Codes and Standards for Carbon Neutral Buildings Initiative Year 3 Market Evaluation Report:

Baseline Estimates and Progress Toward Goals

Final Report

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1. Introduction

The Market Evaluation of the Codes and Standards for Carbon Neutral Buildings initiative was designed to span five years, with final indirect market impacts determined in Year 5 of the evaluation. This Year 3 report presents the Market Evaluation Team's evaluation findings for NYSERDA's Codes and Standards for Carbon Neutral Buildings initiative based on a Delphi Panel study, surveys with participants in NYSERDA-funded trainings, interviews with code officials and building professionals in representative jurisdictions, and interviews with code officials and building professionals in jurisdictions that adopted stretch codes. This report also provides a preliminary estimate of initiative savings, which the Team will finalize in Year 5 of the evaluation, in 2024.

In May 2022 NYSERDA filed Clean Energy Fund (CEF) Compiled Investment Plans with the New York Public Service Commission. This filing renamed the initiative, which had been named Code to Zero, as Codes and Standards for Carbon Neutral Buildings and updated its outputs and outcomes. Table 1 shows the adjusted Outputs and Outcomes.

Table 1. Initiative Changes to Outputs and Outcomes

	Code to Zero	Codes and Standards for Carbon Neutral Buildings
Output	• Number of training participants • Number of pilots supported by NYSERDA • Number of entities supported by NYSERDA in the enactment of energy codes	• Number of training participants (seats filled) • Number of regulations developed[a] • Number of entities adopting pilot approaches[a] • Number of policies or codes adopted at the state or local level
Outcome	• Percentage of market complying with the energy code • Number of jurisdictions (outside of the pilots) adopting alternative enforcement business structures • Number of jurisdictions (outside of the pilots) adopting a stretch code	• 5% increase of buildings in compliance in areas of trainings/resource deployment compared with business as usual under current code • Codes and policies are adopted and enacted faster than they would without NYSERDA's intervention, as reported by industry experts

[a] No outcomes are associated with this output.

Through research conducted in Year 3, the Team continued to gather data to estimate final initiative impacts and track progress toward the initiative goals (associated with outputs and

outcomes). According to the Codes and Standards for Carbon Neutral Buildings initiative's May 2022 Investment Plan, the following goals are set for the end of 2025: [1]

- 20,000 individuals receive training
- Four policies or regulations to promote efficiency, flexibility, and decarbonization are developed or updated
- Thirty-five jurisdictions adopt approaches, such as stretch codes or alternative code enforcement, that are advanced by NYSERDA through pilots
- Twenty-eight policies or codes are adopted at the state or local level

1.1. Initiative Overview

Through its Codes and Standards for Carbon Neutral Buildings 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 support adoption of energy codes with higher performance goals and strengthen compliance and enforcement through several activities:

- 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 pilot programs to identify barriers and opportunities surrounding code development and advancement, testing alternative code enforcement structures, and assessing approaches to stretch and zero energy codes
- Supporting development of the Energy Conservation Construction Code of New York State (ECCCNYS) and local adoption of stretch codes

1 In the Year 2 report, the Market Evaluation Team tracked progress towards the previous investment plan's goals, which were: Code compliance increases by 10% throughout New York State (NYS), 13,250 individuals receive training, 10 jurisdictions adopt a stretch code, 8 jurisdictions adopt alternative code enforcement structures.

- Developing a path for future new energy codes that address all aspects of a building's energy use and moves the market towards state-level energy goals in a prompt and supportive way without being disruptive

NYSERDA designed the initiative activities to increase the percentage of buildings that are energy code compliant and accelerate adoption and enactment of energy codes and policies to promote efficiency, flexibility, and decarbonization at the state and local level.

The ECCCNYS is typically based on the most recent and most energy efficient model codes. For example: the ECCCNYS was updated in May 2020 and is based on the 2018 IECC and ASHRAE 90.1-2016.

1.2. Challenges to Initiative Progress

In Year 2 the Market Evaluation Team reported that delays in implementing Alternative Code Compliance and Stretch to Zero pilots were impeding the initiative's progress in meeting some goals. In 2022 NYSERDA refiled the initiative plan with a revised timeline. However, NYSERDA may still face challenges in meeting its goal of five jurisdictions adopting pilot approaches in 2022, as NYSERDA had not conducted pilots for decarbonization codes or alternative code enforcement at the time this report was drafted.

1.3. Summary of Evaluation Objectives and Activities

In Year 2 the Market Evaluation Team developed a methodology to estimate the indirect impacts of what was then called the Code to Zero initiative under the CEF. The methodology, included in the appendix, outlines the approach and data inputs required to estimate final initiative savings in Year 5 of the evaluation. The methods and activities shown in Table 2 form key building blocks of the indirect savings methodology. In Year 4 the evaluation team plans to review the methodology in light of the initiative's refiling, which may result in adjustments to the evaluation activities.

Table 2. Evaluation Objectives and Methods

Objective	Purpose	Activities
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	Evaluate NYSERDA efforts in advancing the stretch code	Delphi Panel; Representative jurisdiction in-depth interviews; Training participant surveys; Interviews with stretch code jurisdictions
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	Document review Interviews with state policy officials
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

In Year 2 the Market Evaluation Team also began providing preliminary savings estimates from the initiative. The Team designed the methodology for estimating preliminary savings to align with the multi-year indirect impacts evaluation.

1.4. Challenges to the Year 3 Evaluation

In Years 1 and 2, the Market Evaluation Team relied on records sent directly from training implementers to the team to determine the total number of trainings and unique number of individuals trained. The records shared by implementers were also the basis for conducting immediate and follow-up surveys with training participants. At the conclusion of Year 3, the Market Evaluation Team learned that the training records it collected did not true up with those reported directly to NYSERDA by implementers. The Market Evaluation Team's records

indicated that 24,650 persons attended training (not accounting for the same person attending multiple sessions), while those received by NYSERDA indicated that implementers trained 48,854 persons. The Market Evaluation Team and NYSERDA were unable to reconcile the cause of the difference by the end of Year 3.

2. Progress toward Goals and Initiative Impacts

NYSERDA revised the Outputs and Outcomes of the Codes and Standards for Carbon Neutral Buildings initiative in May 2022, midway through the Year 3 Evaluation period. This report reports progress toward the most recently updated goals of the Codes and Standards for Carbon Neutral Buildings initiative.

A key goal of the initiative is to train code officials and building professionals to increase code compliance in NYS by 5% compared with a business-as-usual case. As of August 2022, at least 9,220 individuals received training, with a total of 48,854 trainings completed (because individuals attended multiple trainings). [2] In surveys, both immediately after training and six months later, training participants reported high satisfaction with the trainings and a greater understanding of the ECCCNYS and NYStretch codes; they also said they had made changes to day-to-day activities related to code implementation.

The estimated code compliance has increased across all building sectors and construction activities (new construction and additions/alterations) since 2015, with current compliance estimated at 85% for both commercial and residential single-family new construction. According to Delphi Panel estimates, code compliance increased between 8% and 16%, despite dropping initially when a new code was introduced. In Year 5 of the market evaluation the Team will convene a panel of independent experts to assess to what degree code compliance was affected by the Codes and Standards for Carbon Neutral Buildings initiative—that is, how much the initiative shifted code compliance from a business-as-usual case.

Another key goal of the initiative is to influence local-level policy makers to adopt approaches to code enforcement that lead to increased code compliance (pilot approaches) and to promote policies or codes that lead to energy savings. In July of 2019, NYSERDA published NYStretch-2020, and as of August 2022, forty-two jurisdictions, including New York City (NYC), had adopted stretch codes with NYSERDA's support. NYSERDA is currently developing NYStretch 2023 and aims to help NYS incorporate this code into the next iteration of the ECCCNYS.

2 NYSERDA provided the total number of trainings provided by email. The number of individuals trained is based on training records received by the Market Evaluation team from training implementers.

Table 3 shows the initiative's progress towards goals, as presented in the May 2022 CEF Compiled Investment Plans document.

Table 3. Initiative Progress Toward Goals

	Indicator	Baseline	2022 Target (Cumulative)	2022 Progress (Cumulative)
Outputs	Number of individuals receiving NYSERDA-supported training	2,041	8,000	At least 9,220 code officials and building professionals trained; 48,854 trainings completed (seats filled) since March 2020
	Number of regulations of policies developed	0	2	3: NYSERDA developed and published NYStretch in 2020. The initiative is currently working on the next version of NYStretch. NYSERDA helped NYS develop the ECCCNYS-2020
	Number of entities adopting pilot approaches	0	5	16: NYSERDA identified 13 jurisdictions for Third-Party Support and Advancing Code Compliance Technology Pilots and three jurisdictions for Stretch to Zero pilots
	Number of policies or codes adopted at the local level	0	25	42 jurisdictions have adopted stretch codes
Outcomes	Increase in percentage of market complying with the energy code	0%	Increase of 5% compared with business as usual (without initiative intervention)	8%–16% increase depending on sector and construction activity since 2015[a]
	Codes and policies are adopted and enacted faster than they would without NYSERDA's intervention, as reported by industry experts	Qualitative	Yes	According to jurisdictions adopting NYStretch, NYSERDA played a key role in facilitating adoption by developing the model code and providing financial and technical assistance for adoption

[a] Compliance impact of initiative to be determined in Year 5

2.1. Initiative Logic Model

NYSERDA updated the initiative logic model in 2022 as part of its revision of initiative outputs and outcomes. The Market Evaluation Team reviewed the revised logic model and made the following observations:

- The activities encompassed by NYSERDA's New Construction and Buildings of Excellence initiatives – engage and develop capabilities of design and construction professionals to build high performance buildings – are not currently reflected in the logic model. However, NYSERDA believes those initiatives contribute to accelerating the adoption of more stringent building energy codes by demonstrating the feasibility and successful performance of advanced building practices policymakers might otherwise be reluctant to require. The Evaluation Team recommends adding a corresponding activity and associated outcomes to the Codes and Standards for Carbon Neutral Buildings initiative logic model to reflect this hypothesized significant pathway of influence and ensure it is evaluated.
- Three of the four identified "outputs" would be better classified as "outcomes" and two of them (number of communities adopting pilot approaches; number of policies or codes adopted at the state or local levels) are longer-term outcomes. The Evaluation Team recommends refining the logic model outputs and outcomes to better delineate actual outputs, as well as near- and mid- to long-term outcomes. Doing so will improve initiative evaluability and feedback that can be used for adaptive program management.

2.2. Savings Estimates

The Codes and Standards for Carbon Neutral Buildings initiative has received funding from two sources: it was originally funded as part of the Technology and Market Development Program (T&MD) and later received funds from the CEF. In Year 2 the Team began estimating preliminary savings for the years with CEF funding and savings for the years with T&MD funding. The preliminary savings estimation methodology is based on the long-term indirect savings methods, developed in Year 1. The long-term indirect savings methodology (outlined in the appendix) is aimed at providing initiative energy savings at the end of a five-year evaluation period, with the Team collecting data to inform the final evaluation steps.

NYSERDA estimated the percentages of overall program funding that came from the CEF and from the T&MD from 2015 through 2022. Table 4, Table 5, and Table 6 show Codes and

Standards for Carbon Neutral Buildings initiative savings goals and estimated savings associated with T&MD and CEF investments. Each year's savings is distributed according to the percentage of the budget that came from each funding source. Because the CEF Compiled Invest Plan (CEF CIP) Plan includes prior reported savings estimates, the CEF CIP estimates in Table 4 and Table 6 match CEF savings estimates from 2017 through 2020. This evaluation trued up 2021 savings estimates from those reported in the Year 2 evaluation because additional data became available.

Table 4. Preliminary Initiative Savings Estimates in GWh

	2015	2016	2017	2018	2019	2020	2021	2022
CEF CIP (GWh)	-	-	0.34	21.59	61.79	52.44	55.58	45.89
Total Savings (GWh)[a]	116.88	78.88	88.35	84.19	89.00	53.11	56.28	57.11
Percentage Funded by CEF	0	0	0%	26%	69%	99%	100%	100%
Percentage Funded by T&MD	100%	100%	100%	74%	31%	1%	0%	0%
CEF Savings (GWh) per budget allocation	0	0	0.34	21.59	61.79	52.44	56.28	57.11
T&MD Savings (GWh) per budget allocation	116.88	78.88	88.01	62.6	27.21	0.67	0	0

[a] The Market Evaluation Team analyzed savings using T&MD Review (2015–2019) & CEF Preliminary Assessment (2020–2022). The T&MD savings review is provided in the appendix of this report.

Table 5. Preliminary Initiative Savings Estimates in MW

	2015	2016	2017	2018	2019	2020	2021	2022
CEF CIP (MW)	-	-	-	-	-	-	-	-
Savings (MW)[a]	33.23	22.52	25.01	23.76	25.35	14.90	15.18	15.42
Percentage Funded by CEF	0%	0%	0%	26%	69%	99%	100%	100%
Percentage Funded by T&MD	100%	100%	100%	74%	31%	1%	0%	0%
CEF Savings (MW) per budget allocation	0.00	0.00	0.10	6.09	17.60	14.71	15.18	15.42
T&MD Savings (MW) per budget allocation	33.23	22.52	24.91	17.67	7.75	0.19	0	0

[a] The Market Evaluation Team analyzed savings using T&MD Review (2015–2019) & CEF Preliminary Assessment (2020–2022). The T&MD savings review is provided in the appendix of this report.

Table 6. Preliminary Initiative Savings Estimates in Billion BTU

	2015	2016	2017	2018	2019	2020	2021	2022
CEF CIP (Billion BTU)	-	-	0.4	25.7	69.90	77.24	82.42	68.48
Savings (Billion BTU)[a]	135.4	106.56	103.51	100.13	100.69	78.22	101.73	103.57
Percentage Funded by CEF	0%	0%	0%	26%	69%	99%	100%	100%
Percentage Funded by T&MD	100%	100%	100%	74%	31%	1%	0%	0%
CEF Savings (Billion BTU) after accounting for budget allocation	0	0	0.4	25.68	69.9	77.24	101.73	103.57
T&MD Savings (Billion BTU) after accounting for budget allocation	135.4	106.56	103.11	74.45	30.79	0.98	0	0

[a] The Market Evaluation Team analyzed savings using T&MD Review (2015–2019) & CEF Preliminary Assessment (2020–2022). The T&MD savings review is provided in the appendix of this report.

3. Code Compliance

3.1. Initiative Progress

A key goal of the Codes and Standards for Carbon Neutral Buildings initiative is for energy code compliance to increase by five percent in NYS compared with a business-as-usual case. The current compliance estimate for commercial new construction is 85%, a small increase over the previous estimate of 83%, but a significant increase compared with the 2015 compliance estimate of 74%. The estimate for residential single-family new construction also increased significantly from 77% in 2015 to 85% in 2022. Importantly, the estimates reflect compliance during different state energy code cycles, and the Delphi Panel said that there is a drop in compliance when a new code is adopted.[3] Despite those fluctuations, estimated overall code compliance is improving over time.

3.2. Code Compliance Estimates

There have been three studies to estimate energy code compliance in NYS since 2015, each of which was conducted under a different version of the ECCCNYS.

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,[4] determining compliance rates for the 2010 ECCCNYS. ERS anticipated conducting a second Delphi Panel in 2018 to estimate statewide energy code compliance after NYSERDA provided energy code training and technical assistance. However, this assessment did not take place.

The Market Evaluation Team convened its first Delphi Panel for this study in 2020 as part of the Year 1 evaluation report. At the time this panel was convened, the 2020 ECCCNYS had not yet been adopted, so compliance estimates were based on the last year of the 2016 ECCCNYS. The Team conducted the Year 3 Delphi Panel study approximately two years after the 2020 ECCCNYS was enacted. [5] Table 7 compares energy code compliance estimates in 2015, 2020, and 2022 for commercial and residential construction as well as the model code versions on

3 The Year 1 panel study was in the fourth year of the code cycle; the Year 3 panel study was in the second year of the code cycle.

4 ERS. February 2016. Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results. https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/2016-advanced-energy-codes.pdf

5 ECCCNYS 2020 went into effect on May 12, 2020.

which each ECCNYS version is based. The table shows an increase in estimated energy code compliance, despite more stringent codes having been adopted over time.

Table 7. Estimated Compliance by Study Year and Code Version

Building Type	New Construction			Additions and Alterations		
Study Year	2015	2020	2022	2015	2020	2022
ECCCNYS Version	2010	2016	2020	2010	2016	2020
Based on:	2009 IECC & ASHRAE 90.1-2007	2015 IECC & ASHRAE 90.1-2013	2018 IECC & ASHRAE 90.1-2016	2009 IECC & ASHRAE 90.1-2007	2015 IECC & ASHRAE 90.1-2013	2018 IECC & ASHRAE 90.1-2016
Date Code Implemented	December 2010	October 2016	May 2020	December 2010	October 2016	May 2020
Estimated Commercial Compliance	74%	83%	85%	59% to 68%[a]	70%	84%
Estimated Residential Compliance	77%	77%	85%	62% to 71%	71%	81%

[a] The 2015 ERS Delphi Panel did not provide an estimate for additions and alterations (referred to as renovations), but instead reported that panelists estimated renovation compliance to be 6%–15% worse than new construction compliance. Using this range, addition and alteration compliance increased by 2%–11%.

In Year 1 and Year 3, the Market Evaluation Team also gathered feedback from code officials and building professionals in three representative jurisdictions through in-depth interviews. The code officials and building professionals in the representative jurisdictions stated general agreement with the Delphi panel estimates, although several respondents indicated that they believed code compliance to be lower—particularly for additions and alterations. They thought that the Delphi Panel estimates underestimated the confusion that contractors face in these types of projects and that the same problems affecting compliance in new construction projects are amplified for retrofits and additions.

> *"Those doing refits and additions tend not to be the larger development firms. The large general contractors are better prepared than remodel firms who don't have a general contractor and do it themselves."*
>
> -Jurisdiction Respondent

The Delphi Panel also estimated compliance for key building components that affect energy usage. The panel found that in the commercial sector thermal bridging, continuous air barrier installation quality, envelope insulation installation

quality, and continuous air barrier—all building envelope requirements—are below 80% compliance. Many panelists and interviewees noted that compliance is lowest for provisions that require expert installation or other expert knowledge. In the residential sector, areas that need focused attention to improve compliance rates (compliance below 80%) include documentation, recessed lighting, and duct testing.

4. Stretch Energy Code Adoption and Compliance

NYStretch-2020 is a voluntary, locally adoptable stretch energy code developed by NYSERDA. The code is approximately 19% more energy efficient than the residential provisions of the 2020 ECCCNYS and roughly 7% more energy efficient than the commercial provisions of the 2020 ECCCNYS.

Besides developing NYStretch (which NYSERDA developed in consultation with the New York Department of State), NYSERDA provided technical assistance to jurisdictions to adopt the stretch code. This support included developing and publishing resources on its website (including a comparison document, commercial and residential cost-effectiveness analysis, a stringency analysis, a frequently asked questions document, and a general fact sheet).[6] It also included direct technical support from circuit riders who, in addition to working one-on-one with potential stretch code adopters, conducted presentations to town boards and builders. Additionally, NYSERDA hosted several statewide webinars on NYStretch, which included testimonials from municipalities that had already adopted the code.

The Market Evaluation Team talked with the Delphi Panel, jurisdictional interviewees, and officials from six jurisdictions that had adopted NYStretch-2020 to gain insight into how the current environment in NYS will affect the adoption of stretch energy codes.

4.1. Initiative Progress

In 2022, forty-two jurisdictions, including NYC, had adopted a stretch code, representing 16 additional jurisdictions since the Year 2 evaluation. However, NYC accounted for over 90% of the square footage of all jurisdictions that have adopted stretch codes, meaning that the incremental square footage represented by the 16 new stretch code jurisdictions was relatively small. The Codes and Standards for Carbon Neutral Buildings initiative has facilitated the adoption of stretch codes in NYS. First, NYSERDA provided the foundation for jurisdictions to adopt stretch codes by developing a model stretch code. Second, NYSERDA provided valuable technical support through NYSERDA-funded consultants to adopt the code that some

6 These documents can be found on NYSERDA's website: www.nyserda.ny.gov/All-Programs/Building-Energy-Code-Development-Compliance-and-Enforcement-Training-and-Resources/NYStretch-Energy-Code-2020/NYStretch-Adoption-Resources>

jurisdictions, including NYC, found very valuable. Making funding available through the Clean Energy Communities Fund also acted as a significant motivator for many jurisdictions.

4.2. Stretch Code Adoption Status in New York State

NYC and the Town of Southampton jurisdiction had adopted an energy code that exceeded the state energy code before NYStretch was published by NYSERDA in 2019. NYC first adopted a stretch code in 2011 and subsequently updated its code in 2014, 2016, and 2020. In 2018, NYC passed Local Law 32, which required the city to adopt NYStretch or a code that is 20% more stringent than either ASHRAE 90.1-2013 or ECCCNYS.[7]

The jurisdictions without a prior stretch code adopted NYStretch in its entirety. The Town of Southampton, which had a prior stretch code, adopted a version of NYStretch that accommodated its current energy code. NYC adopted the provisions of NYStretch that were not already included in its current code along with some provisions focused on window performance and thermal bridging that exceeded NYStretch's stringency.

NYC was the first municipality in NYS to adopt a stretch code; the 2020 New York City Energy Conservation Code (NYCECC), which took effect on May 12, 2020, is based on NYStretch. In addition to NYC and Town of Southampton, 29 other jurisdictions have adopted NYStretch. The preliminary savings methodology section includes a complete list of jurisdictions that have adopted NYStretch, including how much new construction and building alteration square footage each jurisdiction represents.

4.2.1. Stretch Code Compliance

> *"There is a greater local knowledge and concern for Energy Code compliance in municipalities with Stretch Codes."*
>
> -Delphi Panel Respondent

Delphi Panel respondents were asked to consider whether compliance differed in municipalities that had implemented NYStretch or other more stringent local energy codes from compliance in municipalities that used the 2020 ECCCNYS. Delphi panelists estimated that for both residential and commercial energy code compliance, new construction compliance was likely slightly higher, and additions and

7 https://www1.nyc.gov/assets/buildings/local_laws/ll32of2018.pdf

alterations compliance was similar. Table 8 shows the Delphi Panel's estimates of stretch code compliance compared with ECCCNYS compliance.

Table 8. Compliance Rate Change in Stretch Code Municipalities

Building Type	Commercial	Residential
New Construction	+1%	+2%
Additions and Alterations	0%	0%

Of the six members of jurisdictions that had adopted NYStretch, three said they have not seen changes in the rate of code compliance, and two said it is too soon to tell. NYC has seen compliance challenges in the areas of insulation and balanced ventilation in residential homes and air leakage in commercial buildings. NYC interviewees noted that commercial builders of high-rise buildings and residential builders see fewer compliance issues than builders of mid-rise buildings, because residential builders have a "strong code group" organizations that coordinates directly with NYSERDA and high rise builders have more resources to gain insight on code compliance than mid-rise builders.

4.3. Jurisdiction Experiences Adopting Stretch Codes

The Market Evaluation Team interviewed energy code experts from six jurisdictions with a mix of rural, suburban, and urban perspectives about their experiences adopting NYStretch. Perspectives on NYStretch code may differ within jurisdictions., depending on the unique perspective and role of the experts interviewed. Because the Market Evaluation Team interviewed only one energy code expert in each jurisdiction, the opinions expressed by interview respondents about their experience with NYStretch may differ from those of other actors involved in adopting or implementing the stretch code.

4.3.1. Awareness Sources and Motivations for Adopting Stretch Codes

Only two jurisdictions reported that they first learned about NYStretch from NYSERDA; other reported sources were New Yorkers for Clean Power, the Sustainability Institute from Molloy College, a nearby municipality that had adopted NYStretch, and emails to local elected officials. While most respondents did not learn about NYStretch directly from NYSERDA, the Code to Zero program is likely responsible for code official awareness: NYSERDA worked with New Yorkers for Clean Power and Molloy College to promote NYStretch, and NYSERDA and NYSERDA-supported organizations sent email communications about NYStretch to elected

officials. This type of indirect market influence is characteristic of market transformation programs, which are designed to mobilize influential market actors.

Respondents from four jurisdictions located outside of NYC stated that their main motivation to adopt NYStretch was to gain points toward NYSERDA's Clean Energy Community Leadership grant funds.[8;9] NYC was mainly motivated to adopt NYStretch to meet its greenhouse gas reduction goals, and the respondent explained that the law requiring the adoption of NYStretch was passed to remove politics from the code adoption process. Secondary motivations respondents cited included the fact that some jurisdictions have a "culture of sustainability" (two respondents), the fact that adopting NYStretch seemed like an easy process (two respondents), the belief that the state code would include NYStretch measures in future years (one respondent), the idea that NYStretch made it easier for homes to achieve the ERI goal of 50 (one respondent), and a desire to remain more energy efficient than the state energy code (one respondent).

Two of the interviewees from representative jurisdictions said they thought the biggest motivator for municipalities to adopt stretch are financial incentives, and three respondents said that a motivator for adopting stretch codes was meeting local energy goals and maintaining an "image of sustainability."

4.3.2. Roles of NYSERDA and Other Key Players in Jurisdiction Adoption Decision

Non-NYSERDA key players driving adoption decisions included volunteer board or committee members (three jurisdictions), the Sustainability Institute at Molloy College (one jurisdiction), building department staff (one jurisdiction), and sustainability staff (two jurisdictions). NYC is required by law to form commercial and residential building code advisory committees; the other two jurisdictions relied on its volunteer Sustainability Committee (one jurisdiction) and its Climate Smart Communities Task Force. In instances where NYC sought to exceed NYStretch's

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[8] Adopting NYStretch is one of 13 High Impact Actions which will generate points toward point-based grant funding. NYStretch Energy Code: 2020 Outreach, Training and Resources - NYSERDA

[9] Based on the number of points earned, available Clean Energy Community Fund Leadership grant amounts for small/medium jurisdictions (population of 0–39,999) range from $10,000–$70,000, and available grant amounts for large jurisdictions (population of 40,000+) range from $30,000–$150,000. NYStretch Energy Code: 2020 Outreach, Training and Resources - NYSERDA

provisions, its building code advisory committee members used NYSERDA's estimates of cost-savings as a basis for additional financial analysis.

NYSERDA's representatives provided support in five jurisdictions' decision-making process to adopt NYStretch, according to the five experts interviewed (one of the six respondents interviewed was not sure):

- **Three jurisdictions reported receiving technical support from consultants funded by NYSERDA to act as regional circuit riders.** NYSERDA's consultants provided presentations to and fielded questions from city staff or elected officials about NYStretch; however, only one respondent thought the consultants were very helpful.[10]

> *"NYSERDA's strategy was to present to elected officials, but it's more important to present information to the planning staff in a way that we deeply understand the code and can speak about it without the aid of PowerPoints."*
>
> -NYStretch Jurisdiction Respondent

- **Two jurisdictions received technical support from NYSERDA's Clean Energy Community Coordinators.** These two jurisdictions found their help and the cost-savings estimates, which were produced by the NYSERDA Codes and Standards for Carbon Neutral Building team and circulated to educate jurisdictions about the impacts of code adoption, to be valuable[11]

- **NYC received in-depth support from a NYSERDA energy codes staff member.** Although the NYSERDA staff member did not serve on NYC's building advisory council, this staff member provided input on NYSERDA's proposed tweaks to the NYStretch code language and guidance throughout the adoption process.

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10 Of the two respondents who did not think the consultants were very helpful, one said that incorrect statements from the consultant almost undermined the credibility of the program to the city's decision-makers; this consultant included a ventilator model that was not a Heat Recovery Ventilator (HRV) in a PowerPoint presentation and stated that NYStretch provisions would become a part of the next New York energy code. The other respondent thought the in-depth support from the Sustainability Institute at Molloy College was more helpful than the NYSERDA consultant's help, which came in the form of high-level presentations.

11 NYSERDA posted the cost analysis, as well as other resources to facilitate NYStretch adoption on its initiative website. These documents can be accessed here: www.nyserda.ny.gov/All-Programs/Building-Energy-Code-Development-Compliance-and-Enforcement-Training-and-Resources/NYStretch-Energy-Code-2020/NYStretch-Adoption-Resources

"If the Clean Energy Community grant funding counts as support from NYSERDA, that support was key to our decision."

-NYStretch Jurisdiction Respondent

When asked what type of support from NYSERDA was most valuable, three jurisdictions cited the opportunity to receive points toward the Clean Energy Community grant, three (including NYC) cited the cost savings and payback period analysis, and two cited the model code language. The non-NYC jurisdiction that had adopted a stretch code before NYStretch stated that although it made amendments to the model code language, the NYStretch provided a valuable reference point for their code.

When asked whether their jurisdiction would have adopted NYStretch without NYSERDA support, the jurisdiction representatives clarified that the type of support matters. While most (5 out of 6) respondents would have adopted NYStretch at the same time (1 respondent) or within a year (4 respondents) without support from NYSERDA's consultants or the financial calculations, only half (3 out of 6) of respondents said they would have adopted NYStretch at the same time (1 respondent) or within a year (2 respondents) without the Clean Energy Communities grant opportunity (Table 9).[12]

Table 9. When Jurisdictions Would Have Adopted NYStretch or Another Stretch Code Without NYSERDA Support (n=6)

Response	Without Clean Energy Communities Grant	Without Other NYSERDA Support
At the same time	1	1
Within a year	2	4
Not in the foreseeable future	2	1
Don't Know	1	0

12 Of those that would have adopted NYStretch without support from NYSERDA's consultants and the financial calculations, two thought that the consultant did not provide enough in-depth support, one thought they would have been better off without the consultant, one was heavily influenced by neighboring jurisdictions that had already adopted NYStretch, and one said that their elected officials made it a high priority to adopt NYStretch. NYC's respondent, on the other hand, found NYSERDA's financial calculations to be crucial to the decision to adopt NYStretch and said that without NYSERDA, the task of performing the financial analysis would have fallen on understaffed agencies.

4.3.3. Impacts of Stretch Code Adoption

Jurisdictions have received no serious pushback from builders about NYStretch provisions. Three jurisdictions stated that they have received very few or no complaints from residential or commercial builders. While two jurisdictions said builders were reluctantly complying with NYStretch, those respondents did not have concerns about builder compliance rates, and one of those jurisdictions predicted that builders would soon adapt to the changes. The sixth jurisdiction said builders were likely unaware of NYStretch because the city's code enforcement officials did not learn about the NYStretch adoption until several months after the city council adopted it. Only one respondent noted this delay. Once those code enforcement officials learned about the adoption, they required several builders to redo work and or reorder windows so their buildings would comply with NYStretch.

Only one jurisdiction received pushback from design professionals and explained that design professionals dislike the extra step of producing calculations via ResCheck; however, another jurisdiction thought ResCheck was a simple task for design professionals to complete. The use of the software ResCheck is one of four compliance path options for NYStretch. Three jurisdictions said design professionals responded positively or with few or no complaints, and one did not know how design professionals were responding. The last jurisdiction said design professionals were caught off-guard about NYStretch, because the city's code enforcement officials did not learn about the NYStretch adoption until several months after the city council adopted it.

When asked what challenges builders and design professionals faced in adapting to NYStretch, three jurisdictions said builders and design professionals need more education about the new provisions. One specified that builders might have a hard time obtaining the correct building materials, such as high-efficiency windows, and another jurisdiction said architects are not comfortable designing balanced HVAC systems. Other jurisdictions said they were not aware of challenges.

Most building departments have responded positively to NYStretch - even the one that was unaware that its city council had adopted NYStretch until several months later; although this jurisdiction's building department staff support the concept of advanced energy codes as way to help lower energy bills, they are still struggling to understand how NYStretch differs from ECCCNYS. Most building departments did not view NYStretch as creating more work for them, because the onus is on the builder to hire third-party inspectors to provide information to the building department staff that demonstrates the building's compliance with NYStretch. However,

one jurisdiction explained that its building inspectors have not bought into the importance of NYStretch, because the city's climate change messaging does not appeal to them and they view their main responsibility to be ensuring the building's structure is safe rather than energy efficient. This respondent recommended that NYSERDA provide messaging that can be tailored to people with different priorities and advised that inspectors will care more about cost-savings to building owners than greenhouse gas reductions.

4.4. Challenges to NYStretch Code and Recommendations to Improve Adoption Process

Three jurisdictions explained that they faced challenges during the code adoption process related to knowing what steps or best practices to take to adopt NYStretch. The non-NYC jurisdiction that already had a stretch code found it difficult to understand how to incorporate NYStretch into its current code. Because the jurisdiction staff needed "more hand-holding than was provided by NYSERDA or its consultant," this jurisdiction relied heavily on help from the Sustainability Institute of Molloy College to work through instances in which NYStretch conflicted with its current code. This jurisdiction recommended that NYSERDA provide additional support to jurisdictions that already have stretch codes and create a list of steps tailored to those jurisdictions.

The jurisdiction located on Long Island also recommended that NYSERDA tailor model language to three geographies—NYC, upstate, and Long Island; several action items provided by NYSERDA do not apply to Long Island, because a Long Island public utility is not under the jurisdiction of the New York Public Service Commission. Another jurisdiction recommended that NYSERDA provide a detailed guidance document that identifies best practices about steps to take during the adoption process and whom to involve; this jurisdiction's code enforcement department claimed it was not involved in the discussions and did not learn about the adoption until a few months after the code went into effect. Finally, one jurisdiction received incorrect information from the regional circuit rider funded by NYSERDA and recommended that NYSERSA verify the validity of information distributed by the regional circuit riders. While NYSERDA provided many of the technical resources, it is possible that the specific respondent did not receive these materials or forgot that they had received them, and that respondents were not involved in the resolution of specific issues. Additionally, NYSERDA provides its technical

support upon request of a jurisdiction and does not dictate with who inside a jurisdiction it should work.

After the code adoption, two jurisdictions said that they learned that a portion of NYStretch that focused on HRVs conflicted with the state energy code, and one said they learned that a portion of NYStretch conflicted with the state building code. Two jurisdictions explained that they lacked clear guidance from the state, NYSERDA, and NYSERDA's consultants about how to manage this conflict. One jurisdiction decided to remove the conflicting part of NYStretch from their code adoption language, one decided to not enforce that part of the code, and one will undergo a formal review by state code officials in September 2022; at the time of the interview, this last jurisdiction lacked clarity about whether any part of NYStretch is enforceable while this one issue remains unresolved. One jurisdiction recommended that NYSERDA provide a detailed post-filing document about steps jurisdictions must take to notify the state that their code exceeds the state energy code, and another recommended that NYSERDA iron out conflicts between the state energy code and NYStretch before encouraging jurisdictions to adopt NYStretch.

After becoming aware of this conflict, NYSERDA drafted a memo for jurisdictions that identified and explained the conflict and provided guidance on steps to take to resolve it. NYSERDA also updated its stretch code adoption guide.

Three jurisdictions encouraged NYSERDA to provide more robust NYStretch enforcement training for code officials and builders. Respondents were not aware of a training focused solely on NYStretch and think that current state-level code enforcement trainings (which by design do not include NYStretch), do not adequately cover this topic. Two jurisdictions' code enforcement staff also said they find it difficult to navigate between the state energy code, NYStretch, and the amendments. One jurisdiction recommended that instead of creating NYStretch as an overlay to the state energy code NYSERDA should create an energy code the jurisdictions can adopt in place of the state code so that they need to reference only one document. Another jurisdiction made the following recommendations:

- Shorten section titles to "Commercial Amendments" and "Residential Amendments"
- Find a way to remind inspectors the amendments are mandatory
- Arrange NYStretch so the Residential section comes before the Commercial section, because most inspectors work more often with the Residential code

5. Energy Code Training and Education

5.1. Initiative Progress

As of mid-2022, NYSERDA had trained 9,220 individual local code official and building professionals (3,118 in 2020, 3,990 in 2021, and 2,921 in 2022) through the Codes and Standards for Carbon Neutral Buildings initiative. Overall, including both code official and building professionals (such as contractors, architects, and energy professionals), a total of 24,650 trainings were completed (4,024 in 2020, 12,103 in 2021, and 8,487 in 2022). Over the course of the period from March 2020 to August 2022, four implementers taught 31 unique courses.

5.2. Training Surveys

The initiative has provided training webinars to code officials and building professionals since March 2020. As part of evaluating this training, the Market Evaluation Team conducted two rounds of online surveys with training participants: the first immediately after the training and the second six months later.

5.2.1. Immediate Survey Results

The Market Evaluation Team launched the first immediate surveys in June 2020. These surveys are sent to participants immediately after they participate in each training webinar. This section covers the selected survey questions, and the remaining survey questions are covered in the report appendix. The analysis includes statistical significance testing, which is reported as applicable.[13] For this analysis, the Market Evaluation Team aggregated total results.

5.2.2. Understanding of Energy Codes

To assess the impact of the training on attendees' understanding of the ECCCNYS, NYCECC, and NYStretch, the Market Evaluation Team asked immediate survey respondents to estimate their level of understanding of the energy code before and immediately following the event on a 7-point scale (where 1 is no understanding and 7 is expert understanding).

The Team asked only individuals attending ECCCNYS-specific training to estimate their level of understanding of the ECCCNYS before and after the training. Overall, 16% of respondents

13 This statistical significance testing included sample t-tests for the continuous data, proportions tests for the binary data, and chi-squared tests for the categorical data.

(n=2,420) ranked themselves as having an understanding of 6 or 7 on the 7-point scale prior to attending the training. When asked how they ranked themselves after the training, the scores improved such that 50% of respondents ranked themselves a 6 or 7. This resulted in a statistically significant increase from a mean score of 4.3 to a mean score of 5.3.

Regarding the NYCECC, the Team asked individuals attending NYC-specific training to estimate their level of understanding of the code before and after the training events. Eleven percent (n=1,849) of the respondents ranked themselves as having an understanding of 6 or 7 on the 7-point scale prior to attending the training. When asked how they ranked themselves after the training, the scores improved such that 35% of respondents ranked themselves as having an understanding of 6 or 7. This resulted in a statistically significant increase from a mean score of 3.4 to a mean score of 4.5.

Regarding NYStretch, the Team asked only individuals attending a training session covering NYStretch topics to provide their level of understanding of the stretch energy code before and after the training events. Only 8% (n=610) of respondents ranked themselves as having a level of understanding of 6 or 7 prior to attending the training. The level of understanding increased to 37% rating themselves a 6 or 7 after the training. Overall, mean scores increased from 3.1 prior to the training to 4.9 after attending the training (this change was statistically significant).

5.2.2.1. Satisfaction with Trainings

Immediate survey respondents were asked to rate a variety of aspects of the training they had just attended on a scale of 1 to 7, where 7 was the best possible score. Respondents rated trainings highly for all elements, with "relevancy to work" generally rated slightly lower than "quality of information" from the webinar or "likelihood to recommend" the trainings to others. None of the elements for any of the trainings got lower than a 5 average rating.

The highest rated trainings included "Review of the Modeling-based Submittals for ASHRAE 90.1 Section 11 and Appendix G," which received an average score of 6.5 (n=18) across all elements and "Integrating Performance-based Compliance into the Design Process," with an average score of 6.4 (n=20). The two lowest rated courses were "Performance-Based Compliance with ASHRAE Standard 90.1 2016" (5.7 average score, n=15) and "2020 ECCCNYS and NYStretch Energy Code for Commercial Buildings: Overview" (5.2 average score, n=10).

Regarding "2020 ECCCNYS for Commercial Buildings: Overview," 67% (n=9) of respondents identified the inspection checklist as a topic that could be improved. Regarding the "Performance-

Based Compliance with ASHRAE Standard 90.1 2016," 54% of respondents (n=39) said that the topic of what documentation must be submitted by code officials could be improved.[14]

5.2.2.2. Expected Impacts on Implementation

The Team asked immediate survey respondents whether they planned to use what they had learned in the webinar in their work. Overall, 91% of all respondents (n=2,961) said they did plan to use what they had learned. Only 2% said they did not plan to use their new knowledge—the remaining 7% said the information they learned was not relevant to their work. The findings were consistent between code officials and building professionals.

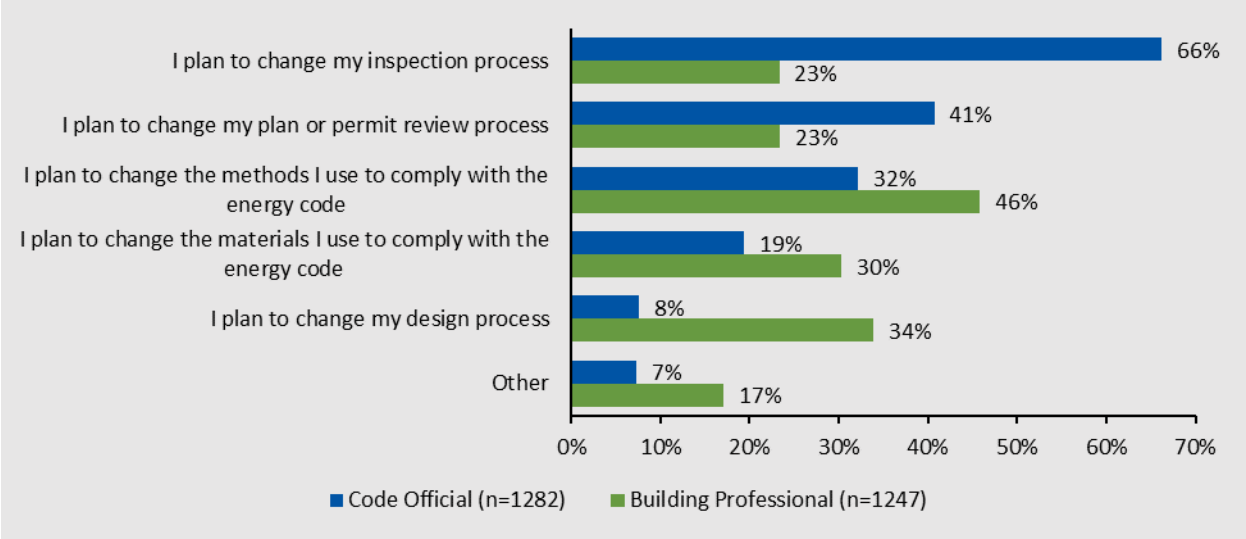
When asked how they planned to apply what they learned, code officials most commonly said they planned to change their inspection process (66%, as shown in Figure 1, compared with 23% of building professionals). Building professionals most commonly said they planned to change the methods they use to comply with energy code (46% compared with 32% of code officials). The difference between responses from code officials and building professionals was statistically significant for all response options, indicating that code officials and building professionals plan to apply new knowledge to their work in different ways.[15]

14 Additional information and detailed survey results are in the appendix of this study.

15 The Team uses a proportion test; all p-values were less than 0.05, indicating statistical significance at 95% confidence.

Figure 1. How Respondents Plan to Apply Knowledge

Source: Immediate Survey Question: "How will you use the training in your work?" August 2022.



In verbatim comments, respondents noted that what they learned had helped improve communication, improve the review process, and led to some (code officials) more seriously considering adoption of the stretch code:

- "As a firm we had a pretty good sense of things, but this really helped tied it together and share the information throughout the firm."
- "The work is normally performed by subconsultants ... This allows us to better understand what they do."
- "I plan to share information with my colleagues."
- "I review designs for compliance with the NYC Energy Code and will now be better able to provide better reviews for the 2020 changes."
- "I plan to utilize additional information to improve my review process."
- "[We will] consider adoption of stretch code."
- "[We will] discuss adoption of the stretch code."

5.2.3. Follow-Up Survey Results

The Market Evaluation Team launched the follow-up survey in March 2021. These surveys are sent out to participants six months after they participate in the training webinars; no follow-up survey respondent is asked to take an additional survey, even if they participate in additional trainings, to ensure there is no double-counting of results as these findings were used to estimate

overall impact of the training. The full set of survey questions are covered in the quarterly memo in the appendix.

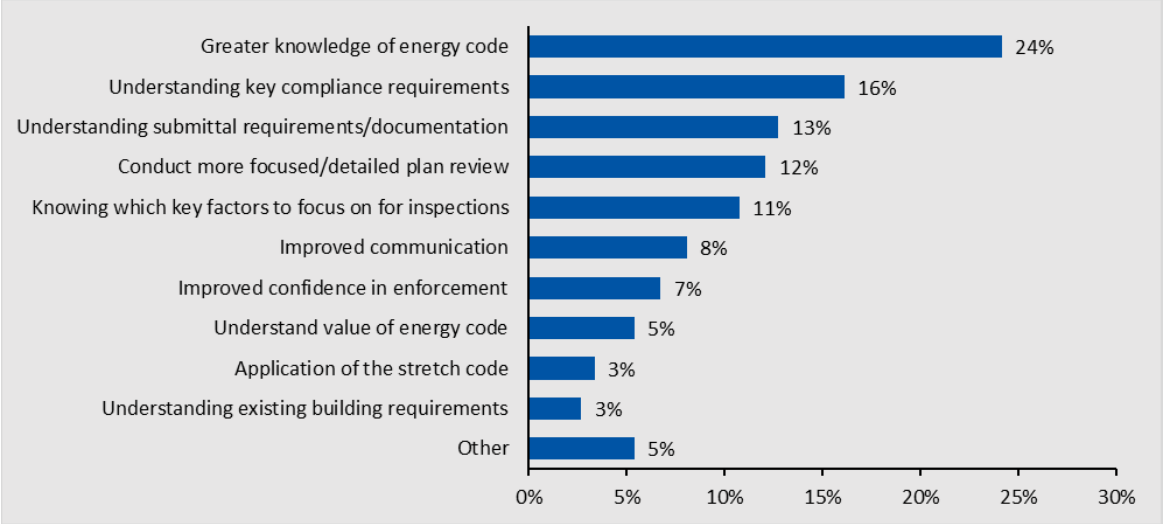
5.2.3.1. Energy Code Implementation

The Market Evaluation Team asked follow-up survey respondents if, after six months, they had changed the way they address code compliance issues compared with their approach before they attended their first training session. Overall, just over half (57%) responded affirmatively. Code officials saw 54% of respondents addressing compliance differently, while 67% building professionals responded affirmatively; those who identified as neither group saw 44% addressing compliance issues differently. There is statistically significant difference between code officials and building professionals in terms of the proportion that changed the way code compliance issues are addressed.

When asked to describe how they address compliance issues differently, respondents most commonly reported a general increase in their knowledge of the energy code (24%; for example, "the training helps define my knowledge and experience in the field and in the office") and understanding key compliance requirements (16%; for example, "more aware of lighting requirements and HVAC controls and operation"); the results are shown in Figure 2.

Figure 2. How Follow-Up Survey Respondents Address Compliance Issues Differently after Training (n=149)

Source: Follow-Up Survey Question: "Please describe how you are addressing the compliance issues differently because of the training." August 2022. Multiple responses allowed.



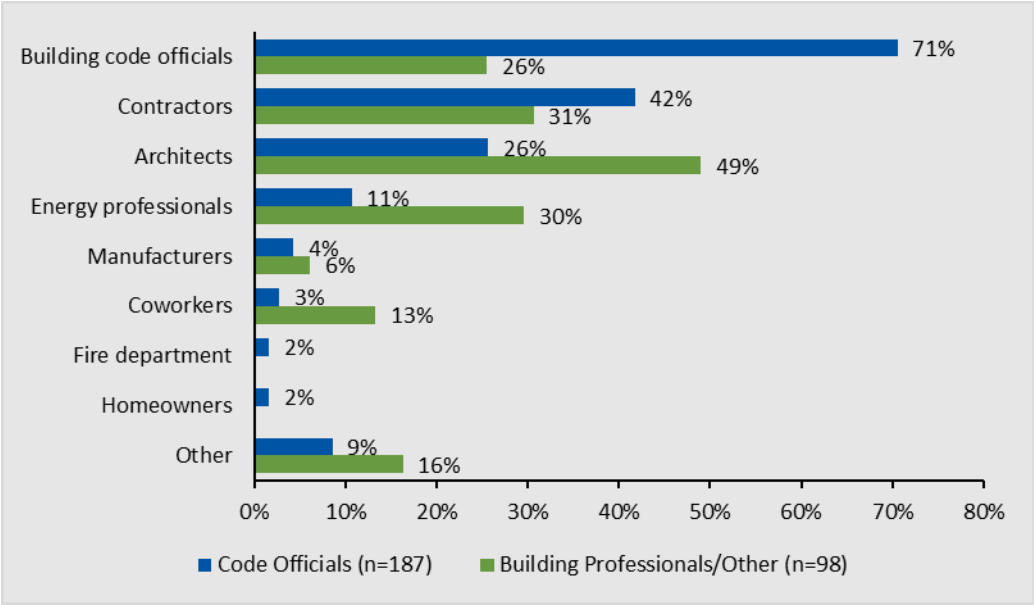
5.2.3.2. Information Sharing

The Market Evaluation Team asked follow-up survey respondents to consider with whom they shared information that they learned at the webinars. As shown in Figure 3, code officials most often shared information with other code officials (71%), significantly more than building professionals shared information with code officials (26%).[16] Nearly half (49%) of building professionals reported sharing information with architects. The high proportion of code officials sharing with other code officials and building professionals sharing with architects, contractors, and engineers may be due to the two respondent types most commonly sharing information with others in their own industry. The difference between responses from code officials and building professionals was statistically significant for all but one response option (manufacturers), indicating that code officials and building professionals share information from the webinars in different ways.

16 This difference is statistically significant at the 95% confidence level.

Figure 3. Webinar Information Shared with Other Professionals

Source: Follow-Up Survey Question: "With which parties listed below have you shared any information from the webinars?" Multiple responses allowed; August 2022.



Those who shared information with code officials also estimated how much of what they learned at the webinars they passed on. Sixty-three percent of respondents (n=126) reported sharing 40% or less of what they had learned with other code officials.. Only 21 % percent of respondents said that they shared at least 80% of what they learned, indicating that NYSERDA can encourage further information-sharing. There was no statistically significant difference in the percentage of information passed onto other code officials between code officials and building professionals.

5.2.3.3. Feedback on Future Training

When asked what sort of training they would find most useful for future webinars, 44% of respondents suggested expanding the list of topics. Respondents suggested several topics for future webinars:

- COMcheck and REScheck
- Manual J and Manual S
- Application of the code to specific building types (i.e., schools)
- Energy code challenges on existing buildings projects
- Passive house, electrification, or Net Zero Energy construction (i.e., strategies for achieving Net Zero Energy)

- Specific training on HVAC requirements (i.e., load calculations, waste heat recovery, new technologies)
- Energy modeling

Twenty-one percent of respondents said they wanted the existing training courses to be offered more frequently; 11% said they would like the existing trainings to include more real-world examples. Six percent of respondents said they were satisfied with current options and had no suggestions.

The Codes and Standards for Carbon Neutral Buildings initiative is currently working to expand the types of topics covered in trainings. Additional training topics under consideration include issues specific to builders and electrification.

Overall, 65% of follow-up survey respondents rated the value of the webinars they attended as a 6 or 7 on a 7-point scale (with a mean score of 5.8 for all responses), suggesting that six months after attending respondents were finding the education the trainings provided valuable.

5.2.3.4. Code Compliance Trends

The Team asked follow-up survey respondents to consider the past 12 months and indicate whether they thought that during that time compliance with the energy code in NYS had increased, decreased, or stayed the same. Overall, 71% of all respondents said energy code compliance had increased over the past 12 months. Of those respondents who said that they had observed an increase in code compliance, 80% said they thought the services provided by the NYSERDA technical support and training initiatives had played a role in this increased compliance, 1% said they did not think the NYSERDA initiative was a notable contributing factor, and the remaining 19% were undecided.

Respondents who had reported an increase in energy code compliance were also asked to identify other factors they thought had contributed to the increased code compliance in NYS. Respondents identified several factors, including an increased focus on energy code in planning and permitting (32%), market demand for greater energy efficiency (27%), and increased builders' knowledge about code requirements (27%). Greater detail on breakdown by respondent job category and the full list of other factors identified by respondents is provided in the Detailed Survey Results section of the appendix.

6. Pilots

One of the Codes and Standards for Carbon Neutral Buildings initiative's strategies is to use pilots to test, refine, and scale new approaches to code and policy development, advancement, enactment, compliance, and enforcement in local jurisdictions. NYSERDA currently implementing pilots in two areas: Third-Party Support and Advancing Code Compliance Technology Pilot Program and Stretch to Zero.

For the Third-Party Support and Advancing Code Compliance Technology Pilot Program, funding for participating jurisdictions is allocated to two components: Advancing Code Compliance Technology or Third-Party Support. Twelve jurisdictions participate in the Advancing Code Compliance Technology component, of which nine also participate in the Third-Party Support component (one additional jurisdiction only participates in the Third-Party Support component).

In 2022, NYSERDA launched the Stretch to Zero Pilots to test approaches for implementing zero-carbon building codes. NYSERDA designed the Stretch to Zero Pilots to make two types of awards to municipalities. The first type of award provides up to $500,000 to municipalities for adopting and implanting a zero-carbon code by 2023. The second type of award provides up to $200,000 to municipalities that have already adopted a zero-carbon code. This award type is designed to promote information sharing between municipalities and NYSERDA about zero-carbon code adoption. In 2022 NYSERDA partnered with two municipalities in the first award category and one municipality in the second award category.

6.1. Alternative Energy Code Enforcement

The Market Evaluation Team asked representative jurisdiction respondents how the energy code is currently enforced in their jurisdictions, what changes they have seen in code enforcement over the last three years, how they stayed informed about alternative code enforcement, how alternate code enforcement approaches can increase code compliance, how to encourage alternative code enforcement, and whether there are drawbacks to new approaches.

The code officials said that they generally followed the standard procedure of conducting plan reviews and on-site inspections (one code official noted that there are no procedures to test air-sealing) with their departments' staff. Code officials said that if they identified building or plan elements that were not compliant with the energy code, they would "follow up" and "work with the contractors or builders" to correct issues and "help them to keep going until they are

compliant." One code official from a rural area noted that he "generally enforces the energy code begrudgingly" because some energy code requirements "are a barrier to home ownership" as they raise the costs, noting that inflation had already increased building costs. This official noted that there would be cost challenges if NYS implemented all electric codes and that rising costs have a definite effect on lower income home buyers.

When asked what changes in energy code enforcement they had seen in the last three years, the seven jurisdiction representatives provided the following responses:

- Better informed code officials (2 respondents)
- Digital plan submission systems (2 respondents)
- Third-party plan review by external professionals (2 respondents)
- On-site inspections using video meetings (2 respondents)

A code official noted that smaller jurisdictions are more constrained in modernizing their approaches; another said that using third parties for plan reviews made him "nervous" and that he would probably prefer to rely on his staff. One code official noted that his department was considering using drones for on-site inspections, but this approach was still in the discussion phase. Four respondents suggested that alternative code enforcement can improve code compliance by "expanding the toolkit for municipalities," and bringing in additional expertise through third-party review.

Representatives also provided feedback on how to encourage jurisdictions to adopt alternative code enforcement approaches. Two respondents indicated that it was important to build consensus about adopting new approaches to ensure that both policy makers and members of the building department aligned on proposed changes. Several respondents noted that buy in from code officials was critical because "if they don't like the idea, they won't get it done." One respondent noted that if approaches were more costly than current practice, financial incentives could help drive changes.

7. Findings and Recommendations

The Market Evaluation Team offers the following findings and recommendations for the Codes and Standards for Carbon Neutral Buildings initiative activities occurring between March 2021 and August 2022.

Finding #1. Estimated code compliance is increasing overall across the state since 2015. According to Delphi Panels conducted in 2015, 2020, and 2022, code compliance has generally increased between 2015 and 2020 in both the residential and commercial building sectors and in construction activity (new construction or additions and alterations). However, code compliance increases have varied by year, building sector, and construction activity; from no increase for residential new construction between 2015 and 2020 to a 14% increase for commercial additions and alterations between 2020 and 2022.

Training survey respondents stated that they have seen an increase in code compliance and that NYSERDA played a role in this increase. However, the Delphi Panel also noted several building code components where compliance was below 80%, including commercial sector code provisions that require expert installation or other expert knowledge, such as thermal bridging, continuous air barrier installation quality, envelope insulation installation quality, and continuous air barrier, as well residential sector provisions for documentation, recessed lighting, and duct testing. Insights related to the timing of code changes and the impact on compliance for these components were not addressed in this evaluation.

Recommendation: NYSERDA should review the component-level jurisdiction compliance rates to identify specific opportunities for more targeted training to increase code compliance for building components where compliance is low. In the commercial sector, these components include thermal bridging, continuous air barrier installation quality, envelope insulation installation quality, and continuous air barriers. In the residential sector, these components include documentation, recessed lighting, and duct testing.

NYSERDA response to recommendation: Implemented. NYSERDA has used Delphi Panel findings to inform the currently offered training and other programmatic efforts and will continue to do so going forward. Thermal bridging, in particular, will be an area of focus in future trainings.

Finding #2. Jurisdictions continue to adopt stretch codes, and NYSERDA plays a key role in stretch code adoption. Since the prior evaluation report, the number of jurisdictions adopting stretch codes has more than doubled, from 15 to 42 jurisdictions. NYSERDA has played a key role in promoting stretch code adoption, through code development and technical and financial assistance. NYSERDA's stretch code adoption technical expert support activities received mixed reviews: interviewees found the support provided by Clean Energy Community Coordinators and NYSERDA staff to be valuable, while several respondents were critical of the support provided by regional circuit rider contractors. Several jurisdictions also provided recommendations on improving how NYSERDA provides support, including making changes to the way the stretch code is presented and how training is provided.

Recommendation: NYSERDA should convene jurisdictions that have adopted NYStretch in a short online debriefing session or focus group to deepen understanding of jurisdictional experience with program support—particularly with circuit riders/consultants—and identify opportunities for improvements with the greatest potential to increase program impact. These improvements can enhance NYSERDA's future stretch code support work.

NYSERDA response to recommendation: Pending. NYSERDA plans to issue a survey to NYStretch adopters and the stakeholders NYSERDA worked with in this effort to better understand their experiences and explore areas for improvement.

Finding #3. The Codes and Standards for Carbon Neutral Buildings Initiative continues to reach a very significant number of code officials and building professionals with trainings. Trainings resulted in a significant increase in self-reported understanding of energy codes, and more than half of training participants report that the trainings have influenced their approach to code compliance.

Training records indicate that Code to Zero Initiative trained at least 9,220 code officials and building professionals since March 2020, filling 48,854 seats. Survey respondents reported a higher level of understanding of the ECCCNYS and stretch codes following the training, that they applied what they learned in their work, and that they shared information with others. Survey results also suggest that there may be opportunities to improve the impact of specific trainings. While 91% of training participants said they intended to use what they learned, a smaller proportion (57%) of participants reported having made one or more changes the way they address code compliance issues six months after the training.

Finding #4. While training attendees rated the courses highly overall, a few trainings received lower ratings and specific recommendations for improvement. These trainings included the "Performance-Based Compliance with ASHRAE Standard 90.1 2016" and the "2020 ECCCNYS for Commercial Buildings: Overview" training.

Specific recommendations from training participants were to improve the topic of what documentation must be submitted by code officials in the "Performance-Based Compliance with ASHRAE Standard 90.1 2016" and the inspection checklist topic in the "2020 ECCCNYS for Commercial Buildings: Overview" training.

Recommendation: Conduct follow-up analysis to identify the specific trainings that generated lower reported impact in terms of behavior changes and information sharing, as well as trainings with lower ratings, to identify and prioritize potential improvements. Review analysis with implementers to determine potential adjustments to the training materials.

NYSERDA response to recommendation: Pending. This recommendation will be implemented in the next planned evaluation.

Finding #5. The initiative logic model would benefit by some minor refinements, to ensure that it and the evaluation fully capture NYSERDA's market influence.

Recommendation: Refine the initiative logic model to include the influence of the New Construction and Buildings of Excellence Initiatives, align outputs and outcomes to reflect expected near- and mid- to long-term outcomes, and complete an evaluability map.

NYSERDA response to recommendation: Pending. This recommendation will be implemented as part of the next planned evaluation.