REGULATORY IMPACT STATEMENT

(Energy Code)

1. STATUTORY AUTHORITY.

Under Energy Law §11-103(2)(a), the State Fire Prevention and Building Code Council ("Code Council") is authorized, from time to time as it deems appropriate and consistent with the purposes of Article 11 of the Energy Law, to review and amend the State Energy Conservation Construction Code ("Energy Code"), or adopt a new Energy Code, through rules and regulations provided that the Energy Code remains cost effective with respect to building construction in the State. Energy Law §11-103(2)(b) provides that when adopting the first amended version of the Energy Code following the effective date of Chapter 374 of the Laws of 2022, or July 5, 2022, and any subsequent codes, the Code Council shall use its best efforts to adopt provisions for residential buildings that achieve energy savings greater than energy savings achieved by the then most recently published International Energy Conservation Code ("IECC") and to adopt provisions for commercial buildings that achieve energy savings greater than energy savings achieved by the then most recently published ASHRAE 90.1, both at levels recommended by the New York State Energy Research and Development Authority ("NYSERDA"), provided that the Code Council determines that such advanced energy savings can be achieved while still meeting the cost effectiveness considerations contemplated by Energy Law §11-103(2).

Energy Law §11-104 provides that the Energy Code shall be designed to satisfy specific criteria, including the following:

(1) the Energy Code's standards and requirements, so far as may be practicable, shall be formulated in terms of performance objectives;

(2) to the fullest extent feasible, use of modern technical methods, devices and improvements which

tend to minimize consumption of energy and utilize to the greatest extent practical solar and other renewable sources of energy without affecting reasonable requirements for the health, safety and security of the occupants or users of buildings shall be permitted;

(3) as far as may be practicable, the improvement of energy conservation construction practices, methods, equipment, materials and techniques shall be encouraged;

(4) the Energy Code shall provide reasonable uniform standards and requirements for construction and construction materials for the improvement of energy conservation construction practices;

(5) The Code Council, in consultation with the Commissioner of the Department of Parks, Recreation and Historic Preservation, is authorized to adopt exemptions to such uniform standards and requirements for historic buildings as defined in Energy Law §11-102, to the extent that the uniform standards and requirements would threaten, degrade, or destroy the historic form, fabric, or function of such historic buildings;

(6) to the fullest extent feasible, the standards for construction of buildings in the Energy Code shall be designed to help achieve the State's clean energy and climate agenda, including but not limited to greenhouse gas (GHG) reduction, set forth within Chapter 106 of the Laws of 2019, also known as the New York State Climate Leadership and Community Protection Act (the "Climate Act"), and as further identified by the New York State Climate Action Council ("CAC") established pursuant to Environmental Conservation Law §75-0103; and

(7) to support the goal of zero on-site GHG emissions and help achieve the State's clean energy and climate agenda, including but not limited to GHG reduction requirements set forth within the Climate Act, the Energy Code shall prohibit the installation of fossil-fuel equipment and building systems, in any new building not more than seven stories in height, except for a new commercial or industrial building greater than 100,000 square feet in conditioned floor area, on or after December 31, 2025, and the Energy Code

shall prohibit the installation of fossil-fuel equipment and building systems, in all new buildings after December 31, 2028, with certain exceptions.

This proposed rulemaking would repeal the current version of the Energy Code and adopt a new version of the Energy Code pursuant to Article 11 of the Energy Law. The current version of the Energy Code is set forth in 19 NYCRR Part 1240 which incorporates by reference the 2020 Energy Conservation Construction Code of New York State ("2020 ECCCNYS") and the 2016 edition of the *Energy Standard for Buildings Except Low Rise Residential Buildings* ("ASHRAE 90.1-2016"), as amended by Part 1240. This proposed rule would repeal the existing Energy Code and adopt new version of the Energy Code set forth in Part 1240 incorporating by reference the 2024 Energy Conservation Construction Code of New York State ("2024 ECCCNYS") and NYS ASHRAE 90.1 - 2024, *Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings* ("2024 NYS ASHRAE 90.1"), which is the New York State-specific version of the publication ASHRAE 90.1-2022. This proposed rule is authorized by Energy Law §11-103(2).

Please note that the Uniform Fire Prevention and Building Code ("Uniform Code") will be the subject of a separate rulemaking.

2. LEGISLATIVE OBJECTIVES.

Energy Law §3-101(2) states that it shall be the energy policy of the State "to encourage conservation of energy and to promote the clean energy and climate agenda, including but not limited to GHG reduction, set forth within [Chapter 106] of the laws of [2019], also known as the [Climate Act], in the construction and operation of new commercial, industrial, agricultural and residential buildings, and in the rehabilitation of existing structures, through heating, cooling, ventilation, lighting, insulation and design techniques and the use of energy audits and life-cycle costing analysis."

Energy Law §11-101 provides that in furtherance of the above-quoted energy policy, an Energy Code shall be adopted "to protect the health, safety and security of the people of the State and to assure a continuing supply of energy for future generations" and that the Energy Code shall "mandate that economically reasonable energy conservation techniques be used in the design and construction of all new public and private buildings in the state."

Energy Law §11-104, as amended by Part RR of Chapter 56 of the Laws of 2023, provides that the Energy Code shall be designed to help achieve the State's clean energy and climate agenda, including but not limited to GHG reduction, set forth within the Climate Act, and as further identified by the CAC, and that the Energy Code shall prohibit the installation of fossil-fuel equipment and building systems in any new building not more than seven stories in height, except for a new commercial or industrial building greater than 100,000 square feet in conditioned floor area, on or after December 31, 2025, and prohibits the installation of fossil-fuel equipment and building systems, in all new buildings after December 31, 2028, with certain exceptions.

On July 5, 2022, Energy Law §11-103 was amended by changing what the Code Council must consider in determining whether the code remains cost effective. Prior to July 5, 2022, when determining whether the Energy Code remained cost effective, the Code Council had to consider "whether the cost of materials and their installation to meet its standards would be equal to or less than the present value of energy savings that could be expected over a ten-year period in the building in which such materials are installed." Energy Law §11-103(2), as amended by Chapter 374 of the Laws of 2022, now requires that the Code Council consider "(i) whether the life-cycle costs for a building will be recovered through savings in energy costs over the design life of the building under a life-cycle cost analysis performed under methodology as established by the New York State Energy Research and Development Authority in regulations which may be updated from time to time, and (ii) secondary or societal effects, such as reductions in GHG emissions, as defined in regulations." On April 29, 2024, the NYSERDA Board approved a new Part 510 of Title 21 of the Official Compilations of Codes, Rules and Regulations of the State of New York ("21 NYCRR Part 510") that established NYSERDA's methodology for life-cycle cost analysis and defined secondary or societal effects. 21 NYCRR Part 510 became effective on June 18, 2024.

Energy Law §11-103(2) also provides that the Energy Code for commercial buildings must meet or exceed the most recently published "*Energy Standard for Buildings Except Low-Rise Residential Buildings*" (ASHRAE 90.1), or achieve equivalent or greater energy savings; and that the Energy Code for residential buildings must meet or exceed the then most recently published edition of the publication entitled "International Energy Conservation Code" (IECC), or achieve equivalent or greater energy savings.

The current version of the Energy Code for commercial buildings meets or exceeds ASHRAE 90.1-2016. The proposed rule will amend the Energy Code for commercial buildings to a code that meets or exceeds the 2022 edition of ASHRAE 90.1 ("ASHRAE 90.1-2022"). ASHRAE 90.1-2022 is the most recently published ASHRAE 90.1 and the 2024 NYS ASHRAE 90.1 is based on ASHRAE 90.1-2022, with modifications to achieve energy savings greater than ASHAE 90.1-2022, as recommended by NYSERDA. Therefore, the Energy Code, as proposed by this rule, will satisfy Energy Law §11- 103(2), which requires the Energy Code for commercial buildings to meet or exceed the then most recently published ASHRAE 90.1.

The current version of the Energy Code for residential buildings meets or exceeds the 2018 edition of the IECC ("2018 IECC"). The proposed rule will amend the Energy Code for residential buildings to a code that includes the "Residential Provisions" of the 2024 ECCCNYS based upon the most recent (2024) edition of the IECC ("2024 IECC"), with modifications to achieve energy savings greater than the 2024 IECC, as recommended by NYSERDA. Therefore, the Energy Code, as proposed by this rule, will satisfy that part of Energy Law §11-103(2) that requires the Energy Code for residential buildings to meet or exceed the most recent edition of the IECC.

As more fully discussed below in Part 3 “General Needs, Benefits, and Costs” of this Regulatory Impact Statement, it is anticipated that (1) buildings that comply with the Energy Code, as proposed by this rule, will use less energy than buildings that comply with the current Energy Code; (2) on average, the Energy Code, as proposed by this rule, will be cost effective for commercial buildings and residential buildings; and (3) on average, the increase in the cost of constructing a commercial or residential building according to the requirements of the Energy Code as proposed by this rule over the cost of constructing a similar commercial or residential building according to the requirements of the current version of the Energy Code will be less than the present value of the savings in energy costs that could be expected over the life-cycle cost of the building. Based on the foregoing, the Department of State (DOS) and the Code Council believe that this proposed rule will encourage the conservation of energy in the construction and operation of new commercial, industrial, and residential buildings; protect the health, safety and security of the people of the State by helping to assure a continuing supply of energy for future generations; maximize the extent to which the use of modern technical methods, devices and improvements which tend to minimize consumption of energy will be permitted; encourage the improvement of energy conservation construction practices, methods, equipment, materials and techniques; mandate that economically reasonable energy conservation techniques be used; help achieve the State's clean energy and climate agenda to the fullest extent feasible; provide a cost-effective building energy code for commercial buildings and residential buildings; and otherwise help achieve the legislative objectives described above.

In addition, this proposed rule will ensure that the Energy Code complies with Title III of the Federal

Energy Conservation and Production Act ("ECPA") (42 U.S.C. 6831, et. seq.).[1]

3. NEEDS AND BENEFITS.

Necessity

This proposed rule is necessary to encourage conservation of energy and installation of clean energy features in the construction and operation of new buildings; to protect the health, safety and security of the people of the State by helping to assure a continuing supply of energy for future generations; to maximize the extent to which the use of modern technical methods, devices and improvements which tend to minimize consumption of energy are employed; to encourage the improvement of energy conservation construction practices, methods, equipment, materials and techniques; to mandate that economically reasonable energy conservation techniques be used; to provide a cost effective building energy code for residential and commercial buildings; and to otherwise help achieve the legislative objectives described above in Part 2 "Legislative Objectives" of this Regulatory Impact Statement, specifically Part RR of Chapter 56 of the Laws of 2023 (Prohibition on the installation of fossil-fuel equipment and building systems) and Chapter 374 of the Laws of 2022 (Advanced Building Codes, Appliance and Equipment Efficiency Standards Act of 2022), which both reference Chapter 106 of the Laws of 2019 (New York State Climate Leadership and Community Protection Act).

In addition, this proposed rule is necessary to ensure that the Energy Code will comply with Title III of the ECPA.

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[1] 42 U.S.C. § 6833(b) provides that when the U.S. Department of Energy ("DOE") determines that commercial buildings constructed to a revised edition of ASHRAE 90.1 would achieve greater energy efficiency than buildings constructed to the prior edition of ASHRAE 90.1, states are required to update their energy codes for commercial buildings to codes that meet or exceed the revised edition of ASHRAE 90.1. DOE issued a determination on March 6, 2024 regarding ASHRAE 90.1-2022 and State certifications for Standard 90.1-2022 must be submitted by March 6, 2026.

The more significant changes to the Energy Code to be implemented by this proposed rule, and the needs associated with each such change, are discussed in greater detail below.

Benefits.

The principal benefits to be derived from this proposed rule will be the reduction in the energy used by buildings that comply with the Energy Code as amended by this proposed rule and the savings in energy costs to be realized by owners of buildings that comply with the Energy Code as amended by this proposed rule. Buildings are responsible for one third of the energy consumed in the State; reduced energy consumption will contribute to the availability and reliability of the energy supply. The following paragraphs describe the principal benefits in more detail.

Cost Effective. The DOS anticipates that the Energy Code, as amended by this proposed rule, will be cost effective, and that, on average, building owners will receive a net economic benefit from this proposed rule. More specifically, the DOS and Code Council anticipate that, on average, when comparing a building constructed to the requirements of the Energy Code as amended by this proposed rule to a similar building constructed to the requirements of the current version of the Energy Code, the life-cycle costs for a building will be recovered through savings in energy costs over the design life of the building under a life-cycle cost analysis performed under methodology as established by NYSERDA, as set forth in 21 NYCRR Part 510, and secondary or societal effects, such as reductions in GHG emissions, as defined in 21 NYCRR Part 510.

Life-cycle cost. Based on the life-cycle cost analysis performed under the methodology established by NYSERDA and secondary or societal effects, such as reductions in GHG emissions,[2] the DOS and Code Council anticipate that, on average, the increase in initial construction costs resulting from constructing a building to the requirements of the Energy Code as amended by this proposed rule, rather than the requirements of the current version of the Energy Code, will be recovered through savings in energy costs over the design life of the building.

Compliance with New York State Energy Law. This proposed rule will ensure that the provisions of the Energy Code applicable to commercial buildings will continue to meet or exceed the most recently published ASHRAE 90.1 and that the provisions of the Energy Code applicable to residential buildings will continue to meet or exceed the most recently published IECC, as required by Energy Law §11-103(2)(a). This proposed rule will also ensure that the provisions for commercial buildings will achieve energy savings greater than energy savings achieved by the most recently published ASHRAE 90.1 as recommended by NYSERDA and that the provisions for residential buildings will achieve energy savings greater than energy savings achieved by the most recently published IECC as recommended by NYSERDA, as required by Energy Law §11-103(2)(b).

Compliance with Federal Law. This proposed rule will ensure that the Energy Code complies with Title III of the ECPA.

Consistency with National Practices. This proposed rule will also ensure that energy conservation construction practices in New York State remain consistent with national practices. It is expected that many other states will update their building energy codes for commercial buildings to codes that meet or exceed ASHRAE 90.1-2022 and update their building energy codes for residential buildings to codes that meet or

[2] See 21 NYCRR Part 510.

exceed the “Residential Provisions” of the 2024 IECC. DOS and the Code Council believe that maintaining consistency with national practices will make it less complicated, more uniform, and less expensive for regulated parties to comply with the Energy Code.

Reduced Demand for Energy from Fossil-Fuel Sources. By reducing energy demands in a cost-effective manner, as required by Energy Law §11-103, this proposed rule will reduce demand for energy from fossil-fuel sources. As new buildings constructed in accordance with the amended Energy Code for commercial buildings replace obsolete, less energy-efficient buildings, energy use should be further reduced. NYS will benefit from Part RR of Chapter 56 of the Laws of 2023, which prohibits the installation of fossil-fuel equipment and building systems in new construction, along with Chapter 374 of the Laws of 2022, known as the Advanced Building Codes, Appliance and Equipment Efficiency Standards Act of 2022, and the consequent reduction of dependence on imported fossil-fuels and the reduction in associated emissions produced by their use to help achieve the State’s clean energy and climate agenda, including but not limited to GHG reduction, set forth in the Climate Act, and as further identified by the CAC.

The more significant changes to the Energy Code to be implemented by this proposed rule and the benefits associated with each such change, are discussed in greater detail below.

Commercial Provisions of 2024 ECCCNYS

The studies, reports, and analyses which served as the basis for the part of this proposed rule that applies to commercial buildings include:

(1) Notice of Determination. Issued by the United States Department of Energy (“DOE”) and

published in the Federal Register on March 6, 2024 in 89 Federal Register at 15983-01.[3] This Notice (hereafter referred to as the "DOE Commercial Notice of Determination") indicates that DOE has determined that buildings constructed to the requirements of ASHRAE 90.1-2022 would improve overall energy efficiency in buildings subject to the Energy Code compared to the requirements of ASHRAE 90.1-2019. See 89 Federal Register 15983-01 (March 6, 2024) at 15984.

(2) Energy Savings Analysis: ANSI/ASHRAE/IES Standard 90.1-2022. Prepared by Pacific Northwest National Laboratory ("PNNL"), Richland, WA (D. Maddox, J. Zhang, M. Rosenberg, Y. Xie, M. Taylor, J. Lerond, M. Tillou, M. Myer, L. Troup, T. Pilet and H. Nagda publication date February 2024).[4] According to this most recent national analysis of ASHRAE 90.1-2022, new commercial buildings meeting the requirements of the updated standard will experience on average, an 8.9 percent energy costs savings over new commercial buildings designed to ASHRAE 90.1-2019.[5] The DOE concluded moving from ASHRAE 90.1-2016 to ASHRAE 90.1-2019 resulted in energy cost savings of 4.3 percent.[6] The cumulative energy savings from ASHRAE 90.1-2016 to ASHRAE 90.1-2022 is 14.5 percent. The prototypes selected for this analysis are those used by PNNL in previous New York State specific analyses to determine the cost effectiveness of ASHRAE 90.1 for its national and New York State specific analyses. Specifically, the PNNL "Energy Savings Analysis" considered sixteen commercial building prototypes (small office, medium office,

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[3] https://www.federalregister.gov/documents/2024/03/06/2024-04717/determination-regarding-energy-efficiency-improvements-in-ansiashraeies-standard-901-2022

[4] ANSI/ASHRAE/IES Standard 90.1-2022 : Energy Savings Analysis, U.S. Department of Energy Office of Energy Efficiency & Renewable Energy, February 2024 available at ANSI/ASHRAE/IES Standard 90.1-2022: Energy Savings Analysis (energycodes.gov)

[5] *ANSI/ASHRAE/IES Standard 90.1-2022 : Energy Savings Analysis*, U.S. Department of Energy Office of Energy Efficiency & Renewable Energy, February 2024 available at ANSI/ASHRAE/IES Standard 90.1-2022: Energy Savings Analysis (energycodes.gov) at p. vii; See 89 Federal Register 15983-01 (March 6, 2024) at 15984.

[6] Preliminary Energy Savings Analysis: ANSI/ASHRAE/IES Standard 90.1-2019 US. Department of Energy Office of Energy Efficiency & Renewable Energy, April 2021 available at Preliminary Energy Savings Analysis: ANSI/ASHRAE/IES Standard 90.1-2019

large office, standalone retail, strip mall, primary school, secondary school, outpatient health car, hospital, small hotel, large hotel, non-refrigerated warehouse, quick service restaurant, full service restaurant, mid-rise apartment, and high-rise apartment) in sixteen climate zones, including two of the three climate zones found in New York State (4A and 5A).[7] Also noted, the cities selected for climate zones 4A and 5A were also the same cities previously used by PNNL in both the 2019 and 2016 reports; namely, New York City, and Buffalo, NY.[8]

Energy Savings Analysis: ANSI/ASHRAE/IES Standard 90.1-2019 prepared by PNNL (J. Zhang, M. Rosenberg, J. Lerond, Y. Xie, C. Nambia, Y. Chen, R. Hart, M. Halverson, D. Maddox and S. Goel publication date July 2021). According to this national analysis of ASHRAE 90.1-2019, new commercial buildings meeting the requirements of the standard would experience on average 4.3% energy cost savings when compared to ASHRAE 90.1-2016.[9]

(3) NORESCO Report. Energy Savings and Cost-Effectiveness Analysis of the 2024 New York State Energy Conservation Construction Code Commercial Provisions. Prepared for NYSERDA by NORESCO (B. Edwards, J. Arent, F. Yousefi, and R. Athalye), dated November 2024. The NORESCO report utilized eight building prototypes that make up approximately 76 percent of the statewide enclosed built environment. These building prototypes included NYC high rise apartment (20-story), high-rise apartment (10-story), mid-rise apartment (4-story), large hotel, standalone retail, large office, secondary school, and warehouse.

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[7] *ANSI/ASHRAE/IES Standard 90.1-2022 : Energy Savings Analysis*, U.S. Department of Energy Office of Energy Efficiency & Renewable Energy, February 2024 available at ANSI/ASHRAE/IES Standard 90.1-2022: Energy Savings Analysis (energycodes.gov) at p. 5-6

[8] *ANSI/ASHRAE/IES Standard 90.1-2022 : Energy Savings Analysis*, U.S. Department of Energy Office of Energy Efficiency & Renewable Energy, February 2024 available at ANSI/ASHRAE/IES Standard 90.1-2022: Energy Savings Analysis (energycodes.gov) at p. 6.

[9] Energy Savings Analysis: ANSI/ASHRAE/IES Standard 90.1-2019 (energycodes.gov)

Explanation of how studies were used – Commercial buildings.

DOS and the Code Council used the DOE Notice of Determination to determine that this proposed rule will reduce energy use by commercial buildings and that the Energy Code, as proposed by this rule, will satisfy that part of Energy Law § 11-103(2) that requires the Energy Code for commercial buildings to meet or exceed the most recently published ASHRAE 90.1, or achieve equivalent or greater energy savings.

DOS and the Code Council used the PNNL National Energy Savings Analysis Study and the NORESCO Report to determine (1) that this proposed rule will reduce energy use by commercial buildings; (2) that the Energy Code for commercial buildings, as proposed by this rule, will be cost effective; and (3) that the aggregate "first costs" associated with compliance with the Energy Code for commercial buildings, as proposed by this rule, will be recovered through savings in energy costs over the design life of the building under a life-cycle cost analysis performed under methodology as established by NYSERDA. The DOS and the Code Council also used the PNNL National Energy Savings Analysis Study and the NORESCO Report to determine the initial costs of compliance with this proposed rule and the ongoing costs of continuing to comply with this proposed rule.

The analyses assume that the proposed code will take effect in 2026. The studies also assume that Energy Law Section 11-104(6)(b), which prohibits installation of fossil fuel equipment in most new construction less than seven stories or 100,000 sf, will prohibit low-rise buildings from using fossil fuels starting December 31, 2025. This means, assuming a three-year code cycle, that all three years of construction for the Standalone Retail, Mid-rise Apartment, and Warehouse building types will be with electric end uses, in compliance with New York State Energy Law. New York City's Local Law 154 (NYC 2021) mandates electrification of all buildings for the final year of the 3-year code cycle modeled. This is incorporated into the study and the final weighting of results.

Energy Usage Savings – Commercial Buildings.

The DOE and PNNL anticipate that commercial buildings constructed to the requirements of ASHRAE 90.1-2022 rather than ASHRAE 90.1-2019 will improve overall energy efficiency in buildings subject to the code. See the DOE Commercial Notice of Determination 89 Federal Register 15983-01 (March 6, 2024) at 15984.[10]

Energy Cost Savings – Commercial Buildings.

PNNL anticipates that the energy costs for commercial buildings constructed to the requirements of ASHRAE 90.1-2022 will be approximately 8.9 percent lower than the energy costs for commercial buildings constructed to the requirements of ASHRAE 90.1-2019.[11] According to PNNL's Energy Savings Analysis of ANSI/ASHRAE/IES Standard 90.1-2019, new commercial buildings meeting the requirements of the standard would experience on average 4.3% energy cost savings when compared to ASHRAE 90.1-2016.[12]

The NORESCO Report anticipates overall, the proposed 2024 State Energy Code is expected to yield 19.5 percent site energy savings and provide a 30-year net present value savings of $10.72 per square foot compared to the current 2020 codes, across all new commercial construction in the State for this code cycle.

Table. Statewide Energy Cost Savings, Incremental Cost, and Lifecycle Cost Savings by Prototype for NORESCO Report

Building Type	First year energy cost savings ($/sf)	Incremental first cost ($/sf)	LCC savings ($/sf)	Societal effects ($/sf)	LCC Savings with societal effects ($/sf)
NYC High-rise Apartment	$0.43	($1.61)	$9.18	$0.60	$9.78

[10]https://www.federalregister.gov/documents/2024/03/06/2024-04717/determination-regarding-energy-efficiency-improvements-in-ansiashraeies-standard-901-2022

[11]*ANSI/ASHRAE/IES Standard 90.1-2022 : Energy Savings Analysis*, U.S. Department of Energy Office of Energy Efficiency & Renewable Energy, February 2024 available at ANSI/ASHRAE/IES Standard 90.1-2022: Energy Savings Analysis (energycodes.gov) at p. vii;

[12] Energy Savings Analysis: ANSI/ASHRAE/IES Standard 90.1-2019 (energycodes.gov)

Building Type	First year energy cost savings ($/sf)	Incremental first cost ($/sf)	LCC savings ($/sf)	Societal effects ($/sf)	LCC Savings with societal effects ($/sf)
High-rise Apartment	$0.60	($0.11)	$11.88	$0.84	$12.72
Mid-rise Apartment	$0.80	$1.46	$13.25	$0.69	$13.94
Large Hotel	$0.60	$3.40	$7.97	$1.25	$9.22
Standalone Retail	$1.05	$1.28	$18.23	$0.88	$19.10
Large Office	$0.45	($2.63)	$13.53	$0.29	$13.82
Secondary School	$0.22	$2.13	$2.26	$0.34	$2.60
Warehouse	$0.28	$3.14	$1.75	$0.33	$2.08
Weighted Average, NYS	$0.53	($0.01)	$10.06	$0.66	$10.72

Cost Effectiveness – Commercial Buildings.

The Energy Code for commercial buildings, as proposed by this rule, will be cost effective when comparing a building constructed to the requirements of 2024 ECCCNYS to a similar building constructed to the requirements of 2020 ECCCNYS. It is anticipated that, according to NORESCO's analyses, based on costs and assumptions, the commercial provisions of the proposed 2024 ECCCNYS are cost effective compared to the 2020 ECCCNYS. Commercial building prototypes studied in the NORESCO Report analyzed the present value of the energy cost savings over 30 years and determined it will exceed the sum of (1) the first costs (i.e., the increase or decrease in the initial costs of construction), (2) present value of the differences in replacement costs over 30 years, plus the present value of the differences in maintenance costs over 30 years.

Table. Cost effectiveness by building type NORESCO Report

Prototype	Construction weights by building type	First year energy cost savings ($/sf)	Incremental first cost ($/sf)	LCC savings ($/sf)
NYC High Rise Apartment	37.7%	$0.43	($1.61)	$9.18
High Rise Apartment	18.3%	$0.60	$0.11	$11.88
Midrise Apartment	8.1%	$0.80	$1.46	$13.25
Large Hotel	7.5%	$0.60	$3.40	$7.97
Standalone Retail	6.9%	$1.05	$1.28	$18.23
Large Office	9.5%	$0.45	($2.63)	$13.53
Secondary School	1.0%	$0.22	$2.13	$2.26
Warehouse	10.9%	$0.28	$3.14	$1.75
Statewide Weighted Average Results	100%	$0.53	($0.01)	$10.06

Life-cycle cost analysis – Commercial Buildings.

Pursuant to Energy Law §11-103(2), in determining that the Energy Code for commercial buildings, as proposed by this rule, will be cost effective (as indicated above), the DOS and the Code Council must consider (1) whether the life-cycle costs for a building will be recovered through savings in energy costs over the design life of the building under a life-cycle cost analysis performed under methodology as established by NYSERDA, and (2) secondary or societal effects, such as reductions in GHG emissions. NYSERDA's methodology considers energy prices, effective useful life, labor and material costs and property tax. For commercial buildings, the methodology considers ownership scenarios, maintenance costs, loan interest rate, income tax rate, and aggregating results. The methodology also considers the societal effects of the value of avoided GHG emissions resulting from changes in electricity and fuel consumption.

This consideration consisted of comparing the first costs (i.e., the increase or decrease in the cost of constructing a building to the requirements of 2024 ECCCNYS compared to the cost of constructing a building to the requirements of 2020 ECCCNYS) to savings in energy costs over the design life of the building under the life-cycle cost analysis performed under methodology established by NYSERDA (21 NYCRR Part 510), including secondary or societal effects (New York State Department of Environmental Conservation's published guidance, [13]).

The NORESCO Report provides the following documentation as a part of their Rulemaking support:

1. An Equivalency Study to (a) provide a determination that the Commercial provisions of the Energy Code are at least as stringent as ASHRAE 90.1-2022 and (b) address the requirements of the Energy Law, Article 11. This study has determined that the Commercial provisions of the Energy Code are as stringent as ASHRAE 90.1-2022.
2. A Cost Effectiveness Study to satisfy (a) the economic impact analysis required by Energy Law §11-103(2), and (b) to determine the continued cost of compliance. This study has determined that 2024 ECCCNYS is cost effective per New York State's requirement for the life-cycle costs analysis.

As in PNNL's previous national analysis, PNNL shared with the national cost data related to the differences in first cost, maintenance cost, and replacement cost over 30 years between ASHRAE 90.1-2016 and ASHRAE 90.1-2022. Note that cost data was only available for two of New York's climate zones: 4A and 5A. Therefore, the cost-effectiveness analysis is limited to two cities: New York City (4A) and Buffalo (5A).[14]

The Cost Effectiveness Rule permits more granular fuel costs, where available. Electricity costs in each New York State climate zone were averaged for residential and commercial electricity prices for the utilities serving each county in the zone. Revenue and sales data were derived from Form EIA-861M's Sales

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[13] NYSDEC Value of Carbon Guidance 2023 Update

[14] Energy Efficiency and Renewable Energy Office, *Determination Regarding Energy Efficiency Improvements in ASNI/ASHRAE/IES Standard 90.1 -2022*, March 2024.

and Revenue data for 2023 (EIA 2024) and then averaged for each zone, based on the utility territory, weighted by population served in each county. Natural gas costs were determined using the 2023-2024 winter small commercial gas tariffs from each utility listed by the New York State Department of Public Service using the same weighted average methodology for the regional costs as electric utilities (National Grid NYC 2023) (ConEd 2023) (Central Hudson 2023) (National Grid Long Island 2023) (NYSEG 2023) (NYSEG 2023) (National Grid Upstate 2023) (ORU 2023) (RG&E 2023) (RG&E 2023) (National Fuel 2024).

Table. Economic Parameters

Parameter	Value	Source
Analysis Period	30 years	NYSERDA Methodology (NYSERDA 2023)
Loan Term	30 years	Same as Analysis Period
Depreciation Term	39 years	IRS Publication 946 (IRS 2012)
Inflation Rate	2.63%	BLS Producer Price Index, new construction (BLS 2022)
Nominal Discount Rate	6.00%	NYSERDA Methodology
Real Discount Rate	3.29%	NYSERDA Methodology
Loan Interest Rate	6.00%	Online Source (RealtyRates 2022)
Overhead and Profit	28.8%	NYSERDA Methodology
Gas Price Escalation Rate	Varies annually	Supplement to NIST 135, Table Ca-1 (Kniefel 2023)
Electricity Price Escalation Rate	Varies annually	Supplement to NIST 135, Table Ca-1
Fuel Price	Table on page 18	EIA and NYS Utilities

Table. Fuel Prices

Fuel Cost	Commercial	Commercial	Residential	Residential
Region	Electricity ($/kWh)	Gas ($/Therm)	Electricity ($/kWh)	Gas ($/Them)
CZ4- NYC	$0.25	$1.31	$0.30	$2.17
CZ4 – Other	$0.20	$1.32	$0.23	$1.83

CZ5	$0.13	$0.81	$0.18	$1.05
CZ6	$0.13	$0.91	$0.17	$1.16

The following table summarizes the societal effects of each building prototype in the NORESCO Report. Avoided GHG emissions were calculated by multiplying the annual building electricity and gas savings by GHG emissions factors published by NYSERDA. The avoided GHG emissions were then converted to annual dollars by following guidance from DEC's *Establishing a Value of Carbon, Guidelines for Use by State Agencies*. A 2 percent discount rate was used and the value of avoided GHG emissions was added to the annual cash flow.

Prototype	LCC savings - no societal benefits ($/sf)	First year emissions savings (lbs CO2e/sf)	Net present value of societal benefits savings ($/sf)	Cost-Effectiveness ($/sf)
NYC High Rise Apartment	$9.18	1.21	$0.60	$9.78
High Rise Apartment	$11.88	1.71	$0.84	$12.72
Midrise Apartment	$13.25	2.42	$0.69	$13.94
Large Hotel	$7.97	2.50	$1.25	$9.22
Standalone Retail	$18.23	3.10	$0.88	$19.10
Large Office	$13.53	1.04	$0.29	$13.82
Secondary School	$2.26	0.99	$0.34	$2.60
Warehouse	$1.75	1.16	$0.33	$2.08
Statewide Weighted Average Results	$10.06	1.60	$0.66	$10.72

<u>Cost Summary by Building Type</u>

The following tables summarize the incremental cost of building components for each prototype impacted by measures in the proposed relative baseline based off the NORESCO Report. Where there were changes, they were costed on an incremental basis, *i.e.*, only those components of a system that provided the increase in performance were costed. The difference between the sum of these component costs is the total incremental cost between baseline and proposed, weighted across climate zones where the prototypes are modeled.

NYC High-rise Apartment Measure Costs

System	Component	Baseline	Proposed
Envelope	Opaque Assembly	$215,384	$202,995
	Fenestration	$579,066	$449,382
	Thermal Bridging Mitigation	$36,700	$47,625
	Air Leakage reduction	$0	$19,465
HVAC	Central System	$1,201,528	$1,002,305
Water Heating	Central System	$101,627	$93,399
Lighting	Interior Lighting	$602,180	$434,419
Clean Energy	PV system	$17,381	$89,085

High-rise Apartment Measure Costs

System	Component	Baseline	Proposed
Envelope	Opaque Assembly	$127,581	$120,645
	Fenestration	$285,861	$223,292
	Thermal Bridging Mitigation	$18,210	$24,500
	Air Leakage reduction	$0	$10,531
HVAC	Central System	$762,589	$643,255
Water Heating	Central System	$54,953	$38,203
Lighting	Interior Lighting	$184,017	$168,679
Clean Energy	PV system	$16,755	$88,444

Mid-rise Apartment Measure Costs

System	Component	Baseline	Proposed
Envelope	Opaque Assembly	$70,850	$70,850
	Fenestration	$49,482	$50,027
	Thermal Bridging Mitigation	$6,907	$10,077
	Air Leakage reduction	$0	$4,365
HVAC	Central System	$201,989	$151,860
Water Heating	Central System	$20,204	$20,204
Lighting	Interior Lighting	$67,250	$45,300
Clean Energy	PV system	$0	$73,462

Large Hotel Measure Costs

System	Component	Baseline	Proposed
Envelope	Opaque Assembly	$579,598	$568,999
	Fenestration	$283,802	$230,370
	Thermal Bridging Mitigation	$17,992	$24,140
	Air Leakage reduction	$0	$13,749
HVAC	Central System	$1,046,650	$1,385,394
Water Heating	Central System	$339,314	$395,247
Lighting	Interior Lighting	$953,958	$771,646
Clean Energy	PV system	$11,995	$234,592

Standalone Retail Measure Costs

System	Component	Baseline	Proposed
Envelope	Opaque Assembly	$282,868	$278,085
	Fenestration	$15,131	$21,901
	Thermal Bridging Mitigation	$6,861	$9,113
	Air Leakage reduction	$0	$4,020

System	Component	Baseline	Proposed
HVAC	Central System	$146,479	$147,023
Water Heating	Central System	$8,695	$7,290
Lighting	Interior Lighting	$244,604	$186,863
Clean Energy	PV system	$8,337	$80,457

Large Office Measure Costs

System	Component	Baseline	Proposed
Envelope	Opaque Assembly	$1419,246	$1,381,780
	Fenestration	$1,268,693	$936,402
	Thermal Bridging Mitigation	$47,321	$60,908
	Air Leakage reduction	$0	$54,292
HVAC	Central System	$2,782,124	$3,120,728
Water Heating	Central System	$126,524	$32,325
Lighting	Interior Lighting	$7,656,156	$6,146,185
Clean Energy	PV system	$18,299	$406,499

Secondary School Measure Costs

System	Component	Baseline	Proposed
Envelope	Opaque Assembly	$601,194	$601,194
	Fenestration	$374,618	$377,813
	Thermal Bridging Mitigation	$21,707	$28,578
	Air Leakage reduction	$0	$19,716
HVAC	Central System	$3,159,363	$3,017,179
Water Heating	Central System	$48,648	$45,672
Lighting	Interior Lighting	$168,312	$121,380
Clean Energy	PV system	$0	$612,571

Warehouse Measure Costs

System	Component	Baseline	Proposed
Envelope	Opaque Assembly	$218,454	$218,454
	Fenestration	$53,608	$53,632
	Thermal Bridging Mitigation	$13,878	$18,792
	Air Leakage reduction	$0	$5,955
HVAC	Central System	$54,586	$67,912
Water Heating	Central System	$2,425	$2,357
Lighting	Interior Lighting	$238,727	$208,816
Clean Energy	PV system	$0	$151,228

Conclusion:

The NORESCO Report concluded the proposed commercial provisions of the proposed 2024 ECCCNYS are cost effective compared to the 2020 ECCCNYS with the 2020 NYC Energy Conservation Code. The costs savings for building owners arise from the reduction in energy consumption and the associated reduction in annual energy costs. Additional savings are derived from the social effects. The Energy Code commercial provisions as proposed by this rule were found to be cost effective under the life-cycle cost analysis performed under methodology as established by NYSERDA as set forth in 21 NYCRR Part 510.

2024 NYS ASHRAE 90.1 achieves energy savings greater than energy savings achieved by the most recently published ASHRAE 90.1 (ASHRAE 90.1 - 2022), in compliance with Energy Law §11-103(2)(b).

Residential Provisions of 2024 ECCCNYS

The studies, reports, and analyses which served as the basis for the part of this proposed rule that applies to residential buildings include:

(1) Notice of Determination. Issued by the United States DOE and published in the Federal Register on July 28, 2021 in 86 Federal Register at 40529.[15] This Notice (hereafter referred to as the "DOE Residential Notice of Determination") indicates that DOE has determined that buildings constructed to the requirements of the 2021 International Energy Conservation Code (2021 IECC) would improve overall energy efficiency in buildings subject to the Energy Code compared to the requirements of the 2018 International Energy Conservation Construction Code (2018 IECC). See 86 Federal Register 40529 (July 28, 2021).

(2) Energy Savings Analysis. 2021 IECC for Residential Buildings. Prepared by PNNL, Richland, WA (V. Robert Salcido, Yan Chen, Yulong Xie, and Z. Todd Taylor, publication date July 2021). According to this most recent national analysis of the IECC, new residential buildings meeting the requirements of the updated code will experience on average, an 8.66 percent energy costs savings over new residential buildings designed to the 2021 IECC. The prototypes selected for this analysis are those used by PNNL in previous New York State specific analyses to determine the cost effectiveness of the IECC for its national and New York State specific analyses.

(3) Resource Refocus Report. Energy Savings and Cost-Effectiveness Analysis of the 2024 New York State Energy Conservation Construction Code, Residential Provisions. Prepared for NYSERDA by Resource Refocus LLC (R. David, N. Heckman, N. Low, S. Naby, and A. LaRue), dated November 2024. The Resource Refocus report includes all combinations of models by building type (single family and low-rise multifamily), electric heating type (electric resistance and heat pump), foundation types (crawlspaces, heated

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[15] https://www.federalregister.gov/documents/2021/07/28/2021-15969/analysis-regarding-energy-efficiency-improvements-in-the-2021-international-energy-conservation-code

basements, unheated basements, and slab foundations) and New York State Climate Zones (4A, 5A, and 6A).

Notice of Analysis. Energy Savings and Cost-Effectiveness Analysis of the 2024 New York State Energy Conservation Construction Code, Residential Provisions. Prepared for NYSERDA by Resource Refocus (R. Davis, N. Heckham, N. Low, S. Naby and A. LaRue).

The 2024 edition of the ECCCNYS was developed as an overlay of the 2024 IECC with additional measures from the 2020 New York State Stretch Energy Code.

The Resource Refocus analyses concluded the updated model code will increase energy efficiency in residential buildings and residential buildings meeting the 2024 ECCCNYS (compared to the previous 2020 ECCCNYS) are expected to incur the following: (1) 43 percent site energy savings, (2) 6 percent increase in energy costs, (3) an $18,921 increase in lifecycle cost per dwelling unit, which results in a 30-year lifecycle savings of $13 per dwelling unit when including the societal benefits of avoided GHG, and (4) GHG reduction of 82 percent.

The Resource Refocus Report included a qualitative assessment of the prescriptive and mandatory residential provisions of the current Energy Code, which is the 2020 ECCCNYS, based on the 2018 IECC residential provisions as modified by New York State, and the proposed residential provisions of the 2024 ECCCNYS. The qualitative assessment includes an evaluation of the expected energy impact of each code change and whether the change will be captured through energy modeling during the *quantitative* analysis. In summary, the code change prohibiting installation of fossil fuel equipment and building systems in low rise residential new construction, taking effect on December 31, 2025, has the largest energy impacts and can be captured using energy modeling in the quantitative analysis.

Secondly, the report produced an overall *quantitative* analysis to assess the stringency and cost-effectiveness of the residential provisions of the proposed 2024 ECCCNYS. The *quantitative* analysis contains:

- A stringency comparison of the residential provisions of the current Energy Code versus the proposed residential provisions of the 2024 ECCCNYS as it applies to the three climate design zones in New York State (4A, 5A, and 6A).
- An assessment of energy cost savings from the proposed residential provisions of the 2024 ECCCNYS over the residential provisions of the current Energy Code calculated in the energy analysis into energy cost savings using average fuel prices for New York State.
- Calculation of the associated incremental construction costs for the requirements of the residential provisions of the proposed 2024 ECCCNYS over the provisions of the current Energy Code.
- Calculating a simple payback 30-year Lifecycle Cost (LCC) savings analysis from the perspective of the homeowner.

Resource Refocus used PNNL draft prototype models to match the specific requirements for the current and proposed residential provisions of the 2024 ECCCNYS in climate design zones 4A, 5A, and 6A. The study utilizes the mandatory and prescriptive provisions of the code in its analyses.

The Resource Refocus Report included residential prototypes modified to match the code requirements and credits of the proposed and baseline codes, including all combinations of models by building type (single family and low-rise multifamily), heating fuel (gas, oil, electric resistance heat, and heat pump) and foundation types (crawlspaces, heated basements, unheated basements, and slab foundations).

The analyses include a qualitative assessment to evaluate anticipated energy impact of code changes proposed by the 2024 ECCCNYS, including a determination of which impacts could be quantified through an energy analysis. The energy savings from the energy analysis were then combined with the incremental construction costs associated with the changes to determine the simple payback, the 30-year life cycle cost (LCC) savings.

<u>Explanation of How Studies Were Used – Residential Buildings</u>. DOS used the Resource Refocus

analyses to determine that the proposed rule will (1) reduce energy use in residential buildings, and (2) assure that the provisions of the Energy Code applicable to residential buildings comply with Title III of the ECPA.

Energy Usage Savings – Residential Buildings. Based on the Resource Refocus analyses, it is anticipated that residential buildings constructed to the requirements of the 2024 ECCCNYS rather than the 2020 ECCCNYS will use approximately 43 percent less energy, on a statewide basis.

Energy Cost – Residential Buildings. Based on the Resource Refocus analyses it is anticipated that the energy costs for residential buildings constructed to the requirements of the 2024 ECCCNYS will be approximately 6 percent higher on a statewide basis than the energy costs for residential buildings constructed to the requirements of the 2020 ECCCNYS.

Cost Effectiveness – Residential Buildings. Based on the Resource Refocus analyses it is anticipated that the Energy Code for residential buildings, as amended by this proposed rule, will be cost effective when considering a 30-year life cycle savings based on societal benefits of avoided GHG. Resource Refocus analyses identified key changes which result in the bulk of the energy savings associated with the updated code:

- Improved efficiency for opaque building thermal envelope assemblies (more stringent specific insulation requirements for ceilings/roof, walls, and floors).
- Improved U-factors and solar heat gain coefficient (SHGC) for fenestration.
- Modified air leakage rate provisions with tighter rates in climate zone 6 and specific requirements for multi-unit testing and small buildings.
- Duct systems required to be installed in conditioned space.
- Heat recovery or energy recovery ventilation system in Climate Zone 6 for dwelling units.

- Separate metering requirement for multi-family dwellings 3-stories or less consistent with the parallel existing requirements for multi-family dwellings 4-stories of more.
- Additional efficiency credit requirements of a minimum of 10 credits earned from a list of options that include more efficient building thermal envelope, HVAC systems, water heating, and lighting, as well as energy efficient appliances, renewable energy, demand response, or renewable energy.
- Limit historic buildings exception to character-defining features of the historic form, fabric, or function of such historic building or historic district.
    - These changes are expected to have a significant and measurable impact on energy efficiency in residential buildings, increase energy savings, and can be reasonably quantified through the established methodology.

Fuel Prices - To estimate electricity costs in each Climate Zone of New York State, average residential electricity prices for all utilities serving each county are pulled from Form EIA-861M's Sales and Revenue data for 2023 and then averaged for each Climate Zone based on the utility territory weighted by population served in each county. Natural gas costs are determined using the 2023-2024 winter residential gas tariffs from each utility listed by the New York State Department of Public Service using the same weighted average methodology for the regional costs as electric utilities. Fuel oil costs are determined using the most recent 2023-2024 heating season weekly prices by region from NYSERDA.

The Tables below shows the fuel prices used for the analyses.

Table. Average New York State Fuel Prices

Climate Zone	Electricity ($/kWh)	Gas ($/therm)	Oil ($/therm)
4A	$0.279	$2.064	$3.269
5A	$0.177	$1.049	$3.261
6A	$0.166	$1.163	$3.186

Table. Average New York State Electricity Prices

Climate Zone	Electricity ($/kWh)
NYC	$0.302
4A	$0.227
5A	$0.177
6A	$0.166

Energy Usage Stringency – Based on the Resource Refocus Report, it is anticipated that residential buildings constructed to the requirements of the 2024 ECCCNYS rather than the 2020 ECCCNYS will use approximately 43 percent less energy, on a state-wide basis.

Energy Cost– Based on the Resource Refocus Report, it is anticipated that the energy costs for residential buildings constructed to the requirements of the 2024 ECCCNYS will be approximately 6 percent higher than the energy costs for residential buildings constructed to the requirements of the 2020 ECCCNYS.

Cost Effectiveness Simple payback – Based on the Resource Refocus Report it is anticipated that the Energy Code for residential buildings, as amended by this proposed rule, will be cost effective.

Net Present Value and Lifecycle Cost savings – The 30-year Lifecycle Cost (LCC) savings analysis found by the report is positive in terms of savings for the homeowner. The 2024 ECCCNYS does not have positive 30-year LLC savings based on the standard calculation, but it does have an LLC when including societal effects from avoided GHG emissions.

Societal Effects: Greenhouse Gas Emissions Savings

The statewide total first-year energy and GHG savings by fuel type are calculated by multiplying annual energy and GHG savings per dwelling unit by the estimated number of annual construction starts by building type and Climate Zone in New York State. The 30-year cumulative energy and GHG savings are calculated by summing the total annual energy and emissions savings over the next 30 years, given the same number of construction starts for each of the three years of the code cycle.

The Resource Refocus Report concludes the GHG savings of the 2024 NYSECCC and Zero Emission New Construction ("ZENC") represent an 82% reduction from the 2020 ECCCNYS and current fuel mix in new construction.

Table. Resource Refocus Report - Annual Average Greenhouse Gas Emissions Savings, 2026-2055

(pounds CO_2e/dwelling unit-year)[a]	Electricity	Fossil Fuels	Total
Single-family	-784	12,103	11,318
Multifamily	-220	4,628	4,409
Total (weighted)	-627	10,020	9,392
(pounds CO_2e/ft^2-year)[a]	Electricity	Fossil Fuels	Total
Single-family	-0.29	4.50	4.21
Multifamily	-0.17	3.55	3.38
Total (weighted)	-0.27	4.35	4.08

Energy Usage Stringency - The results of the energy savings analysis of the proposed residential provisions of the 2024 ECCCNYS over the current Energy Code by end-use at the climate zone and State level are included. These results have been aggregated over the entire set of building types, foundation types, and heating systems using the construction weights matrix. The results show 43 percent site energy savings at the State level as set forth in the following tables.

Table: Site Energy Savings for the Prescriptive and Mandatory Provisions 2024 NYSECCC and ZENC for Single-family Buildings

(kBtu/dwelling unit)	Heating	Cooling	Lighting	Interior Equipment	Fan	DHW	Total Energy
2020 ECCCNYS	51,521	5,639	4,930	37,059	3,660	14,781	117,591
2024 NYSECCC/ZENC	20,127	4,396	4,635	29,279	5,834	2,287	66,557
($kBtu/ft^2$)	Heating	Cooling	Lighting	Interior Equipment	Fan	DHW	Total Energy
2020 ECCCNYS	19.2	2.1	1.8	13.8	1.4	5.5	43.7
2024 NYSECCC/ZENC	7.5	1.6	1.7	10.9	2.2	0.9	24.8
Savings (%)	61%	22%	6%	21%	-59%	85%	43%

Table: Site Energy Savings for the Prescriptive and Mandatory Provisions of 2024 NYSECCC and ZENC for Multifamily Buildings

(kBtu/dwelling unit)	Heating	Cooling	Lighting	Interior Equipment	Fan	DHW	Total Energy
2020 ECCCNYS	13,677	3,166	3,709	22,953	1,558	11,094	56,155
2024 NYSECCC/ZENC	7,186	2,284	3,062	17,562	2,761	1,611	34,466
(kBtu/ft^2)	Heating	Cooling	Lighting	Interior Equipment	Fan	DHW	Total Energy
2020 ECCCNYS	10.5	2.4	2.8	17.6	1.2	8.5	43.0
2024 NYSECCC/ZENC	5.5	1.8	2.3	13.5	2.1	1.2	26.4
Savings (%)	47%	28%	17%	23%	-77%	85%	39%

Table: Weighted Average Site Energy Savings for the Prescriptive and Mandatory Provisions of 2024 NYSECCC and ZENC

(kBtu/dwelling unit)	Heating	Cooling	Lighting	Interior Equipment	Fan	DHW	Total Energy
2020 ECCCNYS	40,973	4,950	4,590	33,127	3,074	13,754	100,468
2024 NYSECCC/ZENC	16,520	3,807	4,196	26,013	4,977	2,099	57,613
(kBtu/ft^2)	Heating	Cooling	Lighting	Interior Equipment	Fan	DHW	Total Energy
2020 ECCCNYS	17.8	2.1	2.0	14.4	1.3	6.0	43.6
2024 NYSECCC/ZENC	7.2	1.7	1.8	11.3	2.2	0.9	25.0
Savings (%)	60%	23%	9%	21%	-62%	85%	43%

Energy Cost Savings. The energy cost savings from the proposed residential provisions of the 2024 ECCCNYS over the current Energy Code by fuel type at the climate zone and State level are included below. These results have been aggregated over the entire set of building types, foundation types, and heating systems using the construction weights matrix.

In summary, the Resource Refocus Report shows a 6 percent energy cost increase at the State level as set forth in the Tables below:

Table: Annual Energy Cost Savings of the Prescriptive and Mandatory Provisions of 2024 NYSECCC and ZENC for Single-family Buildings

($/dwelling unit-year)	Electricity Cost	Natural Gas Cost	Fuel Oil Cost	Total Cost
2020 ECCCNYS	$2,467	$896	$0	$3,362

2024 NYSECCC	$3,624	—	—	$3,624
($/ft^2-year)	Electricity Cost	Natural Gas Cost	Fuel Oil Cost	Total Cost
2020 ECCCNYS	$0.92	$0.33	$0.00	$1.25
2024 NYSECCC	$1.35	—	—	$1.35
Savings (%)[a]	-47%	100%	N/A	-8%

Table: Annual Energy Cost Savings of the Prescriptive and Mandatory Provisions of 2024 NYSECCC for Multifamily Buildings

($/dwelling unit-year)	Electricity Cost	Natural Gas Cost	Fuel Oil Cost	Total Cost
2020 ECCCNYS	$1,729	$374	$2	$2,105
2024 NYSECCC	$2,093	—	—	$2,093
($/ft^2-year)	Electricity Cost	Natural Gas Cost	Fuel Oil Cost	Total Cost
2020 ECCCNYS	$1.32	$0.29	$0.00	$1.61
2024 NYSECCC	$1.60	—	—	$1.60
Savings (%)[a]	-21%	100%	100%	1%

Table: Weighted Average Annual Energy Cost Savings of the Prescriptive and Mandatory Provisions of 2024 NYSECCC

($/dwelling unit-year)	Electricity Cost	Natural Gas Cost	Fuel Oil Cost	Total Cost
2020 ECCCNYS	$2,261	$750	$0	$3,012
2024 NYSECCC	$3,197	—	—	$3,197
($/ft^2-year)	Electricity Cost	Natural Gas Cost	Fuel Oil Cost	Total Cost
2020 ECCCNYS	$0.98	$0.33	$0.00	$1.31
2024 NYSECCC	$1.39	—	—	$1.39
Savings (%)[a]	-41%	100%	100%	-6%

Simple Payback. The following Tables show the weighted average annual energy cost savings, the associated total incremental costs, and the resulting simple payback from the Resource Refocus Report.

Table. Simple Payback and Net Present Value

Building Type	Total Cost Savings ($/year)[a]	Incremental Cost ($)	Simple Payback (years)	10-Year NPV ($)	10-Year NPV minus Incremental Cost ($)[a]
Single-family	-$262	$6,008	N/A	$2,872	-$3,136
Multifamily	$12	$2,156	181.4	$1,199	-$957
All	-$186	$4,934	N/A	$2,405	-$2,529

30-year Life Cycle Cost (LCC) Savings. The table below summarizes the Lifecycle Cost (LCC) savings of the proposed residential provisions of the 2024 ECCCNYS over the current Energy Code at the climate zone and State level. The results have been aggregated over the entire set of building types, foundation types, and heating systems using the construction weights matrix. The residential provisions of the proposed 2024 ECCCNYS are found to be cost-effective for the homeowner and yield positive savings over the life of the dwelling.

Table. Summarized Average 30-Year Cost Effectiveness

Building Type	LCC savings ($/ft^2)[a]	Societal effects ($/ft^2)[b]	LCC savings with societal effects ($/ft^2)[a]	LCC savings ($/dwelling unit)[a]	Societal effects ($/ft^2)[b]	LCC savings with societal effects ($/dwelling unit)[a]
Single-family	-$8.51	$8.48	-$0.03	-$22,881	$22,807	-$74
Multifamily	-$6.64	$6.82	$0.18	-$8,670	$8,908	$238
All	-$8.22	$8.22	$0.01	-$18,920	$18,933	$13

Conclusion:

The prescriptive and mandatory elements of the residential provisions of the 2024 ECCCNYS combined with the impact of ZENC are expected to yield positive energy savings over the baseline 2020 ECCCNYS and current distributions of fuel types used in new construction. Statewide, the weighted average savings (based on an assumed package of credit measures) results in a 43% reduction in annual site energy and 82% reduction in lifetime GHG emissions but a 6% increase in annual energy cost compared to the baseline code and fuel mix. The 2024 ECCCNYS and ZENC result in a statewide 30-year life cycle cost of $18,920 per dwelling unit. However, the 2024 ECCCNYS and ZENC result in a statewide 30-year life cycle savings of $13 per dwelling unit when including the societal benefits of avoided GHG in the analysis.

NORESCO/Resource Refocus Analysis Summary

Model #1**:** This Model compares 2024 ECCCNYS to 2020 ECCCNYS plus the 2020 NYC Energy Conservation Code and local laws as the baseline in New York City.

Moving to the proposed 2024 ECCCNYS is cost-effective for both residential and commercial buildings in New York State and will provide statewide energy savings of 18.6% compared to the current 2020 ECCCNYS. The 2024 ECCCNYS will provide statewide site energy savings of 19.5% for commercial buildings and 17.0% for residential buildings compared to the current Energy Code. Where decarbonization is mandated outside of the Energy Code, both the baseline and proposed conditions are modified. The 2020 New York City Energy Conservation Code and local laws are the baseline in New York City. The average household will save $594 on annual utility bills. Similarly, commercial buildings will save an average of $69,371 in annual utility bills. Assuming a three-year code cycle, the 2024 ECCCNYS will reduce statewide CO_2e emissions over 30 years by 604,657 metric tons and will save $308,000 statewide at Year-1 in societal effects from the emissions reduction. Adopting the 2024 ECCCNYS in New York State is expected to result in buildings that are energy efficient, more affordable to own and operate, and based on current industry standards for health, comfort, and resilience.

The expected statewide energy impact of updating to the 2024 ECCCNYS is shown in the table below and is based on metrics established by the New York State Energy Law and 21 NYCRR Part 510, consistent with the U.S. DOE methodology for evaluation of changes to the Energy Code.

Table. Summary of 2024 ECCCNYS Impact Compared to 2020 ECCCNYS

2024 NYS ECCC Impact	Commercial	Residential*	Total
First Year Statewide Energy			
Electric Savings, MWh	50,190	36,536	86,726
Fossil Fuel Savings, MMBTU	63,421	0	63,421
CO_2e Emission Savings, Metric Tons	18,150	12,075	30,225
30-Year Cumulative Statewide Energy			
Electric Savings, MWh	4,366,528	3,178,605	7,545,134
Fossil Fuel Savings, MMBTU	5,517,597	0	5,517,597

CO_2e Emission Savings, Metric Tons	382,868	221,790	604,657
Life-Cycle Benefits			
Incremental Construction Cost, $/sf	$(0.01)	$2.33	$0.86
Annual Energy Cost Savings, $/sf	$0.53	$0.26	$0.43
Savings, No Societal Cost $/sf	$10.06	$2.05	$7.10
Societal Cost Savings $/sf	$0.66	$0.45	$0.58
Life-Cycle Energy and Societal Cost Savings, $/sf	$10.72	$2.50	$7.68

*Three stories or less, as defined in the ECCCNYS

Model #2: This Model compares the 2024 ECCCNYS to 2020 ECCCNYS

Moving to the proposed 2024 ECCCNYS is cost-effective for both residential and commercial buildings in New York State and will provide statewide energy savings of 21% compared to the current 2020 ECCCNYS. The 2024 ECCCNYS will provide statewide energy savings of 24.2% for commercial buildings and 16.3% for residential buildings compared to the current Energy Code. Where decarbonization is mandated outside of the Energy Code, both the baseline and proposed conditions are modified. The average household will save $605 on annual utility bills. Similarly, commercial buildings will save an average of $79,974 in annual utility bills. Assuming a three-year code cycle the 2024 ECCCNYS will reduce statewide CO_2e emissions over 30 years by 1.3 million metric tons and will save $435 hundred thousand statewide in societal effects from the emissions reduction. Adopting the 2024 ECCCNYS in New York State is expected to result in buildings that are energy efficient, more affordable to own and operate, and based on current industry standards for health, comfort, and resilience.

The expected statewide energy impact of updating to the 2024 ECCCNYS is shown in the table below and is based on metrics established by the New York State Energy Law and 21 NYCRR Part 510, consistent with the U.S. DOE methodology for evaluation of changes to the Energy Code.

Table. Summary of 2024 ECCCNYS Impact Compared to 2020 ECCCNYS

2024 NYS ECCC Impact	Commercial	Residential*	Total
First Year Statewide Energy			

Electric Savings, MWh	49,371	36,911	86,282
Fossil Fuel Savings, MMBTU	148,384	0	148,384
CO_2e Emission Savings, Metric Tons	24,316	12,218	36,535
30-Year Cumulative Statewide Energy			
Electric Savings, MWh	4,295,271	3,211,299	7,506,570
Fossil Fuel Savings, MMBTU	12,909,434	0	12,909,434
CO_2e Emission Savings, Metric Tons	1,166,221	224,153	1,390,374
Life-Cycle Benefits			
Incremental Construction Cost, $/sf	$(0.17)	$1.99	$0.63
Annual Energy Cost Savings, $/sf	$0.58	$0.26	$0.46
Savings, No Societal Cost $/sf	$10.42	$2.61	$7.53
Societal Cost Savings $/sf	$1.10	$0.40	$0.84
Life-Cycle Energy and Societal Cost Savings, $/sf	$11.52	$3.01	$8.37

*Three stories or less, as defined in the ECCCNYS

SIGNIFICANT CHANGES

Some of the more significant changes to the Energy Code to be implemented by this proposed rule, and the needs and benefits, costs, and alternatives associated with these changes, are as follows:

SIGNIFICANT CHANGES TO COMMERCIAL AND RESIDENTIAL BUILDINGS

1. Fossil-fuel equipment and building systems prohibition in new buildings.[16]

19 NYCRR Section 1240.6

Origin: Energy Law §11-104(6), (7)

Description of Change

This code amendment prohibits the installation of fossil-fuel equipment and building systems, with some exceptions, in new buildings: (a) not more than seven stories above grade plane height, except for a new commercial or industrial building greater than one hundred thousand square feet in conditioned floor area, for which a substantially complete building permit application for the initial construction of such building is submitted on or after December 31, 2025: or (b) for which a substantially complete building permit application for the initial construction of such building is submitted after December 31, 2028 (Energy Law §11-104(6)(b), (7)). Such prohibition shall not apply to buildings existing prior to the effective date of the applicable prohibition, including to: (1) the repair, alteration, addition, relocation, or change of occupancy or use of such buildings; and (2) the installation or continued use and maintenance of fossil-fuel equipment and building systems, including as related to cooking equipment, in any such buildings [Energy Law §11-104(7)(a)].

Needs and Benefits

The prohibition on fossil-fuel equipment and building systems shifts energy use from fossil fuel end

[16] Corresponding provisions are proposed to be added to the Uniform Code by a separate Notice of Proposed Rule Making.

uses such as gas furnaces and gas water heaters to heat pump heating and cooling. This fuel shift provides energy savings, as heat pumps are often at least three times more energy efficient than their gas counterparts, but not necessarily energy cost savings, as the cost per unit energy for electricity is four to five times higher than the cost per unit energy for natural gas in New York State, depending on the region. Upfront costs of equipment for a heat pump are higher than a fossil-fuel powered furnace or boiler. Installation costs are approximately $200-$500 more than an equivalently sized air conditioner and cost effectiveness depends on the efficiency of the equipment installed as well as the efficiency of the building thermal envelope.[17] Whether installing a heat pump instead of a fossil-fuel fired appliance will benefit consumers economically in the long term depends on several factors, including regional climate variations and building type. Other economic factors include whether space cooling is being installed simultaneously, the installed cost of the electric appliances themselves, and the relative costs of electricity compared with fossil fuel options.[18] The ideal opportunity for the installation of heat pumps is in new buildings where other energy-efficiency measures, such as more efficient building thermal envelopes, can be leveraged.[19] Nevertheless, nationwide peer-reviewed research has documented that the replacement of fossil-fuel heating equipment in existing buildings with a cold climate heat pump could save households $1,500 annually on average, with savings being highest for homes currently using heating oil, propane, or older electric equipment.[20]

A 2024 nationwide study found that when health costs associated with burning fossil fuels and social cost of GHG emissions are included, electrifying space heating yields over $20,000 to $25,000 in benefits per

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[17]Heat pumps for all? Distributions of the costs and benefits of residential air-source heat pumps in the United States. Wilson, E. Munankarmi, P., Less, B., Reyna, J., Rothgeb, S. 50 Joule. Volume 8, Issue 4

[18] *Beneficial Electrification of Space Heating.* Shipley J., Lazar J., Fansworth D., and Kadoch C.. (The Regulatory Assistance Project). November 2018.

[19] *Beneficial Electrification of Space Heating.* Shipley J., Lazar J., Fansworth D., and Kadoch C.. (The Regulatory Assistance Project). November 2018.

[20]Results in Michigan with similar climate zones as NYS. *For Most Americans, A Heat Pump Can Lower Bills Right Now.* DOE Office of Policy. February 2024. https://www.energy.gov/policy/articles/most-americans-heat-pump-can-lower-bills-right-now

household, while benefits increase about $9,000 to $10,000 for electrifying water heating.[21] Some of the benefits, about $500 for water heating and few $1,000 for space heating, are due to the reduced health costs of lower air pollution but most of the benefits come from avoided costs of climate change.[22] Full electrification is the most beneficial option, reducing costs by about $10,000 relative to electrifying space heating alone.[23]

Electrification of buildings is critical to meet the State's GHG emissions limits under the Climate Act. Electrification is the primary proven strategy to decarbonize space heating, water heating and several other common home energy needs.[24] Electrification of space and water heating with high-efficiency heat pumps is a viable approach to decarbonizing operations for nearly all types of buildings in New York.[25] Modern heat pumps that work in very cold weather are commercially available and able to keep homes and businesses safe and comfortable year-round, as long as they are properly chosen, sized, installed by appropriately trained workers, and paired with an energy-efficient building envelope and HVAC system design.[26]

Critics of the prohibition on fossil-fuel equipment and building systems in new buildings claim the prohibition is premature and the electrical grid does not have the capacity to handle the increase in demand that will come from new buildings installing heat pumps instead of furnaces and boilers. The New York State Independent System Operator (NYISO) projects an increase in electric energy consumption of roughly 50 to 90% over the next 20 years.[27] This increase is largely driven by the electrification of essential energy-consuming

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[21] *The Value of Prioritizing Equitable, Efficient Building Electrification*, American Council for Energy-Efficient Economy (ACEEE) (May 2024) p. 15.

[22] *The Value of Prioritizing Equitable, Efficient Building Electrification*, American Council for Energy-Efficient Economy (ACEEE) (May 2024) p. 15.

[23] *The Value of Prioritizing Equitable, Efficient Building Electrification*, American Council for Energy-Efficient Economy (ACEEE) (May 2024) p. v.

[24] *The Value of Prioritizing Equitable, Efficient Building Electrification*, American Council for Energy-Efficient Economy (ACEEE) (May 2024) p. 1.

[25] *Scoping Plan Full Report*, Climate Action Council (December 2022) p. 176.

[26] *Scoping Plan Full Report*, Climate Action Council (December 2022) p. 176.

[27] *2023-2042 System and Resource Outlook*, New York Independent System Operator (July 23, 2024) p. 5

systems, primarily building heating and electric vehicle charging. [28] The increase in demand is anticipated to be alleviated by additional clean energy electricity capacity coming onto the grid in the coming years, from projects such as the Champlain Hudson Power Express, and large offshore wind projects.

Critics of the prohibition also claim the upfront cost of heat pumps and geothermal systems are higher than those of traditional fossil-fuel equipment and building systems such as furnaces and boilers. For the most part this is true, however, in 2022, New York enacted a State Geothermal Income Tax Credit equal to 25% of geothermal system expenditures up to $5,000 for owner-occupied homes.[29]

Cost

The estimated costs of this proposal for single and low rise residential is between $4,500 and $30,000 and for commercial the estimated costs are between $20,000 and $200,000. The average cost of a residential propane boiler is between $3,300 and $9,800, the average cost of a residential oil boiler is between $4,400 and $9,000 and the average cost of a residential natural gas boiler is between $3,900 and $11,000.[30] The range in costs are due to differences in building type, building size, and building location.

According to the CAC Final Scoping Plan, air source and ground source heat pumps are generally more expensive than fossil fuel boilers and furnaces, and the Scoping Plan provides:

> "For example, for an older single-family home that is otherwise in good condition, the average installed cost for a heat pump for whole-home space heating and cooling paired with an air sealing and insulation upgrade is estimated to be about $21,000 for a cold climate air source heat pump (ASHP) and $40,000 for a ground source heat pump (GSHP) system (before available rebates

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[28] *2023-2042 System and Resource Outlook*, New York Independent System Operator (July 23, 2024) p. 5

[29] Geothermal Energy System Credit (ny.gov)

[30] Bartolone, Ginny. *How Much Does Boiler Installation and Replacement Cost in 2024?* Forbes, How Much Is A New Boiler In 2024? – Forbes Home

and tax credits), as compared with roughly $10,000 or less to replace a fossil fuel boiler/furnace and air conditioner (with no envelope work)."[31]

For new construction, the February 2021 report *Home Innovation Research Labs Cost and Other Implications of Electrification Policies on Residential Construction* prepared for the National Association of Home Builders provides:

"The upfront additional cost of an electric house with a high efficiency inverter heat pump and 80-gallon heat pump water heater (3.75 UEF) compared to a baseline gas house (minimum efficiency natural gas equipment) for a cold climate, the additional cost ranges from $10,524 (19 SEER/10 HSPF inverter heat pump system rated down to -13 degrees F) to $11,803 (20 SEER/13 HSPF inverter heat pump system)."[32]

Accordingly, the estimated additional cost for the installation of heat pumps is between $10,524 (lower efficiency heat pump) and $11,803 (higher efficiency heat pump), for an average estimate of $11,164.

Alternative

An alternative is to not adopt any provisions addressing the fossil-fuel equipment and building systems prohibition in new buildings. This alternative does not comply with Energy Law §11-104, as amended by Part RR of Chapter 56 of the Laws of 2023, which requires the Energy Code to prohibit the installation of fossil-fuel equipment and building systems in any new building not more than seven stories in height, except for a new commercial or industrial building greater than 100,000 square feet in conditioned floor area, on or after December 31, 2025, and prohibits the installation of fossil-fuel equipment and building systems, in all new

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[31] https://climate.ny.gov/Resources/-/media/project/climate/files/Chapter12Buildings.pdf, p. 193 of Chapter 12.

[32] https://www.nahb.org/-/media/NAHB/nahb-community/docs/committees/construction-codes-and-standards-committee/home-innovation-electrification-report-2021.pdf; *see* p. iii of the Executive Summary.

buildings after December 31, 2028, with certain exceptions.

Another alternative is to delay the implementation of the prohibition until later dates. This alternative also does not comply with Energy Law §11-104, as amended by Part RR of Chapter 56 of the Laws of 2023, which contains specific prohibition dates of December 31, 2025 for any new building not more than seven stories in height, except for a new commercial or industrial building greater than 100,000 square feet in conditioned floor area, and December 31, 2028 for all new buildings, with certain exceptions. Absent a statutory amendment, DOS and the Code Council are not authorized to delay the prohibition dates set forth in the Energy Law.

2. More restrictive building thermal envelope requirements.

ECCCNYS Sections C402, R402

Origin: 2024 IECC and NYStretch

Description of Change

The proposed code amendment increases energy efficiency for assembly U-Factors, R-Values, and Fenestration efficiency. It also imposes new mandatory air leakage testing requirements for certain commercial buildings that is consistent with the provisions applicable to residential buildings.

Needs and Benefits

The building thermal envelope includes basement walls, exterior walls, floors, roofs, and any other building element that separates conditioned space from unconditioned space.[33] Increasing the efficiency of the building thermal envelope is an important part of the purpose of every code update, not only at the State level but also at the model code level. The increased efficiency levels in the proposed code are largely consistent with

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[33] See *ECCCNYS.*

the efficiency improvements of the model codes, with additional efficiency increases based on NYStretch 2020 to the requirements for roof, wall, and heated slab insulation values, consistent with the requirements of Energy Law §11-103(2)(b). The building thermal envelope is the most critical aspect of the energy efficiency of the building with the longest useful life and the most challenging to retrofit in the future. Additionally, failure to meet the requirements of the energy code can lead to ice damming (in colder climates), mold and moisture problems, and indoor air quality issues. Meeting the requirements of the code can increase durability of the building envelope components, increase indoor air quality, and assist the builder in complying with health/life safety codes.[34] Increased energy efficiency leads to lower operating costs for buildings.

Cost

For the commercial provisions, the opaque envelope insulation requirements in the national model code did not change. The cost for opaque assembly requirements is in the following table:

Prototype	Walls	Roofs
NYC High-rise Apartment	$164,328	$38,667
High-rise Apartment	$82,256	$38,389
Mid-rise Apartment	$38,964	$31,886
Large Hotel	$464,499	$92,117
Standalone Retail	$174,404	$103,681
Large Office	$1,190,911	$176,419
Secondary School	$122,070	$479,123
Warehouse	$109,749	$108,705

The fenestration performance has been improved in the proposed code. Due to typical cost sources, such as RSMeans, providing insufficient detail for the fenestration performances in this analysis, current fenestration cost survey data from the Façade Tectonics Institute (FTI) were used.[35] The costs for the insulated glazing unit

[34] *Building Energy Codes: Creating Safe, Resilient, and Energy-Efficient Homes*. Institute for Market Transformation, July 2013. pg.3

[35] Component costs were analyzed using an adaptation of the National Fenestration Rating Council (NFRC 2024) Component Modeling Approach, where performance – and, here, cost – for selected technologies was built up, piecewise. See summary (Benney n.d.) for application in codes and standards. Overhead and profit was applied globally. Cost updates were from the FTI's cost data shared during the 2024 IECC development cycle.

technologies are applicable to all fenestration, though the survey was limited to metal-framed commercial applications (curtainwall, window-wall).

Without multipliers to lower the frame costs to represent smaller and non-metal windows, it should be noted that fenestration incremental costs could be elevated relative to installed costs. However, that additional cost is in both baseline and proposed cases, so it cancels in the incremental analysis. Both baseline and proposed vertical fenestration is built up from a double-pane clear reference. Performance and costs associated with necessary additional technologies are incremental, but the reference window cost cancels in the analysis. Because the changes to fenestration performance are not extreme, technology needed to meet the prescriptive minimum does not necessarily differ between cases. That is, the lowest cost window might be common to multiple minimum performances.

For proposed vertical fenestration and skylights, the frame is assumed to be thermally broken metal. Vertical fenestration was priced with the necessary selection of technologies to achieve a given prescriptive performance: low-e coatings, improved spacers, and argon fills.

Prototype	Baseline	Proposed
NYC High-rise Apartment	$579,066	$449,382
High-rise Apartment	$285,861	$223,292
Mid-rise Apartment	$49,482	$50,027
Large Hotel	$283,802	$230,370
Standalone Retail	$15,131	$21,901
Large Office	$1,268,693	$936,402
Secondary School	$374,618	$377,813
Warehouse	$53,608	$53,632

The baseline has air leakage control requirements based on the 90.1-2016 with New York State amendments, but testing is not mandatory. The total building leakage rate dropped from 0.4 cubic feet *per* minute *per* square foot at a pressure difference of 75 Pascals in the baseline to 0.35 cfm/sf in the proposed case, with leakage testing. Leakage in the baseline is assumed to use the deemed to comply materials and assemblies lists in 90.1. Primarily, the air leakage reduction is a result of attention to detail in current designs and installation of materials.

Air leakage testing is less expensive for a lower leakage threshold because less fan power is required to achieve the pressure differential, which means smaller equipment and lower costs to transport the equipment. The real-world cost of this measure depends on the testing approach and schedule. Large buildings can be tested as whole buildings or in sections. Multiple mobilizations of testing contractors are more expensive but often better align with phased completion of the rest of the build out.

Cost estimates are based on PNNL ‘s Envelope Air Tightness for Commercial Buildings (Hart, Nambiar, et al. 2018) research, ongoing research at the ASHRAE 90.1 Envelope Subcommittee Air Leakage Working Group, and the professional experience of the consultants who provided the reports.

Cost estimates for the air leakage measure are in the table below:

Table. Air Leakage Reduction Costs

Prototype	Baseline	Proposed
NYC High-rise Apartment	$0	$19,465
High-rise Apartment	$0	$10,531
Mid-rise Apartment	$0	$4,365
Large Hotel	$0	$13,749
Standalone Retail	$0	$4,020
Large Office	$0	$54,292
Secondary School	$0	$19,716
Warehouse	$0	$5,955

<u>Alternative</u>

An alternative is to retain without increasing the building thermal envelope efficiency values of the current code. This alternative was rejected because without improved efficiency, the burden to the State to update the Energy Code and the burden to regulated parties to adapt to the new code is unmitigated and would not comply with Energy Law §11-103(2)(a).

Another alternative is to increase minimum stringency required. This alternative was rejected because it would impose unreasonable requirements on regulated parties and was not proven to be cost-effective as required pursuant to Energy Law §11-103(2).

A third alternative is to decrease minimum stringency required. This alternative was rejected, not only for the reasons stated in the first alternative but also, because it would be a less restrictive requirement than the model codes, placing the State at a competitive disadvantage for federal code adoption and implementation grants. It would also hinder the State from fulfilling its obligation to certify to the U.S. DOE that it has adopted an Energy Code that is at least as stringent as the national model codes.

The last alternative considered was to include different thermal envelope requirement based upon building use classification. This alternative was rejected because it deviates fundamentally from how both model codes (IECC and ASHRAE 90.1) develop and establish these requirements. These requirements are based on recorded weather data, material properties and their tested efficiencies, and other data. There currently is not well established and reliable data to suggest that the material properties and associated efficiencies of building materials will yield different energy efficiencies in different occupancies or use classifications.

3. Eight counties that were previously in Climate Zone 6 are now in Climate Zone 5.

ECCCNYS Sections C301.1 and R301.1

Origin: 2024 IECC

Description of Change

This proposed code amendment makes changes to the Climate Zone designations in Tables C301.1 and R301.1. The weather data recording the number of heating degree days in each county across the nation is maintained by ANSI/ASHRAE Standard 169, *Climatic Data for Building Design Standards.* That number of degree days is matched to Tables C303.1(1) and R301.1(1) of the IECC to determine the appropriate Climate Zone. The data trends for recent years show that consistently higher temperatures have resulted in fewer heating degree days in these counties as documented in the 2021 version of ANSI/ASHRAE Standard 169. The impacted counties were previously in Climate Zone 6 and are now in Climate Zone 5; they are as follows: Allegany, Broome, Cattaraugus, Schoharie, Schuyler, Steuben, Tompkins, and Wyoming.[36] The main direct impact of this change is more lenient minimum building thermal envelope requirements in these counties than historically required.

Needs and Benefits

ANSI/ASHRAE Standard 169, *Climatic Data for Building Design Standards,* serves as a comprehensive source of climate data for those involved in building design and provides a variety of climatic information for designing, planning, and sizing building energy systems and equipment.[37] The standard provides dry-bulb, dew point, and wet-bulb temperature; enthalpy; humidity ration; wind conditions; solar irradiation; latitude; longitude; and elevation for locations worldwide. Standard 169 also includes statistical data, such as mean temperatures; daily ranges; degree hours; and seasonal percentages within ranges of temperatures.[38] The different requirements applicable to different Climate Zones are based on this data and aim to result in cost-effective energy efficiency.

Cost

There will be a range of costs associated with the varying code requirements associated with Climate Zone 5 instead of Climate Zone 6. Accordingly, new buildings within the eight counties identified above would

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[36] *ANSI/ASHRAE Addendum a to ANSI/ASHRAE Standard 169-2020 – Climatic Data for Building Design Standards* (October 29, 2021) p. 92-95.

[37] ASHRAE Weather Data Center. https://www.ashrae.org/technical-resources/bookstore/weather-data-center (Last viewed Sept 30, 2024)

[38] ASHRAE Weather Data Center. https://www.ashrae.org/technical-resources/bookstore/weather-data-center (Last viewed Sept 30, 2024)

see a decrease in the cost of construction based on the new designation; however, that decrease is offset by the increased requirements in the code update.

Alternative

An alternative is to retain the current climate zone designations, leaving Allegany, Broome, Cattaraugus, Schoharie, Schuyler, Steuben, Tompkins, and Wyoming counties in Climate Zone 6. This alternative was rejected because it would result in the climate zone designations being out of alignment with recent climate data and imposing stricter requirements in those counties that are not supported by current data.

4. Additional efficiency credits for new buildings and existing buildings following the prescriptive compliance path.
ECCCNYS Sections C406 and R408

Origin: 2024 IECC

Description of Change

Additional efficiency credits for new buildings and existing buildings chosen from a list of options. New commercial buildings and alterations that are substantial improvements must earn a minimum number of credits, based on climate zone, occupancy, and size, with 50% of the required credits applying to additions. New residential buildings must earn a minimum of 10 or 15 credits, depending on size, additions must earn a minimum of 5 credits, and alterations that are substantial improvements (e.g. 50 percent of market value) must earn 3 credits.

Needs and Benefits

Compliance with the proposed code requires projects to achieve credits based on additional energy efficiency measures. Required energy credit totals and the number of credits earned for a specific measure vary by building occupancy to reflect the energy savings achieved for a given measure. For example, residential occupancies earn more credits than an office occupancy for efficient water heating, storage, and distribution, because they use more hot water.

It is not feasible to model every combination of credits that could be used to meet the requirements. A package of credit measures was created to achieve the points total for each prototype (based on the prototype occupancy). Credit selection was informed by the number of available credit points and likelihood of the measure being used in an actual building of the given type. A typical and financially reasonable package of credits was chosen for each building and climate. The energy credits included in the cost analysis briefly are described below. Additional detail has been provided in subsequent sections.

Table. Energy Credits Modeled for Each Prototype

Efficiency Credits	Energy Credits Modeled							
Applicable measures for modeled building types.	NYC High-rise Apartment	High-rise Apartment	Mid-rise Apartment	Large Hotel	Standalone Retail	Large Office	Secondary School	Warehouse
E01 Envelope performance				X				
W08 SHW distribution sizing	X	X	X					
H02 Heating efficiency	X	X	X	X	X	X	X	X
H03 Cooling efficiency	X	X	X	X	X	X	X	X
L02 Lighting dimming and tuning				X	X	X	X	
L03 Increase occupancy sensor				X	X	X	X	X
L05 Residential lighting control	X	X	X					
L06 Lighting power reduction	X	X	X	X	X	X	X	X
R01 Renewable energy	X	X	X	X	X	X	X	

- Envelope Performance – Decreases overall envelope load to be satisfied by space conditioning equipment through lower thermal transmission across a selection of assemblies.
- Efficient space heating and cooling equipment adds a 10 percent efficiency improvement.
- Residential Lighting Control – In the apartment prototypes this is an additional master switch in an existing gang for each dwelling unit.

- Lighting Dimming and Tuning, and Power Reduction – This measure contributes to lower lighting energy use. Cost development discussed in a dedicated section below.

Cost

As previously noted, there will be a range of costs depending on the options selected to meet the efficiency credit requirements. Cost estimates for the options selected for this analysis are in the table below and were developed using RS Means, market research, the methodology used in the NORESCO report, and professional field experience.

Table. Energy Credit Costs

CZ	Prototype	$/sf *	$/sf **	Total $/sf	Weight
4A	NYC high-rise apt	$0.91	$0.96	$1.87	37.70%
4A	Highrise apt	$1.03	$0.96	$1.99	17.40%
4A	Midrise apt	$1.15	$0.96	$2.12	0
4A	Large Hotel	-$1.13	$1.67	$0.54	5.10%
4A	Standalone Retail	-$1.44	$1.15	-$0.30	4.40%
4A	Large Office	-$2.03	$1.06	-$0.98	9.50%
4A	Secondary School	-$0.06	$1.20	$1.14	0
4A	Warehouse	-$0.79	$0.71	-$0.08	0
5A	NYC high-rise apt	N/A	N/A	N/A	N/A
5A	Highrise apt	$1.03	$0.92	$1.95	0.80%
5A	Midrise apt	$1.15	$0.92	$2.07	7.00%
5A	Large Hotel	-$1.13	$1.34	$0.21	1.80%
5A	Standalone Retail	-$1.44	$1.15	-$0.29	2.10%
5A	Large Office	-$1.67	$1.09	-$0.57	0.00%
5A	Secondary School	-$0.06	$1.17	$1.11	0.90%
5A	Warehouse	-$0.79	$0.69	-$0.10	9.80%
6A	NYC high-rise apt	N/A	N/A	N/A	N/A
6A	Highrise apt	$1.03	$0.83	$1.86	0
6A	Midrise apt	$1.15	$0.83	$1.99	1.10%
6A	Large Hotel	-$1.13	$1.01	-$0.13	0.70%
6A	Standalone Retail	-$1.44	$1.40	-$0.04	0.40%
6A	Large Office	-$1.19	$0.82	-$0.37	0

6A	Secondary School	-$0.06	$1.09	$1.03	0.10%
6A	Warehouse	-$0.79	$0.99	$0.20	1.20%
	Weighted Average	$0.16	$1.00	$1.16	100.00%

* Based on efficiency credits.
** Based on renewable credits.

Alternative

Three alternatives considered were (1) to not require additional efficiency credits, (2) to reduce the number of credits required, or (3) to require credits only for new buildings and not for substantial alterations to existing buildings. These alternatives were rejected because they would be less restrictive requirements than the model codes, placing the State at a competitive disadvantage for federal code adoption and implementation grants. It would also hinder the State from fulfilling its obligation to certify to the US DOE that it has adopted an Energy Code that is at least as stringent as the national model codes.

Another alternative is to require credits only for commercial buildings or only for residential buildings. This alternative was rejected for the same reasons noted above.

The last alternative is to increase the number of credits required. This alternative was rejected because an incremental approach for this new requirement would impose a lower burden on regulated parties that allows for market adjustment before more stringent requirements are imposed.

5. Limits on the use of electric resistance space heating.

ECCCNYS Sections C403.1.3 and R403.7.1

Origin: 2024 IECC

Description of Change

The proposed amendment includes limits on the use of electric resistance space heating for commercial buildings based on their size and occupancy. The proposed amendment also includes limits on the use of electric resistance space heating to 2.0 kW for detached one-and two-family dwellings and townhouses three stories or less in height.

<u>Needs and Benefits</u>

Electric resistance heat systems, such as electric furnaces and baseboard electric heaters, are inexpensive to install but expensive to run.[39] Electric furnaces include a blower to move conditioned air through ducts and electric resistance coils to provide heat.[40] Electric furnaces are even more expensive to operate than other electric resistance systems because of their duct losses and the extra energy required to distribute the heated air throughout the building.[41]

Baseboard electric heaters are zonal heaters controlled by thermostats located within each room.[42] They contain electric heating elements encased in metal pipes and are located at the bottom of outside walls to supply heat at the building's perimeter where the greatest heat loss occurs.[43] The quality of baseboard electric heaters varies considerably, and cheaper models provide poor temperature control.[44]

Alternatives to electric resistance heat regardless of whether fossil-fuel based, or heat pumps can cut electricity usage for home heating by little more than a half on average.[45]

Heat pumps are much more energy efficient than electric resistance heat.[46] Heat pumps extract heat from

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[39] *Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher-Efficiency Heat Pumps*, American Council for an Energy-Efficient Economy (May 2016) p. iii.

[40] *Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher-Efficiency Heat Pumps*, American Council for an Energy-Efficient Economy (May 2016) p. 1; *Electric Resistance Heating*, Department of Energy, https://www.energy.gov/energysaver/electric-resistance-heating

[41] *Electric Resistance Heating*, Department of Energy, https://www.energy.gov/energysaver/electric-resistance-heating

[42] *Electric Resistance Heating*, Department of Energy, https://www.energy.gov/energysaver/electric-resistance-heating

[43] *Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher-Efficiency Heat Pumps*, American Council for an Energy-Efficient Economy (May 2016) p. 2; *Electric Resistance Heating*, Department of Energy, https://www.energy.gov/energysaver/electric-resistance-heating.

[44] Electric Resistance Heating, Department of Energy, https://www.energy.gov/energysaver/electric-resistance-heating

[45] *Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher-Efficiency Heat Pumps*, American Council for an Energy-Efficient Economy (May 2016) p. iii.

[46] *Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher-Efficiency Heat Pumps*, American Council for an Energy-Efficient Economy (May 2016) p.1.

cold air to produce warm air and exhaust air that is even colder than what is outdoors.[47] Heat pumps are considered two-way air conditioners.[48]

Cost

The cost to install an electric resistance heating system in both new Residential and Commercial buildings is substantially less when compared to fossil fuel and heat pump systems. The installation of such systems, at large, is cost prohibitive when considering the operating cost. Most new buildings do not rely fully on electric resistance heat due to the high cost to operate them. When considering even a simple payback method, it is a matter of a few years to recover the extra cost to install a fossil fuel or heat pump system. Allowing the limited use of electric resistance heat in certain applications provides regulated parties flexibility to install them where the heating needs are low and the cost to install other type of systems too high. This would reduce costs to regulated parties in those situations.

The cost of installation of an electric resistance heating system will vary widely depending on building size, type, design choices and other variables. In general, the initial cost can be assumed to be approximately 60% of the cost to install a heat pump. However, an electric resistance heating system will consume twice the amount of electricity used by a heat pump,[49] with a heat pump having the additional benefit of providing air conditioning.

Alternative

An alternative is to not limit the use of electric resistance space heating. This alternative was rejected because while electric resistance heat carries the lowest cost for initial installation, it results in the greatest

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[47] *Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher-Efficiency Heat Pumps*, American Council for an Energy-Efficient Economy (May 2016) p. 1.

[48] *Opportunities for Energy and Economic Savings by Replacing Electric Resistance Heat with Higher-Efficiency Heat Pumps*, American Council for an Energy-Efficient Economy (May 2016) p. 3.

[49] Electric Resistance Heating | Department of Energy. https://www.energy.gov/energysaver/electric-resistance-heating

energy consumption for the life of the equipment. This imposes unreasonable burdens, not only on the ratepayers, but also on the supply of electricity, straining the utility companies' ability to provide the electricity required to implement the regulation prohibiting the use of fossil-fuel equipment and building systems. Prioritizing initial costs over long-term costs to this extreme degree creates a split incentive between building owners or developers and tenants, where the long-term cost is simply passed on to parties that have no input on the design process or the ability to implement efficiency retrofits later on. This split incentive is most burdensome for tenants of affordable housing and disadvantaged communities.

Another alternative is to increase the limit on the use of electric resistance space heating. This alternative was rejected for the same reasons noted above.

The last alternative is to decrease the limit on the use of electric resistance space heating. This alternative was rejected because a lower threshold would impose an undue burden for buildings with areas that are difficult to condition by other means. A lower threshold would make the installation of heat pumps and heat pump water heaters infeasible in some areas and climate zones.

6. Increased minimum efficiency requirements for gas-fired water heaters, hot-water boilers, air conditioning, and refrigeration equipment as mandated by federal standards.
ECCCNYS Section C403.3.2

Origin: U.S. DOE

<u>Description of Change</u>

This proposed amendment increases minimum efficiency for federally preempted equipment under the Energy Policy and Conservation Act (EPCA). The proposed amendment adds minimum thermal efficiencies and maximum water return temperature for gas hot-water boilers with a system input capacity between 1 and 10 million Btu/h, with exceptions. It also includes new efficiency requirements for gas-fired water heaters that have an input capacity over 1,000,000 Btu/hr and new minimum standards for combustion air positive shut-off, fan motor, and oxygen concentration control for some boiler systems based on input capacity and nameplate rating.

Needs and Benefits

Increasing the minimum efficiency of the HVAC, refrigeration and water heating equipment is an important part of the purpose of every code update, not only at the State level but also at the model code level. The increased efficiency levels in the proposed code are consistent with the efficiency improvements of the model codes with editorial corrections of inconsistencies between the two. Some of the equipment efficiency improvements are also requirements of the U.S. DOE's *Energy Conservation Program for Consumer Products,* 10 CFR 430 and 431. The federal requirements apply to new equipment installed in existing buildings, as well as new buildings.

Cost

DOS does not anticipate a significant cost impact. Most commercially available equipment already conforms to the most recent minimum federal equipment efficiency standards, which will be included in the energy code update. The cost of equipment in compliance with federal minimum efficiency updates has historically been on par with inflation.

Alternative

An alternative is to not increase the minimum efficiency requirements for gas-fired water heaters, hot-water boilers, air conditioning, and refrigeration equipment as mandated by federal standards. This alternative was rejected because such increased efficiency might bring the code update out of compliance with the cost effectiveness criteria of the Energy Law. Additionally, as it applies to federally regulated equipment, the State would need to secure approval from DOE that, even if granted, would delay the implementation of this rule.

Another alternative is to impose stricter efficiency requirements. This alternative was rejected because it would be inconsistent with the model code updates.

SIGNIFICANT CHANGES TO COMMERCIAL BUILDINGS

1. **Renewable energy (solar) for commercial buildings.**

ECCCNYS Section C202, C405.15

ASHRAE 90.1 Section 10.5.1

Origin: 2024 IECC and ASHRAE 90.1

Description of Change

This proposed amendment adds a new minimum prescriptive requirement for on-site renewable electricity generation systems with a power rating of not less than 0.75 watts per square foot in all new commercial buildings, or additions thereto. There is an exception for applicants following the ASHRAE optional compliance path for buildings where installation of a solar photovoltaic system is impractical, such as those with limited roof space, obstructions, and for those with a gross conditioned floor area less than 5,000 square feet. For applicants following the ECCCNYS optional compliance path, instead of a blanket exception, a power purchase agreement is required where the installation of a solar PV system would be impractical. This proposed amendment also includes definitions for financial renewable power purchase agreement and physical renewable energy power purchase agreement which closely align with language in ASHRAE Standard 228P, The Standard Method of Evaluating Zero Energy Building Performance, and in ASHRAE Standard 189.1

Needs and Benefits

This proposed amendment has the potential of saving a significant amount on building energy costs because buildings will be generating their own energy through on-site renewable electricity generation systems.[50] The code change will also allow building owners to hedge against financial risks associated with the

[50] *On-Site Renewable Energy Generation*, Environmental Protection Agency (2014) p. 2.

price volatility of fossil-fuel energy sources.[51] The code change will improve supply reliability of electricity by providing commercial buildings with another source of electrical power.[52] On-site renewable energy generation systems have fewer interconnections (e.g., transmission substations), electricity from these sources is likely to have higher power quality than electricity delivered through the grid from fossil-fuel sources.[53] An additional benefit of photovoltaics systems that harness energy through sunlight, is that the sun is an infinite source of energy, unlike fossil-fuel sources, such as oil and natural gas.

About 20% of buildings with onsite renewable energy systems use the energy generated to meet more than half of their total electricity consumption.[54]

While the requirement is for the building to have on-site renewable energy and could be met through technologies such as ground source geothermal systems, the exceptions are afforded to all buildings where a solar PV system is infeasible.

Cost

The least cost method for meeting the proposal requirements is the installation of a solar PV system.

Material costs were estimated at $1.22/W and labor costs at $1.46/W, based on NREL national average cost (NREL 2023), cost-adjusted and weighted by climate zone. Due to an economy of scale, the cost per square foot will be higher for smaller buildings. An annual maintenance cost of $11/kW was assumed, derived from NREL's 2020 Annual Technology Baseline (NREL 2020).

Table. PV Systems Costs.

Prototype	Baseline	Proposed
NYC High-rise Apartment	$17,381	$89,085

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[51] *On-Site Renewable Energy Generation*, Environmental Protection Agency (2014) p. 1.

[52] *On-Site Renewable Energy Generation*, Environmental Protection Agency (2014) p. 3.

[53] *On-Site Renewable Energy Generation,* Environmental Protection Agency (2014) p. 3

[54] *Commercial Buildings and Onsite Renewable Energy*, Energy Star, Environmental Protection Agency (Sept. 2020) p. 8.

Prototype	Baseline	Proposed
High-rise Apartment	$16,755	$88,444
Mid-rise Apartment	$0	$73,462
Large Hotel	$11,995	$234,592
Standalone Retail	$8,337	$80,457
Large Office	$18,299	$406,449
Secondary School	$0	$612,571
Warehouse	$0	$151,228

Another potential cost for some buildings could be unintended impacts from rooftop solar installations such as premature failure and replacement of rooftop membrane systems. Rooftop solar panels make it more difficult to inspect and perform regular maintenance of the roofing system. This can lead to an increase in maintenance and replacement costs.

<u>Alternative</u>

An alternative is to not require renewable energy for commercial buildings. This alternative was rejected because it would be a less restrictive requirement than the model codes, placing the State at competitive disadvantage for federal code adoption and implementation grants. It would also hinder the State from fulfilling its obligation to certify to the US DOE that it has adopted an Energy Code that is at least as stringent as the national model codes.

Another alternative is to increase the minimum requirement above 0.75 watts per square foot. While this alternative would provide the benefit of an economy of scale, this alternative was rejected because an incremental approach for this new requirement would impose a lower burden on regulated parties that allows for market adjustment before more stringent requirements are imposed.

A third alternative is to reduce the minimum requirement below 0.75 watts per square foot. This alternative was rejected because without an economy of scale, the provision would not be cost effective.

The fourth alternative is to provide a blanket exception for some buildings instead of the optional compliance path through power purchase agreements. This alternative was rejected because the blanket exception is available for those pursuing the optional ASHRAE compliance path.

The fifth alternative was to limit the 0.75 W/SF requirement (or PPA alternative) to structures with flat membrane roofs or sloped standing seam roofs over 5,000 SF. This alternative was rejected because the provisions allow for flexibility in terms of the type of renewable energy provided and exceptions for buildings where rooftop solar installations are infeasible.

The last alternative was to credit the addition or allocation of renewable energy (solar) assets that are part of a district system which serves the subject building in lieu of rooftop solar. This alternative was rejected because, firstly and as mentioned above, the ASHRAE compliance path provides a blanket exception where a PV solar system is infeasible. Secondly, for those pursuing the ECCCNYS compliance path, without a separate power purchase agreement for each building, there is no practical mechanism to tie the assets to the specific building.

2. **Thermal bridge mitigation and documentation of energy loss associated with thermal bridges in commercial buildings.**

ECCCNYS Section C402.7

Origin: 2024 IECC

Description of Change

This proposed amendment requires documentation and mitigation of energy losses associated with structural and physical interruptions in the building thermal envelope of commercial buildings. The proposed amendment includes the reduction of heat transfer through building elements by utilization of materials and methods which reduce thermal conductivity. The proposed amendment also includes prescriptive provisions for mitigating thermal bridge losses in above-grade walls, balconies, floor decks, parapets, structural members penetrating thermal envelope, and for vertical fenestration.

The proposed amendment adds a requirement to note thermal bridges on the construction documents and includes a definition of thermal bridges. Currently, thermal bridges that occur at intersection of assemblies and components are not accounted for or clearly addressed in the 2020 ECCCNYS which therefore assumes no thermal performance degradation at assembly interfaces and penetrations of the building thermal envelope. Ignoring thermal bridges at interfaces makes it seem like building thermal envelopes are performing much better than they do. The proposed amendment includes new provisions to account for thermal bridges at assembly and component intersections. The proposed amendment also includes prescriptive minimum requirements for insulation and structure details.

Needs and Benefits

Thermal bridging has generally been unregulated, except as they occur due to framing members within assemblies. Thermal bridging occurs when a relatively small area of a wall, floor or roof loses much more heat than the surrounding area.[55] Thermal bridging can occur in any type of building construction.[56] A thermal bridge allows heat to "short circuit" insulation.[57] Typically, this occurs when thermal conductive materials, such as steel framing or concrete, penetrates or interrupts a layer of low thermal conductivity material, such as insulation, creating areas of significantly reduced resistance to heat transfer.[58] Thermal bridges can also occur where building elements are joined, such as exposed concrete floor slabs and beams that abut or penetrate the exterior walls of a building.[59] The effects of thermal bridging may include increased heat loss, occupant discomfort, unanticipated expansion or contraction, condensation, freeze-thaw damage, and related moisture and/or mold problems for materials susceptible to moisture.[60] Thermal bridges, and the subsequent damage,

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[55] *Thermal Bridges in Wall Construction*, Concrete Masonry and Hardscape Association (CMHA) p. 1.

[56] *Thermal Bridges in Wall Construction*, Concrete Masonry and Hardscape Association (CMHA) p. 1.

[57] *Thermal Bridges in Wall Construction*, Concrete Masonry and Hardscape Association (CMHA) p. 1.

[58] *Thermal Bridges in Wall Construction*, Concrete Masonry and Hardscape Association (CMHA) p. 1; Love, Andrea and Charles Klee, Thermal Bridging: Observed Impacts and Proposed Improvement for Common Conditions p. 2

[59] *Thermal Bridges in Wall Construction*, Concrete Masonry and Hardscape Association (CMHA) p. 1.

[60] *Thermal Bridges in Wall Construction*, Concrete Masonry and Hardscape Association (CMHA) p. 1.

can be avoided by several strategies which are best implemented during the design stage, when changes can be easily incorporated.[61] After construction, repairing thermal bridges can be both costly and difficult.[62]

Thermal bridging can reduce the thermal performance of the opaque building envelope by between 20 to 70 percent.[63] Non-thermally broken cladding attachments can degrade the thermal performance of opaque panel assemblies by 50 percent.[64] Thirteen percent of the heat loss through a typical steel stud wall with punched opening windows is due to the window to wall transition and heat loss is even higher with poorer edge details.[65] This is a huge degradation in performance that the Energy Code is currently ignoring and must be addressed to improve the energy performance of as-built structures. To achieve net-zero performance the State needs to address these significant energy losses through thermal bridges at the building thermal envelope. This proposed amendment seeks to take a small step towards recognizing and accounting for thermal bridges that are typically present in conventional construction. It seeks to recognize and account for current design and construction practices, not to drive a large change in construction practices. This is a good first step to move building thermal envelope performance and to get the design and construction industry thinking about thermal bridges in the design process.

The inclusion of thermal bridge details on construction documents will encourage design teams to identify and address thermal bridging. The requirements for what thermal bridges to identify on the construction documents is referenced to section C402.6 where the types of thermal bridges are identified. This will ensure that only the main thermal bridges need be shown.

The prescriptive provisions of the proposed amendment create a simple yet flexible approach, focusing

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[61] *Thermal Bridges in Wall Construction*, Concrete Masonry and Hardscape Association (CMHA) p. 1.

[62] *Thermal Bridges in Wall Construction*, Concrete Masonry and Hardscape Association (CMHA) p. 1.

[63] *Thermal Bridging Guide Version 1.5*, BC Housing (2020).

[64] *Thermal Bridging Guide Version 1.5*, BC Housing (2020).

[65] *Thermal Bridging Guide Version 1.5*, BC Housing (2020).

on a few thermal bridge conditions that have the most impact, and which have practical and available means to effectively manage the bridging. In every case, alternative means and methods are permitted with an approved design to avoid any unnecessary restriction or inflexibility.

Mitigation of energy loss associated with structural and physical interruptions in the building thermal envelope will result in a decrease in heat loss through the wall, leading to lower operating costs, decrease in cold or hot spots on the interior and exterior at the thermal bridge locations, leading to more comfort for the building's occupants and less freeze-damage to the exterior of the building.[66] The continuity of a thermal barrier across the entire building envelope is fundamental to good thermal performance, reducing energy consumption, increasing thermal comfort and helping to prevent condensation.[67]

Cost

This code change proposal will result in an increase in the cost of construction. Perfect mitigation or no thermal bridging at interfaces is implied by code, however, current practice is to ignore them or provide no or little mitigation. Any proposal to reduce thermal bridging will increase the cost of construction relative to current practices. This proposal provides a way of practical mitigation which does not require significant changes to current practices, setting a relatively low performance bar.

Table. Thermal Bridging Mitigation Costs

Prototype	Baseline	Proposed
NYC High-rise Apartment	$36,700	$47,625
High-rise Apartment	$18,210	$24,500
Mid-rise Apartment	$6,907	$10,077
Large Hotel	$17,992	$24,140
Standalone Retail	$6,861	$9,113
Large Office	$47,321	$60,908
Secondary School	$21,707	$28,578

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[66] *Thermal Bridges in Wall Construction*, Concrete Masonry & Hardscapes Association p. 1.

[67] Love, Andrea and Charles Klee, *Thermal Bridging: Observed Impacts and Proposed Improvement for Common Conditions* p. 11.

Prototype	Baseline	Proposed
Warehouse	$13,878	$18,792

Alternative

An alternative is to not require thermal bridge mitigation and documentation of energy loss associated with thermal bridges in commercial buildings. This alternative was rejected because it would be a less restrictive requirement than the model codes, placing the State at competitive disadvantage for federal code adoption and implementation grants. It would also hinder the State from fulfilling its obligation to certify to the US DOE that it has adopted an Energy Code that is at least as stringent as the national model codes.

Another alternative is to require documentation only, as an interim measure to provide for market adjustment, without an energy efficiency advantage. This alternative was rejected for the same reasons as the first alternative.

3. Increased equipment efficiency for elevators and escalators.

ECCCNYS C405.8.1.1

Origin: NYStretch

Description of Change

This proposed amendment includes increased equipment efficiency for elevators and conveying systems in commercial buildings. The proposed amendment adds requirement for power conversion system on new elevators with a rise of 75 feet or more, efficiency requirements for elevator motors and transmissions; and requirements for capture and reuse of energy released by elevators during motion.

Needs and Benefits

The increased energy efficiency improvement is essential as it reduces the elevator's overall power consumption, making it a more sustainable and cost-effective option. The proposal also incorporates regenerative drives, which produce energy when the elevators are being lowered, particularly when they have a heavy load. That electricity is returned to a building's power grid and can then be used to power other parts of the property. Regenerative drives also save energy by decreasing the elevator machine room's cooling requirements by as much as 50 percent. There is a range of options in regenerative drives, which can recover up to 30 percent of an elevator's total energy consumption. In terms of extra benefits, a regenerative drive can also allow an older elevator or escalator to provide passengers with smoother, more comfortable travels up and down.

Cost

This code change proposal will result in an increase in the cost of construction when elevators or escalators are installed in a building. Depending on the height of the building the cost of a typical elevator motor can range from $10,000 to $14,000 on average. Depending on the height and use of the elevator the initial cost could be recovered over a short period of time, due to power regeneration, decrease in machine room cooling, and recovery of the elevator's energy consumption.

Alternative

An alternative is to not require an increase in efficiency for elevators and escalators. This alternative was rejected because this is an additional efficiency measure proposed by NYSERDA in accordance with Energy Law §11-103(2)(b).

SIGNIFICANT CHANGES TO RESIDENTIAL BUILDINGS

1. **Separate electric metering for low-rise multi-family buildings**

ECCCNYS Section R404.7

Origin: Department of State, Division of Building Standards and Codes, Energy Code Services Unit

Description of Change

This proposed amendment is to require separate electric metering for all dwelling units in multi-family buildings three stories or less, consistent with existing requirements for multi-family buildings four stories or more.

Needs and Benefits

There are only two different methods by which multifamily buildings are metered for electricity: direct metering and master-metering.[68] In a direct-metered building (also known as individually metered), the utility owns the meter and supplies electricity to each apartment.[69] Residents pay for the electricity they consume, receiving an electric bill from the utility at the residential retail rate.[70] The building receives an electric bill for electricity usage in the common areas, typically at a commercial retail rate.[71] Direct metering encourages individual conservation through consumer informed decisions but it does not yield bulk rate discounts.[72] In a master-metered building, the utility supplies electricity to the entire building.[73] One utility-owned meter serves the building.[74] The building receives one electric bill from the utility, often at a rate that results in a bill significantly lower than the retail residential rate.[75] Individual apartments are not metered, and actual apartment consumption cannot be determined or used as the basis for billing electric charges.[76] Nor is it possible to ensure that all tenants are contributing proportionately to their consumption. With a master-metered building, energy costs can be factored into tenants' leases or the owner charges each tenant for a percentage of the building's

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[68] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[69] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[70] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1; Thurgood, Allen and Lewis M. Kwit, *The Fairness Doctrine for Electric Submetering*, Cooperative Housing Bulletin (December 1996) p.2.
[71] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[72] Thurgood, Allen and Lewis M. Kwit, *The Fairness Doctrine for Electric Submetering*, Cooperative Housing Bulletin (December 1996) p.2.
[73] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[74] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1; Thurgood, Allen and Lewis M. Kwit, *The Fairness Doctrine for Electric Submetering*, Cooperative Housing Bulletin (December 1996) p.1.
[75] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[76] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.

total monthly electric bill based upon the percentage of the building the tenant occupies.[77] Master-metering is inherently unfair and encourages excessive consumption.[78] Submetering combines the best of both the direct metering and master-metering systems.[79] It offers the opportunity for discounts while encouraging conservation.[80] Submetering is the measurement and billing of electric use in individual apartment units in a master-metered multi-family building.[81] Submetering permits the measurement of electricity use in individual apartments via a building-owned meter that is installed for each apartment[82] The building continues to purchase its electricity at a less expensive commercial or bulk residential rate, but now the owner is able to allocate the electric costs to individual apartments on an actual consumption basis.[83] The owner continues to be responsible for the remaining portion of the utility bill that covers the building's common areas.[84]

Submetering allocates the building's total apartment sector electric charges to the individual apartments in direct proportion to their individual usage.[85] It provides a mechanism and incentive for individual residents to monitor and reduce their own monthly electric expense by practicing conservation.[86] Additionally, once the issue of fairness has been addressed, apartment residents are less inclined to scrutinize each other's lifestyle as far as electric usage is concerned.[87] Finally, in those buildings where monthly charges are assessed for appliances such as air conditioners, dishwashers, freezers, washing machines, and dryers, submetering

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[77] *Benefits of Electrical Submetering*, National Electrical Manufacturers Association p. 12, 16.
[78] Thurgood, Allen and Lewis M. Kwit, *The Fairness Doctrine for Electric Submetering*, Cooperative Housing Bulletin (December 1996) p.1-2, 5.
[79] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[80] Thurgood, Allen and Lewis M. Kwit, *The Fairness Doctrine for Electric Submetering*, Cooperative Housing Bulletin (December 1996) p.1.
[81] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[82] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1
[83] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[84] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[85] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p.6.
[86] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 2, 5, 6; *see also Case Study -Park City Estates, Queens Submetering for Multifamily Building*, New York State Energy Research and Development Authority (noting that residents changed their behavior and found ways to reduce their bills after the co-op in Queens, New York, switched from master-metering to sub-metering).
[87] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p.6.

eliminates the building management task of estimating and billing residents for the additional electric consumption associated with these appliances.[88] It eliminates the need for annual apartment inspections to count appliances, many of which are hidden by the residents to avoid the extra charge.[89] Elimination of this task tends to diminish the adversarial relationship between the owner and the residents.[90]

Submetering largely eliminates a volatile, variable and difficult-to-control factor from a building's operating budget- apartment electric usage costs.[91] Owners can better predict costs when the only electric usage to be considered is for common areas under management control.[92] Buildings that use submeters show 15 to 25 percent savings in energy use verses master metering building of like construction.[93] Studies have shown that providing a bill to end users through submetering reduces overall consumption. [94]

Cost

The cost of a smart meter is estimated in the range of $550 to $680 per meter, plus an approximate $35 monthly charge for meter reading, billing, and collection. The $35 monthly charge for meter reading will be included in the utility bill and it is anticipated energy savings will offset some of that cost. Low-income households will be most affected by the split incentive.

Alternative

One alternative is to not require separate electric metering for low-rise multi-family buildings. This alternative was rejected because the benefits far outweigh the costs and provide a means to pursue, to the fullest extent feasible, the use of modern technical methods, devices and improvements which tend to minimize

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[88] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 6; Thurgood, Allen and Lewis M. Kwit, *The Fairness Doctrine for Electric Submetering*, Cooperative Housing Bulletin (December 1996) p.5-6.
[89] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 6.
[90] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 6.
[91] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 6.
[92] *Residential Electric Submetering Manual*, New York State Energy Research and Development Authority (October 2001) p. 1.
[93] *Benefits of Electrical Submetering*, National Electrical Manufacturers Association p. 3
[94] *Benefits of Electrical Submetering*, National Electrical Manufacturers Association p. 13

consumption of energy in accordance with Energy Law §11-104(2) and (4).

Another alternative is to require individual tenant monitoring only without separate billing at less than half the cost for the initial installation and no monthly fees. This alternative was rejected because it only provides the potential benefit of informed consumer energy use behavior without any direct financial benefit attached to those behavior modifications. Further, monitoring could be perceived as a tool to justify rent increases and foster distrust between tenants and building owners.

2. Energy recovery ventilation (ERV) required for residential buildings in Climate Zone 6.

ECCCNYS Section R403.6.1

Origin: 2024 IECC

Description of Change

This proposed amendment requires an energy recovery ventilation or heat recovery system (ERV or HRV) for residential buildings in Climate Zone 6. Previously, an HRV or ERV was only required in Climate Zones 7 and 8, but this provision was modified in the 2024 IECC.

Needs and Benefits

An ERV is a type of heat exchanger that either pre-heats or pre-cools incoming outdoor air, significantly reducing the demand on heating and cooling equipment.[95] ERVs work by exchanging heat and moisture between two airstreams: one contained in exhausted, indoor air exiting the building and one incoming outdoor, supply air that is entering the building.[96] During colder weather, the ERV exhaust air warms and moistens the

[95] Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV) Building Energy Exchange (June 2021) p. 2.

[96] *Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV)* Building Energy Exchange (June 2021) p. 2; *Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced*

supply air from outdoors.[97] During warmer weather, the ERV exhaust air cools and dries the supply air from outdoors.[98] The two air streams do not mix, keeping odor, smoke and pollutants in exhausted air separate from fresh supply air.[99] This technique, called preconditioning, conserves a significant amount of energy that would otherwise be lost with traditional ventilation methods.[100]

Air conditioning and ventilation systems are among the main sources of high indoor levels of air pollutants.[101] Conventional Heating, Ventilation and Air- Conditioning (HVAC) systems must fully temper fresh air before distributing it throughout the building.[102] Tempering fresh air can be an energy demanding process.[103]

An ERV provides controlled and conditioned ventilation that improves indoor air quality and occupant

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Comfort and Savings, Building Energy Exchange (June 2021) p. 2.*Laboratory Evaluation of Energy Recovery Ventilators*, U.S. Department of Energy, Energy Efficiency and Renewable Energy (November 2016) p. 1. D. Ben Guida, H*eat Recovery Ventilation for Energy-Efficient Buildings: Design, Operating and Maintenance*, International Journal of Innovative Technology and Exploring Engineering (2019) p. 3714.

[97] *Laboratory Evaluation of Energy Recovery Ventilators*, U.S. Department of Energy, Energy Efficiency and Renewable Energy (November 2016) p. 1; D. Ben Guida, H*eat Recovery Ventilation for Energy-Efficient Buildings: Design, Operating and Maintenance*, International Journal of Innovative Technology and Exploring Engineering (2019) p. 3714.

[98] *Laboratory Evaluation of Energy Recovery Ventilators*, U.S. Department of Energy, Energy Efficiency and Renewable Energy (November 2016) p. 1; D. Ben Guida, H*eat Recovery Ventilation for Energy-Efficient Buildings: Design, Operating and Maintenance*, International Journal of Innovative Technology and Exploring Engineering (2019) p. 3714.

[99] *Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV)* Building Energy Exchange (June 2021) p. 2; Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced Comfort and Savings, Building Energy Exchange (June 2021) p. 2; D. Ben Guida, H*eat Recovery Ventilation for Energy-Efficient Buildings: Design, Operating and Maintenance*, International Journal of Innovative Technology and Exploring Engineering (2019) p. 3714.

[100] *Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV)* Building Energy Exchange (June 2021) p. 2; *Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced Comfort and Savings*, Building Energy Exchange (June 2021) p. 2.; D. Ben Guida, H*eat Recovery Ventilation for Energy-Efficient Buildings: Design, Operating and Maintenance*, International Journal of Innovative Technology and Exploring Engineering (2019) p. 3715.

[101] D. Ben Guida, H*eat Recovery Ventilation for Energy-Efficient Buildings: Design, Operating and Maintenance*, International Journal of Innovative Technology and Exploring Engineering (2019) p. 3713.

[102] *Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced Comfort and Savings*, Building Energy Exchange (June 2021) p. 2.

[103] *Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced Comfort and Savings*, Building Energy Exchange (June 2021) p. 2.

health and comfort while reducing GHG emissions and saving energy.[104] Buildings that adopt an ERV are less likely to experience persistent odors, mold, dampness, and other issues that trigger complaints and increase health risks.[105] The continuous clean fresh filtered air supply from an ERV can eliminate irritants, allergens and air pollutants.[106]

A home can have several appliances exhausting simultaneously including bath exhaust fans, kitchen hoods and clothes dryers.[107] When exhaust-only appliances operate and a home becomes depressurized, water vapor intrusion from outdoors in more humid climates could generate the additional issue of mold in the building envelope.[108] The operation of all these exhaust-only appliances in conjunction with the mechanical ventilation system raise significant issues related to (1) occupant comfort, health and safety and (2) building and equipment durability and reliability.[109] An ERV can provide a means to deliver make-up air and reduce the level of home pressurization to mitigate these issues.[110] An ERV requires a low level of maintenance[111] An ERV should

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[104] *Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV)* Building Energy Exchange (June 2021) p. 2; *Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced Comfort and Savings*, Building Energy Exchange (June 2021) p. 2.

[105] *Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV)* Building Energy Exchange (June 2021) p. 2; D. Ben Guida, *Heat Recovery Ventilation for Energy-Efficient Buildings: Design, Operating and Maintenance*, International Journal of Innovative Technology and Exploring Engineering (2019) p. 3715.

[106] D. Ben Guida, H*eat Recovery Ventilation for Energy-Efficient Buildings: Design, Operating and Maintenance*, International Journal of Innovative Technology and Exploring Engineering (2019) p. 3715.

[107] *Laboratory Evaluation of Energy Recovery Ventilators*, U.S. Department of Energy, Energy Efficiency and Renewable Energy (November 2016) p. 6.

[108] *Laboratory Evaluation of Energy Recovery Ventilators*, U.S. Department of Energy, Energy Efficiency and Renewable Energy (November 2016) p. 6.

[109] *Laboratory Evaluation of Energy Recovery Ventilators*, U.S. Department of Energy, Energy Efficiency and Renewable Energy (November 2016) p. 6.

[110] *Laboratory Evaluation of Energy Recovery Ventilators*, U.S. Department of Energy, Energy Efficiency and Renewable Energy (November 2016) p. 6.

[111] *Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV)* Building Energy Exchange (June 2021) p. 4; *Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced Comfort and Savings*, Building Energy Exchange (June 2021) p. 4.

typically be inspected every three months and fully cleaned every six months.[112] The air filters within an ERV require regular cleaning.[113]

<u>Cost</u>

Considering that a balanced ventilation system is required by the Uniform Code, the incremental cost of an HRV or ERV ranges from $1,000 to $1,500 depending on the size of the house or dwelling unit.

This provision only applies in Climate Zone 6, which consists of the counties of Chenango, Clinton, Delaware, Essex, Franklyn, Fulton, Hamilton, Herkimer, Jefferson, Lewis, Madison, Montgomery, Oneida, St. Lawrence, Sullivan, Ulster, Warren.

<u>Alternative</u>

An alternative is to not require an HRV or ERV in residential buildings in Climate Zone 6. This alternative is rejected because the cost of installing an HRV and ERV will be recovered through energy savings.

Another alternative is to expand the HRV or ERV requirement to residential buildings in all Climate Zones within New York State. This alternative is rejected because the provision is likely not cost-effective in Climate Zone 4 and the cost-effectiveness analysis for Climate Zone 5 was challenged by developers during the development of the 2024 IECC.

4. COSTS

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[112] *Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV)* Building Energy Exchange (June 2021) p. 4; *Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced Comfort and Savings*, Building Energy Exchange (June 2021) p. 4.

[113] *Tech Primer: Enhanced Ventilation with Energy Recovery Ventilators (ERV)* Building Energy Exchange (June 2021) p. 4; *Tech Primer Dedicated Outdoor Air Systems (DOAS) and Energy Recovery Ventilators (ERV): Controlled Ventilation for Enhanced Comfort and Savings*, Building Energy Exchange (June 2021) p. 4.

(a) Costs to Regulated Parties.

Implementation Costs. "First Costs." In general, the costs to regulated parties for implementing this rule will include the "first costs," i.e. the increase (or decrease) in the costs of constructing a building to the requirements of the proposed Energy Code rather than the requirements of the current Energy Code. For example, under the current Energy Code, fossil-fuel equipment and building systems are permitted, while under the proposed Energy Code fossil-fuel equipment and building systems will be prohibited in new buildings, with exceptions.

For the nine commercial building prototypes studied in Climate Zones 4A, 5A and 6A for the NORESCO Report, the "first costs" range from a decrease of $1,311,156 for a Large Office to an increase of $450,260 for a Secondary School.

Table. Incremental Cost Change for NORESCO Report

Prototype	Incremental construction cost	
	Total $	$/sf
NYC High Rise Apartment	(271,642)	($1.61)
High Rise Apartment	9,419	$0.11
Midrise Apartment	49,267	$1.46
Large Hotel	415,427	$3.40
Standalone Retail	31,521	$1.28
Large Office	(1,311,156)[114]	($2.63)
Secondary School	450,260	$2.13
Warehouse	163,234	$3.14

[114] Savings due to a decrease in lighting power density that results in a reduction in the number of lighting fixtures required in the building. Recent technological advances enable the use of lighting fixtures with a longer useful life and a lower maintenance cost.

Statewide (weighted)	(163,037)[115]	($0.01)

For the residential building prototypes studied in the Resource Refocus Report, the "first costs" average ranges from an increase of $2,156 for a multifamily residence to an increase of $6,008 for a single-family residence. The first costs of the 2024 NYSECCC are primarily driven by the increase in building thermal envelope stringency and the presence of HRV/ERV in Climate Zones 5 and 6 (whether driven by energy credit options or required by prescriptive language). These envelope improvements also have the benefit of enabling the installation of smaller HVAC equipment with a lower price point.

This first cost does not include the incremental cost of a heat pump, as opposed to a traditional heating system, which is anticipated to be installed in most new residential buildings due to the prohibition against fossil-fuel equipment and building systems in residential buildings seven stories or less in height beginning on December 31, 2025 and for residential buildings above seven stories in height beginning on January 1, 2029. The cost of heat pumps is offset, in part, through the avoided cost of fossil-fuel infrastructure installation. The avoided cost is greater in urban and suburban areas where natural gas infrastructure is available. In other areas, where the fossil-fuel alternatives are either propane or fuel oil, either the developer or the buyer will also benefit from the avoided cost of installation and maintenance of tanks and fuel lines.

Other Implementation Costs. A copy of the 2024 ECCCNYS costs approximately $60 to $71 and a copy of 2024 NYS ASHRAE 90.1 costs $198.

Continuing Compliance Costs. In general, the on-going costs of continuing to comply with this rule will consist of the change (increase or decrease) in (1) the cost of maintaining energy-related systems and equipment, (2) the increased or decreased cost of periodic replacement of energy-related systems and

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[115] Same as footnote 110.

equipment, and (3) an increase of 19.5 percent in site energy savings for commercial buildings and an increase of 6 percent in energy costs for residential buildings.

(b) Costs to the Department of State, the State, and Local Governments.

Costs to the DOS. The DOS's Division of Building Standards and Codes ("DBSC") will offer training on the Energy Code, as revised by this proposed rule, to code enforcement personnel, registered design professionals, and other interested parties. Offering such training is part of the DBSC's core mission, and the DOS anticipates that DBSC will be able to provide such training using its existing staff and facilities, at no significant additional cost to the agency.

Costs to Local Governments – Enforcement. Pursuant to Executive Law §381, local governments (cities, towns, and villages) are charged with administration and enforcement of the Energy Code, and some counties administer and enforce the Energy Code within their boundaries. Most counties and certain State agencies are required by existing law to administer and enforce the Energy Code with respect to buildings in their custody and control. These existing administration and enforcement obligations will continue with respect to the Energy Code as amended by this proposed rule. It is not anticipated that this proposed rule will have any significant impact on the existing code administration and enforcement obligations of local governments, counties, and State agencies.

Local governments, counties, and State agencies that currently administer and enforce the Energy Code will be required to ensure that their code enforcement personnel receive training on the new Energy Code for commercial buildings and residential buildings. However, code enforcement personnel are already required by regulation to receive annual "in-service" code training, and the DOS and the Code Council anticipate that code enforcement personnel will be able to receive training on the new Energy Code for commercial buildings and residential buildings as part of the already required in-service training. Furthermore, the DBSC has a program in place for training local government code enforcement officials. The staff of the DBSC will provide complimentary training to assist local governments in understanding the requirements of the new Energy Code for commercial and residential buildings.

Local governments, counties, and State agencies that currently administer and enforce the Energy Code will be required to purchase one or more copies of the 2024 ECCCNYS (about $60 to $71) and one or more copies of 2024 NYS ASHRAE 90.1 ($198). However, DOS and NYSERDA will provide a free copy of the set of code books, either one (1) electronic copy or one (1) hard copy, to each local government administering and enforcing the Energy Code.

Costs to Local Governments – Compliance. Local governments, counties, and State agencies that construct commercial buildings and residential buildings for their own use will be required to comply with the Energy Code for commercial buildings and residential buildings, as amended by this proposed rule. When a local government, county, or State agency constructs a commercial building or a residential building for its own use, it will be a regulated party, and it will be subject to the same costs of implementation and continuing compliance as private parties, as discussed in Part 4(a) ("Costs to Regulated Parties") of this Regulatory Impact Statement.

5. LOCAL GOVERNMENT MANDATES

Enforcement Mandate. As discussed in Part 4(b) "Costs to the DOS, the State, and local governments" of this Regulatory Impact Statement, existing law charges local governments (cities, towns, and villages) with administration and enforcement of the Energy Code, and counties may be responsible for enforcing the Energy Code under certain circumstances. This proposed rule will not change the existing code enforcement responsibilities of any local government or county.

As discussed in Part 4(b) of this Regulatory Impact Statement, local governments and counties that currently administer and enforce the Energy Code will be required to ensure that their code enforcement personnel receive training on the new Energy Code for commercial buildings and residential buildings. However, code enforcement personnel are already required by regulation to receive annual "in-service" code training, and the DOS and the Code Council anticipate that code enforcement personnel will be able to receive training on the new Energy Code for commercial buildings and residential buildings as part of the already required in-service training. Furthermore, the DBSC has a program in place for training local government code enforcement officials. The staff of the DBSC will provide training to assist local governments in an understanding of the requirements of the new Energy Code for commercial buildings and residential buildings.

Compliance Mandate. Local governments and counties that construct buildings for their own use are required to comply with the current Energy Code and will be required to comply with the Energy Code as amended by this proposed rule. The requirement that local governments and counties comply with the current Energy Code, and with the Energy Code as amended by this proposed rule, is imposed by existing provisions of the Energy Law, and will not be a new requirement imposed by this proposed rule. Local governments and counties that construct buildings for their own use are regulated parties, and as such can expect to see the same benefits described in Part 2 ("Needs and Benefits") of this Regulatory Impact Statement and to incur the costs described in Part 5(a) ("Costs to Regulated Parties") of this Regulatory Impact Statement.

6. PAPERWORK

Regulated parties are required by other, existing law to prepare plans and specifications documenting compliance with the current version of the Energy Code and to submit such plans and specifications to the governmental unit or agency responsible for enforcing the Energy Code with the application for a building permit. Governmental units or agencies that enforce the Energy Code are required by other, existing law to review such plans and specifications, to determine compliance with the current version of the Energy Code, to issue permits, to conduct and document construction inspections, and to issue certificates of occupancy. These obligations will continue with respect to the Energy Code as amended by this proposed rule. This proposed rule will not add any new or additional reporting or paperwork requirements.

7. DUPLICATION / RELEVANT RULES AND LEGAL REQUIREMENTS

Rules and other legal requirements of the New York State and Federal governments that are relevant to this proposed rule include the following:

New York State Energy Law §11-103(2) provides that the provisions of the Energy Code applicable to residential buildings must meet or exceed the most recent edition of the IECC. Adoption of this proposed rule will assure that the provisions of the Energy Code applicable to residential buildings meet or exceed the 2024 edition of the IECC.

New York State Energy Law §11-103(2) provides that the provisions of the Energy Code applicable to commercial buildings must meet or exceed the most recently published ASHRAE 90.1. The Energy Code for commercial buildings as amended by this proposed rule will meet or exceed ASHRAE 90.1-2022.

Title III of the ECPA provides that when DOE determines that buildings constructed to a revised edition of the ASHRAE 90.1 Standard would achieve greater energy efficiency than buildings constructed to the prior edition of ASHRAE 90.1, states are required to update their energy codes for commercial buildings to codes that meet or exceed the revised edition of ASHRAE 90.1. On March 6, 2024, the DOE published the DOE Notice of Determination in the Federal Register, indicating that DOE has determined that buildings constructed to the requirements of ASHRAE 90.1-2022 would achieve greater energy efficiency than buildings constructed to the requirements of ASHRAE 90.1-2019. See 89 Federal Register 15983-01 (March 6, 2024) at 15984.[116]

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[116] https://www.federalregister.gov/documents/2024/03/06/2024-04717/determination-regarding-energy-efficiency-improvements-in-ansiashraeies-standard-901-2022

This proposed rule would amend the Energy Code for commercial buildings from one that meets or exceeds ASHRAE 90.1-2016 to one than meets or exceeds ASHRAE 90.1-2022.

Title III of the ECPA, in 42 U.S.C. 6833(a), provides that when the DOE determines that buildings constructed to a revised edition of the 1992 Model Energy Code (MEC) or any successor to that code (i.e. the IECC), would achieve greater energy efficiency than buildings constructed to the prior edition of the MEC or any successor to that code, states are required to review their energy codes for residential buildings and make a determination as to whether it is appropriate to revise such codes to one that meets or exceeds the revised edition of the IECC. States may revise their residential building energy codes such that they meet or exceed the revised edition of the IECC or determine that it is not appropriate for the state to revise its residential building energy code.

Article 11 of the New York State Energy Law requires the adoption of the Energy Code and contemplates that the Energy Code be amended from time to time to achieve the objectives described in Part 2 ("Legislative Objectives") of this Regulatory Impact Statement.

Energy Law §11-103(3) provides that any regulation of any other State agency pertaining to energy conservation is superseded by the Energy Code and will be superseded by the Energy Code as amended by this proposed rule.

There is pending litigation regarding whether the prohibition on fossil-fuel equipment and building systems in new buildings discussed above in Section 3 (fossil-fuel prohibition) is preempted by the federal EPCA, 42 U.S.C. §§6201-6422. As of this date, there has been no court decision binding upon New York indicating that the fossil-fuel prohibition is subject to express preemption under federal law. Additionally, New York has not applied for a waiver from the Secretary of Energy pursuant to EPCA, 42 U.S.C. §6297(d).

Based on the foregoing, the DOS believes that this proposed rule does not duplicate or conflict with any rule or other legal requirement of the State or the Federal government.

8. ALTERNATIVES

The following is a significant alternative to the portion of this proposed rule that applies to commercial buildings that was considered by the DOS and the Code Council:

ALTERNATIVE: ADOPTION OF ASHRAE 90.1-2022 ONLY

In essence, this proposed rule will adopt the "Commercial Provisions" of the 2024 ECCCNYS (primarily based on the 2024 IECC Commercial Provisions) and an amended version of the standard ASHRAE 90.1, as an alternative compliance path, as the new Energy Code for commercial buildings ("2024 ECCCNYS Commercial Provisions"). Simply adopting an amended version of ASHRAE 90.1-2022 as the new Energy Code for commercial buildings was considered as an alternative. However, this alternative was not incorporated into this proposed rule for the following reasons:

1. The 2024 ECCCNYS Commercial Provisions allow a building owner and design professional to choose between complying with (1) ASHRAE 90.1-2022 or (2) one of two alternative compliance paths set forth in the 2024 ECCCNYS Commercial Provisions.
2. The building owners and design professionals typically find that the alternative compliance paths set forth in the 2024 ECCCNYS Commercial Provisions are easier to understand and to apply to smaller, less complex commercial buildings. The application of ASHRAE 90.1 as a compliance path is generally best utilized by design professionals, in more complex building design, high rise buildings, or highly glazed buildings, and is more applicable and compatible with sustainable building design. ASHRAE 90.1-2022 contains an alternative compliance path (Normative Appendix G) identified as a LEED compliance

methodology.[117]

3. The DOS and the Code Council believe that each of the two alternative compliance paths set forth in the 2024 ECCCNYS Commercial Provisions meets or exceeds ASHRAE 90.1-2022, or results is equal or greater energy savings.

Based on the foregoing, the DOS and the Code Council determined that adopting the 2024 ECCCNYS Commercial Provisions provides greater flexibility to building owners and design professionals, while still assuring that the Energy Code for commercial buildings meets or exceeds ASHRAE 90.1-2022 or results in equal or greater energy savings.

9. FEDERAL STANDARDS

As discussed above in Part 7 “Duplication / Relevant Rules and Legal Requirements” of this Regulatory Impact Statement, Title III of the ECPA provides that states’ building energy codes for commercial buildings be updated to meet or exceed updated versions of ASHRAE 90.1 when the DOE determines that the updated version of ASHRAE 90.1 will improve energy efficiency in commercial buildings. Furthermore, Title III of the ECPA provides that when the DOE determines that the updated version of the 1992 Model Energy Code (MEC) or its successor code (i.e. the IECC) will improve energy efficiency in residential buildings, states are required to review their energy codes for residential buildings and make a determination as to whether it is appropriate to revise such codes to one that meets or exceeds the revised edition of the IECC. States may revise their residential building energy codes such that they meet or exceed the revised edition of the IECC or determine that it is not appropriate for the state to revise its residential building energy code. Where the state decides to

[117] https://www.usgbc.org/articles/new-guidance-leed-projects-subject-alternative-energy-codes

not revise said code, it shall submit to the Secretary of Energy, in writing, the reasons for such determination, and such statement shall be made available to the public.

This proposed rule will cause the Energy Code for commercial buildings to meet or exceed ASHRAE 90.1-2022, consistent with Federal standards as established by the EPCA and by the determination regarding ASHRAE 90.1-2022 published by DOE in the Federal Register on March 6, 2024.

This proposed rule will cause the Energy Code for residential buildings to meet or exceed the 2021 IECC residential provisions, consistent with the federal standards as established by the EPCA and by the determination regarding the 2021 IECC published by DOE in the Federal Register on July 28, 2021.

As discussed above in Part 7 "Duplication / Relevant Rules and Legal Requirements" of this Regulatory Impact Statement, there is pending litigation regarding whether the fossil-fuel equipment and building systems prohibition in new buildings discussed above in Section 3 (fossil fuel prohibition) is preempted by Energy Policy and Conservation Act (EPCA), 42 U.S.C. §6297(c). As of this date, there has been no court decision binding upon New York indicating that the fossil fuel prohibition is subject to express preemption under federal law. Additionally, New York has not applied for a waiver from the Secretary of Energy pursuant to EPCA, 42 U.S.C. §6297(d).

10. COMPLIANCE SCHEDULE

This proposed rule and the amendment of the Energy Code to be implemented by this proposed rule will become effective 90 days after the date of publication of the Notice of Adoption in the State Register. The DOS and the Code Council anticipate that regulated parties will be able to comply with the amended provisions of the Energy Code immediately upon this proposed rule becoming effective.