Matter Number 16-00681, In the Matter of the Clean Energy Fund Investment Plan

Clean Energy Fund: Codes Chapter

Portfolio: Market Development

Submitted by:

The New York State Energy Research and Development Authority

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Clean Energy Fund: Codes Chapter		
Revision Date	**Description of Changes**	**Revision on Page(s)**
November 1, 2017	Original Issue	Original Issue
April 19, 2019	As part of the Annual Investment Plan & Performance Report (IPPR) process, NYSERDA has updated budget and benefit values to align with actuals for past years and adjusted budget and benefit forecasts for future years, as appropriate, based on experience to date. Budget and benefit tables have been moved to Appendix B of this chapter and output/outcome tables have been moved to Appendix C of this chapter. Updated rounding convention has been applied to budget and benefit tables.	Multiple
June 15, 2020	As part of the Annual Investment Plan & Performance Report (IPPR) process, NYSERDA has updated budget and benefit values to align with actuals for past years and adjusted budget and benefit forecasts for future years, as appropriate, based on experience to date. Incorporated revisions to benefits estimation to correct an error identified in the original modeling of savings opportunities. Benefits have been shifted entirely to indirect as reflected in Appendix B.	Multiple

Codes

Energy codes set minimum energy efficiency requirements for designing, constructing and renovating buildings, thereby broadening adoption of energy efficient construction to the market. When enforced, energy codes promise long-term energy and cost savings over the lifetime of a building.

New York State's Energy Conservation Construction code (ECCCNYS) is established by the Department of State. The ECCCNYS is based off of the national model codes, the International Energy Conservation Code (IECC) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1. Local jurisdictions adopt the energy code in whole, or they may submit amendments or revisions to the state fire and building code council. An amended or revised energy code must be more stringent than the ECCCNYS.

To maximize the effectiveness of energy codes, NYSERDA seeks to work with stakeholders, participants in building design and construction, and communities to strengthen compliance and enforcement, test approaches to advance the development of codes with higher performance goals, and assist in the enactment of energy codes.

The first initiative described in this Chapter is Code to Zero, which aims to overcome barriers impeding compliance and enforcement. In addition, it will seek to establish a path towards the development of a "stretch-to-zero" energy code that moves the market in a way that is actionable, cost effective and enforceable. Finally, the initiative will assist in the enactment of State and local energy codes.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

22.1 Code to Zero

22.1.1 Overview

Present Situation	• While the actions of early adopters, informational programs, and financial support often can persuade many in the market to act, energy codes set minimum energy efficiency requirements for designing, constructing and renovating buildings, thereby broadening adoption to the rest of the market, and, when enforced, promising long-term energy and cost savings over the lifetime of a building. • However, a 2015 NYSERDA-sponsored survey indicated that energy code compliance in New York State was approximately 74% for commercial new construction and 77% for residential new construction,[1] indicating a lack of understanding by designers, builders and others in the construction process regarding compliance to the energy code and the need for additional compliance and enforcement focused activities.[2] • Historically, NYSERDA's efforts have focused on strengthening compliance and supporting the adoption of codes with higher performance goals, thereby improving compliance rates in an environment of increasingly stringent performance requirements. Based on NYSERDA's compliance assessment results, it is likely that compliance rates improve by at least 10% during a 3-year code cycle. Process evaluations[3] on the code training provided during the legacy Advanced Energy Codes Program found that NYSERDA's training had a positive impact on compliance. Additionally, a majority of the more than 7,000 code officials, architects, engineers, and other participants in NYSERDA's training activities have indicated that NYSERDA's training on code compliance helped them grapple with the complexities of the energy code and improve compliance. • There remains the opportunity to build on this success: It is forecasted that an average of over 253 million square feet of new commercial and multifamily buildings,[4] and over 16,000 low-rise residential[5] dwelling units will be built in New York State annually over the next 5 years. In addition, a significant amount of commercial and multifamily space will undergo renovations that include energy systems, thereby triggering code compliance. • In addition, the Energy Conservation Construction Code of New York State (ECCCNYS) and the national model energy codes it follows[6] do not adequately address all aspects of a building's energy use or energy production needed to maximize energy savings and meet the state's greenhouse gas reduction goals. • Stretch energy codes can introduce technologies and strategies that lead buildings to achieve greater efficiencies. However, to date only a handful of jurisdictions have already adopted or have expressed interest in adopting a stretch code.

[1] "Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results," Industrial Economics Incorporated for NYSERDA, February, 2016, p.5.

[2] Activities identified in NYSERDA's investment plan for New Construction Comprehensive Strategy – distinct from those covered here – will complement this effort by providing financial support for incorporation of more advanced energy technologies and designs in new buildings, thereby providing demonstrated market performance that can be used to help justify adoption of codes with higher performance goals.

[3] https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/Codes-Process-Evaluation-Report.pdf

[4] Dodge Data. Multifamily buildings greater than 3 stories.

[5] Dodge Data. Low-rise residential includes 1-4 family homes and multifamily buildings of 3 stories or less.

[6] The national model energy standards are the International Energy Conservation Code (IECC) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1.

	• Furthermore, State and local code enforcement staff face challenges due to the complexity of the energy code, attrition, local budget cuts, and reduction in technical support from the Department of State.[7] Presently, most building departments in the state do not have staff that specialize in energy code enforcement.[8] The staff that is available needs regular training to stay current on changes to codes, technology and other innovations. Officials typically do not know successful compliance applications and enforcement strategies or compliance issues that may exist, and therefore cannot address them.[9] • Exacerbating these challenges, results of a 2014 survey of code enforcement officials[10] found that 31% of code officials in the United States plan to retire by 2019, with an additional 51% retiring by 2029. The survey also indicated that there aren't enough young people entering the building inspection field to offset these losses, further increasing the need for training activities and alternative enforcement business structures.
Intervention Strategy	NYSERDA will build on its past efforts to help support adoption of energy codes with higher performance goals and strengthen compliance and enforcement by: • Supporting code compliance and enforcement, including general support services (e.g., training, compliance platforms, etc.) for local jurisdictions statewide, and customized support services for jurisdictions that pay into the System Benefits Charge (SBC). • 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, test alternative code enforcement structures, and assess approaches to stretch and zero codes. • Enacting code, including support for the enactment of ECCCNYS and stretch codes,[11]on a statewide basis. • Developing a path to energy codes that addresses all aspects of a building's energy use and moves the market in a way that is prompt and supportive without being disruptive. For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Code to Zero," which can be found in Appendix A.
Goals	• Develop a path to codify a stretch code to zero as a baseline code by 2030. • Increase the percentage of buildings that are code compliant. • Increase the number of jurisdictions that adopt stretch codes. • Increase the number of jurisdictions that adopt alternative enforcement structures to improve code enforcement. • Accelerate the advancement of the energy code and stretch codes to achieve greater carbon reductions.
State Energy Plan/Clean Energy Standard Link	• Generally, the 2015 State Energy Plan identifies buildings as a major source of energy use and greenhouse gas (GHG) emissions in the State. This strategy will reduce energy consumption and GHG emissions associated with buildings, both as a function of how buildings are operated and the efficiency of the installed equipment, contributing to State Energy Plan goals to reduce GHG

[7] "New York Gap Analysis," prepared by the Trust for Conservation Innovation/Building Codes Assistance Project, April 2016, p. 21.
[8] Ibid, p.27.
[9] "Establishing a Plan to Achieve Energy Code Compliance in Cities, 2014, City Energy Project, p. 4.
[10] "The Future of Code Officials: Results and Recommendations from a Demographic Survey," 2014, International Code Council and National Institute of Building Sciences.
[11] A stretch energy code is a voluntary, locally adopted and implemented alternative to a mandatory statewide minimum energy code. It allows local governments and communities to implement a more stringent energy code that is readily adoptable and is easier to enforce.

	emissions by 40% and to implement a 600 trillion BTU increase in statewide energy efficiency. • More specifically, the Energy Plan identifies building codes as a critical strategy for improving the energy efficiency of New York's building stock and calls on NYSERDA to "provide in-person and online training for architects, engineers, contractors, and code officials, as well as other support resources such as technical publications." This initiative will serve as a mechanism to provide these code supporting resources. • This initiative also supports achievement of the Clean Energy Standard goal for renewable resource electric generation (50% renewable electric generation by 2030 – "50 by 30") by reducing the overall electric load, and therefore the amount of renewables necessary to meet the 50 by 30 goal.

22.1.2 Target Market Characterization

Target Market Segment(s)	The target market is defined as: • Commercial and residential construction[12], with an initial focus on low-rise residential, high-rise multifamily, commercial offices, stand-alone retail, and hotels. • Jurisdictions with the highest level of forecasted new construction activity, including New York City, Long Island, Western New York, Hudson Valley and Capital District. • State and national energy code policy makers.
Market Participants	Market participants include: • Architects • Engineers • Code Officials • Builders/Developers • Design Professionals • Construction Trades • Energy Professional firms such as energy efficiency consultants, developers, energy service companies • Other Community Stakeholders (e.g., other municipal officials, utility representatives, etc.)
Market Readiness	• Code officials, design professionals and construction trades seek out energy code training to stay current with code changes and to identify solutions where complying to code is problematic. More than 7,000 individuals took NYSERDA-sponsored code training over the past 3 years. • Effective training techniques vary based on participants. While classroom training is still necessary, on-line, visual hands-on training, and other training techniques have been used successfully to increase participants' understanding of methods to achieve code compliance.[13] • Quality assurance platforms are available or in development that will reduce code complexity, allowing for improved enforcement of the energy code.

[12] The International Energy Conservation Code defines "residential" construction as one- and two-family dwellings and multiple single-family dwellings (e.g., townhouses), and multifamily buildings that are three stories or less. "Commercial" construction is defined as all other buildings not included in the definition of residential, i.e., assembly, educational, business, institutional, mercantile, factory/industrial, hotels/motels, etc. "2015 International Energy Conservation Code and Commentary," International Code Council, Inc., 2015, pp. C2-4, C2-13.
[13] "Advanced Energy Codes Program: Knowledge Survey Process Evaluation," prepared by Industrial Economics, Incorporated, September 2016, p. 15-16.

	• Other alternative business structures for enforcement, such as enforcement at the county level,[14] rather than at the local level, or use of third-party technical code specialists, have been used successfully to improve code enforcement. • Nationally, several cities, states and provinces have already adopted aggressive stretch codes. These jurisdictions recognize that the national model code may not be able to achieve the level of energy efficiency necessary to achieve net-zero-capable buildings, especially for buildings that are taller and more complex and those located in densely settled urban areas. California and Massachusetts offer proven stretch code strategies with readily adoptable model language and aligned incentives to encourage adoption by local jurisdictions. • There are experts in the market who are available to provide technical and regulatory assistance for code-establishing agencies. Furthermore, there are active stakeholder groups who attend and participate in code hearings. Currently the United States Department of Energy (US DOE) makes available modeling protocols for several different building prototypes.
Customer Value	• Training, workload assistance, and tools will increase the effectiveness of code enforcement officials at enforcing code.[15] Other training will provide architects, engineers and participants in the construction trades with solutions to comply with code, particularly for challenging applications, reducing their soft costs. • A model stretch code will provide progressive jurisdictions the opportunity to advance climate goals with a code that is cost effective and easy to enforce. • Improved code compliance will provide energy savings and carbon reductions for municipalities, as well as increased building comfort for building occupants. • Streamlining compliance and enforcement activities will save taxpayer money and will improve the permit processing.

22.1.3 Stakeholder/Market Engagement

Stakeholder/ Market Engagement	• NYSERDA conducted market research with architects, engineers, code enforcement officials, and other entities involved with code compliance and construction to identify gaps and barriers in compliance and enforcement. Results of this analysis informed the strategies and activities in this investment plan for improving compliance and enforcement. • Stakeholders from various sectors, including but not limited to owner and sector representatives, energy efficiency professionals, and communities will be engaged throughout this initiative to identify needs, barriers and obstacles, to determine market responses to proposed activities, and to identify future adjustments or changes in focus. • NYSERDA will build on these stakeholder relationships and continue to seek input, direction, and feedback on activities.

[14] Chenango, Jefferson, and Wyoming Counties have implemented this approach.

[15] "New York Gap Analysis," prepared by the Trust for Conservation Innovation/Building Codes Assistance Project, April 2016.

22.1.4 Theory of Change

Market Barriers Addressed	• **Lack of energy code understanding.** Code enforcement officials find the energy code to be complex, especially the commercial energy code, and are unsure when it is triggered in commercial buildings, how it applies to existing buildings, and how it impacts other building codes.[16] NYSERDA will offer training statewide to improve the knowledge of these officials and offer them insights into building processes and systems that are often a challenge relative to energy code compliance and which may impact other building codes. • **Lack of energy code training.** Code enforcement officials, design professionals, builders, developers and the construction trades lack the training to stay current on changes to energy codes, advanced technologies, and other innovations that would improve code compliance. Other challenges include a lack of educational or training opportunities.[17] NYSERDA will offer audience-specific training statewide to improve the knowledge of these entities and introduce them to advanced technologies and strategies that improve code compliance. • **Code enforcement departments are resource constrained.** Code enforcement officials report that lack of time or staff is the biggest challenge to code enforcement. Quality assurance applications, county-wide code enforcement, third party plan reviews and other alternative enforcement structures exist that can help jurisdictions improve code enforcement. NYSERDA will work with code enforcement officials to identify opportunities for these support services to be provided to resource-constrained jurisdictions. • **Lack of knowledge of value in adoption of stretch codes.** Many jurisdictions do not see value in a stretch code. Many municipal officials fear increased code requirements will hamper economic development because of perceived higher first costs. Community pressure to be less stringent is also a concern.[18] A stretch code is perceived to increase the complexity of the energy code. With 1600 jurisdictions deciding whether to adopt a stretch energy code, it creates an issue of scale and a potential patchwork of requirements for the market to respond to. NYSERDA will address these barriers by developing a stretch code format that is cost effective and easy to adopt and enforce, and by piloting stretch code adoption with several progressive jurisdictions to identify opportunities and hurdles that may exist in adopting and exercising a stretch code. • **National model codes do not address all aspects of a building's energy use, and the pace of national model code advancement will not support New York State's greenhouse gas reduction goals.** The next version of the ECCCNYS is dependent upon the national code and US DOE's review of the cost-effectiveness of that code at the state level. NYSERDA will identify advanced technologies and strategies not currently covered by model codes and validate the achievable savings to inform state and national codes. Pilots of approaches to stretch codes will be studied to determine their credibility and applicability to New York State's climate, their cost effectiveness, and barriers and opportunities to their adoption. • **Constraints on resources and expertise prevent timely enactment of state and local codes.** NYSERDA will provide technical support and modeling services to the Department of State to support enactment of the state energy code and to local jurisdictions who adopt stretch codes.
Testable Hypotheses	• If NYSERDA provides audience-specific training content and approaches, then more of the target audience will attend these trainings.

[16] "New York Gap Analysis," Ibid., p. 21-22.
[17] Ibid., p.21.
[18] "New York Gap Analysis," bid., p. 25.

	• If NYSERDA provides audience-specific training content and approaches, then the application of code by trained participants will improve. • If NYSERDA demonstrates that an alternative enforcement business structure is cost effective and improves enforcement, jurisdictions will adopt it. • If NYSERDA validates the achievable savings from advanced technologies and strategies not currently covered by the ECCCNYS and model codes, they will be incorporated into stretch codes and future cycles of the model codes. • If NYSERDA shows that a model stretch code is cost effective, easy to adopt and enforce, and will advance climate goals, jurisdictions will adopt it. • If NYSERDA provides technical support to state or local jurisdictions for enacting an energy code, it will be adopted more quickly.

Activities	The activities under this plan seek to improve code compliance and enforcement, assist in the development and advancement of codes, and assist in the enactment of codes, allowing NYSERDA to develop a path to codify a stretch to zero code.
	
	Support for Code Compliance and Enforcement
	• NYSERDA will offer trainings statewide to improve the knowledge of code enforcement officials, design professionals, the construction trades, and energy professionals and introduce them to technologies and strategies that improve code compliance.
	  ○ Training efforts will include classroom, web-based, in-the-field training, and conferences. The curricula will be tailored to the specific audience and building sector.
	  ○ Services will be procured under mechanisms such as mini-bids or solicitations. Mini-bids will use either existing contractor pools available at NYSERDA or a codes-specific pool developed through a request for qualifications process.
	  ○ Current training contracts, competitively selected under NYSERDA's Technology & Market Development (T&MD) portfolio, will be extended with Clean Energy Fund (CEF) funds to provide continuity in the market while a solicitation is developed and issued for audience specific training content and approaches and provision of support services.
	• NYSERDA will provide general support services (e.g., training, platforms, etc.) statewide and customized support services (e.g., plan review, inspections, etc.) to assist resource constrained local jurisdictions that pay into the SBC, to supplement existing code enforcement resources.
	• NYSERDA's activities will include teaming with Clean Energy Communities outreach efforts to inform community stakeholders on the value of enforcing ECCCNYS and any stretch code that is adopted.
	
	Code Development and Advancement
	• Stakeholder input and public comment informed NYSERDA's first version of the one-cycle stretch code[19] called "NYStretch-Energy." Future versions of NYStretch-Energy will be informed by stakeholders including energy efficiency professionals, utility representatives, representatives of market groups (e.g., Real Estate Board of New York, National Association of Home Builders), and staff from New York City's Department of Buildings and the Mayor's Office of Sustainability. Their feedback will inform NYSERDA on all aspects of NYStretch-Energy including, but not limited to technologies, efficiency levels, building types, and ease of adoption, compliance and enforcement. Contractor(s) will be engaged to assist with the stakeholder and public comment process and to draft the code language

[19] Energy codes are developed on a three year cycle. Typically by the time New York enacts the ECCCNYS, the next version of the energy code has been developed. A "one-cycle" stretch code would include elements of the next version of the energy code and therefore, when adopted, would be one code cycle ahead of the ECCCNYS.

	• Market research will be conducted to determine how communities in New York State view one-cycle stretch codes and stretch to zero codes.[20] This effort will help inform Code to Zero activities, including the development of a plan to achieve a stretch to zero code baseline by 2030. Interest, barriers, and opportunities will be identified. This effort will prioritize NYSERDA's outreach activities and inform messaging.
	• For new technologies and strategies to be adopted by the market and incorporated into state and national model code, savings must be validated, and the technologies demonstrated to be cost-effective. Market research will be conducted to identify case studies of successful incorporation of advanced technologies and of systems typically addressed in renovation, including information on the building types, technologies, location, and renovation scopes involved. In addition, measurement and verification activities identified in NYSERDA's New Construction Comprehensive Strategy investment plan will complement this effort by providing verified information on the incorporation of more advanced energy technologies and designs in new buildings, thereby providing demonstrated market performance that can be used to help justify adoption of codes with higher performance goals.
	• Newly constructed buildings in targeted sectors[21] that incorporated advanced technologies or strategies not yet considered in code will be identified so that achievable savings and Energy Use Intensities (EUIs) can be validated. Where similar uses or space types exist in other building sectors (e.g., approaches that work for hotels that would translate well in dormitories), lessons learned will be considered for other market segments. Results from this activity will be used to inform stretch code activities and, where appropriate, suggestions or code language will be submitted to the national code councils for consideration during the development process for future iterations of national model codes.
	
	Pilots
	• NYSERDA will issue a series of competitive solicitations for pilots to test new approaches to code development, enactment and enforcement. Pilot participants may be from any region of New York State, however only SBC-paying jurisdictions may receive any available incentive funding. Participants will be selected based on criteria such as geographic diversity, replicability, savings potential, and value of the proposed services. Once the participants are selected, NYSERDA will provide technical assistance, track and monitor progress, and collect and share results of the pilots. Where appropriate, results from the pilots will be submitted with requests for revised code language to the national code council for consideration during development of future iterations of national model codes.
	  o **Pilot #1: Enforcement.** Entities will be invited to demonstrate alternative enforcement business structures, (e.g., county level code enforcement, quality assurance platforms for plan reviews and inspections, third party services, etc.) that can improve code enforcement.
	  o **Pilot #2: One-cycle Stretch Code.** Communities will be invited to demonstrate a one-cycle stretch code to identify barriers, opportunities, and lessons learned regarding the adoption, implementation and enforcement of stretch codes. Communities will respond to a list of suggested areas of assistance, or propose other needs, and demonstrate why the assistance is necessary to adopt a one-cycle stretch code. Pilot

[20] A "stretch to zero" code refers to an energy code that would go beyond a one-cycle stretch code such that a building's energy use would be near or the same as the energy it generates. It may also address unregulated systems (e.g., plug load, data centers, etc.), renewable technologies, district (vs building) energy systems, and zoning requirements.

[21] See Target Market Segments section.

	activities will be based on communities' needs and may include funds for training assistance, toolkits, or implementation support. NYSERDA will work with the utilities to align them with NYSERDA on offering incentives for projects in communities that adopt a stretch code. ○ **Pilot #3: Stretch to Zero Code.** Other cities and states have adopted a variety of approaches to establish a stretch to zero energy code. Jurisdictions will be invited to demonstrate suggested approaches, or propose an approach, to implementing zero energy codes. The pilots will help to determine how well the approaches will work in New York's climate, their credibility and cost effectiveness, and the barriers and opportunities for them to be incorporated into a stretch to zero code. Pilots may include funding for implementation support to communities that test a zero stretch code approach. NYSERDA will work with the utilities to align them with NYSERDA on offering incentives for projects in communities that adopt a stretch code. **Code Enactment** • NYSERDA will provide services (e.g., technical support, modeling services, etc.) to support enactment of the ECCCNYS and stretch codes. NYSERDA will contract with technical consultant(s) and provide direct staff time. • Utilities will be invited to participate in stretch code development and will be informed of jurisdictions that adopt a stretch code in conjunction with NYSERDA's support.
Key Milestones	<u>Milestone 1 (2017) - Complete</u> • Extend training and third-party plan review contracts. <u>Milestone 2 (2017) - Complete</u> • Issue a procurement to provide third-party services through 2018. <u>Milestone 3 (2019) - Complete</u> • Issue NY Stretch-Energy stretching off of IECC[22] 2018. <u>Milestone 4 (2019) - Complete</u> • Issue solicitation for audience-specific training content and approaches. <u>Milestone 5 (2020)</u> • Issue awards from Alternative Enforcement Structures solicitation <u>Milestone 6 (2020</u> • Issue awards from pilot #2 Stretch to Zero assistance solicitation <u>Milestone 7 (2020)</u> • Contracts for audience-specific training content and approaches. <u>Milestone 8 (2020)</u> • Issue awards from RFI for Technical input to NYStretch 2022 <u>Milestone 9 (2020)</u> • Contract for development of NY Stretch-Energy (IECC2021). <u>Milestone 10 (2022)</u> • Finalize plan to codify stretch-to-zero as baseline by 2031.

[22] IECC = International Energy Conservation Code created by the International Code Council through a consensus-based process.

	Milestone 11 (2022) • Issue NY Stretch-Energy stretching off of IECC 2021.
Goals Prior to Exit	• Code compliance reaches a level of 90% across the State. • 20% of the jurisdictions in the State adopt a stretch code. • Jurisdictions who have adopted alternative code enforcement structures or to whom training and supplemental services have been provided report improved enforcement of the energy code.

22.1.5 Relationship to Utility/REV

Utility Role/Coordination Points	• NYSERDA will share both the details of the stretch code development process and the final product with utilities. Utility representatives will be invited to participate in stretch code development and to provide comments during the public comment period. • A coordinated effort between NYSERDA and the utilities, and DPS if necessary, is needed to establish a single baseline for code that would apply to incentives statewide and reward projects within communities that adopt stretch codes. NYSERDA will establish a meeting with the utilities upon approval of the investment plan by DPS and will hold periodic meetings until there is alignment on an approach for this subject.
Utility Interventions in Target Market	The New York utilities do not currently have any similar offering to this market.

22.1.6 Budgets

An annual commitment budget for all activities included in this chapter is shown in Appendix B. Budgets do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within Appendix B is intended for informational purposes only.

22.1.7 Progress and Performance Metrics

Appendix C provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

Other outcomes that will NYSERDA will be monitoring include:

- Integration of stretch code concept into ECCCNYS by NYS DOS.
- Development of a more comprehensive national model code that addresses all aspects of a building's energy use and energy production.

Benefits shown in Appendix B, labeled as direct, are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. The direct benefits in Appendix B align with direct incentives

and services funding. The funding in 2017-2018 and 2021-2022 will be used for code training, enforcement and enactment activities, which are reflected in the indirect benefits.

Benefits shown in Appendix B, labeled as indirect, represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+) of the years noted in Appendix B and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented in Appendix B are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

22.1.8 Fuel Neutrality

Fuel Neutrality	• This initiative will be offered as a fuel neutral program as building energy codes cover total building energy, including electricity and all fuels. • Offering the Code to Zero initiative on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of $221 per annual ton of carbon, compared to a cost of $241 per annual ton of carbon in an electric only scenario.

22.1.9 Performance Monitoring and Evaluation Plans

Performance Monitoring & Evaluation Plan	NYSERDA's approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.
	
	<u>Test-Measure-Adjust Strategy</u>
	• Collect, analyze and report on progress of the initiative by comparing progress against identified goals on a regular basis (i.e., quarterly, bi-annually).
	• The strategy design will be tested to gauge the target population's reaction to the strategy. This information will be used to help inform decisions about how to allocate time and resources within the initiative and to confirm market interest and preparedness for full scale implementation.
	• Insights as to how the initiative can be optimized will be gathered and applied to future initiative design to ensure greatest market impacts within the identified market sectors.
	• Activity specific test-measure-adjust work will include:
	  o Compliance: Assess the impact of NYSERDA's training to improve compliance. Receive input from stakeholders on training components and approaches. Review and adjust as necessary.
	  o Alternative Enforcement Business Structures: For each structure used, assess its impact on the enforcement process (e.g., how effective was it? How easy was it to use? Cost compared to value? Etc.). Identify market potential to offer tool or service without NYSERDA assistance. Solicit input from users and stakeholders. Review and adjust as necessary.

	○ Stretch Code Pilots: Assess ease of adopting stretch code, compliance to stretch, barriers to and opportunities from adoption, success of alternative approaches, energy savings. Receive input from stakeholders. Review and adjust as necessary. ○ Enactment: Assess the impact of NYSERDA's services to support code enactment on state and local level. Review services offered to determine need and effectiveness. Receive input from stakeholders. Review and adjust as necessary. <u>Market Evaluation</u> • Market evaluation will draw on the logic model and will include baseline measurements of key market indicators. Regular longitudinal measurements (e.g., annual or biennial) will include updates of the baseline metrics as well as additional measurements to assess market change resulting from the initiative. ○ Due to the historically demonstrated difficulty of obtaining samples for studying code compliance, Delphi panels will be utilized in order to track key indicators in the initiative that would traditionally require widespread data collection to measure, such as the number of jurisdictions adopting alternative enforcement business structures and stretch codes. This will allow NYSERDA to trade expensive, widespread sampling for focused, expert consensus where appropriate. In order to supplement the panels, a targeted longitudinal study may be conducted for a limited number of representative jurisdictions. This longitudinal study would not be used to draw conclusions about the population of new construction or renovation projects, but rather as a comparison to the Delphi panel responses to validate findings or raise questions in need of additional research. ○ Baseline measurements of key market indicators will occur within one year following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These include but are not limited to: number of recipients receiving training and improvement in code compliance levels. • Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: number of jurisdictions adopting alternative enforcement business structures, pilots conducted to inform code compliance issues and opportunities, and increases in energy efficiency as a result of new and substantially renovated buildings. • The evaluation will also: ○ Assess impact of audience-specific training content and approaches. Review training effectiveness using an established framework such as the Kirkpatrick model. Receive input from attendees and stakeholders and adjust training content and approaches as necessary. ○ Interview architects and engineers to discuss project plans that met energy code. Determine if projects were built as planned or if variances to the energy code were filed. ○ Survey code departments to identify building applications with and without variances and identify whether there are any variances to the energy code. • Market evaluation will build a longitudinal model to measure non-compliance over time by interviewing builders, code officials, and other key municipal officials 6 months prior to and 6 months after a change in the ECCCNYS. This will enable NYSERDA to collect the data necessary to determine level of compliance and impact of training across different iterations of the Energy Code. • As appropriate, the market evaluation will leverage sector-level market studies as well as publicly and commercially available data to inform the tracking of key market indicators. <u>Impact Evaluation/Field Verification</u> • Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users. Impact Evaluation will have access

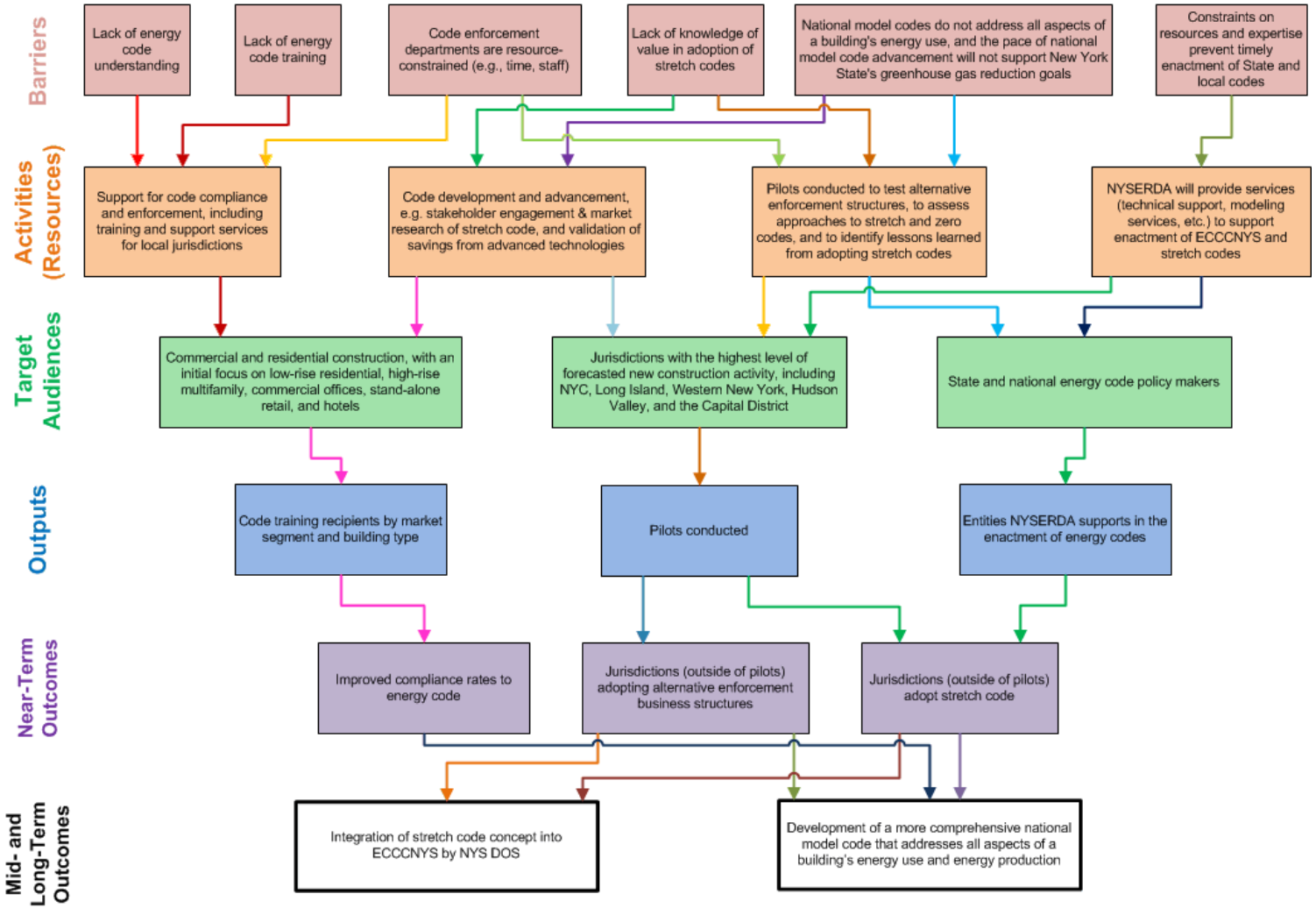
	to code compliance evaluation and other data necessary to validate direct impacts per International Performance Measurement and Verification Protocol (IPMVP) standards.

Verified Gross Savings Specifications

Verified Gross Savings Specification Codes	
Date of CEF filing: See cover page	
CEF Chapter Name: Codes	
Initiative Name	Code to Zero
Initiative Period	This initiative was first offered in November 2017.
Initiative Description	To maximize the effectiveness of energy codes, NYSERDA seeks to work with stakeholders, participants in building design and construction, and communities to strengthen compliance and enforcement, test approaches to advance the development of codes with higher performance goals, and assist in the enactment of energy codes.
Gross Savings Methodology	N/A: all savings for the initiative are indirect and will be evaluated through market evaluation.
Realization Rate (RR)	N/A
Planned VGS Approach	N/A: all savings for the initiative are indirect and will be evaluated through market evaluation.
Exemption from EAM Status	N/A

Appendix A – Logic Models

LOGIC MODEL: Code to Zero



Appendix B | Initiative Budget and Benefits Summary

Code to Zero

	Actuals	Actuals	Actuals	Actuals	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	
Direct Benefit	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total**
Energy Efficiency MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MMBtu Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MMBtu Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Efficiency MW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Participant Bill Savings Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Participant Bill Savings Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leveraged Funds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Indirect Benefit	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total**
Energy Efficiency MWh Annual	-	-	-	-	28,342	27,078	55,494	-	-	-	-	-	-	-	-	110,913
Energy Efficiency MMBtu Annual	-	-	-	-	37,168	35,927	68,832	-	-	-	-	-	-	-	-	141,927
Renewable Energy MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy MW Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual	-	-	-	-	16,340	15,636	31,766	-	-	-	-	-	-	-	-	63,742
CO2e Emission Reduction (metric tons) Lifetime	-	-	-	-	408,511	390,898	794,150	-	-	-	-	-	-	-	-	1,593,559

Energy Usage	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total**
Direct Energy Usage MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Direct Energy Usage MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Direct Energy Usage MMBtu Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Direct Energy Usage MMBtu Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indirect Energy Usage MWh Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indirect Energy Usage MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indirect Energy Usage MMBtu Annual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indirect Energy Usage MMBtu Lifetime	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Participants	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total**
Training Participants	-	-	596	1,611	4,500	5,000	4,000	4,500	5,000	4,000	-	-	-	-	-	29,207
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**596**	**1,611**	**4,500**	**5,000**	**4,000**	**4,500**	**5,000**	**4,000**	**-**	**-**	**-**	**-**	**-**	**29,207**

Budget	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total**
Direct Incentives and Services	-	-	-	-	2,000,000	2,000,000	500,000	-	-	-	-	-	-	-	-	4,500,000
Implementation Support	-	12,733	38,534	253,589	520,000	720,000	-	-	-	-	-	-	-	-	-	1,544,857
Research and Technology Studies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tools, Training and Replication	91,313	40,000	655,423	5,082,611	3,225,000	2,900,000	2,960,797	-	-	-	-	-	-	-	-	14,955,143
Business Support	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**91,313**	**52,733**	**693,956**	**5,336,200**	**5,745,000**	**5,620,000**	**3,460,797**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**21,000,000**

Table Notes:

a. These direct impacts are based only on new construction activity. There is no data available currently to calculate the impact of this initiative on reconstruction activity that must adhere to energy codes. When the impacts from that activity is included, it is expected that direct benefits will be higher.

b. Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 25-year measure life. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

c. Training participants are architects, engineers, design professionals, builders/developers, members of the construction trades, code enforcement officials, elected officials, and communities. Pilots reflect the number of communities where one-cycle stretch codes and stretch codes to zero will be tested.

Code to Zero

	Indicators	Baseline (Before/Current)	2021 Target (cumulative)
Outputs	Number of individuals receiving NYSERDA-supported code training by market segment and building type	7,000	13,250
	Number of pilots	0	6
	Number of entities NYSERDA supports in the enactment of energy codes	0	5
Outcomes	Percentage of market complying with the energy code	TBD	%Δ = 10%
	Number of jurisdictions (outside of the pilots) adopting alternative enforcement business structures	TBD	8
	Number of jurisdictions (outsid of the pilots) adopting stretch code	TBD	10

Table notes

a. TBD denotes that NYSERDA requires more data in order to quantify baseline/market metrics to the degree needed to measure against in the future. Baseline measurements of key market indicators are anticipated to occur soon following initiative approval and NYSERDA will update the information in this table as the information becomes available, which is anticipated within 9-12 months of initiative approval. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

'b. A study by Pacific Northwest National Laboratory indicates that for commercial codes, compliance in the first year when a new code is adopted is estimated at 50%. This rate increases asymptotically every year to near 80% after 10 years. For residential codes, compliance in the first year is estimated at 80%, going to 100% (asymptotically) after 10 years. “Impacts of Model Building Energy Codes,” p. iv and 9, PNNL-25611 Rev. 1, October 2016, Pacific Northwest National Laboratory.