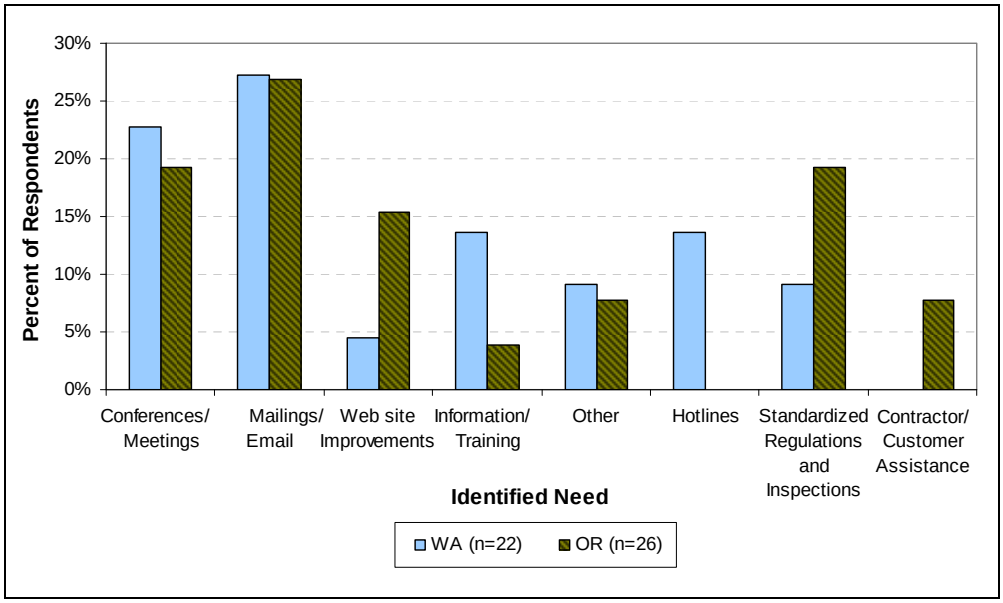
additional services. Figure 32presents the number and type of builder responses by state. Generally, respondents most frequently requested additional e-mails and mail.

Figure 32. Additional Code-Related Services Requested by Respondents – Builders



Designers in Washington and Oregon identified similar needs, as presented in Figure 33. Again, they offered few recommendations (48 of 125, or 38% of respondents). Additional suggestions included reducing the amount of training, doing away with the energy code, and providing financial assistance.

Figure 33. Additional Code-Related Services Requested by Respondents – Designers



For the smaller, non-significant subgroups, two Montana designers suggested assistance to residential customers would be helpful, but the responses provided by Montana and Idaho designers were otherwise similar to those provided by the statistically significant groups. The remaining subgroups also provided comparable responses.

Summary of Key Findings from Target Audience Surveys

- In general, building professionals working with energy codes are largely familiar with their state code requirements, and the vast majority does not find compliance with any areas particularly difficult.

- Most often, builders and designers in all states looked to their building departments when they had questions regarding the energy code. Builders also frequently consulted with colleagues or industry contacts, while designers looked to either colleagues or Web sites for energy code help. To a lesser extent, designers also utilized code-related books and manuals. These trends were similar among each of the professions across all states.

- Low awareness exists regarding energy code support services among the Northwest building community. Across states, builders were most aware of training activities, yet less than half knew about them. A third or fewer builders knew about Web sites, and less than a quarter were aware of the hotlines. Designers indicated a similar knowledge of services, with less than half the designers aware of trainings and Web sites, and less than a third aware of the hotlines.

- Because there was a particularly low awareness of the technical support hotlines, we examined respondents' preferred methods of contact to provide pertinent code information (training events, code changes, updates, etc.). For builders, the overwhelming choice of contact was direct mail, and to a lesser extent, e-mail. For designers, direct mail was still the leading preference, followed more closely by e-mail.
- Overall, when asked about the need for additional services, there was a call for more information in general. Consistently, respondents requested NEEA provide this information via mailings or e-mail, followed by conferences and meetings. There were also several comments about improvements to Web site content.

Appendix I: Energy Code Compliance Analysis

Methodology

The code compliance analysis conducted by Quantec consisted of a review of RLW's analysis and used the RLW database to replicate the code compliance shares by the categories listed above. Quantec analyzed code compliance rates and prepared distributions of compliance by state for each of four major building components. The analysis presents two code compliance summaries: (1) Code Compliance Rates; and (2) Code Compliance Distributions. Montana was dropped from the analysis because of its small sample size (n=13).

We created a weighted component/overall building compliance rate summary on three levels:

- State and home type level
- State level incorporating all home types
- All states combined at the home type level

The RLW database contained both code values and actual building U values both at the component level and the whole building level for 162 multifamily homes, and 245 single family homes. Component level areas and total home square footage were also included in the database.

For each component, we developed UA/sq. ft. values by dividing the UA by the related component square footage. For the entire building, UA values for the building were divided by the total home floor area (square footage). We weighted compliance rates and distributions by RLW's home level case weights. There were too few data points to include Montana in the analysis. Therefore, we made no specific recommendations for Montana.

Table 103. Average Component Floor Area and Overall Square Feet Summary

State	Home type	n	Windows	Wall	Floor	Roof	Overall
Idaho	Multifamily	28	115	827	301	883	1,055
Idaho	Single Family	39	307	2,224	1,263	1,894	2,382
Oregon	Multifamily	44	127	865	617	744	986
Oregon	Single Family	114	382	2,095	1,579	1,752	2,495
Washington	Multifamily	81	145	765	431	697	1,121
Washington	Single Family	88	322	2,174	1,493	1,692	2,448
Idaho	All	67	216	1,561	807	1,414	1,752
Oregon	All	158	307	1,733	1,296	1,456	2,051
Washington	All	169	244	1,548	1,021	1,250	1,858
All	Multifamily	153	135	804	467	740	1,070
All	Single Family	241	348	2,144	1,507	1,741	2,462
All	All	394	265	1,623	1,102	1,352	1,921

Table 103 summarizes the component areas and overall square footage of homes by state and home type. On average, Washington multifamily residences (1121 sq. ft.) are larger than Oregon

multifamily residences (986 sq. ft.). Single family residences on average are similar ranging from 2400-2500 sq. ft. across the three states.

Replicating RLW Results

The first task assigned to Quantec was to verify the RLW compliance summaries and distributions. RLW presented component compliance distributions only for single family homes. We checked their single family compliance rates at the component level and they matched.

We also matched RLW's U-value component bin distributions for roofs and overall. However, for the other three components (windows, walls, and floors) there were some inconsistencies with the RLW classifications into bins. For example, the RLW UA/sq. ft. distributions sometimes didn't add up to 100%, because some of the homes were not correctly mapped to the appropriate bin. We reclassified these cases into the correct bin.

Table 104 shows the strict code compliance rates, where a building or component meets code if it has a lower UA/sq. ft. value than the code for the site. From Table 104 we can see Idaho has a very low compliance rate overall. Only 26% of multifamily homes and 47% of single-family homes in Idaho are compliant. The compliance rates for Oregon and Washington are better for both home types, although Oregon multifamily compliance rates are still rather low.

With the exception of Oregon multifamily homes, windows code compliance rates are good (>75%). The low compliance rate for Oregon multifamily is primarily due to poor window compliance (42%). For Idaho, the low compliance rates (under 50%) are due mainly to poor wall u-values.

Table 104. Compliance Rate Summary (at code level)

State	Home type	N	Windows	Wall	Floor	Roof	Overall
Idaho	Multifamily	28	74%	29%	11%	50%	26%
Idaho	Single Family	39	88%	39%	8%	13%	47%
Oregon	Multifamily	44	42%	76%	78%	81%	30%
Oregon	Single Family	114	85%	80%	83%	96%	77%
Washington	Multifamily	81	78%	74%	87%	95%	75%
Washington	Single Family	88	85%	58%	65%	95%	73%
Idaho	All	67	81%	34%	9%	30%	37%
Oregon	All	158	72%	79%	82%	92%	64%
Washington	All	169	82%	65%	72%	95%	74%
All	Multifamily	153	67%	68%	77%	83%	54%
All	Single Family	241	85%	66%	69%	87%	72%
All	All	394	78%	67%	71%	86%	65%

Table 24 presents compliance rates within 10% of code. Quantec did not base the 10% figure on any scientific criterion; rather, it is merely an indicator showing how close some homes may be to meeting the code, and likely compensates for any measurement error at the site. Additionally, if the level of insulation is at code at the time of construction and initial inspection, it is not

surprising insulation levels may appear slightly below code a year or two after construction, when investigators originally took field measurements for this analysis.[21]

It should also be noted that because a home can use either the performance or prescriptive path, specific measures may be below code when using the performance path, but the building could still meet code overall. This may be another reason why the analysis found some low compliance rates at the component level.

Increasing the tolerance for acceptable code compliance to 10% below code allows some additional sites to meet the "pass code" criteria. The compliance rates improve significantly, particularly for Idaho single-family homes. The wall compliance rate across all states increases from 67% to 91%. Idaho multifamily still has a very low compliance rate (37%).

Again, with the exception of Oregon multifamily homes, windows code compliance rates are good (>75%). In contrast to the strict code, although the windows in Oregon are poor, the overall homes are still within 10% of code. For Idaho, the low compliance rates (under 50%) are primarily due to poor wall u-values.

Table 105. Compliance Rate Summary (within 10% of code)

State	Home type	n	Windows	Wall	Floor	Roof	Overall
Idaho	Multifamily	28	74%	60%	40%	50%	37%
Idaho	Single Family	39	90%	57%	20%	25%	86%
Oregon	Multifamily	44	42%	100%	78%	81%	78%
Oregon	Single Family	114	85%	98%	83%	96%	94%
Washington	Multifamily	81	78%	92%	87%	95%	84%
Washington	Single Family	88	92%	97%	69%	97%	91%
Idaho	All	67	82%	58%	26%	36%	62%
Oregon	All	158	72%	98%	82%	92%	89%
Washington	All	169	86%	95%	74%	96%	88%
All	Multifamily	153	67%	89%	80%	83%	75%
All	Single Family	241	88%	93%	72%	89%	92%
All	All	394	80%	91%	74%	87%	85%

In summary, where we consider compliance rates acceptable when they fall within 10% of code, overall compliance rates across the three states and two housing types range from 78% to 91%. Idaho multifamily still has a very low compliance rate of 37%. Considering all states and housing types together, compliance rates are 85% overall.

[21] For example, cellulose insulation may compact some after initial installation. According to the Cellulose Insulation Manufacturers Association "Open blow cellulose installations do lose R-value as the material settles, however such installations provide "bonus R-value" until they reach settled density." <http://www.cellulose.org/pdf/cellulose_bulletins/tech_bulletin1.pdf>

Code Compliance Distributions

We created weighted state and home-type charts of the percent difference from code to the building as reported, for each building component and for the building overall. The percent difference (i.e. the percent above or below code) is defined as:

Percent_Difference_From_Code = (Code UA/sq. ft. – Actual UA/sq. ft.) / (Code UA/sq. ft.)

Note that in the distributions where the Y axis represents the deviation from code, negative values are below code, positive values are above code, and 0 values are exactly at code. The numbers at the X axis (at code) represent percent of the total sample.

The points in each of the state and home-type charts represent percentile points (0 to 100%) of the percent UA/sq. ft. above or below the code values. Because of some outliers, we allowed the range on the charts to vary from 50% below to 50% above code (-50% to +50% of code). Only 1-2% of the values actually fell outside the 50% absolute range, and were truncated to the nearest end-point.

Distributions for each state and sector summarize the code compliance distributions at the various component levels for each state and home type combination.[22] The reader can compare the distributions in the figures to the estimates in Table 104 and Table 24.

Windows

Figure 34 through Figure 39 summarize the distributions for code compliance for windows. For example, in Figure 34 the four percentile points at the -50% level (i.e., there are 4 points at -50% of code: 0%, 1%, 2%, 3%) indicate that only approximately 3% of windows in Idaho multifamily residences are 50% below code. About 26% of windows in Idaho multifamily homes fall more than 10% below code. The remaining 74% of the homes are within 10% of code or better.

Figure 35, Idaho single family, almost all sites are within 10% of code or better. About 30% of home's windows are more than 10% above code. Figure 36, Oregon multifamily, shows that more than 60% of windows are more than 20% below code. By contrast, Figure 37, Oregon single family, shows that 85% of windows are installed at or above code.

Walls

Figure 40 through Figure 45 present distributions for code compliance for walls. In Figure 40, Idaho multifamily, about 70% of homes' walls fall below code. However, 30% are within 10% of code, and therefore only 40% of walls constructed in Idaho multifamily residences fall more than 10% below code. By contrast, in Figure 43, Oregon single family, only 20% of homes fall below code. Only 2% of Oregon single family homes fall significantly below code for wall construction.

[22] Note that due to the placement of the x-axis slightly below the 0 line some of the values very close to 0 may actually be slightly negative, and hence not to code. Also due to rounding, some percentiles may be off by 1%.

Floors

Figure 40 through Figure 51 present distributions for code compliance for floors. In Figure 46, Idaho multifamily, only 11% of floors are at or above code. However, an additional 40% of floors are marginally below code (i.e., less than 3% below code). Washington multifamily floors, on the other hand, are primarily above code with only 13% falling below code (Figure 50).

Roofs

Figure 52 through Figure 57 present distributions for code compliance for roofs. In Idaho, 86% of single family homes have roofs that are below code (Figure 53). By contrast, Figure 55 shows that 97% of Oregon single family homes have roofs above code

Overall - Whole House

Figure 58 through Figure 63 present distributions for code compliance for the whole house (overall). Figure 58 shows that only 24% of Idaho multifamily residences are at or above code. Another 30% of residences are more than 30% below code. Figure 59 shows that more than half (53%) of Idaho single family homes fall below code. However, the average Idaho single family home is not very far from code; only 14% of homes are more than 10% below code. Figure 60 shows the distribution for Oregon multifamily residences. Nearly 70% of homes were below code, however, only 20% of homes are more than 10% below code. Figure 61 shows the distribution for Oregon single family residences where 77% are at or above code. Only 6% of Oregon single family residences are more than 10% below code. Similarly, Figure 62 shows that 75% of Washington multifamily residences are at or above code, and 16% of Washington multifamily residences are more than 10% below code. Figure 63 shows the distribution of Washington single family homes where only 27% of these homes fall below code. Two percent of homes appear to be early-adopters, going well above code.

Summary of Key Findings from Code Compliance Analysis

- Where compliance rates are considered acceptable within 10% of code and considering all states and housing types together, compliance rates are 85% overall. Considering the home in compliance, if measured values are within 10% of the code specified UA/sq. ft. value, likely compensates for any measurement error at the site. Additionally, it compensates for any settling between the initial installation and field measurement a year or more after installation. An overall 85% compliance rate indicates room for improvement. Analyses indicate 75% compliance in multifamily buildings and 92% compliance in single-family buildings overall.

- Where compliance rates are considered acceptable within 10% of code, overall compliance rates across the three states and two housing types range from 78% to 91%, with Oregon multifamily (78%) and Washington (84%) multifamily falling below 85% compliance. Idaho multifamily has a very low compliance rate of 37%. Compliance rates in multifamily buildings have more room for improvement than in single-family buildings. We recommend additional attention and resources on multifamily buildings.

- Where a building or component meets code if it has a lower UA/sq. ft. value than strictly required by code, Idaho single-family and multifamily code compliance rates are low overall (47% and 26% respectively). Oregon multifamily window compliance rates are low, bringing overall compliance to 30%. Oregon single-family (77%) and Washington single-family (73%) and multifamily (75%) compliance rates are 73% or better. We recommend additional resources for compliance training in Idaho, in particular.

- There were too few data points to include Montana in the analysis. Therefore, we made no specific recommendations for Montana. However, it is likely the state has multifamily compliance issues similar to the other three states.

- We recommend NEEA conduct additional field verification and measurement to confirm the low compliance rates found in various state-housing type-component combinations. Confirmation of low compliance could warrant additional code support efforts; we recommend NEEA add code related training with confirmation of low compliance.

Figure 34. Windows: Idaho Multifamily Percent Above Code

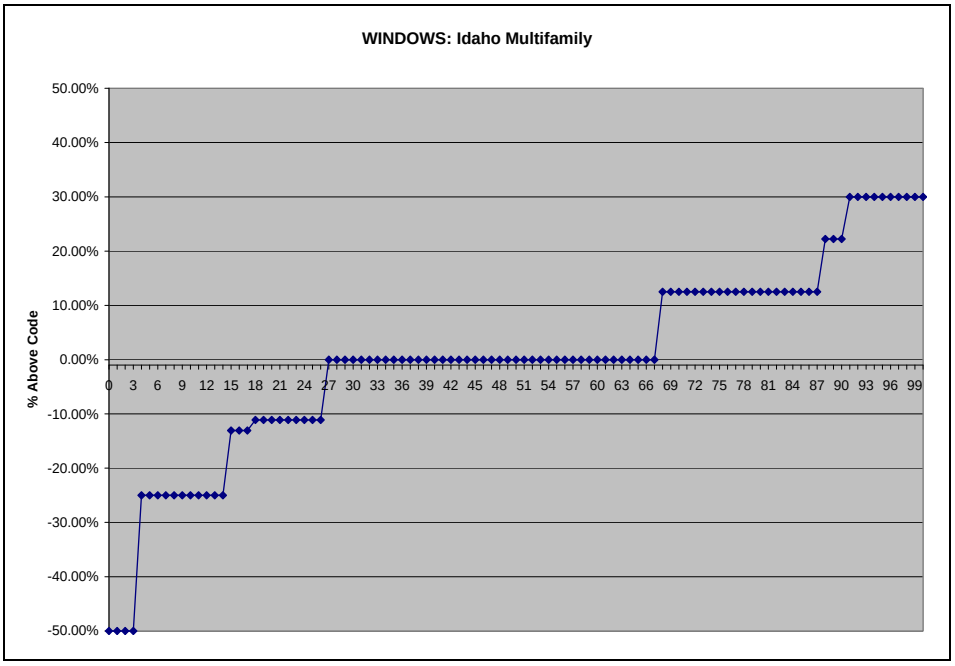


Figure 35. Windows: Idaho Single Family Percent Above Code

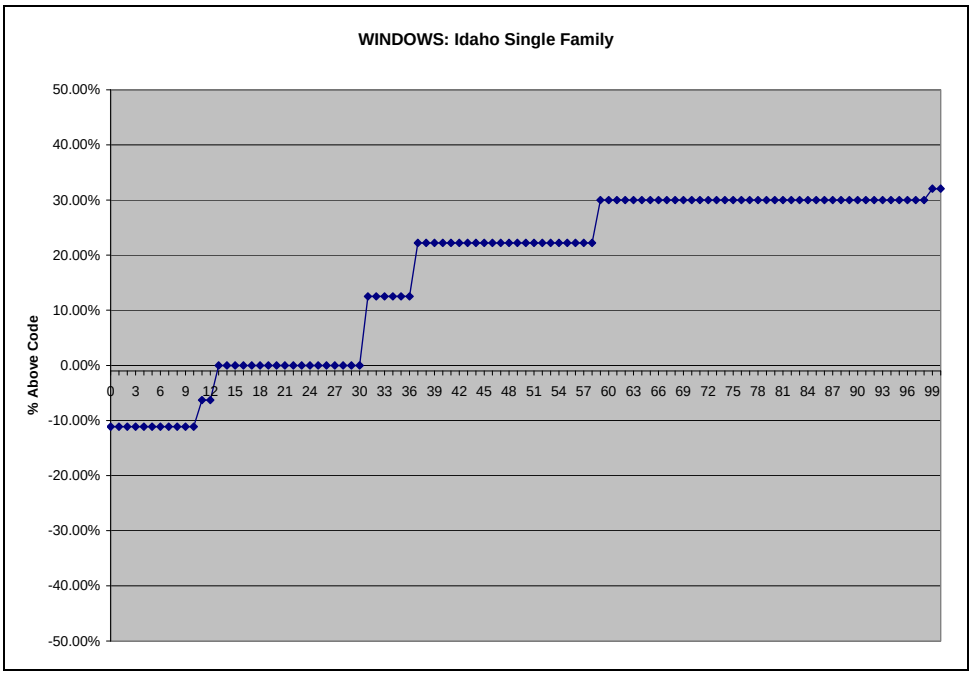


Figure 36. Windows: Oregon Multifamily Percent Above Code

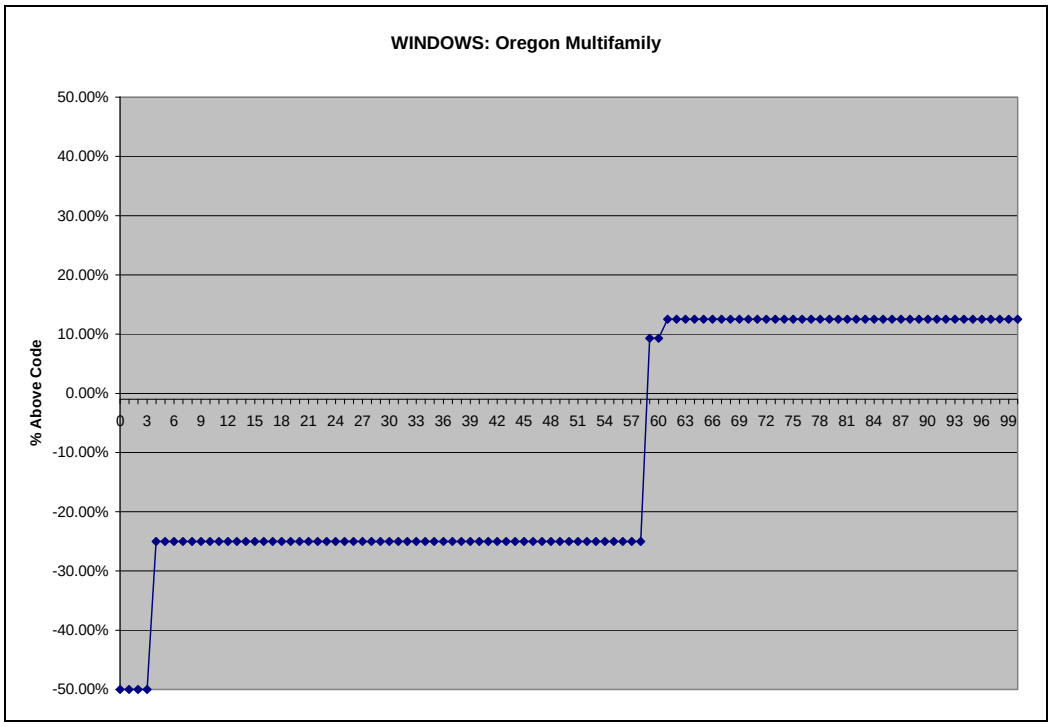


Figure 37. Windows: Oregon Single Family Percent Above Code

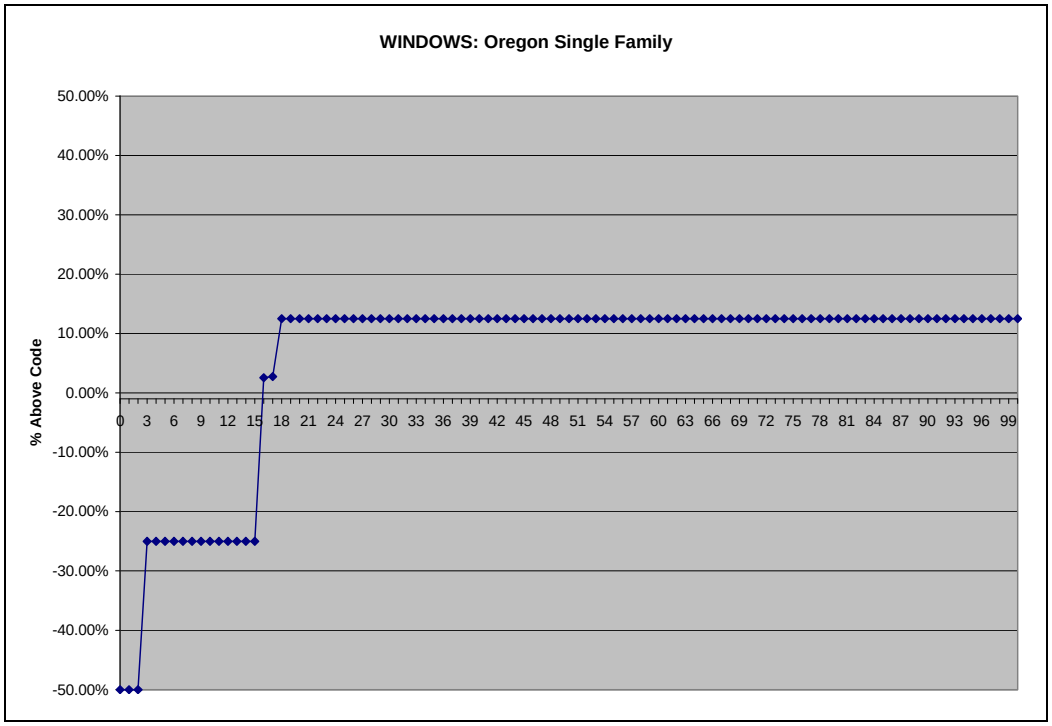


Figure 38. Windows: Washington Multifamily Percent Above Code

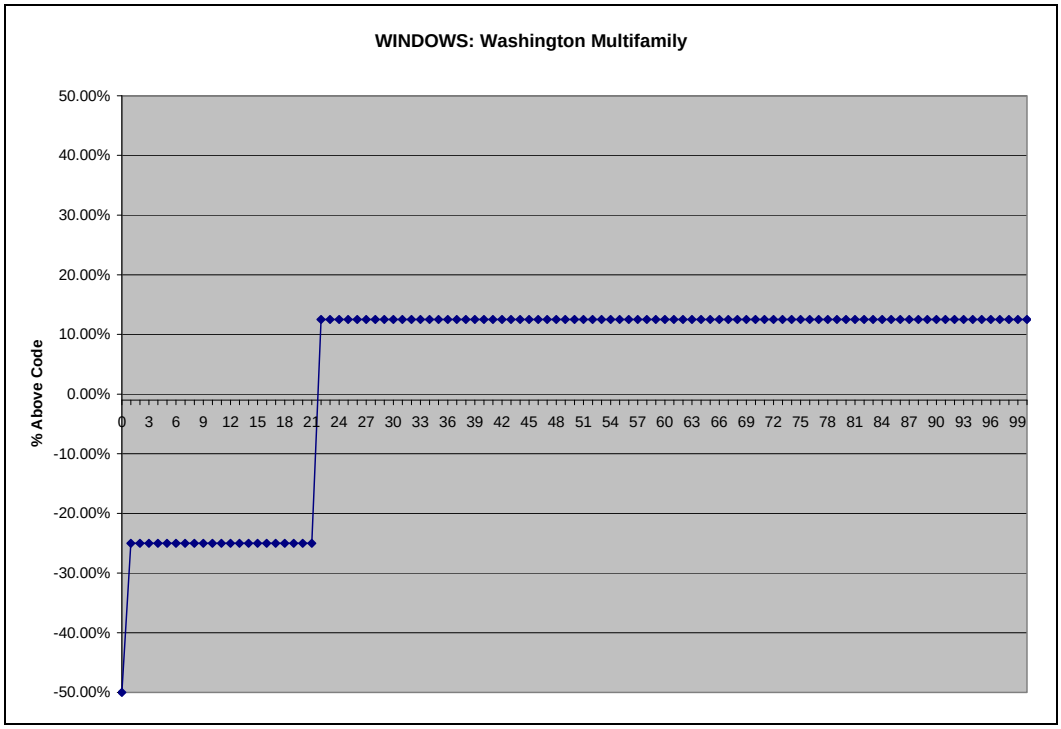


Figure 39. Windows: Washington Single Family Percent Above Code

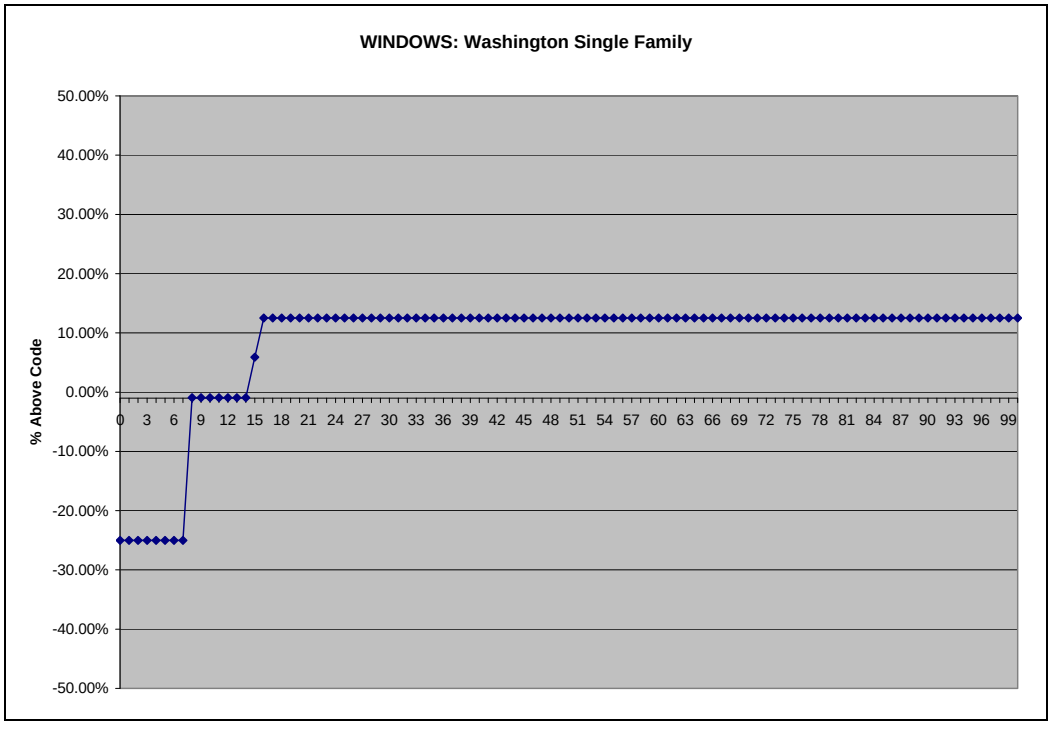


Figure 40. Walls: Idaho Multifamily Percent Above Code

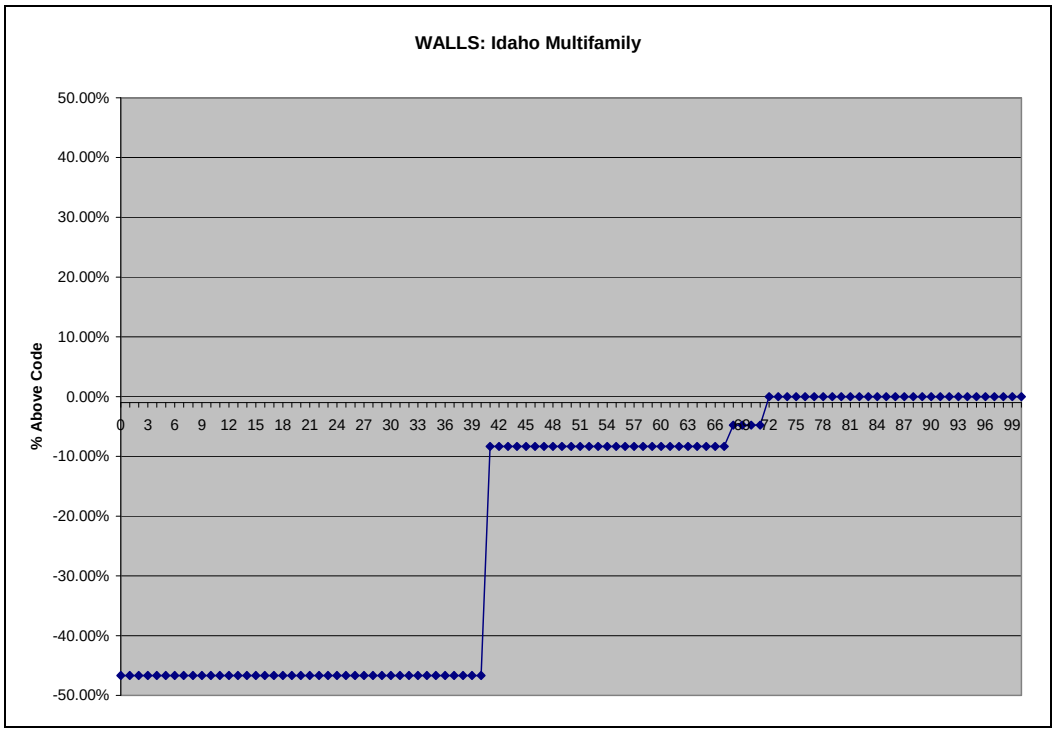


Figure 41. Walls: Idaho Single Family Percent Above Code

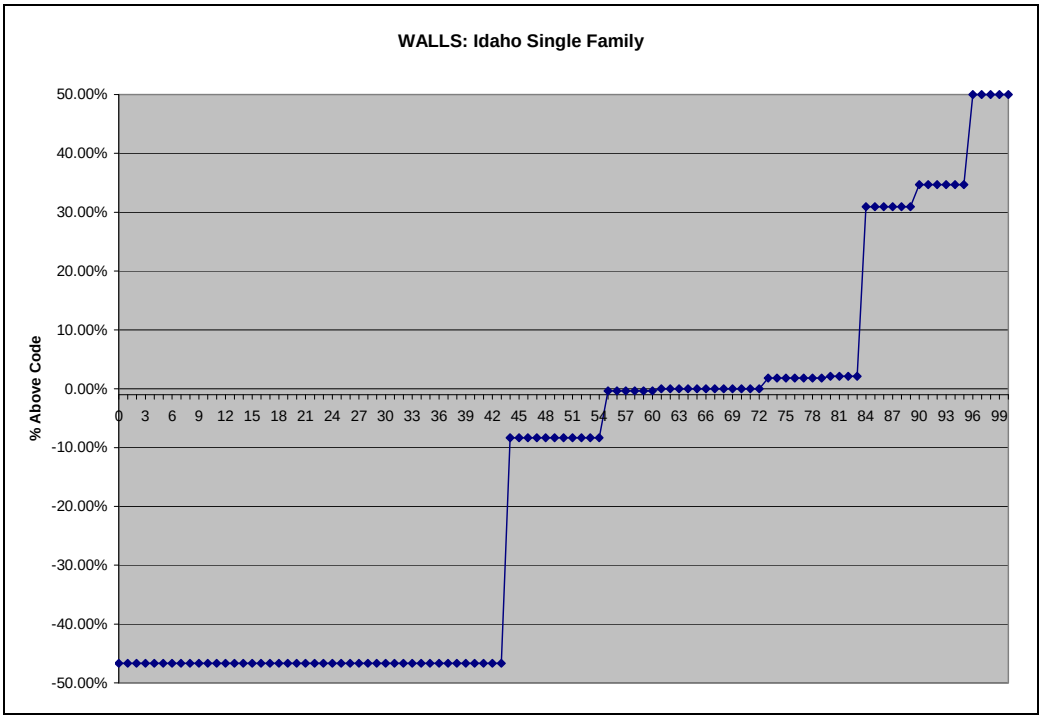


Figure 42. Walls: Oregon Multifamily Percent Above Code

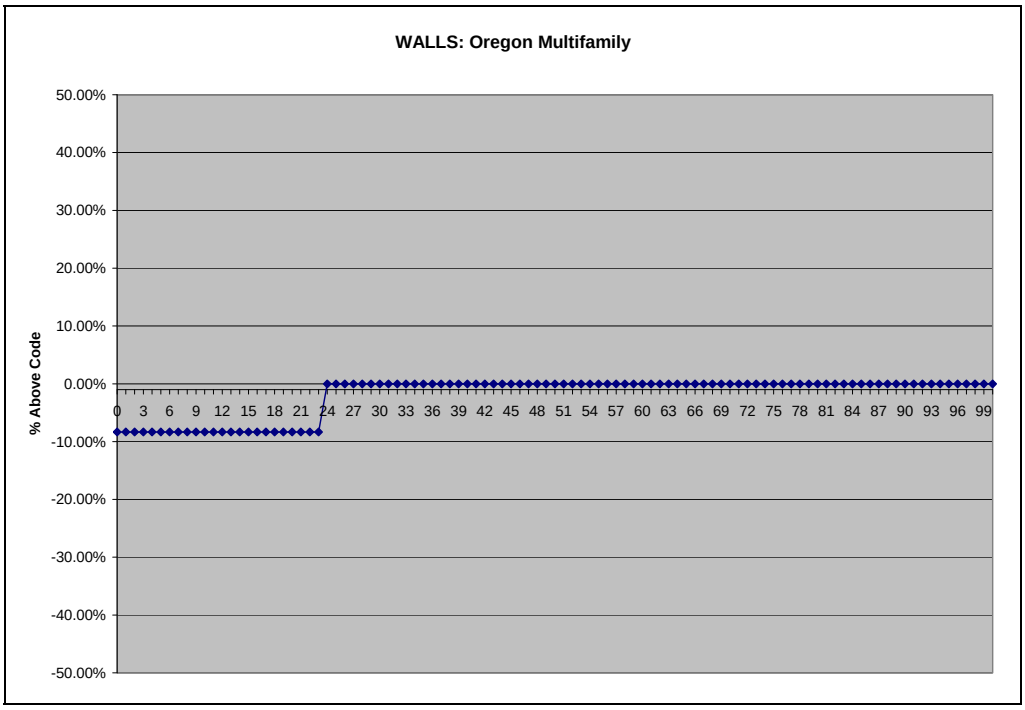


Figure 43. Walls: Oregon Single Family Percent Above Code

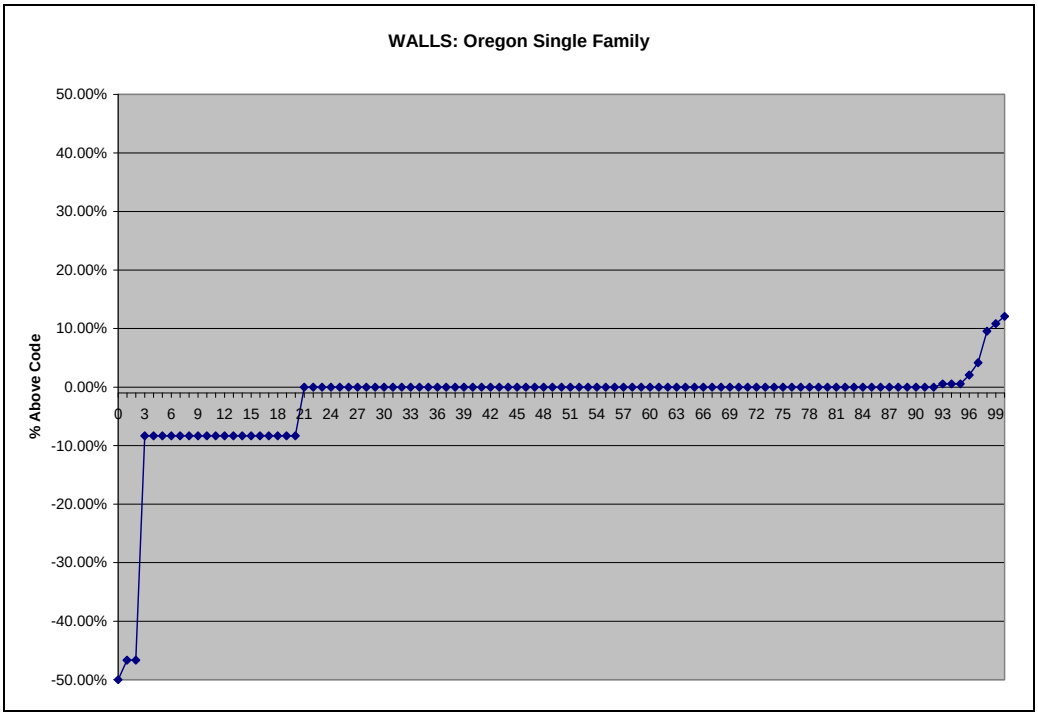


Figure 44. Walls: Washington Multifamily Percent Above Code

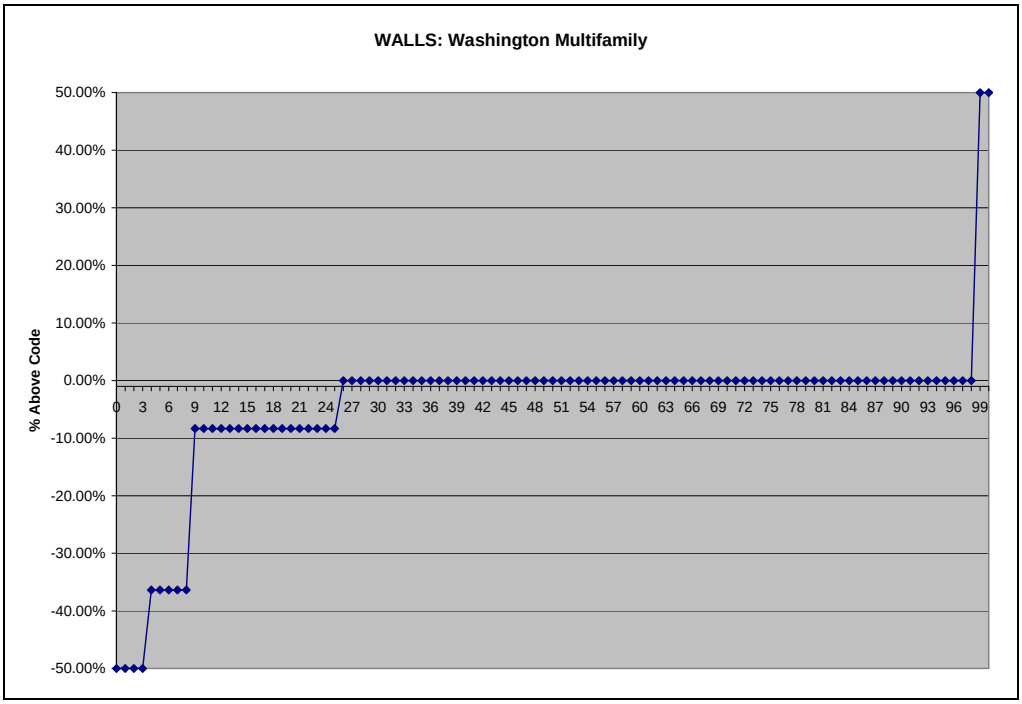


Figure 45. Walls: Washington Single Family Percent Above Code

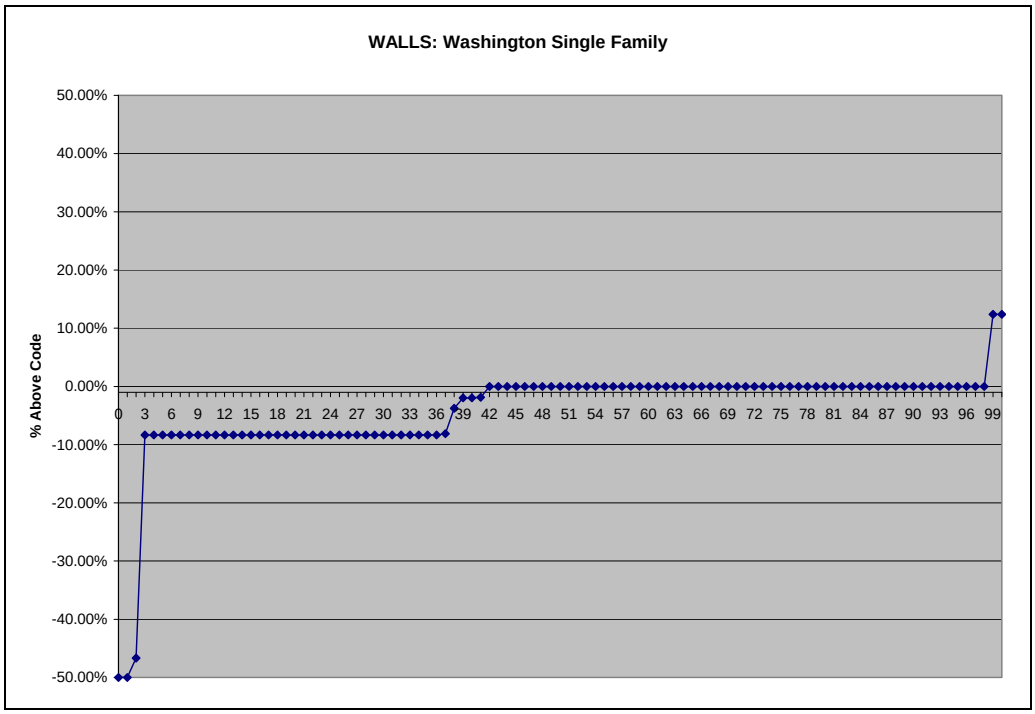


Figure 46. Floors: Idaho Multifamily Percent Above Code

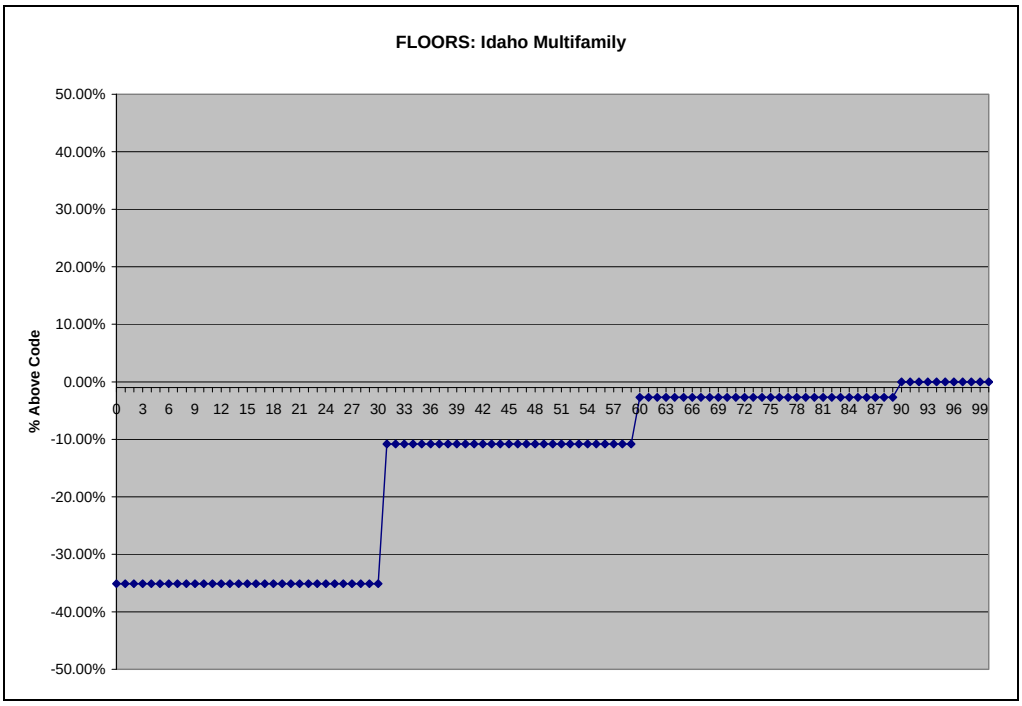


Figure 47. Floors: Idaho Single Family Percent Above Code

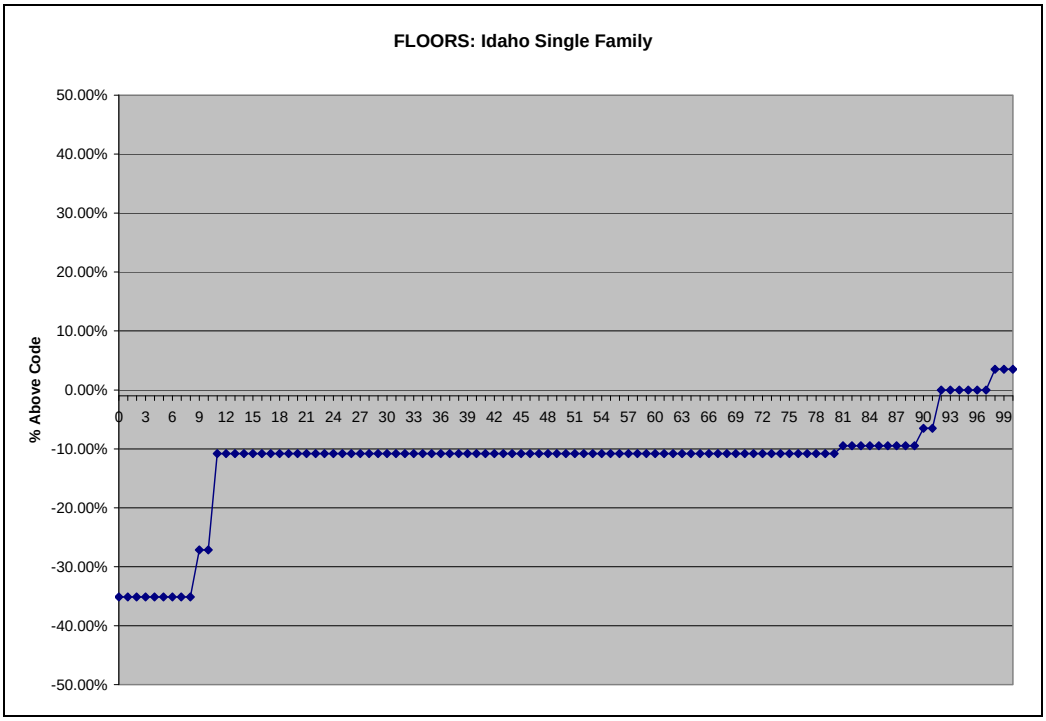


Figure 48. Floors: Oregon Multifamily Percent Above Code

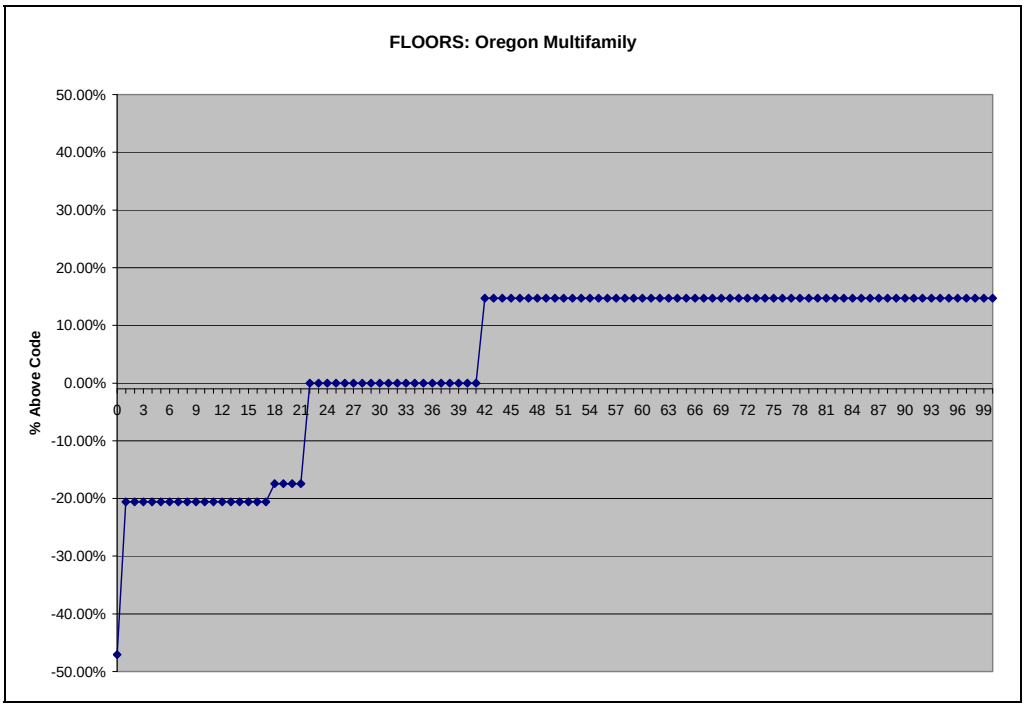


Figure 49. Floors: Oregon Single Family Percent Above Code

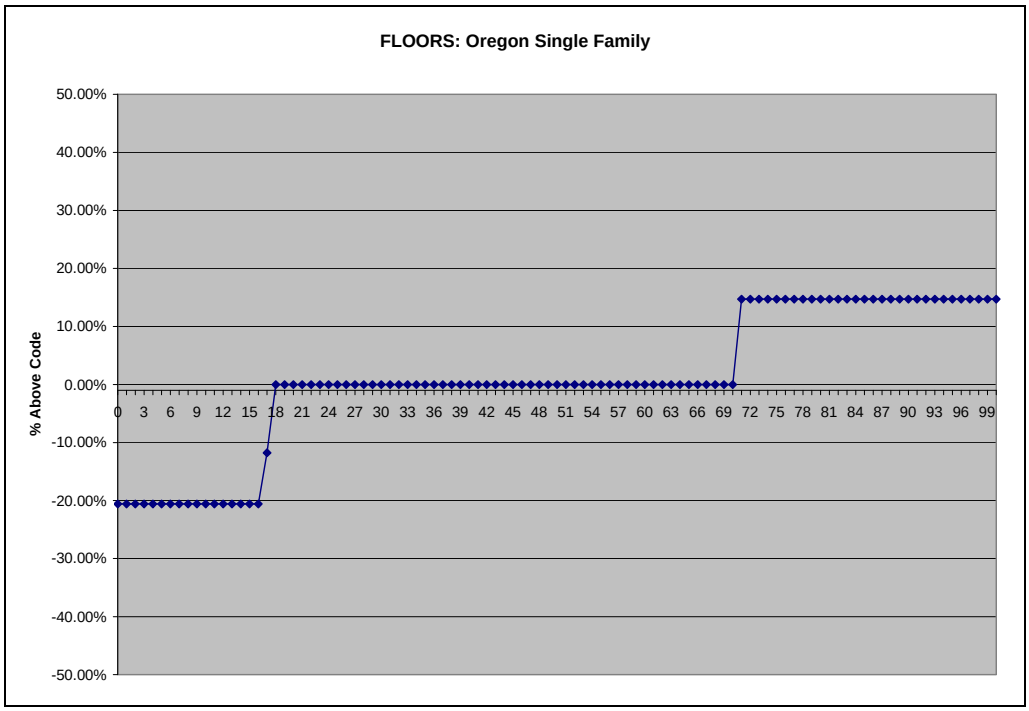


Figure 50. Floors: Washington Multifamily Percent Above Code

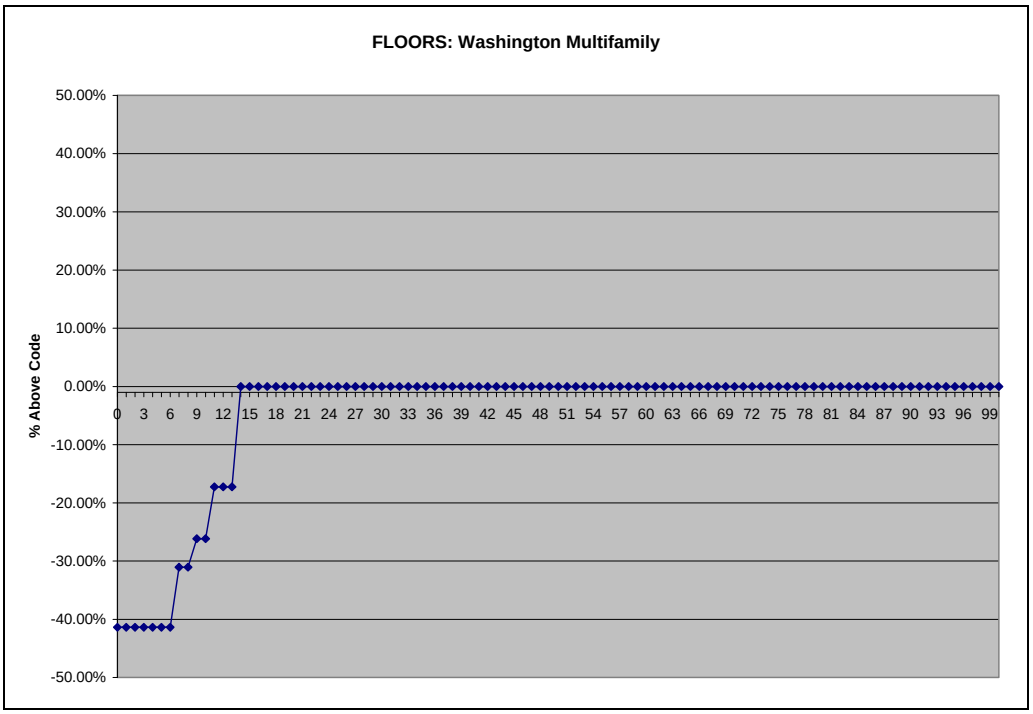


Figure 51. Floors: Washington Single Family Percent Above Code

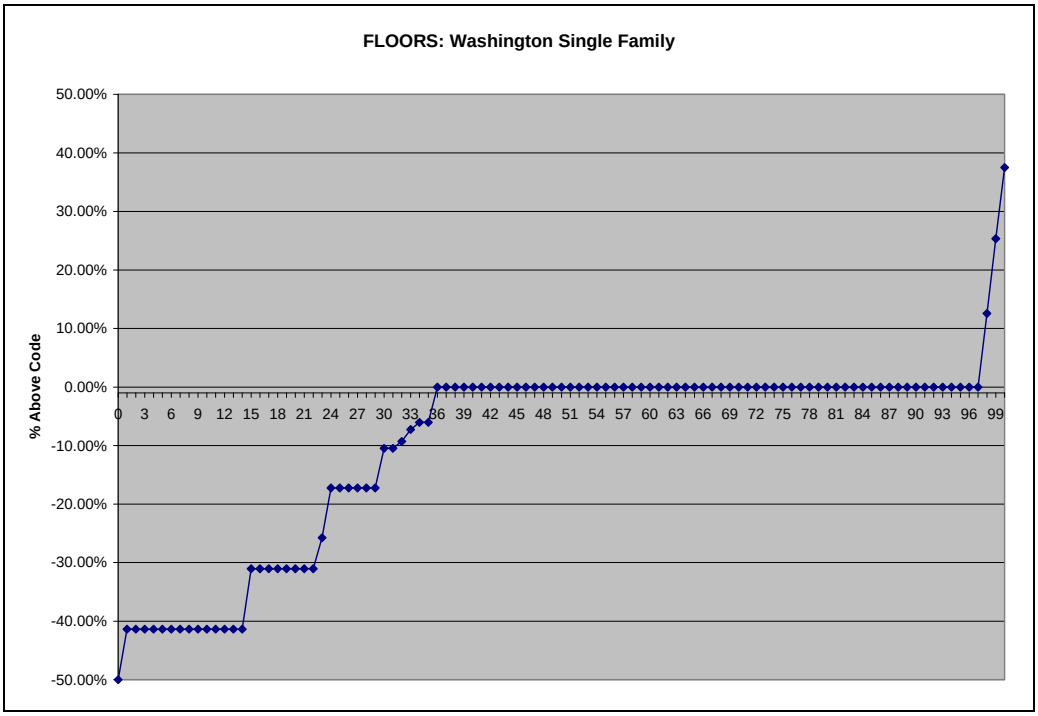


Figure 52. Roofs: Idaho Multifamily Percent Above Code

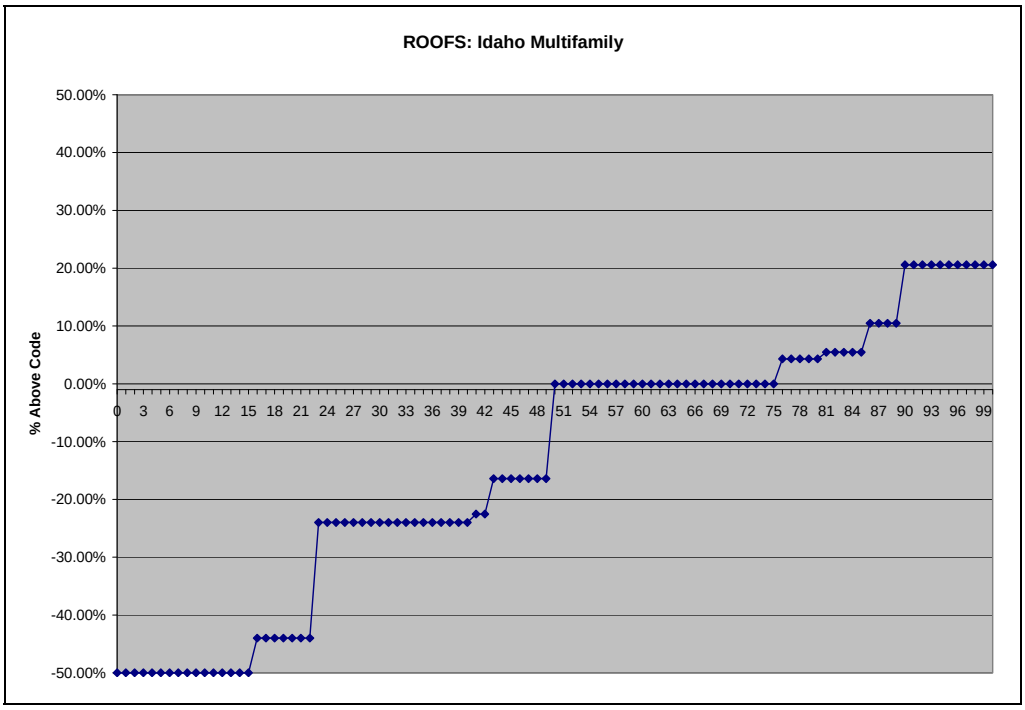


Figure 53. Roofs: Idaho Single Family Percent Above Code

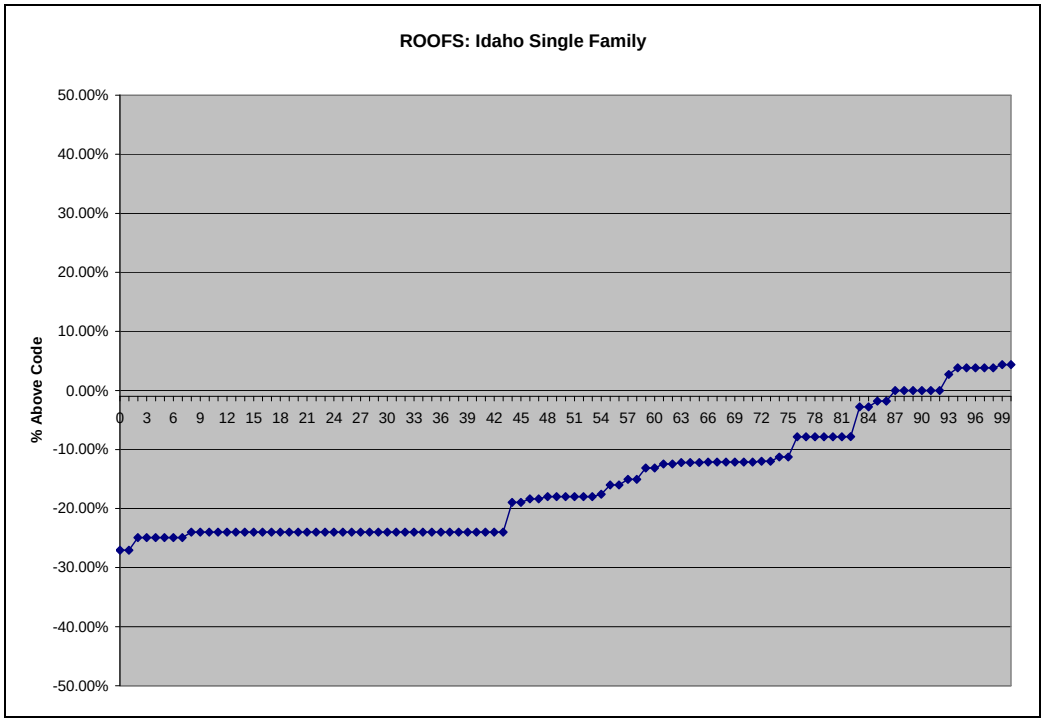


Figure 54. Roofs: Oregon Multifamily Percent Above Code

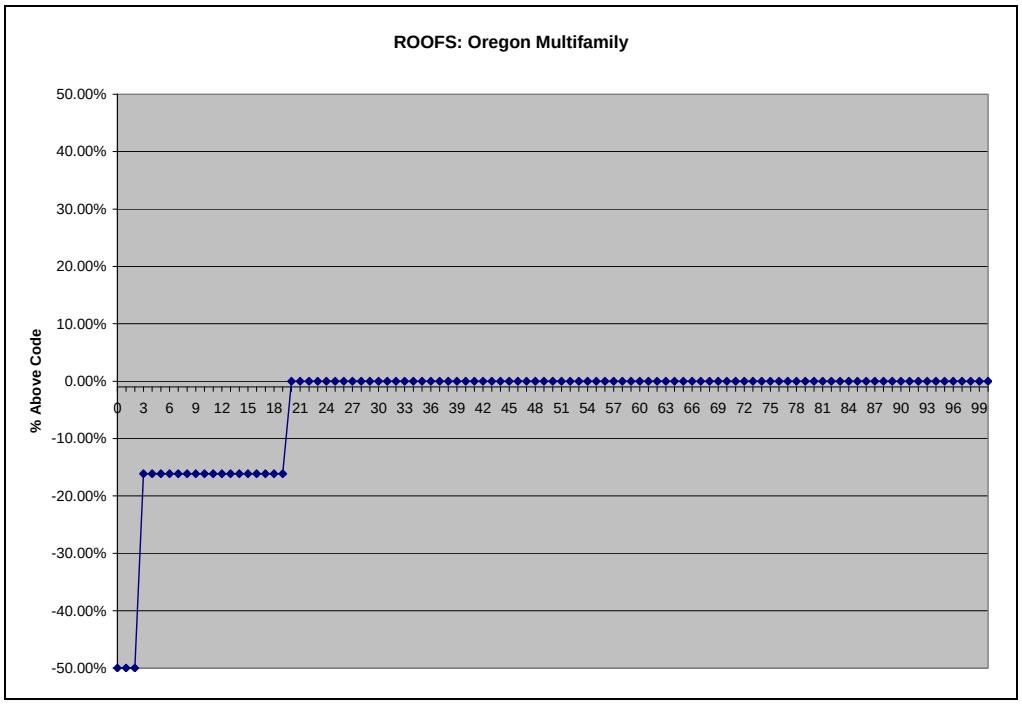


Figure 55. Roofs: Oregon Single Family Percent Above Code

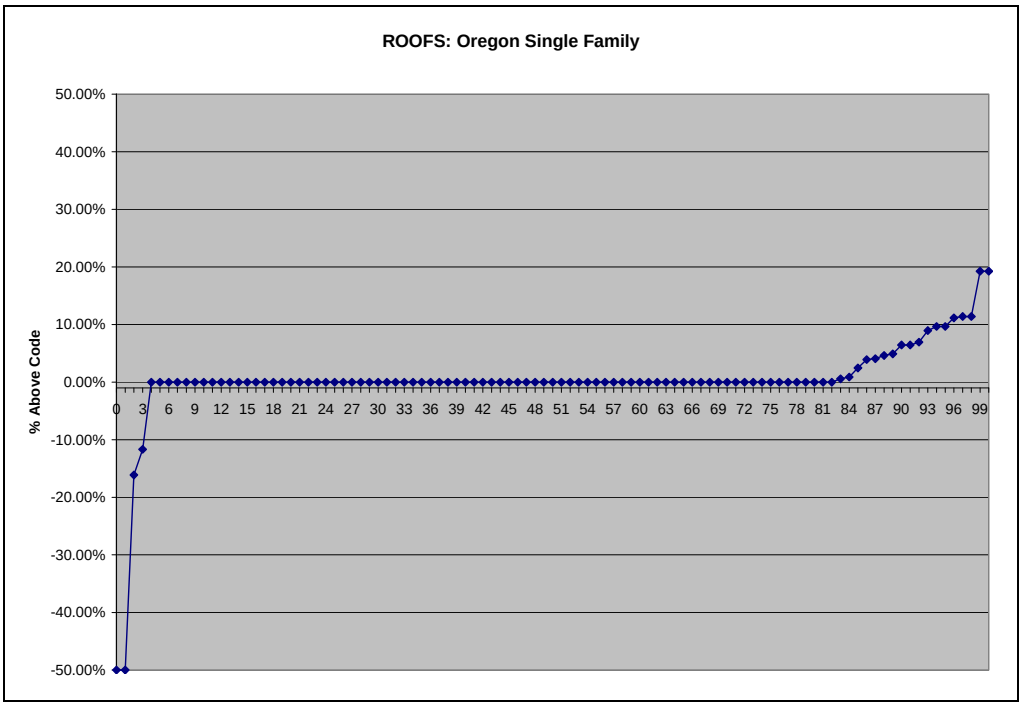


Figure 56. Roofs: Washington Multifamily Percent Above Code

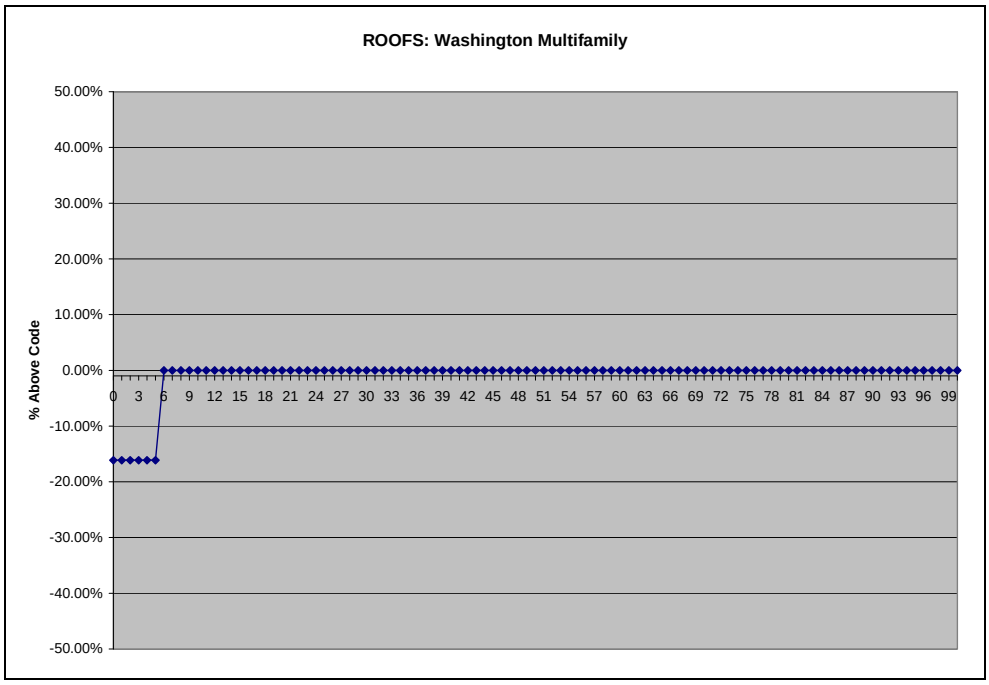


Figure 57. Roofs: Washington Single Family Percent Above Code

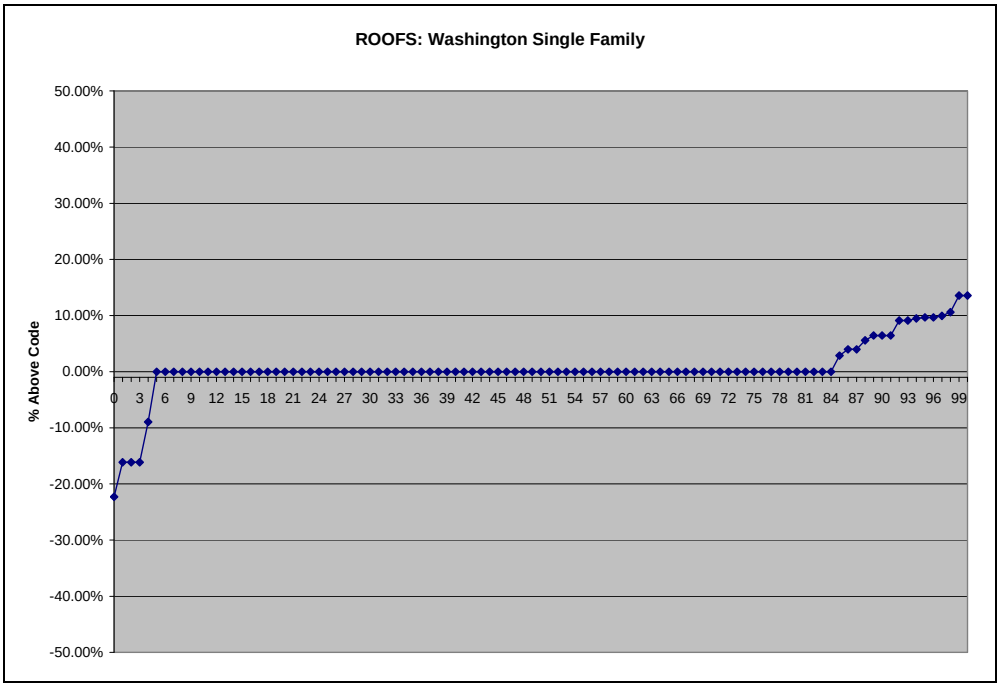


Figure 58. Overall Home: Idaho Multifamily Percent Above Code

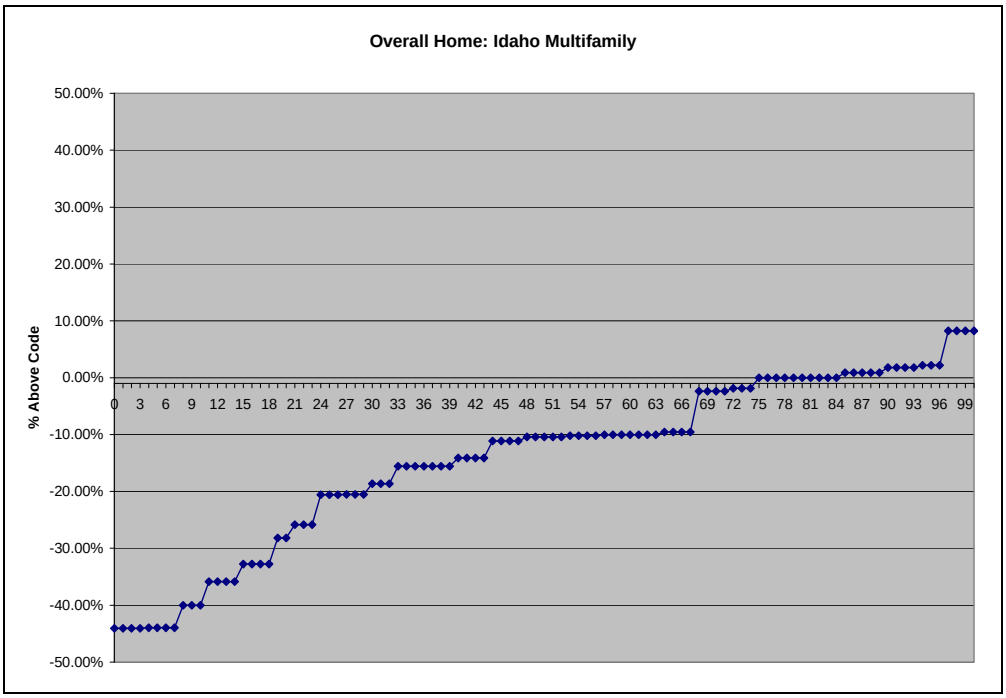


Figure 59. Overall Home: Idaho Single Family Percent Above Code

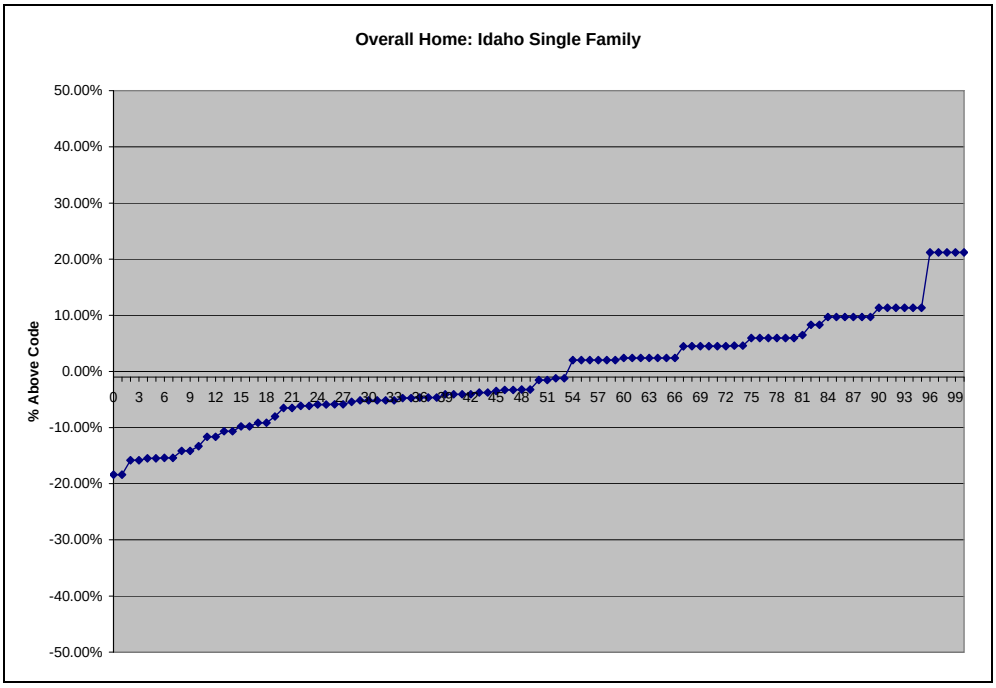


Figure 60. Overall Home: Oregon Multifamily Percent Above Code

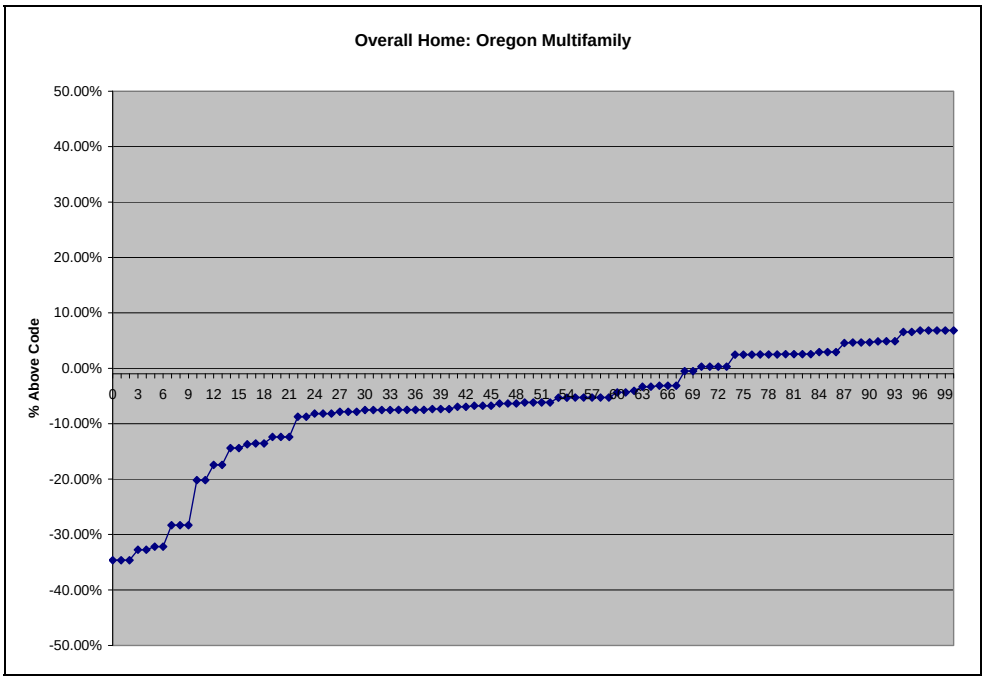


Figure 61. Overall Home: Oregon Single Family Percent Above Code

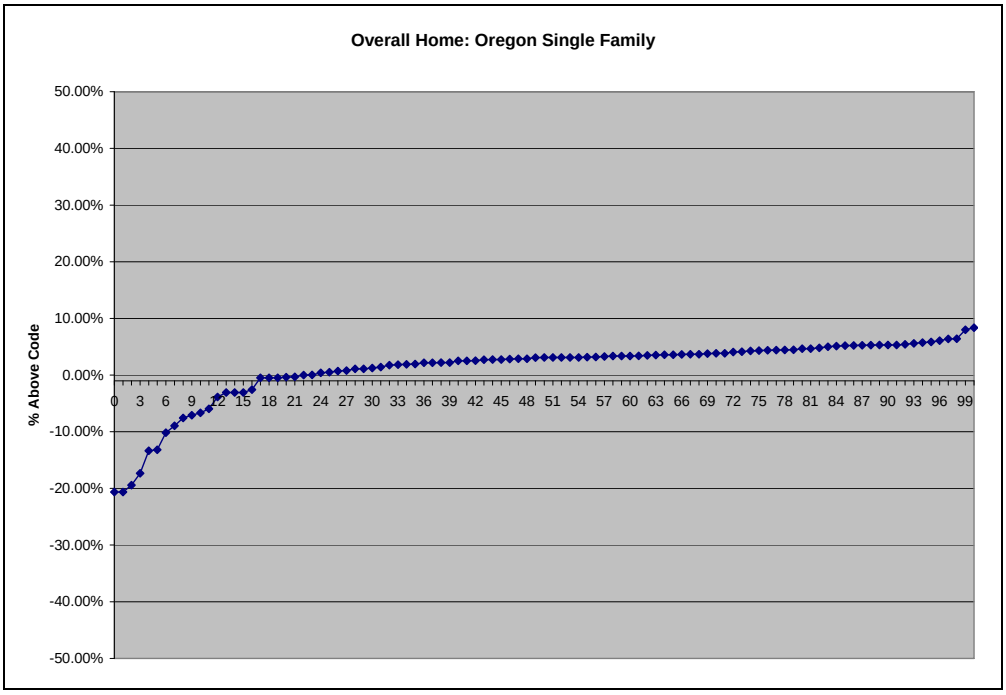


Figure 62. Overall Home: Washington Multifamily Percent Above Code

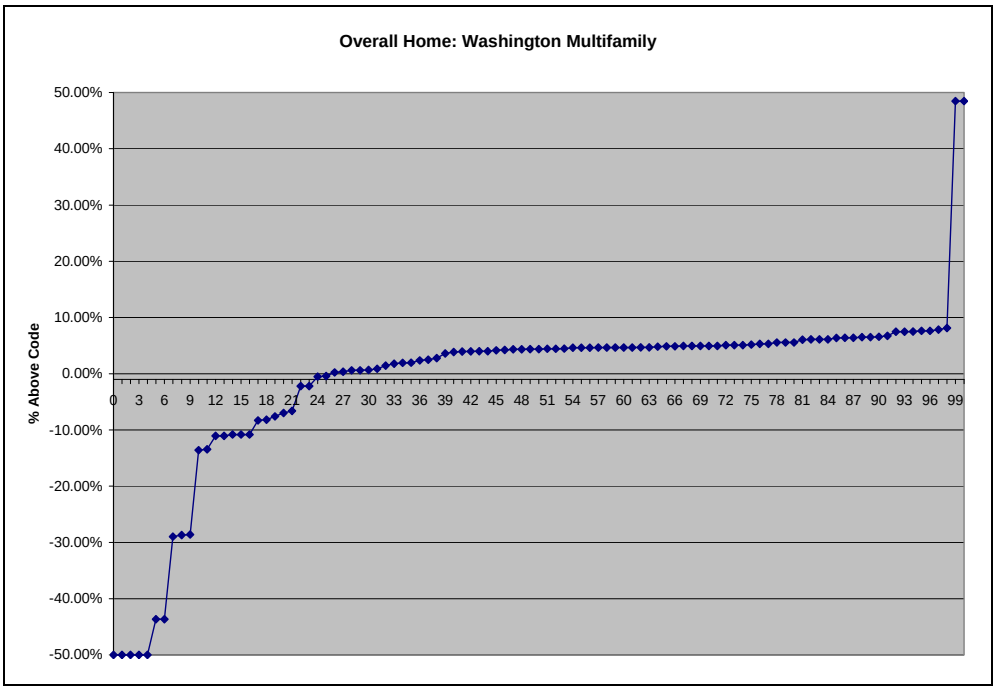
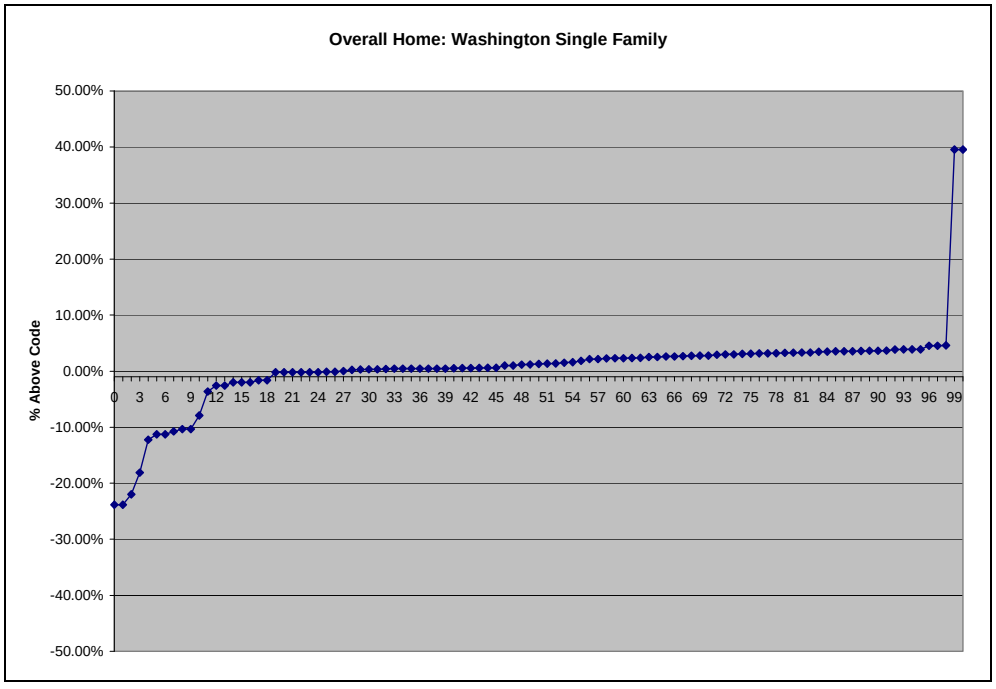


Figure 63. Overall Home: Washington Single Family Percent Above Code



Appendix J: Code Change Updates

Energy Code Schedule

Each Northwest state has a different energy code, and each state conducts its own energy code adoption and support activities. Adoption of energy codes is the province of state or local entities as shown below.

Table 106. Status of Energy Codes in the Northwest States – December 2007

State	Residential	Commercial	January 2005 Status	January 2008 Status
Idaho	2003 IECC	2003 IECC (includes ASHRAE/IESNA 90.1-2001, Addendum G)	Three-year cycle. 2003 IECC effective Jan. 2005.	2006 IECC adopted April 2007 and effective January 1, 2008.
Montana	2003 IECC	2003 IECC (includes ASHRAE/IESNA 90.1-2001, Addendum G)	Three-year cycle. Building Codes Bureau adopted 2003 IECC effective Dec. 2004.	2003 IECC became effective Dec 2004. Ongoing consideration of 2006 IECC; adoption expected March-April 2008.
Oregon	State Developed (more stringent than 2000 IECC)	State developed (exceeds ASHRAE/IESNA 90.1-1999 levels)	Three-year cycle. Residential update effective April. 2003. Commercial Oct. 2003.	Residential update expected January 2008. Commercial update effective Oct. 2005.
Washington	State Developed (more stringent than 2000 IECC for most homes)	State developed (meets or exceeds ASHRAE/IESNA 90.1-1999 levels)	Annual cycle. Residential and Commercial updates effective July 2005.	WSEC 2006 Edition effective July 1, 2007.

[1] References: Idaho - http://dbs.idaho.gov/energy/energy_code.html
Montana - http://www.energycodes.gov/implement/state_codes/state_status.php?state_AB=MT
http://www.energycodes.gov/implement/state_codes/state_stat_more.php?state_AB=MT
Oregon - http://www.energycodes.gov/implement/state_codes/state_status.php?state_AB=OR
http://www.energycodes.gov/implement/state_codes/state_stat_more.php?state_AB=OR
http://www.oregon.gov/ENERGY/CONS/Codes/cdpub.shtml
Washington - http://www.energy.wsu.edu/code/

Table 107 provides a summary of the energy code process and schedule in each of the four Northwest states. Table 107provides a snapshot of the status of energy codes in the Northwest states.

Table 107. Energy Code Process and Schedule

State	Process	Schedule
OR	Administrative. Building Codes Division (BCD) is the administrator. Building Codes Structures Board represents a variety of stakeholders appointed by the governor. Board committees consider each individual code (e.g. energy, electrical) and make recommendations on each proposed change. Full Board and BCD must then come to agreement. Only those changes approved by both Board and BCD then go to public hearings. Changes at that stage are rare but have occurred.	3-year cycle. Adoption process starts approximately 14 months before adoption.
WA	Administrative. State Building Code Council, consisting of approximately 20 diverse stakeholders appointed by the governor, adopts and amends energy codes. They are supported by a Board energy committee and a TAG. The energy committee recommends *yes* or *no* on each amendment but SBCC can reject or accept the recommendations. All changes to the energy code must sit through a session of the legislature before they are official.	Code change proposals are accepted before March 1 each year. The SBCC decides whether or not to go into rulemaking but will always do it every third year coinciding with the ICC cycle. Two public meetings in Sep and Oct. Vote is in November and adoption occurs July of following year.
ID	Legislative or administrative. The legislature can adopt and amend codes; the Building Code Board of the Division of Building Safety (stakeholder group appointed by the governor) can adopt codes through rule-making but cannot amend them.	The official State Energy Plan contains a 3-year adoption cycle. Legislation or rule-making can be initiated in any year if warranted.
MT	Administrative. The Building Codes Advisory Council stakeholder group (appointed by the governor) works under the Montana Dept. of Labor and Industry. The Council listens to debates and receives testimony from the public and makes recommendations which are generally adopted by the Dept of L&I. Once adopted, the new code becomes part of Montana state regulations through administrative rulemaking.	Three-year cycle, though in practice this varies widely. Energy codes tend to lag other codes in being adopted.

Source: NEEA, May 2007

One of NEEA's long-term goals for the Code Support Project is to *ensure that codes continue to increase in stringency and to incorporate all cost-effective measures*. In addition, one of NEEA's key objectives is to e*ncourage the adoption of uniform and easily interpreted energy codes in the Northwest*. As codes become more similar across the states, and in line with federal codes, they are easier to understand and promote more uniform interpretation. NEEA targeted specific code changes for adoption by 2008. These included:[23]

- *Idaho:* Update from 2003 IECC to 2006 IECC in 2007
- *Montana:* Update from 2003 IECC to 2004 or 2006 IECC in 2006
- *Oregon:* Amend OR code to require U-.35 residential windows for all homes and U-.45 for non-residential windows
- *Washington:* Adopt 2006 IECC in 2006 (with all necessary amendments to ensure that it is no less stringent than the current WA State Energy Code). —OR— Adopt a streamlined, IECC-formatted version of the WA State Energy Code with .35 windows required for all homes

States have made continued progress toward increasing energy efficiency in each of their respective state codes. Idaho adopted the 2006 IECC and Montana expects to adopt the 2006 IECC by April 2008. Washington adopted the 2006 WSEC requiring a U-0.35 window in climate

[23] Source: NEEA Energy Code Support Project Description, June 2005

zone 1 and U-0.30 window in climate zone 2 in residential construction, excluding multifamily and townhomes. Oregon's proposed changes include the requirement for U-.35 residential windows and U-.45 for nonresidential windows. NEEA met nearly all of their key code change objectives over the last three years.

Montana State Energy Code Changes

The Residential Code utilizes the 2003 IECC with amendments: (1) Basement wall insulation maybe delayed until space is finished. (2) Log walls are exempt from R-value requirements. (3) All residential buildings must have an energy component label, listing insulation levels, window and heating and water heating efficiencies to be placed in/on the electrical panel. The Commercial Code utilizes the 2003 IECC with reference to ASHRAE 90.1-2001. The Montana Department of Labor and Industry expects to adopt the 2006 IECC with amendments in March or April of 2008.

Oregon State Energy Code Changes

Oregon approves the residential code including mechanical, structural, plumbing, energy, etc. as one package. Oregon's new residential code is was approved in January 2008 and became effective April 1, 2008. The new Residential Code is 15% more stringent than the prior code. To achieve this savings target, several building envelope requirements are upgraded and four new required category measures are added to the Residential Energy Code prescriptive standards. Additionally, builders must choose one of nine energy efficiency options to include in the structure. The total code package will achieve 15 percent savings, while maintaining clear prescriptive standards and allowing builders some flexibility.

Changes in the standards include:

- R-30 under floor insulation
- R-10 under heated slabs
- Window, skylight increased U-values
- R-38 vaulted ceilings
- High efficiency lighting installed in minimum of 50% of permanently installed fixtures
- SEER 13 air conditioning

In addition to the new prescriptive standards, builders are required to choose one of nine energy efficiency options. The option selected may be more stringent than and be installed in place of a required prescriptive standard. The nine additional measure paths include: (1) high efficiency HVAC; (2) high efficiency ducts; (3) high efficiency building envelope; (4) zonal electric heat or ductless furnace/heat pump; (5) high efficiency windows with advanced framing in vaulted or flat ceilings and lighting; (6) high efficiency windows with advanced framing in vaulted or flat ceilings and on-demand water heating; (7) high efficiency water heating and lighting; (8) solar photovoltaic; and (9) solar water heating.

Washington State Energy Code Changes

Residential Upgrade from the 2004 edition to the 2006 edition

Washington expects at least 7% reduction in energy use for residential new construction. The following lists the most significant changes in the residential code.

1. Improvement in the building envelope achieving a 7% reduction in energy use. For climate zone 1, this is a change from a U-0.40 to a U-0.35 window. For climate zone 2, this is a change from a U-0.35 to U-0.30 window, or a change in the wall from R21 into R19+R5. This change does not apply to multi-family or townhomes.

   The UA trade off method improved the target wall U-factors to R21 in climate zone 1 and R19+ R5 in zone 2. This will impact single family and multifamily construction. Because much of the multifamily market uses this approach, we assume there will be savings in this category, especially in climate zone 2.

2. Single Rafter Vaults. Change from R30 to R38. There is still an exception for 500 square feet at R30 when the rafters are only 2x10" deep.

3. Requirement for high efficiency lighting outdoors. Perhaps not a substantial energy savings, but a crack in the door for residential lighting.

Commercial Upgrade from the 2004 edition to the 2006 edition

1. Lighting Power Densities. In 2005, lighting power densities dropped by 20% in the commercial office and other large occupancy categories. This year, the lighting power densities dropped by more than 40% in manufacturing, and several other large nonresidential spaces.

2. A number of requirements were added for specific mechanical systems. This includes variable flow pumping, hydronic system controls, and ventilation controls for high occupancy spaces. Each will provide savings through control strategies that were previously unregulated.

3. The commissioning section was significantly modified to improve enforceability.

4. Minimum building envelope requirements for semi-heated spaces are more stringent. The revision is also designed to make conversion to fully heated space more successful.

Idaho State Energy Code Changes

Residential Upgrade from the 2003 IECC to the 2006 IECC

Idaho expects at least 10 to 15% reduction in energy use for residential new construction. The most significant changes in the residential code include:

1. Floor over a crawlspace changed from R19 to R30.

2. Unvented crawlspace walls changed from an R17 (2003) to R10 rigid or R13 batt (2006).

3. Window U-factor goes from .37 to .35 with unlimited glazing in 2006.

4. ResCheck doesn't allow easy trade-off for 2x4 walls.

Non-Residential Upgrade from the 2003 IECC to the 2006 IECC

A 5% reduction in energy use for non-residential new construction is expected. The most significant changes in the non-residential code were:

1. Heat recovery required for exhaust systems over 5000 cfm.

2. SHGC of 0.4 required for factory assembled glazing in the 2006 IECC. SHGC under 2003 code varies from 0.4 to 0.7 depending on projection factor.

3. U factor of 0.35 required under the 2006 IECC. U factor under 2003 varies from 0.7 to 0.4.

4. Section 503.3.1 requires economizers for all cooling systems for systems ≥ 54,000 Btu/h. This is down from the old requirement of 65,000 Btu/hr.

5. Now a single column for Lighting Power Densities for all occupancy types that can be used for either a whole building or tenant area or portion of building approach.

6. Reduces the Lighting Power Densities for a portion of the occupancies e.g. Office (1.0 w/ft2) and Retail (1.5 w/ft.2).

Appendix K: NEEA's Influence on Achieved Energy Savings

Achieving energy savings through energy codes requires adopting stringent energy codes and compliance with stringent codes. Adopting more stringent energy codes can require overcoming significant barriers including, for example, opposition from manufacturers or building associations. Each state has its own process for adopting and promulgating energy codes. Adopting the energy codes does not guarantee achieved energy savings. Compliance, and enforcing compliance, are required to achieve energy savings through codes and standards.

Attributing achieved energy savings to NEEA's efforts through the Codes and Standards Project is nontrivial. While conceptually straightforward, it is methodologically difficult. In this MPER, we reviewed a prior study conducted for NEEA that assessed NEEA's influence on codes and standards efforts to estimate net savings attributable to the NEEA Codes and Standards Project.[24] Quantec assessed the reasonableness of the attribution factor using data collected in this MPER.

Attributing influence to the achieved energy savings must consider both NEEA's efforts to increase code stringency and increase compliance. NEEA's funding for the Codes Project provides staff for code development, technical analysis and assistance to develop, adopt, and enforce the codes, and training for the building trades and enforcement community. All of these activities are required to achieve energy savings through codes.

Attributing achieved energy savings to NEEA's efforts through the Codes and Standards Project is nontrivial. While conceptually straightforward, it is methodologically difficult. In this MPER, we reviewed a prior study conducted for NEEA that assessed NEEA's influence on codes and standards efforts to estimate net savings attributable to the NEEA Codes and Standards Project.[25] Quantec assessed the reasonableness of the attribution factor using data collected in this MPER. In the next two sections, we review methods and results of the 2006 Summit Blue study, and provide an assessment of NEEA's influence on achieved energy savings using data collected in this MPER.

Summary of 2006 Review of Energy Savings Related to Codes and Standards Efforts

In the prior NEEA study, contractors Summit Blue assessed NEEA's influence on codes and standards efforts to estimate net savings attributable to the NEEA Codes and Standards Project.[26] For their attribution study, Summit Blue reviewed existing documentation on codes promulgation and compliance, and interviewed 18 regional stakeholders knowledgeable about regional codes. Summit Blue included three task elements in their assessment: (1) analysis of energy savings calculation methodologies; (2) analysis of baseline and savings increments due to

[24] Summit Blue, *Review of Energy Savings Related to Codes and Standards Efforts*, April, 2006.
[25] Ibid.
[26] Ibid.

code changes; and, (3) analysis of stakeholder interviews. Contractors used the interview responses to develop a range of attribution percentages for each state and to recommend a value for calculating net savings. The recommended value was applied to regional gross energy savings numbers (by state) to develop estimates of non-residential savings attributable to NEEA efforts through 2005.

The Summit Blue study stated regional code adoption efforts improved through NEEA activities. For example, the study summarizes NEEA's efforts by state as follows:[27]

- In **Idaho**, NEEA funding was critical to the initial adoption of the 2000 IECC. Interviewees also believed that the 85% compliance estimate would be much lower without NEEA funding.

- In **Montana**, the DEQ was the single largest influence in code promulgation. NEEA support for DEQ staff was important to code adoption, but sentiments regarding the degree of influence were mixed.

- In **Oregon**, interviewees cited the ODOE as the single most significant organization pushing for codes that are more stringent. NEEA funded four staff persons at the ODOE in 2004. Interviewees indicated that NEEA influenced compliance in a positive way, and that it would definitely be lower without NEEA's support.

- In **Washington**, the impact of the Alliance on code promulgation was lower, in part because state politics have a large influence on the promulgation of more stringent energy codes. NEEA-funded trainings for the enforcement and building communities in Washington were vitally important to good compliance with the energy codes.

Table 108 below presents the Summit Blue study's range of savings and recommended attribution levels by state.

Table 108. Attribution of Savings to Alliance Efforts by State[28]

	Low-End	Recommended	High-End
Idaho	50%	70%	90%
Montana	20%	40%	60%
Oregon	60%	75%	90%
Washington	30%	40%	50%

[27] Ibid. Pp 1-2.

[28] Ibid. Page 2. Table ES-1.

MPER #2 Summary of NEEA's Influence on Energy Savings Related to Codes and Standards Efforts

Methodology

Given the highly qualitative nature of the data collected through interviews with market actors and stakeholders, Quantec developed metrics to assess NEEA's influence on achieved energy savings.

NEEA's influence on achieving energy savings through changes in the energy code baseline was assessed by looking at (1) state adoption of more stringent codes, and, (2) perceptions about NEEA's influence on the evolution of energy codes.

NEEA's influence on code enforcement and compliance was assessed by (1) examining the respondents' perceptions of NEEA's role in encouraging compliance and enforcement, and, (2) reanalyzing compliance by state using RLW's field data.

Respondents' perceptions were assessed via review and analysis of qualitative responses to interview questions. In response to several questions, respondents named parties influential in the codes adoption process. These were unprompted open-ended questions, asked without providing answer option categories. Responses indicated both positive involvement and barriers presented by entities opposing more stringent energy codes. There was some overlap in responses between questions, that is, the same entities were named in response to more than one question. We counted each mention of an entity involved and influential in the codes process. Each positive mention is an indicator of that entity's activity toward achieving savings. Likewise, we noted the significance of the barriers presented by counting the number of times respondents named entities opposing more stringent energy codes.

All respondents' perceptions were counted, regardless of whether the respondent or their organization was directly funded by NEEA The results tables do indicate whether the named entity receives funding from NEEA. A count of all named entities receiving funding from NEEA indicates NEEA's involvement and influence. This method gives equal weight to all comments. Some comments may have been much more expressive of NEEA's role than others. For example, consider the two comments below. While one could argue that the first comment should carry more weight than the second (where the NEEA-funded staff person is included in a larger list) it is difficult to quantify the appropriate response weight.

- NEEA has been influential at the state level and regionally. I don't see many other organizations coming to the forefront as they are generally opposed to more stringent energy codes.

- Ken Baker, State Energy Bureau, ID Assoc. of Building Officials, Association of ID cities, incentive programs.

Likewise, comments made by one specific individual might need more weight than another. Therefore, because of the highly qualitative nature of these interviews, we chose not to weight

responses.[29] In the example above, the first comment records the response "NEEA" and the second comment records each named entity separately. Response tables are presented for each state below.

Appendix B of this report provides two tables summarizing influential entities listed in the open-ended questions by the energy code contractors, state and local codes officials, and other market actors interviewed. Appendix tables reflect responses from those (1) directly or indirectly funded by NEEA, and (2) respondents receiving no direct funding from NEEA.

The following assessments by state reflect the perceptions of respondents from that state.

Idaho

When asked what factors influenced the evolution of energy codes, one respondent noted that in the early 1980s BPA provided money and staffing, technical support, demonstration projects, and training to demonstrate the true cost and value of energy efficiency.

Public pressure, demands for better products, the rising cost of energy and increasing utility bills are also factors influencing the evolution of energy code adoption in Idaho. In Idaho, the 1986 codes were the residential standard until 2002, when legislators passed the first energy code: the 2000 IECC. One respondent noted Idaho adopted the 2001 statewide code to satisfy accessibility requirements. The most recent code change in Idaho upgraded the 2003 IECC to the 2006 IECC. Idaho expects 10% to 15% reductions in energy use for residential new construction, and 5% reductions in nonresidential new construction. This upgrade was possible with NEEA funding to staff codes positions and committees where participation could make a difference.

Quantec's compliance analysis using field data showed that compliance fell below 85% for all components in the multifamily sector, including wall insulation (60%), roof (50%), windows (74%), floor (40%) and overall (37%). In the single family sector, only windows showed 90% compliance rates bringing the overall rate of compliance to 86%. Wall insulation (57%), roof (25%), windows (74%), and floor (20%) components were all less than 85%.

Six of the 8 NEEA codes contractors and market actors interviewed stated an 85% rate of compliance with the code overall were reasonable. Respondents stated that compliance was low for individual measures including HVAC, duct design, heat load calculations, and economizers (5 comments). Three commented that lighting and controls are in low compliance. Air sealing, envelope, and glazing each received 1 comment.

Six of the 8 NEEA codes contractors and market actors interviewed stated the energy codes are not uniformly enforced. To some extent, this is because Idaho is a "home rule" state. The state adopted the 2006 IECC energy code but adoption within each jurisdiction is at the discretion of the jurisdiction. In some locations, code enforcement depends on whether the building is inside or outside the city limits. This presents a significant barrier to achieving energy savings. Reasons given for low enforcement related to lack of time, lack of expertise, and differences in approach

[29] Future assessments of attribution could include a much more rigorous interview, scoring, and weighting process. One such method is an Analytic Hierarchical Process o (AHP).

between jurisdictions. All market actors stated that energy codes are not high priority during inspections.

Table 109 shows that NEEA and entities it directly and indirectly funds were mentioned in 58% of comments. These comments indicated NEEA had a positive influence on energy code adoption, compliance and enforcement. Table 110 shows the entities posing some amount of opposition to code adoption, according to the respondents' perceptions. These comments show that opposition was not insignificant and effort was needed to work in collaboration with these entities to adopt energy codes.

Table 109. Entities Influencing Adoption of More Stringent Energy Codes in Idaho

Idaho Stakeholders and NEEA Contractors Comments: Entities Engaged in Adopting and Enforcing More Stringent Energy Codes			
Funding	Entity	Number of comments	Percent of comments
Direct funding from NEEA	NEEA	14	29%
Direct funding from NEEA	Association of Idaho Cities	8	17%
Fund staff to participate in committee	International Code Conference (ICC chapters)	6	13%
No funding	Division of Building Safety	5	10%
No funding	Building Officials	4	8%
No funding	Legislative action	3	6%
No funding	ID State Energy Bureau	3	6%
No funding	BPA	2	4%
No funding	AIA	2	4%
No funding	Disabled advocates	1	2%
	Total	48	

Table 110. Entities Presenting Potential Opposition to More Stringent Codes

Idaho Stakeholders and NEEA Contractors Comments: Entities Presenting Potential Barriers to More Stringent Energy Codes		
Entity	Number of comments	Percent of comments
Realtors' Association	4	19%
Building Contractors Association	4	19%
Idaho Association of Building Officials	3	14%
Home Builders Associations	3	14%
Building Industry Association	2	10%
AGC	2	10%
NFPA	1	5%
Industry, in general	1	5%
ESCOs	1	5%
Total	21	

Respondents reported that without NEEA's funding and training, compliance and enforcement would be even lower that it is currently. The market actors realize the value of training, and the majority stated more training is needed to increase compliance. Respondents also noted the most

successful strategies used by market actors to influence codes adoption include outreach to industry, collaboration, funding training and education, and lobbying.

Idaho recently passed the 2006 IECC and NEEA contractors contributed to that adoption process and increased code stringency. Energy savings realized through codes and standards are lower than desired in Idaho and there is room to increase achieved energy savings. As shown in the tables above, NEEA had a significant presence.

Summit Blue's 2006 analysis stated the range of attribution was 50% on the low end, 90% on the high end, and recommended attributing 70% of achieved energy savings to NEEA (Table 108). Quantec's assessment is that while the amount of achieved energy savings is lower than anticipated, and there is room for improvement, NEEA did influence achievement of savings. Given 58% of positive comments credited NEEA with influencing energy codes, there was opposition to codes, and savings are difficult to achieve in a home rule state, Quantec believes Summit Blue's recommendation is for attributing 70% is reasonable as the upper-end estimate.

Montana

In September 2004, Montana adopted the 2003 IECC with Montana Amendments, effective December 2004, making it Montana's first statewide energy code for all building types. The Montana Department of Labor and Industry expects to adopt the 2006 IECC in March or April 2008.

When asked what factors influenced the evolution of energy codes, Montana respondents stated legislative action and increases in energy costs influenced the evolution of the energy codes adopted in their state. Quantec did not include Montana in the compliance analysis using field data because there were insufficient data points.

Four of the 5 NEEA codes contractors and market actors interviewed stated 85% rates of compliance with the code overall were reasonable. Respondents stated that compliance was low for individual measures including lighting and controls (4 comments), and air sealing (3 comments). Duct design, heat load calculations, crawl space venting, and slab-on-grade ventilation each received one comment. Two stated they lacked authority to enforce the codes.

Three of the 5 NEEA codes contractors and market actors interviewed stated the energy codes are not uniformly enforced. Respondents reported that in some areas there are both city and county building departments and rural areas are not subject to energy codes. One noted that in most parts of the state, contractors self-certify that they have met the energy code, and the only demonstration of code compliance is self-certification from contractors. One respondent stated the commercial sector demonstrated, on paper, 95% code compliance. Compliance with the energy code is difficult to enforce, and measure, in this state. Reasons given for low code enforcement included lack of resources including time and money, and jurisdictional issues. Compliance rates are quite likely to be less than 85% since contractors' compliance is self-certified, and, there are areas exempt from energy code compliance.

Table 111 shows respondents mentioned NEEA and entities it directly and indirectly funds in 43% of comments. These comments indicated NEEA had a positive influence on energy code adoption, compliance and enforcement. Table 112 shows the entities posing some amount of

difficulty, or barriers, to code adoption, according to the respondents' perceptions. In Montana, various builder and contractor associations are actively involved in the codes process. As shown in the tables, NEEA had a significant presence in the codes arena as did the building and contracting industry. One respondent commented that the most effective strategy improve energy codes is participation in the forums and simple diligence. Another noted amending the codes was a collaborative effort.

Table 111. Entities Influencing Adoption of More Stringent Energy Codes in Montana

Montana Stakeholders and NEEA Contractors Comments: Entities Engaged in Adopting and Enforcing More Stringent Energy Codes			
Funding	Entity	Number of comments	Percent of comments
Direct funding from NEEA	NEEA	2	29%
Direct funding from NEEA	MT Dept Environmental Quality	1	14%
No funding	Code Bureau	1	14%
No funding	MT Dept of Natural Resources	1	14%
No funding	MT Dept of Labor	1	14%
No funding	Legislative action	1	14%
	Total	7	

Table 112. Entities Presenting Potential Opposition to More Stringent Codes in Montana

Montana Stakeholders and NEEA Contractors Comments: Entities Presenting Potential Barriers to More Stringent Energy Codes		
Entity	Number of comments	Percent of comments
Building Industry Association	3	38%
Home Builders Associations	1	13%
Building Contractors Association	1	13%
Manufacturers, general	1	13%
NAHB (National Association of Home Builders)	1	13%
Building Code Advisory Council	1	13%
Total	8	

Summit Blue's 2006 analysis stated the attribution of achieved energy savings to NEEA ranged from 20% on the low end, 60% on the high end, and recommended attributing 40% of achieved energy savings to NEEA (Table 108). Quantec's assessment is that while the amount of achieved energy savings is probably lower than desired, NEEA did influence achievement of savings. Given 43% of positive comments credited NEEA with influencing energy codes, and there was opposition to codes, Quantec believes Summit Blue's recommendation for attributing 40% of energy savings to NEEA is reasonable.

Oregon

Respondents reported Oregon is progressive state; the State Department of Energy putting an energy code into place after the 1974 oil embargo. Oregon updated both the residential and nonresidential energy codes in 2003. In February 2006, Governor Kulongoski issued an *Action Plan for Energy* calling for an effective program to achieve energy independence. This kind of

support from the Governor's office helped advance Oregon energy codes. Oregon has two separate building codes: Oregon Structural Specialty Code (OSSC) and Oregon One and Two-Family Dwelling Code. Oregon adopts and amends the parent document to each of these codes. Energy conservation requirements are contained in Chapter 13 of the Oregon Structural Specialty Code and Appendix E of the Oregon One and Two-Family Dwelling Code. Oregon updated the OCCS text, effective April 1, 2007, based on the IBC. Approval of the new residential code, including an updated energy code, was given in January 2008, effective April 1, 2008.

In Oregon, NEEA funding enabled progress on both state and national levels. Several respondents attributed energy codes to the work of ODOE. Respondents reported that the positive, collaborative relationship with the Home Builders Association and people on the Structures Board made a difference to code adoption efforts. Continuous meetings were instrumental in developing the collaborative relationship.

Quantec's compliance analysis using field data showed that compliance fell below 85% for the windows components in the multifamily sector (42%), floor insulation (78%), roof insulation (81%), and overall (78%). Wall insulation was 100% in compliance in the multifamily sector. In the single family sector, all components were near or above 85% compliance. Wall insulation (98%), roof (96%), windows (85%), floor insulation (83%), and overall (94%).

Four of the 5 NEEA codes contractors and market actors responding to questions about code enforcement stated 85% rates of compliance with the code overall were reasonable. Only one comment identified lighting and controls as an area with low rates of compliance.

Five of the 10 NEEA codes contractors and market actors interviewed stated the energy codes are not uniformly enforced. Four stated codes were uniformly enforced and 2 stated they did not know. Those who felt codes were not uniformly enforced referenced jurisdictions that were not as stringent and lack of time to properly enforce the code.

Table 109 shows that NEEA and entities it directly and indirectly funds were mentioned in 68% of comments. These comments indicated NEEA had a positive influence on energy code adoption, compliance and enforcement. One could also argue that the government entities referenced could have also benefited indirectly from NEEA's funding. Table 114 shows the entities posing some amount of difficulty, or barriers, to code adoption, according to the respondents' perceptions. These comments show that opposition in this state comes more from manufacturers than from the building industry. As with other entities, NEEA worked in collaboration with these actors in efforts to adopt energy codes.

Table 113. Entities Influencing Adoption of More Stringent Energy Codes in Oregon

Oregon Stakeholders and NEEA Contractors Comments: Entities Engaged in Adopting and Enforcing More Stringent Energy Codes			
Funding	Entity	Number of comments	Percent of comments
Direct funding from NEEA	NEEA	6	27%
Direct funding from NEEA	ODOE	7	32%
Fund staff to participate in committee	ASHRAE	2	9%
No funding	Governor's office	3	14%
No funding	Legislative action	3	14%
No funding	Government in general	1	5%
	Total	22	

Table 114. Entities Presenting Potential Opposition to More Stringent Codes in Oregon

Oregon Stakeholders and NEEA Contractors Comments: Entities Presenting Potential Barriers to More Stringent Energy Codes		
Entity	Number of comments	Percent of comments
Home Builders Associations	3	23%
Manufacturers, General	3	23%
Manufacturers, Windows	3	23%
GAMA	2	15%
Manufacturers, Insulation	1	8%
Oregon Structures Board	1	8%
Total	13	

Summit Blue's 2006 analysis stated the attribution of achieved energy savings to NEEA ranged from 60% on the low end, 90% on the high end, and recommended attributing 75% of achieved energy savings to NEEA (Table 108). In Oregon, compliance rates are close to 85% overall, but there is still room for improvement. Comments indicate that NEEA influenced achievement of savings with 68% of comments referencing NEEA's positive influence on code adoption and enforcement. NEEA also worked with manufacturers and builders to overcome opposition to more stringent codes. Quantec's assessment is that Summit Blue's recommendation for attributing 75% of energy savings to NEEA is reasonable. ODOE's work adopting more stringent codes, and their influence on the Governor's *Action Plan* as well as membership in ASHRAE, IECC, NWECG and other committees would suggest Summit Blue's high-end estimation is also reasonable.

Washington

In November 2004, the Washington State Building Code Council adopted a number of changes to the Washington State Energy Code effective July 2005. Washington most recently adopted the 2006 Washington State Energy Code, effective July 2007. With the 2006 WSEC, Washington expects reductions in energy use for residential new construction by more than 7%. The code made significant modifications in the commercial sector in lighting power densities, controls, and commissioning.

When Washington respondents were asked what factors influenced evolution of energy codes they stated economics, energy prices and technology are factors driving energy code adoption and that ASHRAE 90.1 technical standards have influenced code development. Respondents stated that proactive leadership by state and local governments influenced the evolution of the energy codes. Several respondents stated that City of Seattle has been influential over the last few years. Stakeholder and constituency groups' constant involvement and participation on committees pushed code adoption. These entities include, for example, NEEA, the NWECG, Community Trade and Economic Development, ASHRAE, and the Association of Washington Cities. Home Builders Association and the Building Industry Association of WA were listed as opponents to more stringent energy codes. In addition, respondents noted the national push for greener buildings, sustainability, and the focus on climate change will make it easier to pass more stringent energy codes in the future.

Quantec's compliance analysis using field data showed that compliance fell below 85% for the windows components in the multifamily sector (78%), and overall (84%). Wall insulation was 92% in compliance in the multifamily sector, floors were 87% in compliance, and roofs 95% compliance. In the single family sector, only floors fell below 85% with 69% compliance. All other components were well above 85% compliance. Wall insulation (97%), roof (97%), windows (92%), and overall (91%). In Washington, there is some room for improvement in areas below or at 85% of compliance.

Five NEEA codes contractors and market actors responded to questions about code enforcement; two stated 85% rates of compliance with the code overall were reasonable, two didn't know, and one stated residential was higher and commercial compliance was lower. Respondents identified several areas in low compliance, including glazing (2 comments), lighting and controls, envelope, mechanical review, slab-in-grade insulation, and the entire residential code (1 comment each).

Seven of the 10 NEEA codes contractors and market actors interviewed stated the energy codes are not uniformly enforced. Four stated codes were uniformly enforced and 2 stated they did not know. Those who felt codes were not uniformly enforced referenced jurisdictions that were not as stringent, and, lack of time to properly enforce the code.

Table 115 shows that NEEA and entities it directly and indirectly funds were mentioned in 38% of comments. Table 116 shows the entities posing some amount of difficulty, or barriers, to code adoption, according to the respondents' perceptions. These comments show that opposition in this state are primarily from the building industry.

Table 115. Entities Influencing Adoption of More Stringent Energy Codes in Oregon

Washington Stakeholders and NEEA Contractors Comments: Entities Engaged in Adopting and Enforcing More Stringent Energy Codes			
Funding	Entity	Number of comments	Percent of comments
Direct funding from NEEA	NEEA	4	15%
Direct funding from NEEA	NWECG	1	4%
Fund staff to participate in committee	ASHRAE	4	15%
Fund staff to participate in committee	International Code Conference ICC chapters	1	4%
No funding	BPA	3	12%
No funding	City of Seattle	3	12%
No funding	Legislative action	2	8%
No funding	AIA	1	4%
No funding	Seattle City Light	1	4%
No funding	Association of WA Cities	1	4%
No funding	Energy Star	1	4%
No funding	Environmental groups	1	4%
No funding	Local Associations	1	4%
No funding	Low-income groups	1	4%
No funding	Mechanical Engineers	1	4%
	Total	26	

Table 116. Entities Presenting Potential Opposition to More Stringent Codes in Oregon

Washington Stakeholders and NEEA Contractors Comments: Entities Presenting Potential Barriers to More Stringent Energy Codes		
Entity	Number of comments	Percent of comments
Building Industry Association	4	36%
CTED--Comm Trade & Economic Development	2	18%
Manufacturers, Insulation	1	9%
IES local chapters (lighting)	1	9%
Home Builders Associations	1	9%
Building Contractors Association	1	9%
BOMA (for existing bldgs)	1	9%
Total	11	

Summit Blue's 2006 analysis stated the attribution of achieved energy savings to NEEA ranged from 30% on the low end, 50% on the high end, and recommended attributing 40% of achieved energy savings to NEEA (Table 108). In Washington, compliance rates are close to 85% or better overall. Comments indicate that NEEA influenced achievement of savings with 38% of comments referencing NEEA's positive influence on code adoption and enforcement. In Washington, several other factors contributed to code adoption including the active role of Seattle City Light, and advocacy groups. Quantec's assessment is that Summit Blue's recommendation for attributing 40% of energy savings to NEEA is reasonable.

Future Attribution Studies

Estimating energy savings from codes and standards that are attributable to NEEA's efforts is complex. Quantec recommends that NEEA consider alternative attribution models. Models include, for example, studies both completed and underway in California, where CPUC attributes energy savings to the IOU that have Codes and Standards Programs, and are heavily involved in the codes adoption process. Future studies should include interviews with a larger sample of market actors and panels of experts involved in the codes process. Evaluators should design interview questions to include both qualitative responses and quantitative responses, with discrete answer option categories. Analytic techniques to consider include the Analytic Hierarchical Process, assessing and weighting the importance of the actor and activities influencing code adoption. Attribution studies should also assess the naturally occurring market adoption estimates. We also recommend a comprehensive compliance analysis. Within this framework, responses result in distributing a percentage of net savings achieved through codes and standards to each of the identified factors and players determined to be important in the establishment of any new code or standard.

Appendix L: Summary of Key Findings

NEEA Energy Codes and Support Project

- As NEEA notes, *code improvements only occur as the result of direct, sustained action by efficiency advocates and even then only when there is a favorable conjunction of an economically viable technical advance and a political opportunity.* NEEA funded staffers ensure the continued availability of energy code experts at state agencies; provide training, education, and technical support to the building industry; and participate in local, regional, and national committees that influence energy efficiency and energy codes.
- NEEA allocated about half the funding (54%) to implementation and compliance activities, 17% to adoption-related activities, 17% to staffing committee memberships, and 12% to support regional and national energy codes efforts. NEEA's funding strategy is flexible to meet the variations in each state's needs and respond to political situations, new technologies, or volunteer programs. Given the intricate nature of state and national codes and committees, Quantec finds NEEA funding is well spent and well placed.

Logic Model and Market Actors

- NEEA has not developed a logic model for this Project. A logic model and framework identifying the players and relationships could assist with quantifying energy savings attributable to Project activities.
- There is no visual representation of a conceptual or theoretical framework depicting the complex relationships within and between the entities and players involved in energy code adoption, enforcement, and compliance activities. There is no Gantt-type chart listing the players, their affiliations, and financial or other ties to NEEA.

NEEA's Influence on Energy Code Development and Adoption

- Attributing achieved energy savings to NEEA's efforts through the Codes and Standards Project is nontrivial. While conceptually straightforward, it is methodologically difficult. A full-scale attribution study was outside the scope of this project. To estimate net savings attributable to the NEEA Codes and Standards Project in this MPER, we reviewed a prior study conducted for NEEA by Summit Blue that assessed NEEA's influence on codes and standards efforts.[30]

- Quantec found no evidence to dispute the estimates of savings attributable to NEEA's efforts presented in a 2006 Summit Blue study, *Review of Energy Savings Related to Codes and Standards Efforts.* The percentages of comments referring to entities directly and indirectly funded by NEEA are similar to the attribution levels recommended by

[30] Summit Blue, *Review of Energy Savings Related to Codes and Standards Efforts*, April, 2006.

Summit Blue. Quantec concludes that it is reasonable for NEEA to continue to use the attribution levels recommended by Summit Blue.

- The evaluation team recommends that NEEA consider alternative attribution models. Models include, for example, studies both completed and underway in California. Analytic techniques to consider include the Analytic Hierarchical Process, assessing and weighting the importance of the actor and activities influencing code adoption. Attribution studies should also assess the naturally occurring market adoption estimates. Evaluators also recommend a comprehensive compliance analysis.

NEEA Staff and Codes Contractor Interviews

- NEEA codes contractors stated a 15%–30% increase in stringency is possible in the residential sector and 30%–50% in the non-residential sector by 2015. Contractors stated a 15%–30% increase in stringency (i.e., improvement in energy efficiency) is not a technical issue in that buildings will still look the same and have the same components. However, after that, the next 30% increase in efficiency will require additional changes to processes and building techniques. Others stated that with serious focus on global warming, momentum could carry codes and the building industry swiftly toward the net zero goal of the 2030 Challenge.

- Contractors stated code adoption activities should focus next on specific measures, compliance path options, and systemic changes. Specific measures referenced for non-residential sector improvement included glazing requirements, lighting and controls, technology developments in general, and HVAC. In the residential sector, the areas most ready for energy code improvements are shell improvements, including construction and insulation, HVAC, ducts, and lighting. Respondents referred to two timelines, the first being the work of codes and the resulting energy-efficient building and the second timeline as verification, occurring after codes have done their job. Commissioning and performance testing both occur on the second timeline and address the quality of construction and measure installation, and building efficiency performance.

- Contractors pointed to several areas with low energy code compliance, including lighting and controls in all four states. Other areas included HVAC, ducts, and air sealing. There appear to be two things linked to code compliance, that is, the specific words in the code, and adoption and field enforcement.

- All respondents stated energy codes are not uniformly enforced. Lack of resources, including staffing and field time, is the primary reason. Respondents stated codes officials do not give energy codes the same priority as health, life, and safety codes.

- Factors that influence the adoption of energy codes include legislative action, the high cost of energy, and NEEA's funding to staff participation in codes committees. Stakeholder and constituency groups' constant involvement and participation on committees pushed code adoption. In addition, contractors noted the national push for

greener buildings, sustainability, and the focus on climate change will make it easier to increase energy efficiency and adopt more stringent energy codes in the future.

- Industry associations, codes-related organizations, and government entities are groups that influence energy code adoption activities. Respondents noted that over time, through regular collaboration, organizations once opposed to energy codes have become supportive.

- About 75% of the codes contractors supported testing-based performance requirements in the energy code. Funding and a current lack of infrastructure are listed as barriers. ENERGY STAR® requirements calling for performance testing for duct leakage provide support and an infrastructure for performance-based testing. Respondents stated the program is a good model and an example of a symbiotic relationship between voluntary programs and codes.

- The majority of respondents stated utilities could play a role once states or jurisdictions adopt the energy codes. Utilities could provide various types of support, including funding third-party special plans inspectors. Several reported that utilities funded compliance inspections in the past, referencing, for example, the 1990s NW Utility Code Group.

State and Local Energy Codes Officials Interviews

- The majority of state and local officials and stakeholders advocated for continuous improvement in energy code stringency. Respondents expect continuous improvement in the stringency of energy codes is achievable by responding to technological advancements and keeping current with national codes, including adopting the 2009 IECC. Respondents stated 10%–50% improvement by the next code cycle is possible, with most stating a 30% increase is possible.

- Stakeholders stated code adoption activities should focus next on specific measures, compliance path options and systemic changes, such as simplifying code language. Specific measures referenced ducts and energy-efficient HVAC, advanced framing techniques, envelope and glazing improvements, lighting and controls, plug loads, and technology developments in general.

- Stakeholders pointed to several areas with low energy code compliance, including lighting and controls, air sealing, and HVAC. Several respondents noted there were no areas where compliance with code was low.

- Additional resources needed to enforce the code include training, education and outreach, funding, and staffing. Responses were consistent with suggestions for methods to improve code compliance.

- Respondents were nearly equally split in their perceptions that codes are and are not uniformly enforced. In Idaho and Oregon, more people stated codes were not uniformly

enforced. In Montana and Washington, more respondents stated codes were uniformly enforced.

- Over half the stakeholders (53%) supported inclusion of testing-based performance requirements in the energy code; 35% oppose. Proponents and opponents stated testing-based performance requirements need an infrastructure, appropriate funding, and independent third-party implementers.

- The high cost of energy, the combined works of advocacy groups, utilities, legislative action, and public awareness stemming from the energy crisis are factors influencing the evolution of energy codes.

- Industry associations, codes-related organizations, and government entities are influential energy code adoption activities.

- The most effective strategies used to influence energy-code adoption activities include: collaboration, outreach, and participation in industry groups, technical advisory groups, and grassroots campaigns. Simple diligence and reliance on accurate data supporting claims are also important strategies.

Northwest Best

- Other than NEEA energy codes contractors (seven respondents in survey Group One), familiarity with *Northwest Best* among energy codes stakeholders was low, where 25% (4 of 16) respondents reported knowing about *Northwest Best*. Of those aware of *Northwest Best*, most understand the model code provisions can advance codes in their jurisdictions. Two did not understand the intent was not to adopt all code provisions proposed but to glean language for individual code provisions that could be beneficial to their jurisdiction.

- The 11 respondents not involved with the *Northwest Best* TWG but familiar with *Northwest Best* stated it was a good and useful process. However, no one in this group had used *Northwest Best*.

- *Northwest Best* TWG members identified the "*Best of the Region*" in energy codes, improved them by 15%, and provided a coherent road map to future efficiency improvements through code language any state can utilize. As codes around the region come more in sync with each other, *Northwest Best* is a powerful tool, and offers a clear means to push beyond the *Best of the Region*. Respondents from the *Northwest Best* TWG noted Washington, Oregon, and Idaho used *Northwest Best* in their code change submittals and that *Northwest Best* provided synergy with the Planning and Conservation Council's MCS in the Fifth Power Plan.

- *Northwest Best* pushed energy codes to new levels, forcing serious consideration of not only stringent prescriptive code, but also performance-based practices.

- *Northwest Best* sets a new benchmark, can help to bring buildings into mainstream compliance, and can act as a stepping-stone as we address carbon footprints and global warming. Respondents report energy code changes are happening more quickly than expected, and *Northwest Best* has counterparts in increasing energy efficiency, such as Advanced Homes and ENERGY STAR® Homes in the residential sector and ASHRAE 189, LEED and green building standards in the commercial sector.

Northwest Energy Codes Group

- The NWECG is well organized and in a good position as a moderate within the efficiency camp. They are a respected, active player working for code change at the national level. The NWECG submitted nine amendments to the March 2005 IECC hearings, all based on Northwest code experience. In 2007, the NWECG submitted about 28 code change proposals. The IECC has approved some code proposals submitted by the NWECG.

- The NWECG has the opportunity to and can influence energy code adoption at the national level and improve energy efficiency. As invited participants to other energy codes stakeholder groups, the NWECG can build alliances, share information, and assist other groups.
- The NWECG has been effective in creating relationships necessary to push forward national code changes. The NWECG can increase influence and success by reaching out, building relationships and recognition with IECC stakeholder groups, and staying involved at the national level.
- NEEA contractors are also members of other energy code committees, including ASHRAE, NFPA, NFRC, and IRC. Their work contributes to the overall increase in energy efficiency and stringency of these standards. Coordinated efforts both push and pull state and national codes, increasing compatibility between national IECC codes and Oregon and Washington state codes.

Energy Codes Webinar Training Survey

- The majority, 90% of participants, stated their knowledge of the Washington energy code increased because of attending the training. More specifically, respondents indicated their knowledge of building energy codes was either *very improved* (18%) or *somewhat improved* (71%) because of the Webinar training.

- About 90% of participants have applied the information received in the three training sessions. The most common applications include plan review and code updates. For those who did not apply the information, the material was typically not relevant to their work or no issue had been raised requiring use of the information.

- The majority of participants stated the Webinar format worked better than in-person training sessions, largely because it is more convenient and efficient. Webinar training is the preferred format for future training, although approximately 28%–36% prefer in-

person training. Participants preferring the in-person format indicated a desire to have questions answered right away and appreciated training format options.

- The majority of participants stated they were "satisfied" or "very satisfied" with the Webinar trainings overall. Approximately 80% of participants rated their Webinar instructor "very knowledgeable."

- About 66% of respondents stated it is easy or somewhat easy to ensure compliance with energy codes, and about 33% stated it is somewhat difficult. The most significant obstacle to compliance with energy codes is lack of knowledge and training on the energy code (35%). Almost 20% of respondents indicated noncompliance or lack of coordination was another large obstacle to complying with the energy codes.

Target Audience Surveys

- In general, building professionals working with energy codes are largely familiar with their state code requirements, and the vast majority does not find compliance with any areas particularly difficult.

- Most often, builders and designers in all states looked to their building departments when they had questions regarding energy code. Builders also frequently consulted with colleagues or industry contacts, while designers looked to either colleagues or Web sites for energy code help. To a lesser extent, designers also utilized code-related books and manuals. These trends were similar among each of the professions across all states.

- There is low awareness of support services for energy code among the Northwest building community. Across states, builders were most aware of training activities, yet less than half knew about them. A third or fewer builders knew about Web sites, and less than a quarter were aware of the hotlines. Designers indicated a similar knowledge of services, with less than half being aware of training and Web sites, and less than a third aware of the hotlines.

- Because there was a particularly low awareness of the technical support hotlines, we examined respondents' preferred methods of contact to provide pertinent code information (training events, code changes, updates, etc.). For builders, the overwhelming choice of contact was direct mail and to a lesser extent e-mail. For designers, direct mail was still the leading preference, followed more closely by e-mail.

- Overall, when asked about the need for additional services, there was a call for more information in general. Consistently, respondents requested they receive this information via mailings or e-mail, followed by conferences and meetings. There were also several comments about improvements to Web site content.

Compliance Analysis

- Where compliance rates are considered acceptable within 10% of code, and considering all states and housing types together, compliance rates are 85% overall. Considering the home in compliance, if measured values are within 10% of the code specified UA/sq. ft. value, likely compensates for any measurement error at the site. Additionally, it compensates for any settling between the initial installation and field measurement a year or more after installation. An overall 85% compliance rate indicates room for improvement. Analyses indicate 75% compliance in multifamily buildings and 92% compliance in single-family buildings overall.

- Where compliance rates are considered acceptable within 10% of code, overall compliance rates across the three states and two housing types range from 78% to 91%, with Oregon multifamily (78%) and Washington (84%) multifamily falling below 85% compliance. Idaho multifamily has a very low compliance rate of 37%. Compliance rates in multifamily buildings have more room for improvement than single-family buildings. We recommend additional attention and resources on multifamily buildings.

- Where a building or component meets code if it has a lower UA/sq. ft. value than strictly required by code, Idaho single-family and multifamily code compliance rates are low overall (47% and 26% respectively). Oregon multifamily window compliance rates are low, bringing overall compliance to 30%. Oregon single-family (77%) and Washington single-family (73%) and multifamily (75%) compliance rates are 73% or better. We recommend additional resources for compliance training in Idaho, in particular.

- There were too few data points to include Montana in the analysis. Therefore, we made no specific recommendations for Montana. However, it is likely the state has multifamily compliance issues similar to the other three states.

- We recommend NEEA conduct additional field verification and measurement to confirm the low compliance rates found in various state-housing type-component combinations. Confirmation of low compliance could warrant additional code support efforts; we recommend NEEA add code related training with confirmation of low compliance.

Appendix M:Survey Instruments

MPER #2 Stakeholder Interviews: NEEA Energy code Contractors & Staff

INTRODUCTION

I am calling on behalf of the Northwest Energy Efficiency Alliance. As part of our evaluation of energy code support activities, we are conducting interviews with NEEA energy code contractors. This will take about 20-30 minutes. Is this a good time to talk? Arrange time to call back if needed:_____

Role

1. What role does your organization play in energy code adoption?
2. What is your role? (What do you do personally?)
3. What are the general duties and activities associated with your position that are related to energy codes?

Energy code Stringency

4. How much more stringent would you like the residential energy code to be by 2010? By 2015? Given the current politics that influence energy codes how realistic do you think it is to achieve these?
5. How much more stringent would you like the non-residential energy code to be by 2010? By 2015? Given the current politics that influence energy codes how realistic do you think it is to achieve these?
6. What areas of the energy code is most ready (in terms of awareness and general knowledge) for improvement in the near future? (Where would you focus next on code adoption activities?)
7. Is there anywhere else where energy could be saved that the energy code has not focused on?

Energy code Compliance

8. Do you know what areas of the energy code have low compliance is low in your state? (Probe: residential and non-residential) (*Interviewer: Ask for specifics*)
9. How do you know when compliance is high or low?
10. Limited information suggests regional energy code compliance is approximately 85% on average. Does this number sound reasonable for your state?
11. What do you think can be done to improve energy code compliance?
12. How important are Alliance sponsored training programs to energy code compliance? Do you think compliance rates would be higher, lower or the same without the training programs? Are we doing enough training? What could be done to improve them?

Energy code Enforcement

13. Are energy codes uniformly enforced in your state? Explain
14. What are the barriers to energy code enforcement?

Energy Savings Attributed to Alliance Codes & Standards Project

15. What are the major factors (in your opinion) that have influenced the evolution of the energy codes adopted in your state?
16. What have specific individuals, trade associations, manufacturers or organizations been influential in energy code adoption activities? If so, why do you feel that individual or organization had a strong influence on the in your state?
17. Among those you just mentioned, who have been the most influential players in the energy code adoption process either supporting or opposing more stringent energy code requirements) for: ***Use table below***

FOR EACH TYPE OF MEASURE IN THE TABLE BELOW, DETERMINE WHETHER THEY ARE FOR OR AGAINST MORE STRINGENCY AND THEN ASK:

18. What have been the most effective strategies used by this individual/group?

Component	Group or Individual most influential	For / Against stringent codes	Most effective strategy used by this group or individual
Windows and fenestration			
Wall insulation			
Roof insulation			
HVAC			
Performance based energy codes			
Energy codes in general			

19. What are the major challenges to adopting more stringent energy codes?

Performance-Based Energy code Change Proposals

20. The energy code compliance process currently does not measure whether the equipment or materials used in construction perform the way they are supposed to. Do you think it is reasonable to put testing-based requirements in the energy code? An example would be determining whether air infiltration in a home is below a code-specified level by requiring a blower door test.
21. Is work being done in your state to encourage or adopt performance or testing-based energy codes? (Who is working on that? What are they doing) *Explain.*
22. How could NEEA improve its energy code support efforts?

Northwest Best

23. I'd like to ask a couple of questions about Northwest Best. Northwest Best refers to a best-practice goal for NW energy codes. Have you heard about Northwest Best?

    No

    Yes, If yes
    - What is your general opinion about Northwest Best?
    - Have you ever used Northwest Best?

24. As a last question, NEEA is thinking of developing a strategy to encourage utilities to engage in energy codes. What role or roles do you think they would be most effective in?

These are all my questions. Thank you for your time.

MPER #2 Stakeholder Interviews: Local and State Officials

INTRODUCTION

Hello, this is _____ from Quantec. I am calling on behalf of the Northwest Energy Efficiency Alliance. We're conducting a study of the energy codes process and activities to provide better support to building industry professionals such as yourself. We understand that you are involved, in some way, with energy codes and [*NEEA -- or person who referred*] has recommended that we speak with you. I would like to ask you a few questions. This will take about 20-30 minutes. Is this a good time to talk?
Arrange time to call back if needed:_____

Role

1. What role does your organization play in code adoption?
2. How familiar are you with the energy code adoption process? What is the role of your organization in this process? (What are your duties?) *(Interviewer note: if person is not involved with codes, stop, and ask for the name of the person who is involved in the code adoption process).*
3. What sort of activities related to energy codes were you personally involved in over the last 18 months (since about May 2006)?
    a. Residential
    b. Non-residential

Energy code Stringency

4. What is your long-term vision of the energy code? *(Do not read suggested answer options; probe)*
    a. Continuous improvement
    b. How much more stringent do you think the **residential** energy code should be by 2010? By 2015?
    c. How much more stringent do you think the **non-residential** energy code should be by 2010? By 2015?
    d. Leave it as it is
    e. Given the trends you're currently seeing, how much more stringent do you think the **residential** energy code will be by 2010? By 2015?
    f. Given the trends you're currently seeing, how much more stringent do you think the **non-residential** energy code will be by 2010? By 2015?
    g. Just use it to sell product
5. If not by 2010 or 2015, what do you think is the right time frame and what is a reasonable goal to increase energy code stringency?
6. What activities are currently being pursued to increase the adoption of more stringent energy codes?
7. What areas of the energy code would you most like to see changed? (Where will you focus next on code adoption activities?)
8. Is there anywhere else where energy could be saved that the energy code has not focused on?
9. Is there an area of the energy code about which you are most concerned?

Energy code Compliance

Interviewer: This section is for those who work with energy code compliance. Skip to #15, Energy code Enforcement, if respondent is not involved with Energy code Compliance.

10. Earlier you noted that you *[were/were not]* involved with energy code compliance. Is this correct
    a. Not involved with energy code compliance - Skip to #15 Code Enforcement
    b. Involved with energy code compliance
        i. Could you tell me which elements of compliance you work with, for example, design inspection or plans review, building inspection, something else (*Record verbatim*)
    c. design inspection
    d. plans review
    e. building inspection
    f. other, specify
11. We are interested in the process your jurisdiction uses to fully enforce the code. Can you tell me about that?
12. What do you think motivates you or your team to do a good plan review for energy code compliance?
13. Do you know what areas of the energy code have low compliance in your area/state? (Probe: residential and non-residential) (*Interviewer: Ask for specifics*)
14. How do you know when compliance is high or low?
15. Limited information suggests regional energy code compliance is approximately 85% on average. Does this number sound reasonable for your area/state?
16. What do you think can be done to improve energy code compliance?
17. Can you tell me if there are additional resources you need to enforce the code?

Energy code Enforcement

18. Do you know if the energy codes are uniformly enforced in your area? If not, explain.

Energy Savings Attributed to Alliance Energy codes & Standards Project

19. As a stakeholder in the NW new construction industry, or organization that interacts with this industry, what are the major factors (in your mind) that have influenced the evolution of the energy codes adopted in your state.
20. Have specific individuals, trade associations, manufacturers or organizations been influential in energy code adoption activities? If so, why do you feel that individual or organization had a strong influence on the in your state?
21. Among those you just mentioned, who have been the most influential players in the energy code adoption process either supporting or opposing more stringent code requirements for: ***Use table below***

FOR EACH TYPE OF MEASURE IN THE TABLE BELOW, DETERMINE WHETHER THEY ARE FOR OR AGAINST MORE STRINGENCY AND THEN ASK:

22. What have been the most effective strategies used by this individual/group?

Component	Group or Individual most influential	For / Against stringent codes	Most effective strategy used by this group or individual
Windows and fenestration			
Wall insulation			
Roof insulation			
HVAC			
Performance based energy codes			
Energy codes in general			

Performance-Based Energy code Change Proposals

23. The energy code currently does not measure whether the equipment or materials used in construction perform the way they are supposed to. Do you think it is reasonable to put testing-based requirements in the energy code? An example would be determining whether air infiltration in a home is below a code-specified level by requiring a blower door test.
24. Is work being done in your state to encourage or adopt testing-based energy code requirements? (Who is working on that? What are they doing?) *Explain.*

Northwest Best

25. I'd like to ask a couple of questions about Northwest Best. Northwest Best refers to a best-practice goal for NW energy codes. Have you heard about Northwest Best?
    a. No
    b. Yes, *If yes*
        i. What is your general opinion about Northwest Best?
        ii. Have you ever used Northwest Best?

Stakeholder Participation

26. Can you recommend other people we should talk to who are involved with energy codes adoption? (Who are the key players?) *For people named, what areas are they involved with, e.g., residential, non-residential, windows, etc*.
27. Is there anything else that we have not yet talked about that you think would be helpful for us to know so that we can make recommendations regarding the energy codes process and providing support to building industry professionals?

THANK YOU!

MPER #2 Stakeholder Interviews: Northwest Best

INTRODUCTION

I am calling on behalf of the Northwest Energy Efficiency Alliance. We're conducting a study of the energy codes process and activities to provide better support to building industry professionals. We understand that you are involved with energy codes and Northwest Best and [*NEEA -- or person who referred*] has recommended that we speak with you. I would like to ask you a few questions about Northwest Best. This will take about 10-15 minutes. Is this a good time to talk?
Arrange time to call back if needed:_____

Northwest Best

1. Please describe your role in the development of Northwest Best.
2. Has your role changed over time?
3. What was the objective, or overall concept, behind developing Northwest Best?
4. Who was supposed to use NW Best? Did they? How did they use it?
5. What was learned through the process of developing Northwest Best?
6. What were the outcomes of Northwest Best?
    a. What other benefits have resulted from Northwest Best?
7. What barriers or potential barriers to Northwest Best have you encountered?
8. What role does Northwest Best play now?
    - Do you use it? If yes, How? When? If no, why not?
    - Do you hope to use it in the future?
    - Do you know of people who are using it?

Those are all my questions. Do you have any other comments you'd like to make about Northwest Best that we have not already covered?

Thank You for your time.

MPER #2 Stakeholder Interviews: National Level

INTRODUCTION

I am calling on behalf of the Northwest Energy Efficiency Alliance. We're conducting a study of NEEA's energy codes activities and we understand from David Cohan that you are involved with these at the national level. I would like to ask you a few questions about the Northwest Energy Codes Group and code adoption activities at the national level. This will take about 5-10 minutes. Is this a good time to talk?
Arrange time to call back if needed:_____

National Level

1. What is your role in the code adoption process at the national level?
    a. Please describe your role with the Northwest Energy Codes Group (NWECG)
2. In terms of the IECC/IRC code adoption processes, how would you describe the reputation of the NWECG?
    a. Do you believe most people think the NWECG represents the entire NW?
3. Can you give examples of specific areas where you think the NWECG has been successful or influential?
4. How do you think the NWECG can increase its influence and success?
5. Do you have any suggestions for the lead spokesperson? How can he increase his influence?

Those are all my questions. Do you have any other comments you'd like to make about national level energy codes activities or NWECG activities that we have not already covered?

Thank You for your time.

MPER #2 Surveys: Washington Webinar Participants

Participant Name: :_____
Training Session Title:_____
Date Attended:_____

INTRODUCTION
I am calling on behalf of the Northwest Energy Efficiency Alliance. We're doing a study on energy codes to provide better support to building industry professionals such as yourself. We understand that you recently completed a Web based training on Washington State energy codes and would like to ask you a few quick questions. This isn't a sales call and will take about 5 - 10 minutes. Is now a good time to talk?
Arrange time to call back if needed:_____

Background

1. Which of the following best describes your professional responsibilities? [Check all that apply]
    a. Field inspector
    b. Design (plans) inspector
    c. Both Field and Plans Inspector
    d. Facility professional
    e. Other, specify: _____
2. In what sector do you primarily work? [Please answer questions based on this sector]
    a. Residential
    b. Non-residential
3. Our records indicate that you attended the [Envelope] [Envelope and Mechanical] [Envelope and Lighting] [Mechanical] [Mechanical and Lighting] [Lighting] [Envelope, Mechanical, and Lighting] webinars. Is this correct?
    a. Yes
    b. No, specify (check all that apply):
        i. Envelope
        ii. Mechanical
        iii. Lighting
4. [For EACH of the sessions that the respondent **attended**]: For what reason did you choose to attend the [Envelope, Mechanical, Lighting] Webinar? [DO NOT PROMPT]
    a. Required by job[Record any comments]
    b. Other, Record verbatim response
5. [For EACH of the sessions that the respondent **did not attend**]: For what reason did you choose **not to** attend the [Envelope, Mechanical, Lighting] webinar? [DO NOT PROMPT]
    a. [Record verbatim response]
    b. Was not required by job [Record any comments]
    c. Was not satisfied with the Webinar that I had already attended

6. [If respondent answered Question 5 with "Was not satisfied"]: Which Webinar was it that you weren't satisfied with? _____
    a. [For each Webinar specified]: Please describe the reason why you were not satisfied [Record verbatim]
7. Did you attend the training session(s) alone or as a group, with other professionals?
    a. Alone [Skip to 9]
    b. With group
        i. If with group: How many were in your group _____
8. Do you think that the Webinar format is a good way to deliver training for group participation?
    a. Yes - Why? [Record] _____
    b. No – Why not [Record] _____
9. How would you rate your knowledge of the Washington energy code ***before*** the training(s) that you attended?
    a. Very knowledgeable
    b. Somewhat knowledgeable
    c. Not very knowledgeable
    d. Not at all knowledgeable
10. As a result of the web-based training, how would you say your knowledge of the building energy code has changed?
    a. Significantly improved
    b. Somewhat improved
    c. No change
    d. Other:_____

Changes in Practice

11. [If attended the Envelope Training] Did you apply any of the information that you received from **envelope** training to your professional practices? *(Note to interviewer: if respondent is building official they will <u>ensure compliance</u> and anyone else may be <u>building in compliance with code</u>)*
    a. Yes – In what way did you apply the information? _____
    b. No – Why not (probe if necessary: Training wasn't relevant, was unclear, was too advanced) _____
        i. Do you expect to utilize (or continue to utilize) that information in your professional practices in the <u>near future</u>?
            - Yes, explain
            - No, explain

12. [If attended the Mechanical Training] Did you apply any of the information that you received from **mechanical** training to your professional practices? *(Note to interviewer: if respondent is building official they will <u>ensure compliance</u> and anyone else may be <u>building in compliance with code</u>)*
    a. Yes – In what way did you apply the information?
    b. No – Why not (probe if necessary: Training wasn't relevant, was unclear, was too advanced)

i. Do you expect to utilize (or continue to utilize) that information in your professional practices in the near future?
   - Yes, explain
   - No, explain

13. [If attended the Lighting Training] Did you apply any of the information that you received from **lighting** training to your professional practices? *(Note to interviewer: if respondent is building official they will ensure compliance and anyone else may be building in compliance with code)*
    a. Yes – In what way did you apply the information?
    b. No – Why not (probe if necessary: Training wasn't relevant, was unclear, was too advanced)
        i. Do you expect to utilize (or continue to utilize) that information in your professional practices in the near future?
           - Yes, explain
           - No, explain

Training Format and Presentation

For each of the training sessions attended by the participant

14. Would you recommend the [From Quota] training session to any professional colleagues?	A. Envelope	B. Mechanical	C. Lighting
	Yes	Yes	Yes
	No	No	No
	If no: Why not? [Record]	If no: Why not? [Record]	If no: Why not? [Record]
15. Was the [From Quota] training session sufficiently geared toward your area of specialization?	D. Envelope	E. Mechanical	F. Lighting
	Yes	Yes	Yes
	No	No	No
	If no: Why not? [Record]	If no: Why not? [Record]	If no: Why not? [Record]
16. Overall, does the webinar format or does an in-person format work better for the [From Quota] training?	G. Envelope	H. Mechanical	I. Lighting
	Webinar better	Webinar better	Webinar better
	In-person better	In-person better	In-person better
	Same	Same	Same
	Comments: [Record]	Comments: [Record]	Comments: [Record]
17. Was the Webinar format of the [From Quota] training more or less convenient for you to attend than in-person training?	J. Envelope	K. Mechanical	L. Lighting
	More	More	More
	Less	Less	Less
	If less: Why? [Record]	If less: Why? [Record]	If less: Why? [Record]
18. Were the materials provided through the [From Quota] training adequate?	M. Envelope	N. Mechanical	O. Lighting
	Yes	Yes	Yes
	No	No	No
	If NO: What materials would have improved the training? For example, were more illustrations needed? [Record]	If NO: What materials would have improved the training? For example, were more illustrations needed? [Record]	If NO: What materials would have improved the training? For example, were more illustrations needed? [Record]
19. Was the length of the [From Quota] training session appropriate for the material?	P. Envelope	Q. Mechanical	R. Lighting
	Yes	Yes	Yes
	No – too long	No – too long	No – too long
	No – too short	No – too short	No – too short
	Comments: [Record]	Comments: [Record]	Comments: [Record]
20. In the future, would you prefer to receive in-person [From Quota] training or webinar training?	S. Envelope	T. Mechanical	U. Lighting
	In-Person	In-Person	In-Person
	Webinar	Webinar	Webinar
	Why is that? [Record]	Why is that? [Record]	Why is that? [Record]

Training Satisfaction

21. [For each training received by the participant]: On a scale of 1 to 5, with "1" being *Not at all knowledgeable* and "5" being *Very Knowledgeable*, how would you rate the instructor for the:

    For each webinar: Envelope / Mechanical / Lighting Webinar

Not at all knowledgeable ..... Very Knowledgeable				
1	2	3	4	5

22. For each training received by the participant]: On a scale of 1 to 5, with "1" being *Not at all satisfied* and "5" being *Very Satisfied*, how would you rate the overall Webinar for the:

    For each webinar: Envelope / Mechanical / Lighting Webinar

Not at all satisfied ..... Very Satisfied				
1	2	3	4	5

General Energy Code Questions

23. In your sector, how easy has it been for you to ensure compliance with the energy code?
    a. Very easy
    b. Somewhat easy
    c. Somewhat difficult
    d. Very difficult
24. In your opinion, what is (are) the biggest obstacle(s) to compliance with the energy code? **[Check all that apply]**
    a. Lack of training on energy code
    b. Lack of available information on code
    c. Complexity of codes
    d. Lack of availability of qualifying products (windows, etc.)
    e. Clients request non-compliant products
    f. Designers do not specify to code
    g. Lack of support by state/local code officials
    h. Other, specify:
    i. None

25. In your sector, which areas of the code are the most difficult to comply with?

26. Please indicate how much you agree with each of the following statements, where 1 is Strongly Disagree; 5 is Strongly Agree

	Strongly Disagree .....Strongly Agree				
	1	2	3	4	5
A) Building professionals are adequately informed about energy codes.					
B) Local Code Officials are knowledgeable of the energy code.					
C) Energy codes are consistently enforced within my jurisdiction.					
D) There are advantages to working in certain parts of the state due to differing levels of energy code enforcement.					

27. Is there any additional energy code training that you would like to receive?
    a. Yes Please Specify_____
    b. No

Thank you for your time.

MPER #2 Survey: Target Audience

INTRODUCTION

I am calling on behalf of the Northwest Energy Efficiency Alliance. We're doing a study on energy codes to provide better support to building industry professionals such as yourself, and would like to ask you a few quick questions. This isn't a sales call and will take five minutes. Is now a good time to talk?

[SCREENING]

A1. **[If Contact Name is Available]:** Hi, is **[Name from List]** available?

Yes When connected, continue to B
No ……Skip to C

A.2 **[If Contact Name is Not Available]:** Hi, could I speak with a person in your office whose work requires a knowledge of **[State from list]** energy codes? I am calling on behalf of the Northwest Energy Efficiency Alliance, and would like to learn how they get information about the **[State from list]** energy code.

Yes When Connected, Continue to Introduction
No ……**[Terminate call: "Thank you"]**

B. Does your work require a knowledge of **[State from list]** energy codes?

Yes Skip to Introduction
No ……Continue

C. Is there anyone else who refers to the **[State from list]** Energy Code in their work available for me to speak with?

Yes .....When connected, continue to Introduction
No ……**[Terminate call: "Thank you"]**

1. First, let me confirm that you are a [Company type from list] [Check appropriate company type, or record if stated to be different]

Architect
Architectural Designer
Architectural Engineer
Building Contractor
Building Designer
Engineering Contractor
Industrial and Commercial Contractor
Heating Ventilation and Air Conditioning Engineer
Construction Engineer
Designing Engineer
Electrical Engineer
Energy Management Engineer
Industrial Engineer
Professional Engineer
Systems Engineer
Heating Contractor
Insulation Contractor
Lighting Consultant
Lighting Engineer

2. Do you work primarily with residential or non-residential buildings?
    a. Residential
    b. Non-residential
    c. Equally in both
3. Are the majority of your projects in [State from list] [Check appropriate State]?
    a. Washington
    b. Oregon
    c. Montana
    d. Idaho
    e. Other, Record _____
4. How would you rate your familiarity with the requirements of the **[Defined State from Q3]** energy code?
    a. Completely familiar
    b. Somewhat familiar
    c. Not very familiar
5. For what portion of your building projects are you asked to document energy code compliance? [**If asked to clarify *document***, say "For example, when you submit plans or have your project inspected, are you required to specify insulation levels, heating efficiency, etc.?"]
    a. _____%
    b. I am not responsible for code compliance
6. In your experience, are any areas of the energy code difficult to comply with?
    a. Yes (Specify_____)
    b. No
7. When you've had a question about energy codes, what resources have you used to get the information that you need? **[Do Not Read. Check all that apply – Prompt for "any other resource" after response]**
    a. Building Department
    b. Colleague/industry contact
    c. Technical Support Hotline
    d. Web Site
    e. Training
    f. Other, Record_____
    g. Never have questions about energy codes
8. [If respondent has never had a question about energy codes, skip to Q10. For each of the resources mentioned above, ask]: How did you find out about the [Service from above]?
    c.Record _____
9. [For each of the resources NOT mentioned above, ask]: Are you aware that there is:
    a) A technical support hotline in your state for energy code questions?
        Yes
        No
    b) A website in your state for energy code questions?
        Yes
        No

c) Training available on the energy code?
Yes
No

10. **[If respondent has used any of the services]** Do you have any recommendations for improvements to the existing services? _____Record
11. What is the best way to make you aware of energy code changes, training events, and technical support? **[Do not prompt. Check all that apply]**
    a. Direct mail
    b. Industry newsletter
    c. Conferences and meetings
    d. Other_____
12. Finally, can you think of any other services that the state of **[State from list]** could offer that would better address your needs? **[Do not prompt. Check all that apply]**:
    a. Different Website
    b. Brown bag lunch presentation
    c. Workshop
    d. Email listserv with frequent updates

Thank you for your help with this, you've given us some great information!

Reference information for surveyor:

	Organization	Tech Support Hotline	Web Site
OR	Oregon Department of Energy	1-800-221-8035	http://egov.oregon.gov/ENERGY/
WA	Washington State University Energy Program	1–800–872–3568	http://energy.wsu.edu/
	Washington State Building Council	n/a	http://www.sbcc.wa.gov/
	Northwest Energy Efficiency Council	n/a	http://www.neec.net/resources/resources.html
ID	Association of Idaho Cities	1-800-344-8594	http://www.idahocities.org
	Idaho Department of Building Safety	n/a	http://www2.state.id.us/dbs/
MT	Montana Department of Environmental Quality	406-841-5232	http://deq.state.mt.us/energy or www.energizemontana.com
	Montana Department of Labor and Industry	n/a	http://dli.mt.gov/