

Code to Zero Initiative Market Evaluation Report: Baseline Estimates and Progress Toward Goals

Deliverable 2 – Final Report

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1 Introduction

This report presents the Market Evaluation Team’s evaluation findings for NYSERDA’s Code to Zero Initiative based on a Delphi Panel process, representative jurisdiction in-depth interviews, and a broad literature review conducted from March 2019 through March 2020. Through this research, the Team established baseline measurements for and evaluated progress toward the three main Initiative goals:

- Code compliance reaches 90% throughout New York State
- Twenty jurisdictions adopt a stretch code¹
- Jurisdictions that adopt alternative code enforcement structures or receive training and supplemental services report improved enforcement of the energy code

1.1 Initiative Overview

Through its Code to Zero Initiative, NYSERDA aims to overcome barriers impeding code compliance and enforcement, establish a path toward the development of a stretch-to-zero energy code, and assist in the enactment of New York State (NYS) and local energy codes. The Initiative builds on NYSERDA’s past efforts to help support the adoption of energy codes with higher performance goals and strengthen compliance and enforcement through several activities:

- Supporting code compliance and enforcement by providing general support services (such as training) to local jurisdictions statewide, as well as customized support services for jurisdictions that pay into the System Benefits Charge.
- Promoting code development and advancement activities, including stakeholder engagement, market research of stretch codes, and validation of savings from advanced technologies.
- Conducting pilots to identify barriers and opportunities surrounding code development and advancement, testing alternative code enforcement structures, and assessing approaches to stretch and zero energy codes.

¹ The goal of the Initiative, as outlined in the “Codes” chapter of the *Clean Energy Fund Investment Plan*, was for 20% of jurisdictions to adopt a stretch code. NYSERDA’s project manager informed the Market Evaluation Team that this goal was modified to 20 jurisdictions. The Clean Energy Investment Plan is available on NYSERDA’s website at <https://www.nysesda.ny.gov/About/Funding/Clean-Energy-Fund>.

- Supporting state adoption of the Energy Conservation Construction Code of New York State (ECCCNYS) and local adoption of NYStretch Energy Code–2020 (NYStretch).
- Developing a path to energy codes that addresses all aspects of a building’s energy use and moves the market in a prompt and supportive way without being disruptive.

The Code to Zero Initiative activities will increase the percentage of buildings that are energy code compliant and the number of jurisdictions adopting stretch codes; improve energy code enforcement by increasing the number of jurisdictions that adopt alternative code enforcement structures; and accelerate the advancement of the energy code and stretch codes to achieve greater carbon reductions.

1.2 Challenges to Initiative Progress

Progress of the Code to Zero Initiative in the first year was slowed in large part due to a delay in the adoption of the 2020 ECCCNYS. Adoption of the updated energy code was expected in 2019 but was delayed nearly one year when the 2020 ECCCNYS took effect in May 2020. This delay impacted most Initiative activities, including the stretch code and alternative code enforcement pilots and energy code training. The Initiative project manager reported that while progress has been slower than anticipated, the delay allowed NYSERDA more time to collect data to support Initiative activities and provided an opportunity for them to learn more about the communities and individuals the Initiative serves.

Further delays resulted from the coronavirus pandemic, which limited in-person training opportunities and impacted the economy throughout NYS. NYSERDA and the energy code training implementers were quick to effectively begin webinars in place of in-person trainings and will remain flexible while NYS continues to overcome pandemic-related delays.

The delay of the 2020 ECCCNYS adoption and the effect of the pandemic may also impact stretch code adoption in general because communities are generally less likely to adopt a stretch code when the adoption of an updated state energy code is nearing. Updates to the ECCCNYS generally follow the release of the updated national model energy code, which is next released in the fall of 2020—so while the 2020 ECCCNYS just became effective, an update is expected in 2022 or 2023. As such, communities that may have adopted a stretch code in 2020 but were unable to do so are less likely to adopt the stretch code in 2021, instead waiting for the updated NYS code to be adopted.

1.3 Summary of Evaluation Objectives and Methods

The Market Evaluation Team initiated a longitudinal measurement of the key objectives listed in Table 1, developed to track the progress of energy code compliance and stretch code adoption throughout NYS as it relates to the activities of the Code to Zero Initiative. During the first year of the Initiative, the Market Evaluation Team convened a Delphi Panel and conducted in-depth interviews with representative jurisdictions to establish a baseline for future years of the evaluation. The Team also completed a broad literature review to document stretch code adoption trends and identify best practices for alternative code enforcement structures. The Market Evaluation Team will use results from these evaluation activities to assess the indirect impacts of the program over time.

Table 1. Evaluation Objectives and Methods

Objective	Purpose	Methods
Determine the percentage of the market complying with the energy code	Estimate the level of energy code compliance to determine change over time	Delphi Panel; Representative Jurisdiction In-Depth Interviews; Training Participant Surveys
Determine the number and percentage of jurisdictions adopting a stretch code	Estimate NYSERDA efforts in advancing the stretch code	Delphi Panel; Representative Jurisdiction In-Depth Interviews; Training Participant Surveys
Determine the number and percentage of jurisdictions adopting alternative code enforcement business structures outside the Initiative	Understand the impact of the alternative code enforcement pilots as well as the needs of and motivations for jurisdictions seeking alternative ways to enforce the energy code	Delphi Panel; Representative Jurisdiction In-Depth Interviews; Training Participant Surveys
Determine the extent to which stretch code concepts are integrated into ECCCNYS and future cycles of model codes	Understand the impact of the stretch code on NYS and national model energy codes	Literature Review; Stretch Code Expert Interviews
Assess the impact of NYSERDA’s training on compliance levels, decision making, and behavior	Estimate effects of energy code training and education on the market	Training Participant Surveys

1.4 Previous Delphi Panel Results

In 2015, ERS utilized a Delphi Panel as part of an impact evaluation of the Energy Code component of the Advanced Energy Codes and Standards program,² determining baseline compliance rates for the 2010 ECCCNY. ERS anticipated conducting a second Delphi Panel in 2018 to estimate statewide energy code compliance after NYSERDA provided energy code training and technical assistance. The difference in compliance levels would have been used to estimate energy savings attributable to the activities of NYSERDA's Energy Code component. However, the second Delphi Panel never occurred. Therefore, where appropriate, this report compares findings from the 2015 estimate of energy code compliance to the compliance estimate developed in the current evaluation.

² ERS. February 2016. *Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results*. <https://www.nysersda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/2016-advanced-energy-codes.pdf>

2 Market Characterization and Assessment Results

In late 2019, the Market Evaluation Team convened a Delphi Panel of 12 building energy codes and code compliance experts (panelists) working across NYS. The Delphi Panel process used the judgement of this group of experts to develop estimates and compile informed opinions; the Delphi Panel methodology is detailed in the *Evaluation Methodologies* section. Participants in the Delphi Panel conducted several activities:

- Established metrics for baseline compliance with the 2016 ECCCNY
- Estimated the rate of adoption of more stringent local energy codes, such as NYStretch
- Provided insight into energy code enforcement practices
- Discussed the use of new technologies and building practices

The Team then selected nine individuals from three representative jurisdictions (an urban jurisdiction [New York City], a suburban jurisdiction, and a rural jurisdiction) for in-depth interviews. Throughout the interviews, the Market Evaluation Team presented findings from the Delphi Panel process and noted differences between the experiences of each jurisdiction and the statewide baseline estimates established by the Delphi Panel. The Team did not use the results of these in-depth interviews to draw conclusions about the population of new construction or renovation projects, but rather as a comparison to validate the Delphi Panel response findings or raise questions in need of additional research. Table 2 shows the number of experts that participated in the Delphi Panel and jurisdiction in-depth interviews.

Table 2. Number of Participants by Evaluation Method

Evaluation Method	Number of Participants
Delphi Panel	12
Jurisdiction In-Depth Interviews	9

The following sections detail the results of the Delphi Panel process and representative jurisdiction in-depth interviews, and include information from the Team’s broad literature review. Full reports on each of these evaluation activities are included as appendices to this report.

2.1 Energy Code Compliance

The Market Evaluation Team asked Delphi Panel participants to estimate statewide compliance with the 2016 ECCCNYs, the energy code in effect throughout the duration of the Delphi Panel.³ The ECCCNYs was updated in May 2020 and is based on the 2018 IECC and ASHRAE 90.1-2016. The panelists provided estimates of the overall commercial compliance rate, compliance rate by system, and compliance rate by component for both new construction and for additions and alterations in the commercial and residential sectors. For this study, the *overall compliance rate* is the average percentage of requirements that are in compliance for the entire building. The *compliance rate* for building systems is the average percentage of requirements for a specific system that are in compliance. The Market Evaluation Team compared the statewide compliance rate estimates resulting from the Delphi Panel to the unique experience of experts from the urban, rural, and suburban jurisdictions.

Ten of the 12 panelists had expertise in both the residential and commercial energy codes, and the remaining two had either residential or commercial expertise only. Five of the nine jurisdiction interviewees had commercial expertise and four had residential expertise.

2.1.1 Commercial Energy Code Compliance

The overall weighted panelist estimate of energy code compliance for commercial new construction in New York was 83%, and the overall estimate of compliance for alterations and additions was 70%.⁴ When asked if they agreed with the Delphi Panel's estimate of overall new construction compliance, the five jurisdiction representatives with experience in the commercial sector had varied responses:

- One rural respondent said the estimate should be a bit higher (closer to 90%)
- One rural respondent and one suburban respondent said the estimate should be slightly lower

³ The 2016 ECCCNYs was based on the 2015 International Energy Conservation Code (IECC) and ASHRAE 90.1-2013 and was modified by the *2016 Supplement to the New York State Energy Conservation Construction Code*. The ECCCNYs and *2016 Supplement* are available on the U.S. Department of State, Division of Building Standards and Codes website at <https://www.dos.ny.gov/DCEA/CodeUpdate.html>.

⁴ The compliance rates presented to the representative jurisdiction interviewees were the unweighted average response from the Delphi Panel and were slightly different than the final, weighted response. The new construction compliance rate was presented as 84% (instead of the 83% weighted compliance rate) and the additions and alterations compliance rate was presented as 72% (rather than the 70% weighted compliance rate).

- One New York City respondent said the overall compliance rate might be closer to 70% at the state level, but agreed with the Delphi Panel estimate for their own jurisdiction
- An additional New York City respondent and one rural respondent agreed that the estimated percentage was close to their own observations

In estimating overall compliance for commercial alterations and additions, two jurisdiction respondents agreed with the Delphi Panel (one from New York City, one suburban), another two said the estimate should be higher (both rural respondents), and one rural respondent said the estimate should be lower (closer to 60%).

Table 3 shows that new construction commercial compliance estimates have increased by 9% from the baseline estimates established through the 2015 ERS Delphi Panel. The 2015 ERS Delphi Panel did not provide an estimate for additions and alterations (referred to as *renovations* in the previous report), but instead reported that panelists found renovation compliance to be 6% to 15% worse than new construction compliance. Using this range, addition and alteration compliance increased by 2% to 11%.

Table 3. Comparison of Commercial Compliance Rates by Study Year

Study (ECCCNYS Version)	New Construction	Additions and Alterations
Current Study (2016 ECCCNYS)	83%	70%
2015 ERS Delphi Panel Baseline Estimate (2010 ECCCNYS)	74%	59% to 68%

Panelists also estimated the compliance rate for each major building system (the building envelope, mechanical systems, and electrical power and lighting systems). For new construction, panelists identified the building envelope as having the highest compliance (85%). For alterations and additions, panelists identified the mechanical systems as having the highest compliance (72%). Table 4 shows that the compliance estimate varied very little across the systems for both new construction and additions and alterations. Interview respondents generally agreed with the Delphi Panel study findings.

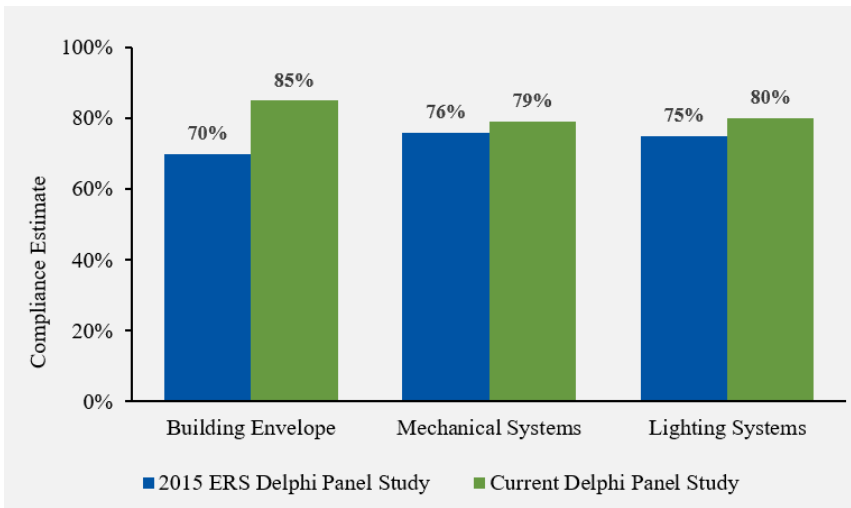
Table 4. Commercial Compliance Rate by System

System	New Construction	Additions and Alterations
Building Envelope	85%	68%
Mechanical Systems	79%	69%
Electrical Power and Lighting Systems	80%	72%

Figure 1 provides a comparison of panel estimates of commercial new construction compliance rates by system for the current study and the 2015 ERS Delphi Panel study. The current Delphi Panel study found an increase in compliance in each of the three main commercial building systems over the previous Delphi Panel study. Compliance with the building envelope experienced the greatest increase in estimated compliance between the two study years, from 70% in 2015 to 85% currently.

Figure 1. Comparison of Commercial System Compliance Rates by Study Year

Sources: ERS. February 2016. *Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results*. Cadmus. June 2020. *Code to Zero Initiative Market Evaluation Report: Baseline Estimates and Progress Toward Goals*.



Finally, the panelists estimated the compliance rate for select building components, each identified either as having a significant impact on building energy use (identified through research and past energy code studies) or as being subject to a newer code requirement. Table 5 shows the average of the panelists’ compliance rate estimates for each select building component in new construction; averages for additions and alterations are in Appendix A. Individual component compliance rate estimates may provide guidance for NYSERDA and training implementers on which topics to focus energy code training and other technical assistance.

Table 5. Commercial Compliance Rate by Component – New Construction

Code Requirement	Description	Compliance Estimate
Energy recovery ventilation	The energy recovery ventilation provided for fan systems exceeds values specified in the code; the exhaust air recovery efficiency is $\geq 50\%$	58%
Additional efficiency package options	Projects meet the additional efficiency requirements of Section C406	62%
Continuous air barrier installation quality	The air barrier is installed well with no gaps and all openings sealed continuously	66%
Thermal bridging	Continuous insulation is in use for commercial projects to mitigate thermal bridging	66%
Mechanical commissioning	HVAC system is completed, including air and hydronic system balancing and functional performance testing; documentation and reporting requirements have been met	66%
Envelope insulation installation quality	Envelope insulation is installed per manufacturer requirements	67%
Demand controlled ventilation	Demand controlled ventilation is provided in all spaces greater than 500 square feet with an average load of 25 occupants per 1,000 square feet	69%
Continuous air barrier	The air barrier meets the code requirements for materials, assembly, or testing	70%
Vertical fenestration (windows and doors)	The vertical fenestration area is less than 30% of the gross above-grade wall area or up to 40% with automatic daylighting controls	71%
Equipment sizing	Equipment meets sizing requirements	80%

Code Requirement	Description	Compliance Estimate
Daylighting controls	Daylit spaces have separate controls from general lighting controls or are automatically controlled with daylight sensors	80%
Economizers	Economizers are provided where required, meet the design requirements for capacity, and have appropriate controls	85%
Distribution systems	Ductwork and piping meet the required insulation levels	85%
Envelope insulation	The building meets envelope insulation requirements	86%
Interior lighting controls	Manual and automatic lighting controls are installed and functioning properly	86%
Fenestration (windows, skylights, and doors)	Windows and doors meet U-factor and solar heat gain coefficient requirements	88%
Variable air volume systems	Variable air volume fan motors are ≥ 10 horsepower, are driven by variable speed drive, have a vane-axial fan with variable pitch blades, or have controls or devices to limit fan motor demand	88%
Exterior building lighting power	Exterior lighting does not exceed the exterior lighting power allowance	89%
Multiple HVAC systems	Multiple zone HVAC systems have supply air temperature reset controls and limit simultaneous heating and cooling to each zone	90%
Lighting power density	Meets space-specific lighting power density requirements	91%
Exterior lighting controls	Exterior lighting controlled by either motion sensor or a time clock	91%

Code Requirement	Description	Compliance Estimate
Mechanical controls	Mechanical controls include a programmable thermostat that provides heating and cooling to each zone, with capability for automatic setback and shutdown	92%
Equipment efficiency	Installed equipment meets efficiency requirements	95%

The 2015 ERS Delphi Panel study identified several topics as commercial focus areas—air sealing and the building envelope, daylighting, commissioning, advanced mechanical controls (demand controlled ventilation and economizer requirements), distribution systems, and lighting power density—with each topic estimated to have a compliance rate below 70%. In this study, while air sealing, commissioning, and demand controlled ventilation continued to have low compliance estimates, compliance for the remaining focus areas (daylighting, economizers, distribution systems, and lighting power density) greatly improved. New focus areas with compliance rates below 70% include the additional efficiency package options and energy recovery ventilation. Many panelists and interviewees noted that compliance is lowest for provisions that require expert installation or other expert knowledge, and highest for products that can be purchased with code-required specifications.

The Market Evaluation Team used the Delphi Panel and jurisdiction in-depth interviews to gain insight into other commercial compliance topics. There were several key findings (expanded on in Appendix A and Appendix B):

- Panelists estimated that 62% of all new commercial buildings are permitted using the prescriptive compliance option of either the IECC or ASHRAE 90.1.
- On average, panelists estimated that compliance would decrease by 9% at the beginning of a new code cycle (estimates ranged from a 5% decrease to a 15% decrease). Jurisdiction interviewees found this estimate to be reasonable.
- Panelists identified several challenges the commercial building market must overcome when complying with energy codes: the cost of implementing the energy code requirements, the complexity of the energy code requirements, a lack of understanding of energy code requirements, inconsistent energy code enforcement, and a perception that energy codes are not as critical as life/safety codes. In addition to these,

jurisdiction interviewees identified unlicensed contractors and contractors who willfully do not comply with the energy code as challenges.

- Panelists and jurisdiction interviewees identified training, technical assistance, incentives, compliance tools, and public demand as having the greatest impact on increasing commercial building energy code compliance.
- Commercial panelists estimated that, on average, a training program aimed at educating all sectors of the building industry could increase the overall compliance rate of commercial buildings by 15% (estimates ranged from 5% to 25%).
- Five of eight panelists who provided a response agreed that commercial energy code compliance should be considered separately from compliance with other building codes (as opposed to being integrated).

2.1.2 Residential Energy Code Compliance

The panelists' overall weighted estimate of energy code compliance for single-family residential new construction in NYS was 77%, and their overall estimate of compliance for single-family alterations and additions was 71%.⁵ The Market Evaluation Team presented *unweighted* compliance rates to the interviewees of 71% for new construction and 67% for additions and alterations. Jurisdiction interviewees considered the unweighted estimate as too low for new construction, but three of four said the estimate is reasonable for alterations and additions.

Table 6 shows a comparison of the current weighted residential compliance estimates to the baseline estimates established through the 2015 Delphi Panel study. New construction compliance remained steady between the study periods; additions and alterations also remained steady compared to the high end of the 2015 ERS Delphi Panel study estimate.

⁵ The Market Evaluation Team presented compliance rates to the representative jurisdiction interviewees that were the unweighted average responses from the Delphi Panel and were slightly different from the final, weighted response. The Team presented the residential new construction compliance rate as 71% (instead of the 77% weighted compliance rate) and presented the additions and alterations compliance rate as 67% (rather than the 71% weighted compliance rate).

Table 6. Comparison of Residential Compliance Rates by Study Year

Study (ECCCNYS Version)	New Construction	Additions and Alterations
Current Baseline (2016 ECCCNYS)	77%	71%
2015 ERS Delphi Panel Estimate (2010 ECCCNYS)	77%	62% to 71%

For low-rise residential (low-rise multifamily) new construction, panelists estimated the current overall compliance rate as 73%.

Panelists also estimated the compliance rate for each major building system (building envelope, mechanical systems, electrical power and lighting systems, and documentation). For single-family new construction and additions and alterations, panelists identified the building envelope as having the highest rate of compliance (80% and 77%, respectively), as shown in Table 7.

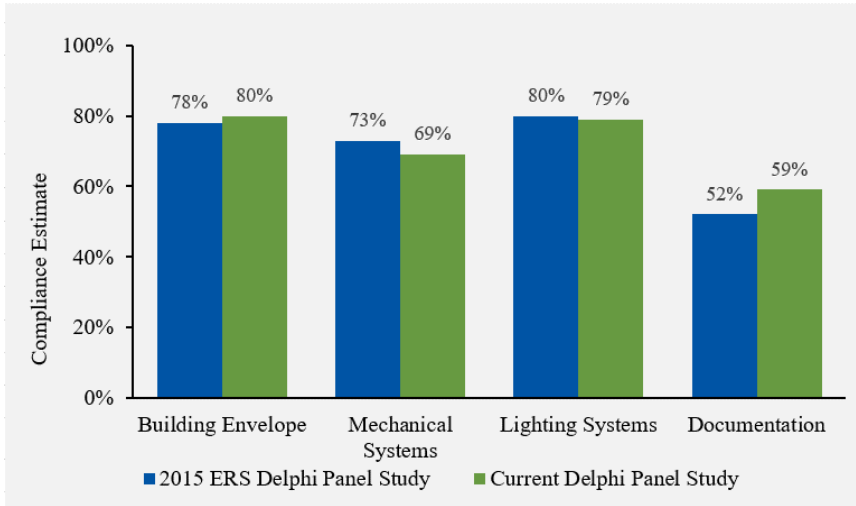
Table 7. Residential Compliance Rate by System or Category

System or Category	New Construction	Additions and Alterations
Documentation	59%	55%
Building Envelope	80%	77%
Mechanical Systems	69%	61%
Electrical Power and Lighting Systems	79%	63%

Figure 2 provides a comparison of residential new construction compliance rates by system for the current study and the 2015 ERS Delphi Panel study. Compliance estimates increased for the building envelope and documentation and decreased slightly for mechanical and lighting systems. Overall, compliance levels by system have largely remained steady between the two study years.

Figure 2. Comparison of Residential System Compliance Rates by Study Year

Sources: ERS. February 2016. *Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results*. Cadmus. June 2020. *Code to Zero Initiative Market Evaluation Report: Baseline Estimates and Progress Toward Goals*.



As with commercial, the panelists estimated the compliance rate for select residential building components. Table 8 shows the average of the panelists’ compliance rate estimates for each select building component in single-family new construction; averages for additions and alterations are in Appendix A.

Table 8. Residential Compliance Rate by Component – Single-Family New Construction

Code Requirement	Description	Compliance Estimate
Documentation	Projects supply enough detail on the construction documents for code official to assess compliance, including details for air sealing and duct sealing and mechanical system design	58%
Rooms containing fuel burning appliances	Appliance and combustion air opening is located outside the building thermal envelope or is enclosed in a room; combustion closets are insulated to levels not less than the basement wall R-value requirements in Table R402.1.2 of the ECCCNY; closet is air sealed and door is fully gasketed	60%

Code Requirement	Description	Compliance Estimate
Air sealing	Building thermal envelope is sealed to limit infiltration; all joints and penetrations are sealed, as well as windows, doors, and attic access	61%
Duct testing	Ducts located in unconditioned spaces are tested for air leakage; total duct leakage does not exceed 4 cfm per 100 square feet of conditioned floor area	62%
Certificates in panel	Permanent certificates are posted on or in the electrical panel to document code compliance	63%
Recessed lighting	Recessed fixtures in the building envelope are IC-rated and sealed with a gasket or caulk to limit air leakage	64%
Equipment sizing	Heating and cooling equipment is sized per Manual J or similar requirements	65%
Air barrier and insulation installation	Components of the thermal envelope are installed and inspected per Table R402.4.1.1 of the ECCCNYIS and verified with a blower door test	67%
Insulation installation quality	Envelope insulation is installed per manufacturer requirements and Table R402.4.1.1	69%
Tenant separation walls	The fire separations between dwelling units in two-family dwellings and townhouses are insulated to R-10 or greater and walls are air sealed	70%
Distribution systems	Ductwork and piping are insulated and sealed	74%
Inspection stickers	Builders leave window and door certification National Fenestration Rating Council stickers for inspection	78%

2.1 Energy Code Compliance

The Market Evaluation Team asked Delphi Panel participants to estimate statewide compliance with the 2016 ECCCNY, the energy code in effect throughout the duration of the Delphi Panel.³ The ECCCNY was updated in May 2020 and is based on the 2018 IECC and ASHRAE 90.1-2016. The panelists provided estimates of the overall commercial compliance rate, compliance rate by system, and compliance rate by component for both new construction and for additions and alterations in the commercial and residential sectors. For this study, the *overall compliance rate* is the average percentage of requirements that are in compliance for the entire building. The *compliance rate* for building systems is the average percentage of requirements for a specific system that are in compliance. The Market Evaluation Team compared the statewide compliance rate estimates resulting from the Delphi Panel to the unique experience of experts from the urban, rural, and suburban jurisdictions.

Ten of the 12 panelists had expertise in both the residential and commercial energy codes, and the remaining two had either residential or commercial expertise only. Five of the nine jurisdiction interviewees had commercial expertise and four had residential expertise.

2.1.1 Commercial Energy Code Compliance

The overall weighted panelist estimate of energy code compliance for commercial new construction in New York was 83%, and the overall estimate of compliance for alterations and additions was 70%.⁴ When asked if they agreed with the Delphi Panel's estimate of overall new construction compliance, the five jurisdiction representatives with experience in the commercial sector had varied responses:

- One rural respondent said the estimate should be a bit higher (closer to 90%)
- One rural respondent and one suburban respondent said the estimate should be slightly lower

³ The 2016 ECCCNY was based on the 2015 International Energy Conservation Code (IECC) and ASHRAE 90.1-2013 and was modified by the *2016 Supplement to the New York State Energy Conservation Construction Code*. The ECCCNY and *2016 Supplement* are available on the U.S. Department of State, Division of Building Standards and Codes website at <https://www.dos.ny.gov/DCEA/CodeUpdate.html>.

⁴ The compliance rates presented to the representative jurisdiction interviewees were the unweighted average response from the Delphi Panel and were slightly different than the final, weighted response. The new construction compliance rate was presented as 84% (instead of the 83% weighted compliance rate) and the additions and alterations compliance rate was presented as 72% (rather than the 70% weighted compliance rate).

The Delphi Panel and jurisdiction in-depth interviews offered additional insight into residential compliance topics. There were several key findings (expanded on in Appendices A and B):

- Panelists estimated that 86% of all residential new construction is permitted using a prescriptive compliance option, most commonly the Total UA Alternative (generally complied with using *REScheck*). Energy code consultants and third-party energy professionals estimated a higher use of the Energy Rating Index compliance option compared to panelists with another occupation.
- As with commercial, panelists estimated that residential compliance would decrease by 9% at the beginning of a new code cycle (estimates ranged from a 5% decrease to a 15% decrease).
- Panelists with residential expertise identified several common challenges the residential building market must overcome when complying with energy codes that matched challenges in the commercial building market: the cost of implementing the energy code requirements, a lack of understanding of energy code requirements, and inconsistent energy code enforcement. Residential-specific challenges included homebuilder resistance to changes in construction practices, homeowners completing construction without energy code knowledge, limited funding for or the non-involvement of design professionals, and infrequent or incomplete documentation submission. Jurisdiction interviewees agreed with these challenges, adding that there is also a challenge in the high price for typical code-compliant materials (such as windows and doors) and emphasizing the issue with unlicensed or uneducated contractors completing largely unregulated construction (in the rural and suburban jurisdictions).
- Panelists and jurisdiction interviewees identified training, the use of third-party energy professionals, mandatory performance testing, and rebates or incentives as having the greatest impact on increasing residential building energy code compliance. Interviewees also said that state support has a large impact in smaller jurisdictions.
- Residential experts estimated that, on average, a training program aimed at educating all sectors of the building industry has the potential to increase the overall compliance

rate of residential buildings by 13% (estimates ranged from 10% to 30%). This average is slightly lower than the 15% estimated for commercial compliance enhancement.

- Six of nine panelists who provided a response agreed that residential energy code compliance should be considered separately from compliance with other building codes (as opposed to being integrated).

2.1.3 Initiative Progress

A key goal of the Code to Zero Initiative is for energy code compliance to reach 90% throughout NYS. The current baseline compliance estimate for commercial new construction is 84%, a large increase from the 2015 ERS Delphi Panel study estimate and nearing the 90% goal. The current baseline for residential single-family new construction, however, is currently estimated at just 77%, showing no improvement over the last estimate and leaving a larger gap between current conditions and the 90% goal.

2.2 Stretch Energy Code Adoption

NYStretch Energy Code–2020 is NYSERDA’s latest voluntary, locally adoptable stretch energy code, and is approximately 19% more efficient than the residential provisions of the 2018 IECC and roughly 7% more efficient than the commercial provisions of ASHRAE 90.1-2016. NYStretch is also more efficient than the 2020 ECCCNY, which took effect May 12, 2020.

The Market Evaluation Team designed the Delphi Panel survey to gain insight into the current environment in NYS for the adoption of stretch energy codes, including NYStretch, and supplemented information learned from the panelists through a broad literature review. For this evaluation, a stretch code is a voluntary, locally adopted code or compliance option that offers municipalities a more energy-efficient alternative to the NYS base code (that is, the ECCCNY).

2.2.1 Current Stretch Code Adoption Status in New York State

For many years, jurisdictions throughout NYS have incorporated above code programs and practices such as Leadership in Energy and Environmental Design (LEED), ENERGY STAR, and the Home Energy Rating System (HERS) into local legislation. These programs are typically required in addition to meeting the requirements of the ECCCNY, resulting in a more stringent local energy code.

New York City was the first municipality in NYS to adopt a stretch code; NYStretch is included in the 2020 New York City Energy Conservation Code (NYCECC), which took effect on May

12, 2020. The City of Beacon adopted NYStretch shortly after New York City and it will take effect on October 1, 2020. Both cities received support from NYSERDA throughout the adoption process.

Additionally, the City of Ithaca included NYStretch as an option for achieving points towards compliance with their points-based Energy Code Supplement; the Ithaca Town Board was expected to consider adoption of the final legislation in May 2020.

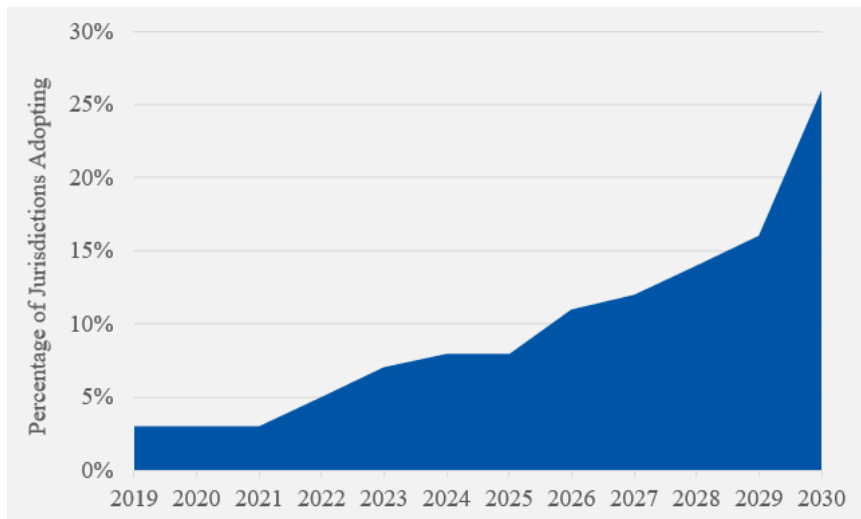
2.2.2 Naturally Occurring Market Adoption Rate of Stretch Codes

To support evaluation of NYSERDA’s programmatic impact in the future, the Market Evaluation Team used the Delphi Panel to establish a baseline forecast of the naturally occurring market adoption rate of stretch codes. Panelists estimated the likely adoption rate by NYS jurisdictions from 2019 to 2030. The Team asked panelists to consider the NYS market only and to provide estimates that represent current market factors, assuming no market intervention by NYSERDA or any other entity.

Figure 3 shows the final average of all panelists’ responses with outliers removed.⁶ Panelists estimated that, by 2030, 26% of NYS jurisdictions will adopt a stretch energy code.

Figure 3. Stretch Energy Code Naturally Occurring Market Adoption Rate

Source: Delphi Panel Surveys by Market Evaluation Team.



⁶ The Team identified responses outside 1.5 times the interquartile range as outliers and removed them from the analysis. The number of outlier panelist estimates in each year varied; there were no outliers in 2019, 2020, or 2030.

While some jurisdiction interviewees considered their region uninterested in adopting a stretch code, most agreed that, for NYS overall, the Delphi Panel study estimate provided an accurate assessment. Two respondents, one from a rural area and one from a suburban community, said the estimate is a little high without an incentive to encourage adoption. In general, the rural interviewees believed energy efficiency to be an interest of wealthier communities and said smaller or more rural jurisdictions, particularly those with a large low-income population, are unlikely to adopt a stretch or more stringent energy code.

2.2.3 Stretch Energy Code Adoption Considerations

To help the Team better understand the motivation for and factors driving stretch energy code adoption throughout NYS, the panelists identified reasons that some jurisdictions have adopted more stringent local energy codes while others have not.

- The primary motivations for stretch code adoption were to meet statewide targets and climate change goals, particularly those related to a reduction in greenhouse gas emissions; to gain distinction from other jurisdictions; to be eligible for incentives for meeting above-code requirements; to appeal to the community and attract businesses and people; and to counter high electric and natural gas rates.
- The primary reasons for jurisdictions not adopting a stretch code, as identified by the panelists, were due to shortfalls in state legislation recognizing energy code benefits, additional costs and lack of financial incentives, lack of demand by consumers, and pushback from communities and the construction industry.

To encourage and support stretch code adoption, panelists most commonly suggested providing rebates, grants, or other incentives to adopting jurisdictions.

Jurisdiction interviewees also discussed challenges in implementing or enforcing more stringent local energy codes. Respondents from rural communities said that there is no political interest for such changes in their area, and that residents and builders in their area are intimidated by the idea of having more regulation around meeting the energy code (saying that residents would be more likely to buy a manufactured home than to build a new single-family home just to avoid the extra costs associated with meeting the energy code). A respondent from a suburban community said the main issue their jurisdiction faces is a lack of knowledge, including how to address cost issues. Interviewees generally agreed that two key issues would need to be addressed for jurisdictions to adopt more stringent codes—education and incentives.

2.2.4 Initiative Progress and Successes

The goal of the Code to Zero Initiative is for 20 jurisdictions to adopt a stretch code; to date, the Initiative has successfully supported New York City and the City of Beacon in NYStretch adoption, and the City of Ithaca will likely be a successful adoption as well. Stretch code adoption in each of these jurisdictions is outside of the pilots offered through the Initiative; however, support for energy code adoption in NYC and the City of Beacon is progress toward a secondary Initiative goal of supporting the enactment of energy codes in five jurisdictions.

NYSERDA successfully achieved several additional accomplishments related to stretch codes:

- NYStretch adoption will be included in the Clean Energy Communities program as an option for receiving program credits.
- NYSERDA is conducting active outreach across NYS through four firms with outreach circuit rider positions.
- One additional NYSERDA staff person will be focused on stretch code–related tasks.
- In early summer 2020, the next round of stretch code development will begin, with the goal of the next NYStretch being adopted statewide.

2.3 NYStretch Impact on ECCCNY and Model Energy Codes

An objective of the Market Evaluation Team’s research was to determine the extent that stretch code concepts were integrated into the ECCCNY and future cycles of national model codes. NYSERDA staff reported that no NYStretch concepts were integrated into the 2020 ECCCNY because the state energy code is based on the IECC (which generally had few changes in the newest version). NYSERDA intends for NYStretch to have a larger influence on the statewide energy code in the 2023 code cycle.

NYSERDA supported select residential proposals during development of the 2021 IECC. Twelve voting members from within NYSERDA voted as a block on energy provisions and shared voting strategies with additional state agencies. NYSERDA plans to be even more involved in the 2024 IECC code development process.

2.4 Alternative Code Enforcement Structures

Typical code enforcement structures vary by state and local jurisdiction and are often dependent on availability of resources, with plan reviews and on-site inspections as the most common methods to ensure compliance with the energy code. There is a growing interest in alternative

code enforcement structures, defined in this study as new, innovative, or otherwise atypical methods or structures for enforcing the energy code outside of the traditional plan review and inspection practice. Examples of alternative code enforcement structures include county-level energy code enforcement, shared services, quality assurance platforms for plan reviews and inspections, and third-party services.

Panelists estimated that, on average, 8% of jurisdictions throughout the NYS are currently using an alternative code enforcement structure, most commonly third-party energy professionals or county-level enforcement. Eight of nine jurisdiction interviewees said their jurisdiction does not use alternative code enforcement strategies. One suburban interviewee said their city and neighboring communities sometimes outsource certain aspects of enforcement to third-party professionals, including occasionally hiring an architecture or engineering firm to assist with the permit review process. Another suburban respondent said that while they had not seen it in practice, they are interested in the possibility of remote inspections. A respondent from New York City said they are interested in the possibilities offered by outcome-based compliance tools (such as utility bill enforcement).

The panelists cited the important features of alternative code enforcement structures as saving the building department time and money, improving the efficiency and quality of services, increasing compliance, providing greater enforcement and compliance consistency between towns, and increasing the knowledge of contractors and building owners. Panelists said jurisdictions typically share several concerns when deciding to employ an alternative code enforcement structure:

- How will the new enforcement structure impact the building department budget?
- Will the building department lose authority or oversight from having third party or other alternative code enforcement mechanisms?
- What forms of technical assistance and training opportunities will be available to support the alternative code enforcement structure that becomes implemented?
- Are qualified, experienced third-party personnel available in the jurisdiction?
- Will the new enforcement structure improve overall compliance with the energy code?

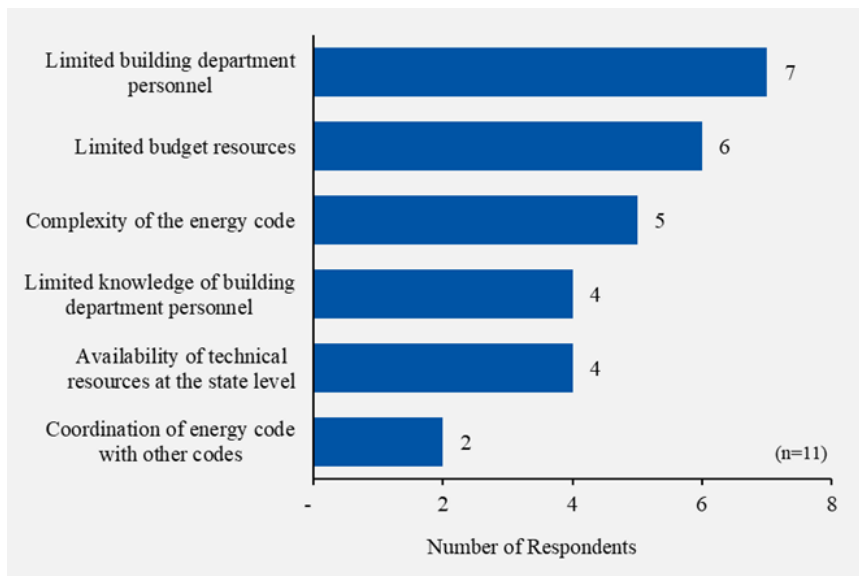
Panelists expressed the need to train jurisdictions about the benefits of using third-party energy professionals for code enforcement, as well as for an official agency to maintain a database of qualified third parties. Additionally, panelists said it will be important for code officials to maintain authority regardless of the enforcement alternative.

2.4.1 Current Enforcement Practices and Challenges

Through the Delphi Panel process, the Market Evaluation Team gathered information on commercial and residential energy code enforcement practices and challenges across NYS to gain insight that may support future alternative code enforcement structures. The Team asked panelists to select the three most significant challenges facing energy code enforcement from a provided list,⁷ with the option of suggesting additional challenges if needed. Figure 4 shows the number of panelists who selected each option as one of the top three challenges.

Figure 4. Challenges Facing Energy Code Enforcement

Source: Delphi Panel Surveys by Market Evaluation Team.



Jurisdiction interviewees agreed that the most significant challenges facing current residential and commercial energy code enforcement are insufficient staffing, financial limitations, and lack of education.

2.4.2 Initiative Progress and Successes

NYSERDA has a Code to Zero Initiative goal of implementing alternative code enforcement structure pilot programs in jurisdictions and for those jurisdictions to report improved energy code enforcement. As of March 2020, NYSERDA was conducting market research to identify communities interested in responding to a solicitation for pilot program participation and has

⁷ The Team selected this list of challenges based on previous code compliance studies, both in NYS and in other states.

found initial interest among building departments in some communities to pilot several different enforcement strategies. NYSERDA plans to expand its market research within interested communities prior to moving forward with a solicitation of pilot funding opportunity.

2.5 Energy Code Training and Education

NYSERDA has four contractors who provide energy code training for the Code to Zero Initiative. Due to delays in the adoption of the 2020 ECCCNY and in full execution of the implementers' contracts, no energy code training specific to the 2020 ECCCNY had occurred as of March 2020. NYSERDA dedicated the first quarter of 2020 to curriculum development, with a goal of having new training available when the 2020 ECCCNY took effect in May 2020. In achievement of this goal, training on the 2020 ECCCNY largely kicked off in late April 2020.

NYSERDA did, however, provide energy code training on the 2016 ECCCNY to roughly 2,000 individuals using funds from the Clean Energy Fund (597 trainees in 2018, 993 trainees in 2019, and 451 trainees in 2020).

2.5.3 Initiative Progress and Successes

Once training begins, the Market Evaluation Team will assess the impact of NYSERDA's training on compliance levels, decision making, and behavior by surveying training attendees.

3 Findings and Recommendations

The Market Evaluation Team offers the following findings for Code to Zero Initiative activities occurring between March 2019 and March 2020 and recommendations for future Initiative years.

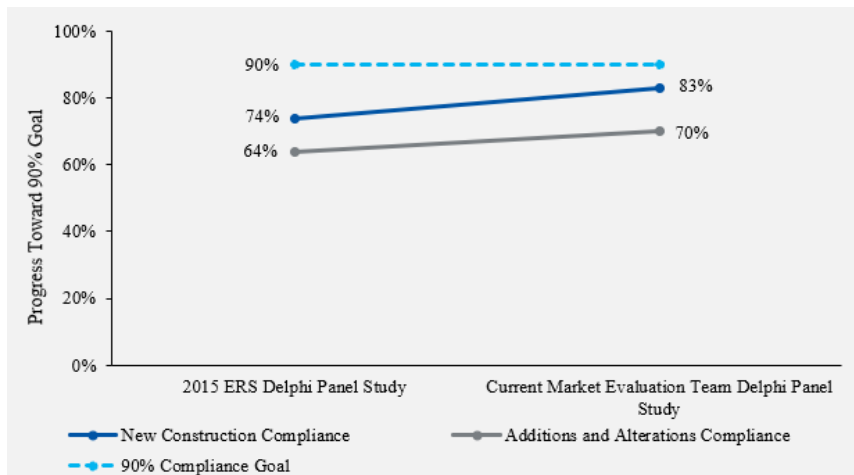
Finding 1: Overall compliance increased significantly in the commercial sector for both new construction and additions and alterations.

The Delphi Panel estimated overall compliance for commercial new construction at 83%, a 9% increase from the baseline estimate established through the 2015 ERS Delphi Panel. New construction compliance with commercial building envelope provisions increased most notably, from an estimated 70% in 2015 to 85%.

The compliance estimate for commercial additions and alterations also increased compared to the 2015 ERS Delphi Panel estimate, from a range of 59% to 68% in 2015 to an estimated 70% currently. Figure 5 illustrates the current estimated compliance rate in relation to the 2015 ERS Delphi Panel and the goal of 90% compliance.⁸

Figure 5. Progress Toward 90% Compliance Goal – Commercial

Sources: ERS. February 2016. *Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results*. Cadmus. June 2020. *Code to Zero Initiative Market Evaluation Report: Baseline Estimates and Progress Toward Goals*.



⁸ The 2015 ERS Delphi Panel study provided a range for commercial additions and alterations compliance (59% to 68%). The beginning value shown in Figure 4 is the rounded average of the range (64%).

A comparison of the 2015 ERS Delphi Panel study estimates and the current Delphi Panel study estimates suggests that the gap between new construction and additions and alterations compliance may be increasing, from a 10% difference in 2015 to 13% currently.

The Delphi Panel estimated that compliance would decrease by 9% at the beginning of a new code cycle and that a training program would increase compliance by 15%.

Recommendation 1: The Market Evaluation Team recommends that the Initiative continue offering training and education focused on low commercial code compliance, including for the areas of air sealing, commissioning, demand controlled ventilation, energy recovery ventilation, and additional efficiency package options. Although panelists estimated that a large drop in compliance would occur with the adoption of the 2020 ECCCNY, it also estimated that a training program increases compliance significantly. Training may provide the necessary improvements to achieve the Initiative goal of 90% compliance.

Recommendation 2: The Team recommends ensuring code compliance enhancement efforts are focused on additions and alterations as well as on new construction. An estimated 20% increase in compliance is needed to bring the existing commercial building market to 90% compliance.

Finding 2: The Delphi Panel estimate for compliance in the residential sector has not had the same level of improvement as compliance in the commercial sector.

The panelists' overall weighted estimate of energy code compliance for single-family residential new construction in NYS was 77%, showing no improvement over the 2015 ERS Delphi Panel study estimate. The representative jurisdiction interviewee respondents estimated that residential compliance was higher than the final average estimate from the panelists (71%).

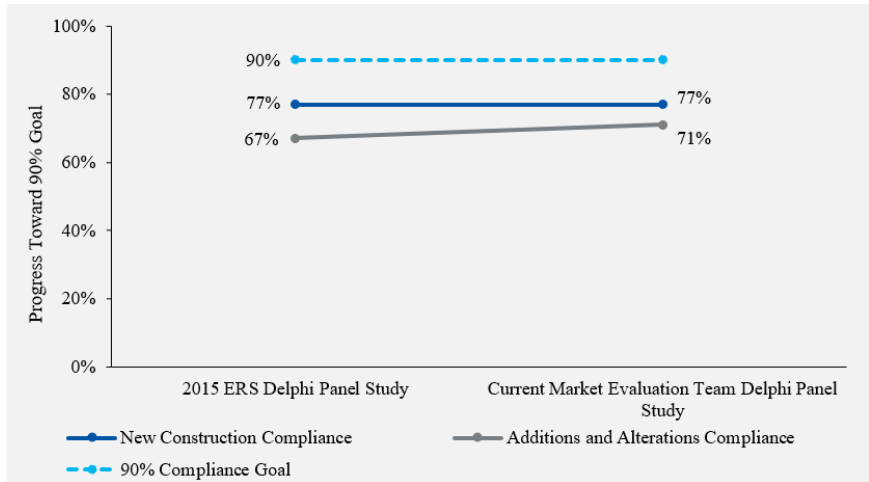
The panelists' overall weighted estimate of compliance for single-family alterations and additions was 71%, which is in the range of compliance estimated in the 2015 ERS Delphi Panel study (62% to 71%). Figure 6 illustrates the current compliance rate in relation to the 2015 ERS Delphi Panel and the goal of 90% compliance.⁹ The current Delphi Panel study estimated that an approximate 13% increase in compliance is needed to reach the Initiative goal of 90%

⁹ The 2015 ERS Delphi Panel study provided a range for residential additions and alterations compliance (62% to 71%). The beginning value shown in Figure 5 is the rounded average of the range (67%).

compliance. Compliance for additions and alterations must increase by an estimated 19% to achieve the 90% goal.

Figure 6. Progress Toward 90% Compliance Goal – Residential

Sources: ERS. February 2016. *Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results*. Cadmus. June 2020. *Code to Zero Initiative Market Evaluation Report: Baseline Estimates and Progress Toward Goals*.



Panelists estimated that residential compliance would decrease by 9% at the beginning of a new code cycle and that a comprehensive training program could increase the overall compliance rate of residential buildings by 13%.

Rural and suburban interviewees offered unique insight into challenges smaller jurisdictions must face. These include providing affordable, code-compliant products for large low-income populations; unlicensed contractors; and a lack of education and tools to support compliance. Despite the prevalence of free, publicly available sources for current energy code language, rural interviewees noted a lack of access to affordable code books. Interviewees from rural and suburban jurisdictions generally viewed the energy code as an “unfunded mandate” and often perceived compliance with the energy code as attainable only in wealthier communities. Advances in efficiency, interviewees noted, need to be initiated from within the community.

Recommendation 3: As with the commercial sector, the Market Evaluation Team recommends that the Initiative continue offering training and education focused on the areas of low compliance, such as documentation on plans and in electrical panels, mechanical equipment sizing, air sealing, envelope insulation installation, recessed lighting fixtures, rooms with fuel burning appliances, and duct leakage testing. This is especially relevant because the focus areas identified in the 2015 ERS Delphi Panel study have seen little improvement. The Team suggests

making training easily accessible across the state and providing education in innovative ways that may better reach homebuilders and contractors and involve the greater community. For example, the Initiative could educate employees at local box or hardware stores on code-compliant materials or initiate a community education campaign that highlights the benefits of code compliance to homeowners and communities.

Recommendation 4: The Team suggests providing resources such as testing equipment directly to jurisdictions that are unable to purchase it to mitigate the cost of energy code enforcement. For example, NYSERDA could make blower door and duct testing equipment available to jurisdictions in need, even if shared at the county or regional level (if distance permits). NYSERDA should continue to remind jurisdictions of free resources for accessing current code text.

Finding 3: The Code to Zero Initiative made slow progress toward its goals of 20 jurisdictions adopting a stretch code and implementing alternative code enforcement structure pilots to interested jurisdictions; however, NYSERDA staff are actively researching and providing outreach to support both goals.

Finding 4: The extent of NYSERDA's influence on current versions of the ECCCNY and the IECC is relatively unknown, but there is potential for NYSERDA-driven advances in energy efficiency to impact codes nationally.

NYSERDA aims to impact future iterations of the state and national model energy codes through the Code to Zero Initiative. The Market Evaluation Team interviewed the project manager in March 2020 and it was reported that NYSERDA influence on the ECCCNY and IECC has been limited to date. However, NYSERDA provided support to a small number of 2021 IECC code change proposals and expects to have a greater impact on the 2024 IECC by developing code change proposals and providing research and analyses in support of other proposals.

Recommendation 5: The Market Evaluation Team recommends that NYSERDA develop a database or other tool for tracking code advocacy efforts. The database should include, at a minimum, a high-level summary of NYSERDA's role and influence in the development and adoption of energy codes throughout the state and at the national level. Activities to document may include code change proposal development or support; technical analyses that support code change proposals; and participation in International Code Council development hearings. The

team also recommends NYSERDA track any secondary sources that document NYSERDA's advocacy efforts. These sources may include the following:

- Emails between NYSERDA and stakeholders
- Meeting notes
- Presentations
- Hearing and workshop transcripts
- Stakeholder comments and testimony
- Communication with various organizations and industry groups

The database and secondary sources may be valuable inputs to future evaluations of the savings attributable to NYSERDA for code development efforts.

Recommendation 6: Finally, the Team recommends that NYSERDA coordinate efforts with other organizations that are engaged in model energy codes and code change proposal development to further impact the advancement of the national model energy code.

4 Evaluation Methodologies

The Market Evaluation Team used the findings from the Delphi Panel and jurisdiction in-depth interviews to establish baseline estimates and assess progress toward the Initiative goals. These research methods and the Team's methods to calculate findings are presented in this chapter.

4.1 Delphi Panel Process

For the Delphi Panel process, the Team combined the opinions of a group of experts through an interactive, iterative process.

The Delphi method, first developed by the RAND Corporation in the 1950s, is widely used to develop informed opinions from a group of experts. Using this method, the implementer has experts anonymously reply to a survey or questionnaire, then aggregates the results and shares the group feedback with those experts, encouraging experts to consider the insight from other experts and refine their estimates, as needed. The implementer repeats this process, with the goal of reducing the range of responses or, in some cases, reaching a consensus.

For this evaluation, the panelists completed three rounds of questionnaires to provide feedback and opinions based on their own experiences with the energy code in NYS building construction markets and as experts in their fields. First, the Market Evaluation Team asked panelists to review background material on the Code to Zero Initiative, information on the adoption of the ECCCNY and NYStretch, and information related to energy code compliance and enforcement in NYS. Once familiar with the study intent, panelists completed the first survey round, which included questions on energy code compliance and enforcement, the adoption of more stringent local energy codes, and the use of new building technologies.

The Market Evaluation Team anonymized and aggregated the first round estimates and rationales from panelists and returned them to the group for a second round of input. Panelists reviewed their own responses alongside the responses of their peers and adjusted or revised their answers based on the results, if desired. The Team repeated this process with a third and final survey round, providing experts with one additional opportunity to adjust their input or offer commentary.

The Delphi Panel comprised a diverse group of experts within the community of building code experts in New York. Table 9 shows the distribution of experts by occupation; several panelists selected more than one title for their current occupation, noting that it can vary depending on the

nature of the work or their role for a specific project. Most frequently, architects and engineers also serve as energy or code consultants or third-party energy professionals. More than half the experts have been using or applying the energy code in NYS for over 20 years and all 10 economic regions defined by the New York State Department of Labor were represented.

Table 9. Delphi Panelists by Occupation

Delphi Panelist Occupation	Number of Experts Recruited
Design professional (architect or engineer)	4
Energy or code consultant	4
Third-party energy professional	4
Code enforcement officer	2
Construction industry	2
State or local code development	1

Since panel participation was voluntary, one limitation of the Delphi Panel process is the possibility of self-selection bias. To mitigate self-selection bias from a predominance of one or a few respondent types, the Market Evaluation Team strategically recruited panelists to ensure that they represented a variety of occupations and regional expertise.

Full details of the Delphi Panel process, panelist characteristics, and findings are in Appendix A.

4.1.1 Energy Code Compliance Assessment Methodology

Delphi Panel survey panelists estimated the overall commercial and residential compliance rate, compliance rate by system or category, and compliance rate by component for both new construction and additions and alterations. In survey rounds two and three, panelists reviewed and responded to input from the group and recorded changes to their estimates, if applicable.

The Market Research Team calculated the overall compliance rate by weighting each panelists' individual system estimates by relative energy impact in accordance with the distribution of weighting used in the 2015 ERS Delphi Panel study.¹⁰ The energy impact weights were based on the Score + Store compliance tool developed by the U.S. Department of Energy with the Pacific Northwest National Laboratory, which assigned a weighted value to energy code provisions

¹⁰ The Team reviewed past and current compliance methodologies and concluded that the weights developed and used by ERS are still accurate.

based on their energy impact, and modified by ERS based on research and experience. The Market Evaluation Team reviewed the Score + Store tool, past and current compliance methodologies, and significant changes to the 2015 IECC, and concluded that the weights developed and used by ERS in the *Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results* report are still accurate. Table 10 shows the weight applied to each system for residential and commercial compliance rating.

Table 10. Distribution of Compliance Rating Weights by System

System	Commercial Weight	Residential Weight
Building Envelope	39%	62%
Mechanical Systems	39%	22%
Electrical Power and Lighting Systems	23%	11%
Documentation	-	5%

The Team used this weighted methodology for overall compliance to ensure consistency with the 2015 ERS Delphi Panel study. A comparison of these two studies could be used to claim savings attributable to NYSERDA’s code compliance enhancement efforts. The Team also reported unweighted average responses from the Delphi Panel for determining compliance estimates by system and component.

4.1.2 Naturally Occurring Stretch Code Market Adoption Rate Methodology

To establish a baseline forecast of the naturally occurring market adoption rate of stretch codes, panelists estimated the likely adoption rate by NYS jurisdictions from 2019 to 2030. Panelists considered the NYS market only and provided estimates that represent current market factors. Panelists reviewed commentary from one another and modified their responses, if desired, in survey rounds two and three. The Team presented panelists with the average of all panelists’ responses, with and without outliers removed (responses outside 1.5 times the interquartile range). The majority of panelists said the round three estimates with outliers removed were the best prediction of naturally occurring market adoption; these are the estimates reported by the Market Evaluation Team.

4.2 Representative Jurisdiction In-Depth Interview Process

The Market Evaluation Team combined the opinions from a group of experts, obtained through interactive, one-on-one, in-depth phone interviews. The Team asked respondents to provide

information parallel to that of the Delphi Panel based on their own experiences with the NYS energy code market and as experts in their respective fields.

To ensure geographical, socioeconomic, and building density diversity, the Team interviewed professionals who work with the energy code in an urban jurisdiction (New York City), a suburban jurisdiction, and a rural jurisdiction. For anonymity, the Team did not identify the suburban and rural jurisdictions in this report.

The Market Evaluation Team selected jurisdictions by conducting an analysis of new square footage in New York’s urban, suburban, and rural counties since 2006. First, the Team mapped counties to a census-defined, core-based statistical area (CBSA) by urban, suburban, and rural categories. Then the Team assessed the new square footage over time for each CBSA. As expected, the CBSA that included New York City consistently had the highest new construction rates for the commercial and residential sectors. The Team filtered out the New York City CBSA to determine which suburban and rural counties consistently experienced the greatest amount of new construction between 2006 and 2017, then used this list to select jurisdictions for participation.

The Market Evaluation Team created a potential sample list of experts for each of the three types of jurisdictions and set a target to interview three individuals in each jurisdiction. The Team developed the sample by researching local energy code experts and building professionals with experience in each jurisdiction, contacting building departments and design professional firms, and speaking with code officials and other experts for recommendations. To reduce self-selection bias in these interviews, the Team recruited respondents who represented a variety of occupations and regional expertise. The occupations of the interviewees complemented the panelists’ occupations well by providing greater representation of the construction industry. Table 11 shows respondent types from each region. Interviewees had, on average, 17 years of experience working with the ECCCNY.

Table 11. Jurisdictional Interview Respondent Types

Municipality Type	Code Officials	Construction Firms	Architecture Firms
Urban	0	1	1
Suburban	0	2	1
Rural	2	2	0