MODEL PROGRESSIVE BUILDING ENERGY CODES POLICY FOR NORTHEAST STATES

A White Paper of the NEEP Building Energy Codes Policy Project

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Model Progressive Building Energy Codes Policy for Northeast States

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1. Executive Summary

Northeast Energy Efficiency Partnerships' (NEEP) Model Progressive Building Energy Code Policy delineates comprehensive measures to maximize the energy savings potential of the building energy codes that govern new building construction and major additions in the Northeast states.[1] The ultimate goal of these guidelines is to support state adoption and implementation of policies that will lead the majority of new building construction by 2030 to be comprised of "net-zero energy" buildings.[2]

NEEP developed this white paper in response to expressed public policy needs for guidance in creating and/or adopting building energy policies that will result, ultimately, in large-scale energy and carbon emissions savings in the built environment across the region. If building energy codes in Northeast states were to require all new buildings constructed by 2030 to be net-zero energy buildings, the region collectively would realize 663 trillion BTUs annually in energy savings and a reduction of 35 million metric tons annually of carbon emissions. These savings correspond to (for the Northeast region) approximately 7.5 percent of current energy use of residential and commercial buildings and 12 percent of current carbon dioxide emissions emitted by electricity generating power plants.

This white paper highlights each element of the policy and includes suggested enabling statutory language, explanations of the specific policies, the manner in which the policy relates to other energy efficiency policies such as appliance standards and ratepayer-funded (or "systems benefit charge," i.e. SBC) energy efficiency programs, and references to industry and policy best practices. This paper also includes state-level estimates of the energy and carbon savings potential of progressively more stringent building energy codes that reduce building energy consumption.

NEEP's Model Progressive Building Energy Codes Policy includes three areas of concentration:

Code Adoption

The Policy addresses the need to regularly update state building energy codes to reflect the most recent editions of national model building energy codes – specifically, the International Energy Conservation Code (IECC) – and recommends that states participate actively in national model energy code update processes to advance energy efficiency. It also recommends that the state "Authority Having Jurisdiction" [3](AHJ) include as part of their building energy codes an "Informative Appendix" that constitutes "above code" or "beyond code" building standards, such as the New Buildings Institute Core Performance Guide and ENERGY STAR for Homes.® The Informative Appendix

[1] Northeast states include: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

[2] A net-zero energy buildings as a residential or commercial building with greatly reduced energy use through energy efficiency gains such that the balance of energy needs can be supplied with renewable technologies. There is, however, no ultimate consensus definition of net-zero energy buildings. In fact, there are many definitions of net-zero energy buildings. The above definition is taken from a paper submitted to the 2006 American Council for an Energy Efficient Economy Summer Study. *Zero-energy buildings: A critical look at the definition*. Torcellini et al. http://www.nrel.gov/docs/fy06osti/39833.pdf

[3] Authority Having Jurisdiction: The state, county or municipal government charged with adoption, administration or enforcement of a regulation or code.

provides a guide to building professionals seeking to build more energy efficient buildings, as well as to states seeking to implement policies that promote the construction of more energy efficient buildings.

Code Compliance

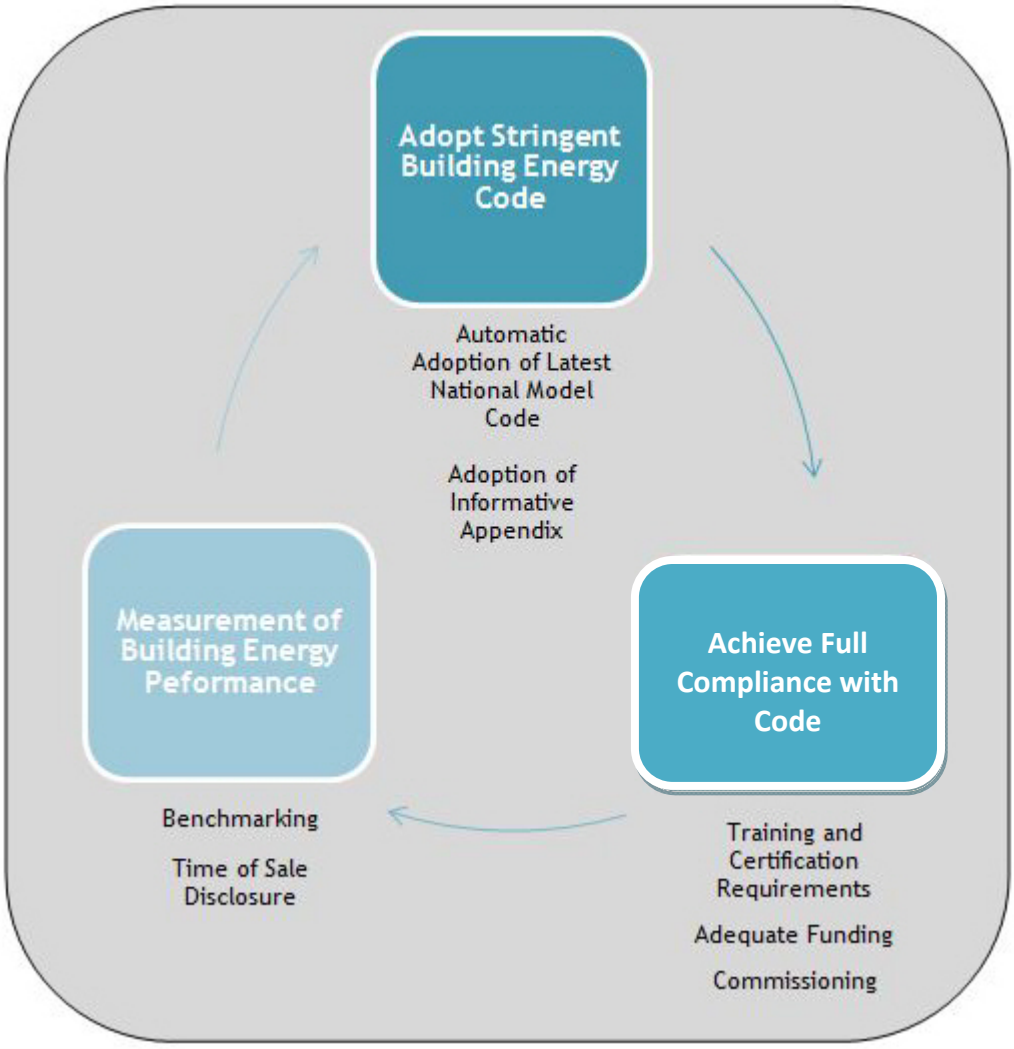
The Policy recommends methods and strategies for improving building energy code compliance such as:

- Better training and certification of code officials, building professionals and building operations and maintenance staff through the state building energy code administrator;
- Increase local and state capacities and expertise to enforce code through the use of certified independent energy code inspectors;
- Maintaining adequate funding so that code agencies can administrate, train local officials, provide technical support and finally enforce the code; and
- Tracking and reporting energy code compliance to inform progress.
- Strategic coordination with energy efficiency program administrators to train the building design community in best practices to meet and exceed minimum energy code requirements.

Measuring and Reporting Energy Performance

Lastly, the Policy highlights the need to establish requirements to measure and rate the energy performance of dwellings and commercial buildings (both new and existing). The goals of measuring building performance including establishing a market value for existing energy efficient homes and buildings, allowing policymakers to assess the impact of energy code policies to generate energy savings and ultimately improving the energy performance of both new and existing buildings. Specific measurement recommendations include the use of benchmarking and time-of sale disclosure.

Maximizing Building Energy Performance Through Codes



An effective codes policy recognizes the interdependence of policy, enforcement and measurement. Lack of compliance with the energy code undermines the potential energy savings of a code. Measurement of building performance helps determine the actual amount of energy savings in compliant (or non-compliant) buildings. Results of the measurement of building performance gives policymakers and code officials the information needed to determine the next steps in code adoption.

In summary, the authority having jurisdiction (AHJ) over building energy codes should act on the following key elements of NEEP's recommendations for the Model Progressive Building Energy Codes Policy:

Summary of Policy Recommendations

Energy Code Adoption

- The AHJ should adopt the latest edition of the national model code every three years.
- The state should participate in national model energy code update processes to advance energy efficiency.
- State amendments to the national model energy code should maintain or enhance the stringency or energy savings of the code.
- The AHJ should adopt an Informative Appendix for both residential and commercial buildings that is at least 20 percent more energy efficient than the base state code.
- The AHJ should maintain a Technical Advisory Committee to inform updates to the energy code and the Informative Appendix.

Energy Code Compliance

- The AHJ should train and certify all energy code inspectors.
- The AHJ should incorporate a third party inspection system such as the Specialized Plan Examiner/Inspection System originally instituted in Washington State and/or a system based on the Home Energy Rating System Index (HERS).
- The AHJ should institute a fee for service structure that sets aside dedicated funding for plan review and inspections of energy code.
- The AHJ should adopt commissioning requirements as part of the building energy code. The commissioning requirements should cover work prior to and after the achievement of a certificate of occupancy.
- Commissioning should include all building systems including HVAC, lighting.

Measuring Building Energy Performance

- The AHJ should require the measurement and disclosure of residential dwelling and commercial building energy performance prior to sale of existing and new buildings.
- The AHJ should require the labeling of all buildings with information on energy performance.
- The AHJ should require improvements in energy performance at the time of sale.
- The AHJ should require the energy performance benchmarking of all commercial buildings.
- For benchmarking, the state should require the use of the EPA Portfolio Manager or equivalent.

2. Introduction

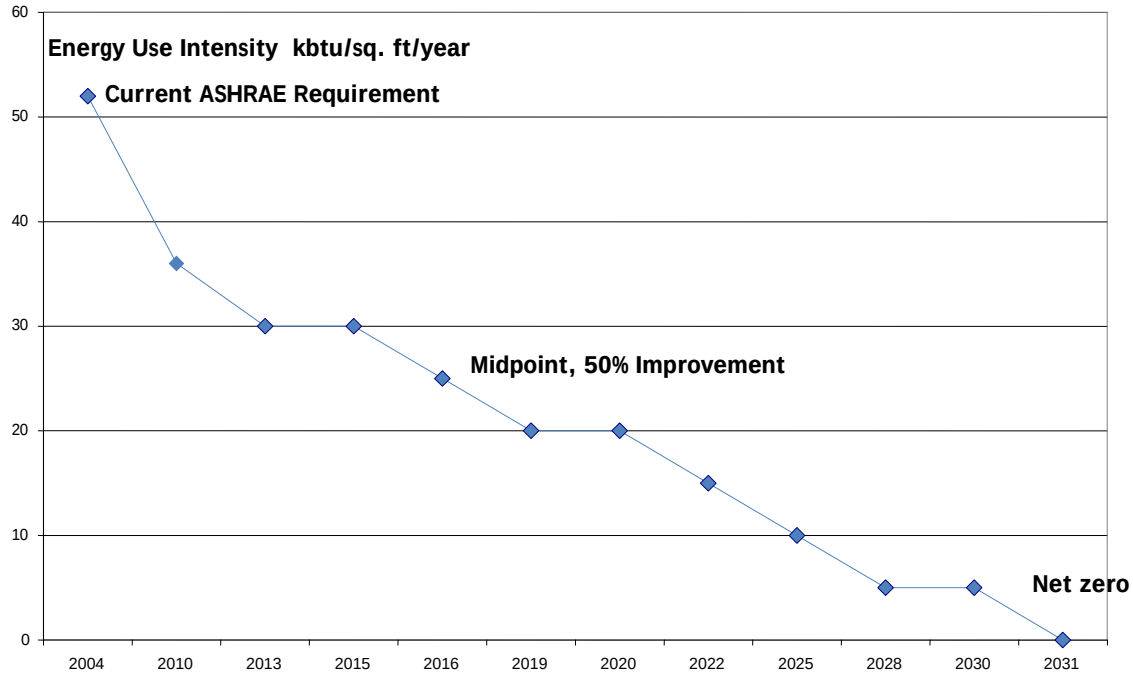
A. Goals of NEEP Progressive Building Energy Codes Policy

The goal of the Policy is to dramatically improve the energy efficiency of both new and existing buildings. Ultimately, for new construction the goal is to make net-zero energy buildings the standard of construction. Buildings consume 40 percent of the energy and 70 percent of the electricity in the U.S.[4] Unlike automobiles, appliances or other energy consuming devices, buildings, by their very nature, are meant to last, meaning that a building built today will have an impact on our energy use for 50 to 100 years or more. Therefore, any effective energy policy must address building energy use. Adopting and effectively implementing energy efficient statewide building energy codes represents one of the most cost-effective ways of reducing building energy consumption in new construction and substantial building renovation, including building additions. **To realize the goal of net-zero energy buildings, states must adopt progressively stronger building energy codes. These progressively more stringent codes will lead to continual improvements in building practices such that by 2030, net-zero energy buildings should comprise the majority of new construction.** *The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) has set goals for the increasing stringency of the 90.1 building standard with the intent of reaching net zero energy standards by 2031.*[5]

The following graph shows the building energy performance goals set for the ASHRAE 90.1 standard en route to the goal of net-zero energy buildings as approved by the ASHRAE Board of Directors. ASHRAE 90.1 is one of the two recognized national model codes.

[4] United States Environmental Protection Agency; Buildings and the Environment, A Statistical Summary; December 20, 2004
[5] NEEP staff chart based on information derived from ASHRAE. Please see www.ashrae.org/

Building Energy Performance Goals For ASHRAE 90.1 Standard



B. How Building Energy Codes Reduce Energy Consumption in Buildings

Building energy codes set a floor for energy efficiency in new construction by establishing minimum energy efficiency requirements for all new and renovated homes and buildings. These efficiency requirements affect the design, materials, and equipment installed in dwellings and buildings which reduce the energy inputs needed to maintain healthy, comfortable and fully functioning indoor environments over the life of the building. Because the energy code applies to all construction, it affects energy consumption across all building types and sizes.

Improving the energy code generates energy savings in a consistent and long lasting manner. As noted above, buildings last a long time and an energy efficient building has the potential to save energy throughout that span. However improvements to state energy codes have typically been slow to occur. Progressive changes to national model energy codes require significant research to identify, test and incorporate new building methods and technologies. Moreover, some states have been reluctant to adopt those model codes with regularity, some preferring to instead use their own state-specific codes which, though often based on model codes, can take significant amounts of time to vet and adapt.

Beyond adoption, high levels of compliance with the code requires intensive education of building professionals from designers to builders, as well as code officials, on both the state and local levels. Finally, measuring building energy use requires the continual development of effective tools and methodologies to accurately gauge the energy

footprint of a building. All of this takes time. Under current policies in Northeast states, building energy performance is upgraded only when renovations or replacements occur. As a result, an inefficient building built today will typically remain inefficient for decades. Therefore, states must act decisively to regularly improve energy efficiency in the building code.

Potential Energy and Environmental Savings

Adopting and implementing strong building energy codes – as well as providing informed guidance on the construction and renovation of beyond-code, high performance buildings – provides an effective means of tackling the twin goals of reducing energy use in the region and lowering emissions of greenhouse gases.

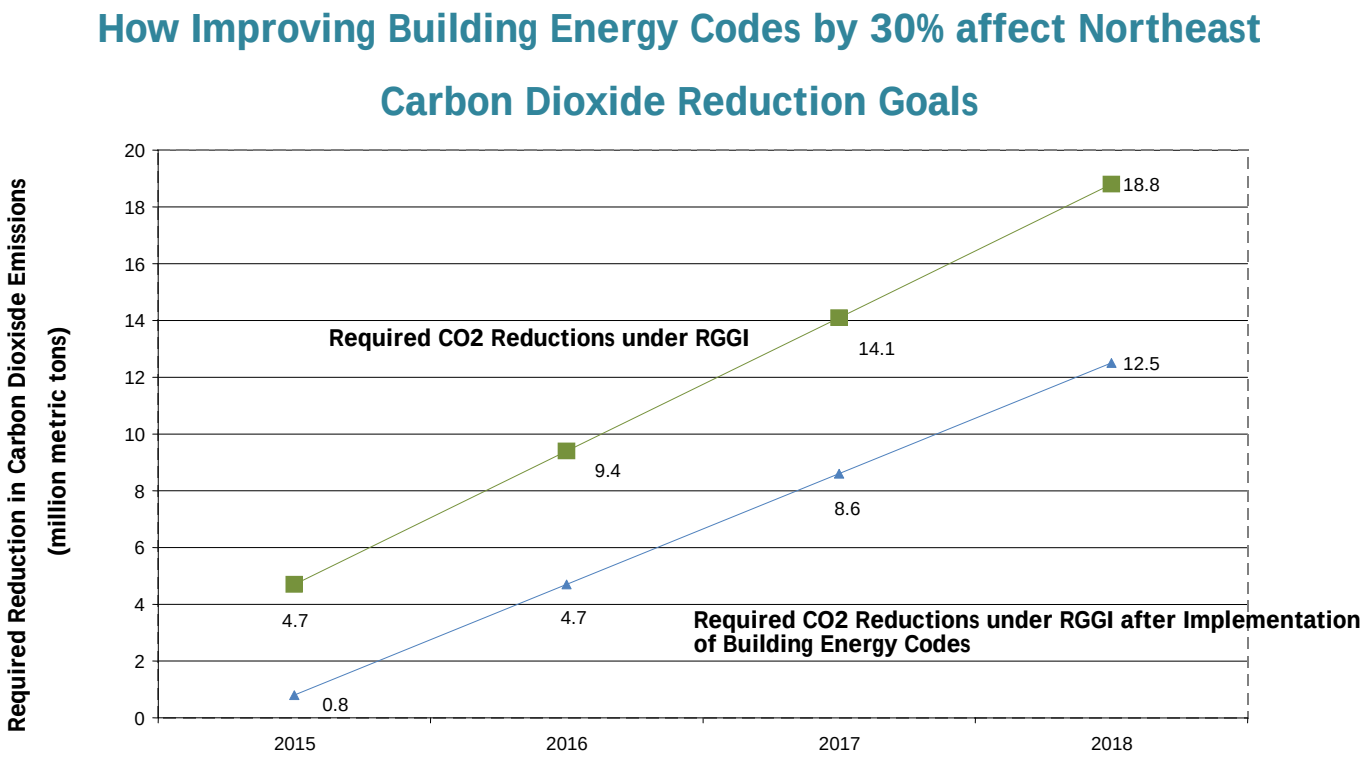
Under a progressive building energy codes policy energy savings and reduced carbon dioxide emissions for the Northeast add up rapidly. If Northeast states adopt residential building energy codes that are 30 percent above the current national model energy code by 2011 and achieve full compliance, energy savings would rise every year so that by 2019 the Northeast would realize savings of 63 trillion BTUs per year. Similar action regarding commercial energy codes would total savings of 104 trillion BTUs. If Northeast states adopt codes requiring net-zero energy buildings by 2030, by 2050 energy use in the region would drop by 594 trillion BTUs per year in residential buildings and 1.25 quadrillion BTUs (quads) annually from commercial buildings.[6]

The lower energy use of a progressive building energy code policy can have a substantial impact on carbon dioxide emissions as measured against similar benchmarks. By 2019, annual carbon dioxide emissions could drop by 8 million metric tons in the Northeast. Annual CO_2 savings could increase to 32 million metric tons by 2029 as a result of implementing building energy codes that increase energy efficiency by 70 percent over current national model codes in 2020. Finally, by 2050, building energy codes mandating net-zero energy buildings will result in carbon dioxide emission savings of almost 99 million metric tons per year. This is equivalent to removing more than 16 millions cars from the road.[7] For more details see Appendix A.

The following graph demonstrates how building energy codes can help meet regional environmental goals. If all states in the region adopt and achieve full compliance with energy efficient codes, the carbon dioxide savings (as shown in Appendix A), by 2018 will generate one-third of the required carbon dioxide emission reductions specified in the Regional Greenhouse Gas Initiative.

[6] The amount of energy savings accumulates rapidly because once a building gets built efficiently, it lasts for decades. Thus, a home built efficiently in 2015 will still be part of the total energy savings in 2035, for example.

[7] According to the United States Environmental Protection Agency: http://www.epa.gov/climatechange/emissions/ind_calculator.html



Fully enforcing codes that go 30% above the current national model code would make a large contribution towards meeting regional Northeast carbon dioxide reduction goals developed through the Regional Greenhouse Gas Initiative (RGGI). RGGI aims to reduce carbon dioxide emissions by 10 percent between 2015 and 2018[8].

D. Need for Comprehensive Approach to Building Energy Codes

Any one of the measures discussed in this white paper would improve building energy code policy. However, to ensure the ultimate goal of reducing building energy consumption, policymakers must pursue a comprehensive approach to building energy codes, including compliance and measurement. Increased code stringency alone will not guarantee energy savings unless construction actually conforms to these heightened requirements. Compliance with the code results from a combination of building practices, such as the use of commissioning, along with properly trained building inspectors and maintenance staff. In order to know whether compliance goals are being achieved, robust methodologies designed to measure building performance must be implemented. Finally, because building energy codes address only new construction or substantial renovations, a comprehensive policy must also address the energy performance of existing buildings.

[8] See http://www.rggi.org/docs/RGGI_Executive_Summary.pdf

E. Integrating Building Energy Codes with Other Energy Efficiency and Environmental Policies

The various public policies that currently govern energy efficiency in Northeast states, such as building codes, appliance standards and ratepayer-funded energy efficiency programs, are interconnected, and good policy design will facilitate the ability for all to work together to maximize savings potential. Appliance efficiency standards are often included as part of building energy codes in ways such as heating and cooling equipment. State code agency staff should know the statutory requirements for HVAC and lighting efficiency standards both at the federal level and in their own state. The state staff should make sure that code requirements do not diverge from minimum appliance efficiency standards to prevent confusion among building inspectors as to the actual required equipment efficiency. If states want to exceed statutory requirements for appliances, understanding these requirements can guide state code agency staff in designing the more stringent code requirements.

Energy efficiency programs exist to motivate developers and building owners to construct energy efficient buildings that exceed the state building energy code requirements and in the process help building professionals acquire the skills necessary to reduce energy consumption in building operations. This, in turn, allows for consistent improvements with respect to the ability of building professionals to adapt to updated and enhanced building energy codes.

A benefit of coordinating statutory (codes) and voluntary (efficiency programs) efforts is the increased recognition by regulators that as energy codes increase in stringency, baselines above which efficiency programs work must also rise. Program administrators and regulators should carefully analyze voluntary programs before the adoption of new codes so that program designs promotes technologies and products that are significantly more efficient than the new code. These actions maintain an appropriate distance between the efforts to “raise the ceiling” on building technologies and practices (programs) and efforts to “set a floor” on the minimum required energy savings generated by the building energy codes. These discussions and analyses must explicitly recognize that efficiency programs themselves generate zero savings from their ratepayer funding for code training and compliance under current regulatory constructs, a dynamic that itself may merit change.

Building energy code agencies and other stakeholders (building code and energy efficiency advocacy organizations; organizations of building professionals; and others) should work with energy efficiency program administrators, promoting the exchange of information to ensure that the program administrators are aware of energy code changes that may affect program designs, and inform appropriate code updates. In addition, opportunities will exist for state building code administrators to collaborate with the energy efficiency program administrators on training and certification programs, particularly because the program administrators already have established relationships with many building professionals.

Attention to the efforts at integration should extend to other energy efficiency related efforts. For example, a progressive energy code policy would be an integral part of the development of high performance building protocols and specifications for buildings such as schools or hospitals. The protocols and/or specifications would undoubtedly incorporate strong building energy codes as a minimum baseline for energy performance and mandate engagement of and participation in the related energy efficiency programs

Finally, states should endeavor to integrate building energy codes into environmental policy efforts such as climate change. Already, strengthening building energy codes comprise key parts of climate change action plans in states such as Rhode Island, Connecticut and Maine.

A building code policy properly integrated with energy efficiency programs should result in:

1. The building energy code as a clear and consistent statewide "construction baseline" to assess the costs and savings of residential, commercial and industrial energy efficiency programs the promote advanced efficiency in homes and buildings

2. The "advanced code" informative appendix as the technical basis for ratepayer-funded energy efficiency programs that promote advanced efficiency in new construction, renovation and remodeling. (See Section A2)

3. Efficiency program administrators' active support for and participation in energy code update processes at the state and national levels, and energy code training and technical support.

3. Policy Recommendations

A comprehensive and effective building energy code policy requires the adoption of stringent code requirements, institution of effective means of enforcing the code requirements, and on-going measurement and documentation of building energy use to guide policy development and implementation to truly result in lower energy consumption. The following sections detail the elements of a Model Progressive Building Energy Code Policy. To illustrate the integrated nature of the various elements of such a Policy, the table below shows how stakeholders interact with the different policies.

Involvement of Various Stakeholders in Progressive Building Energy Codes

	Energy Code Adoption	Code Compliance	Building Energy Measurement
Energy Efficiency Program Administrators	• Advocacy of More Efficient Codes • New Building Construction Programs • Inform development of "Advanced Code" Informative Appendix • Provide data from baseline practice market assessments to state code officials • Participate in Energy Code Technical Committee	• Coordinate/Integrate Advanced Efficiency Program Training and Technical Support with Energy Code Training and Technical Support • Fund Energy Code Training and Technical Support	• Include Building Benchmarking as Program Element
Building Professionals[9]	• Advocacy of More Efficient Codes • Inform development of "Advanced Code" Informative Appendix • Participate in Energy Code Technical Committee	• Assist Training of Local Code Officials • Develop capacities to meet and exceed minimum energy code • Identify energy code implementation issues	• Provide information needed for building energy benchmarking and to assess energy code compliance
State Code Offices	• Maintain State Energy Code consistent with national model energy codes • Inform National Model Code Development to advance energy efficiency • Maintain "Advanced Code" Informative Appendix • Maintain Energy Code Technical	• Train and certify energy code inspectors (state, local, third party) • Maintain statewide energy code training for regulated community • Maintain technical support tools and services	• Maintain up to date building energy performance benchmark • Establish electronic data systems to monitor code compliance • Assess energy code

[9] The definition of "Building Professionals" includes architects, engineers, contractors and building operators.

	Energy Code Adoption	Code Compliance	Building Energy Measurement
	Advisory Committee • Coordinate code development with appliance efficiency standards	• Oversee local code enforcement	compliance rates and issues
State Energy/ Public Utility Commissions	• Inform state and national energy code development as element of overall state energy policy • Encourage Efficiency Program support for energy code evolution • Align construction standards for state funded construction with "Advanced Code" Informative Appendix • Tap federal funding for energy code development and implementation	• Encourage Efficiency Program support for energy code training and technical support • Include building energy code impacts in state energy planning and evaluation	• Inform building energy benchmarking policies and coordinate with overall state energy policies • Include energy benchmarking as element of efficiency programs • Train and certify building energy raters
Energy Efficiency Advocates	• Advocate for Stronger Codes • Support Efficiency Program Administrator code activities • Participate in Energy Code Technical Committee • Encourage federal funding for state energy codes	• Encourage Efficiency Program support for energy code training and technical support • Recommend code implementation tools and training resources	• Encourage and inform Time of Sale Building Energy Rating and Performance Policies
Other State Offices (e.g., Consumer Protection)	• Advocate for Stronger Codes • Support Efficiency Program Administrator code activities • Participate in Energy Code Technical Committee	• Track energy code compliance • Encourage consumer awareness and education	• Encourage and inform Time of Sale Building Energy Rating and Performance Policies

For each proposed policy, the white paper includes: (1) policy recommendations; (2) explanation of the policy; (3) opportunities for integration with other energy efficiency policies; (4) examples of government and industry best practices; and (5) and suggested statutory language.

A. Code Adoption

1. Regularly Update the State Building Energy Code

Policy Recommendations:

a. Adopt latest national model energy code every three years.

b. The state should participate in national model energy code update processes to advance energy efficiency.

c. Restrict state amendments to national model energy code to increase overall energy savings (e.g., to increase stringency, improve compliance, etc.)

d. Maintain a Technical Advisory Committee to inform updates to the energy code and the Informative Appendix.

Policy explanation: Regular updates to the state building energy code align a state code with the latest developments in building technologies and practices. However, the process for updating a state-specific building energy code requires a significant amount of time and effort involving research and analysis, as well as coordination with other elements of state building codes, such as the mechanical and electrical codes. This often results in an extended process that leaves the energy code out of date, unnecessarily complex and out of step with codes from nearby states (particularly important in areas where building professionals work in multiple states). In addition, state code offices or other authorities having jurisdiction are often forced to complete the updates with limited resources and staff. A better process for updating state building energy codes is to automatically reference the latest edition of the national model codes as a statutory requirement, and to pursue cooperative participation in the national code change cycles with like-minded jurisdictions to influence the efficiency requirements of the model energy code.

NEEP recommends that states seek to automatically adopt the latest version of the IECC as an integral part of a comprehensive codes adoption process, such as is the case in Massachusetts, Pennsylvania, Maine, Maryland and Vermont. The IECC is the nationally recognized model energy code, developed by the International Code Council (ICC) through a rigorous amendment adoption process that ensures all changes are subject to open public comment and debate.[10] The ICC amendment process guarantees a formal process to propose amendments for committee review and recommendation, and a final vote by code officials and other state representatives from across the U.S. Furthermore, the IECC and International Existing Building Code (IEBC) integrate and work in concert with the other ICC codes, such as existing building and mechanical codes, to ensure seamless implementation and the elimination of conflicts among the various codes. The ICC process brings out the best proposals that stand the tests of consistency, energy cost reduction, energy use reduction, and reduction of greenhouse gas emissions. In the end, automatic adoption of the IECC allows the AHJ to allocate its resources to concentrate on other important functions such as improved compliance. Consistency in state energy code policies to automatically adopt the latest version of the IECC can reduce the burden for building professionals to stay abreast of and comply with state energy code requirements…

The ICC code updates occur on a three-year schedule, with two cycles of hearings between its three-year publication intervals. This cycle benefits states by providing for regular and aggressive improvements to energy

[10] For the same reasons, NEEP also recommends that states automatically adopt the complementary International Existing Building Code (IEBC).

efficiency while also allowing time for states to incorporate new technological advances into practice and to update energy code training and enforcement materials.

The ICC incorporates amendments based on a process that depends on the participation of state code officials. **State collaboration with regional and national efforts** to increase the IECC energy efficiency requirements can leverage resources and build momentum to positively affect each new edition of the code.

Best Practices: For regular, periodic state energy code updates, NEEP recommends that:

- **First, the AHJ be required to adopt the latest version of the national model code.** Care should be taken not to introduce vague language.[11]

- **Second, any statutory language should prohibit adoption of less stringent provisions.** This is particularly important in highlighting the differences between the IECC and the International Residential Code (IRC), which, over the last several updates, have diverged in terms of energy efficiency measures. The IRC has either adopted weaker standards or failed to adopt strong new standards included in the IECC. Therefore, states should link all prescriptive requirements to the IECC either by simply adopting the IECC or through amendments to the IRC. Alternatively, a state could simply delete the energy chapter of the IRC (Chapter 11) simultaneous with its adoption of the latest IECC. Because of the slightly different requirements, adopting both energy codes will inevitably lead to confusion.[12]

- **Third, to provide for a well informed building code adoption processes, state code offices should maintain a Technical Committee** such as those found in New York and Massachusetts to inform code updates. Technical Committees are typically made up of key stakeholders that provide guidance on technical questions related to the adoption of the code. Such guidance can include pointing out possible sources of conflict with other codes or technical standards (e.g., appliance standards) as well as address the technical feasibility or cost-effectiveness of individual requirements.

[11] This could possibly have been the case in Vermont. See Act Number 0092 Section 8 V.S.A 21 and Section 9 V.S.A 21, 2007 Legislative Session)

[12] In Maine, for example, a new building codes statute enacted in 2008 mandates adoption of both the IRC and IECC, leaving it to the newly-created Technical Building Codes and Energy Committee to resolve any inconsistencies between the two codes. Unfortunately, this situation also opens the door to the possibility that the committee may adopt the less stringent IRC provisions. Likewise, Pennsylvania law [12] allows both the IECC and the IRC and also provides an additional alternative to complying with the IRC energy provisions. Such situations are unnecessarily complicated and may reduce energy savings if the less energy efficient code is enforced.

Code Update Policy: Best Practices Examples

State	Statute
Massachusetts	Green Communities Act, Chapter 143; Section 94; Item (m) http://www.mass.gov/legis/laws/mgl/143-94.htm
Summary: The "Green Communities Act" of 2008 contains language that will tie the state energy conservation code to the IECC, and includes "anti-backsliding" language in that it requires any changes to the IECC to increase energy efficiency. The state code update must occur after each model code update.	

Suggested statutory language: *The Authority Having Jurisdiction (AHJ) shall adopt, at least every three years, the latest edition of the International Energy Conservation Code (IECC), published by the International Code Council, together with any other more stringent energy efficiency provisions that the {AHJ} concludes are warranted. No amendments to the energy conservation code or the existing building code shall be adopted that will result in a net increase in energy consumption in buildings.*

2. Include an Informative Appendix to the State Energy Code

Policy Recommendations

a. States should adopt an Informative Appendix for both residential and commercial buildings that is at least 20 percent more energy efficient than the base state code.

Policy Explanation: In recent years, municipalities have shown increased interest in building energy codes that are more energy efficient than the national model codes or adopted state energy codes. Alternatively referred to as "stretch code," "beyond code," or "above code," these advanced building energy standards have been included as policies in several municipalities and states in the region. Unfortunately, there has been no coordination in this effort and it has resulted in spawning a plethora of above code standards with differing baselines and measurements for achieving energy improvements. Although well-intentioned, these various policies have generated significant confusion in the marketplace, particularly in regard to defining the "above code" standard. Moreover, many new state laws include requirements for certain categories of buildings to be a certain percentage more efficient than the state energy code, a vague standard that is difficult to implement. An AHJ can address this confusion and provide guidance by adopting an "Informative Appendix," or a section of the code that contains a listing of codes

and building standards that have been determined by the AHJ to be acceptable as more energy efficient codes. An Informative Appendix:

- Informs architects, engineers and other building and design professionals who are looking to build energy efficient buildings with an appropriate reference.
- Establishes criteria for ratepayer funded energy efficiency new construction programs.
- Establishes criteria for state policies to incentivize high performance buildings, such as tax credits or utility demand-side management rebates.
- Points the way for changes to future energy conservation codes.

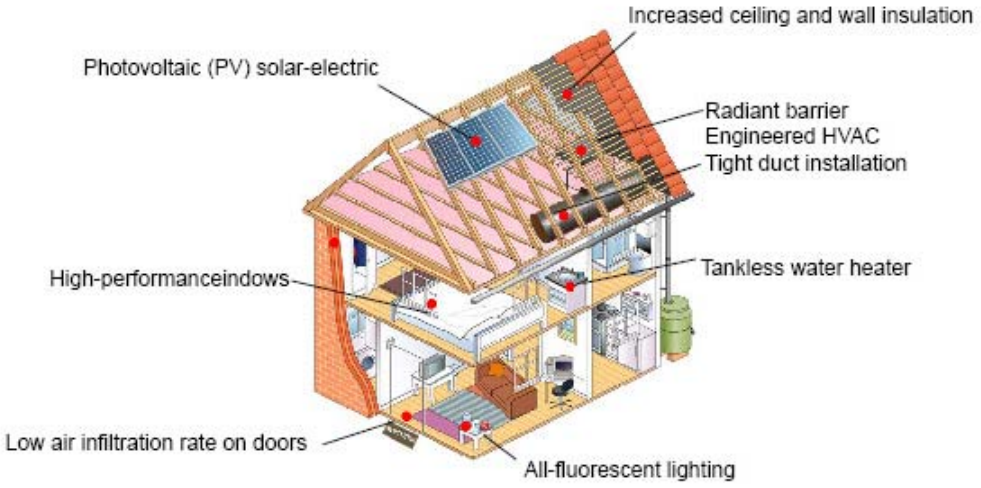
Municipalities: For municipalities that wish to adopt building energy codes more stringent than the model national code, the Informative Appendix provides a consistent set of requirements. This ensures that the municipalities actually adopt a more stringent, enforceable code. The Informative Appendix will limit the number (and inevitable confusion and difficulty to building professionals) of multiple "stretch" codes within a state. In some states, legislation may be needed to allow municipalities to adopt energy code requirements other than the state minimum code requirements.

Support for Future Code Upgrades: The use of the Informative Appendix builds market capacities to deign and construct dwellings and buildings with advanced energy efficiency features. Developing such market "know how" supports the eventual adoption of strategies that result in net-zero energy buildings. Adoption of an informative appendix makes a state building energy code dynamic and forward-looking, providing ever increasing energy savings while working in conjunction with the baseline minimum building energy code. As such, an Informative Appendix works well, for example, within the context of state exploration of net-zero energy buildings, such as the effort currently underway in Massachusetts where the Governor has established a net-zero energy building task force with the goal of:

- Pointing the way toward broad marketability of net-zero energy residential and commercial buildings in the private sector by 2020, and universal adoption of net-zero energy buildings for new construction by 2030;
- Establishes criteria for local or state programs or policies that require state or municipal-funded construction to exceed minimum energy code requirements.
- Specifying an interim standard for state-owned construction that is significantly more stringent than the current Mass LEED Plus benchmark; and
- Developing specifications for the first state-owned net-zero energy building by January 1, 2010.[13]

[13] More information on the Massachusetts Net Zero Energy Building Task Force can be found at www.mazneb.org.

Components of a Net-zero Home



Integration with Energy Efficiency Programs: There are two ways that the Informative Appendix can interact with energy efficiency programs. First, the Informative Appendix can be the technical basis for energy efficiency programs in new construction. Otherwise, in places where a municipality wants to adopt a stretch code, the Informative Appendix can serve as the basis for the code itself. It is important to stress, that for the second option, the utility should retain the ability to provide financial incentives to buildings meeting the Informative Appendix even though the Informative Appendix is the code.

Best Practices: Any code or standard included within an Informative Appendix must possess the following features.

- A building meeting this code or standard must exceed the energy efficiency of the current state building energy code by a given policy-directed minimum, e.g. 30 percent.
- The code or standard must be written in code-enforceable language, and not, for example, as a building energy rating model, i.e., LEED, Green Globes, etc.
- Building officials must be able to verify that the buildings meet the code or standard. (This may include programs to train building inspectors on how to inspect for compliance. The specific code or standard should include mechanisms for its enforcement such as it being tied, but not limited to, Home Energy Rating System (HERS[14]) that can provide documentation to the building official that the building meets the requirements of the code or standard being used.)
- The AHJ must specify within its adopted code that a building complying with a code or standard listed in the Informative Appendix would comply with the state energy code.

Among the advanced building guidelines that NEEP recommends for potential inclusion in an Informative Appendix are:

[14] See Glossary for definition.

For Commercial Buildings	For single, duplex & multi-family homes
• New Buildings Institute *Core Performance Guide*[15]	• Title 24 of the California Building Code[16] (for residential buildings) • The "30% Solution" savings package introduced by the Energy Efficient Codes Coalition for adoption by the International Code Council (ICC) [17] • ENERGY STAR for Homes. [18]

Suggested Statutory Language: *The AHJ shall, within one year from enactment of this section, develop specific options defining how any proposed residential or commercial building can exceed the requirements of the adopted energy conservation code by a minimum of twenty (20) percent. These options shall be set forth in such code as an Informative Appendix thereto. Any building that complies with an option listed therein shall be deemed as meeting the requirements of the energy conservation code.*

B. Energy Code Compliance

1. Develop training and certification requirements for Building Energy Code Inspectors

Policy Recommendations:

a. The AHJ should incorporate a third party inspection system such as the Specialized Plan Examiner/Inspector (SPE/I) System originally instituted in Washington State and/or a system based on the RESNET Home Energy Rating System (HERS[19]).

b. Train and certify all inspectors on building energy codes.

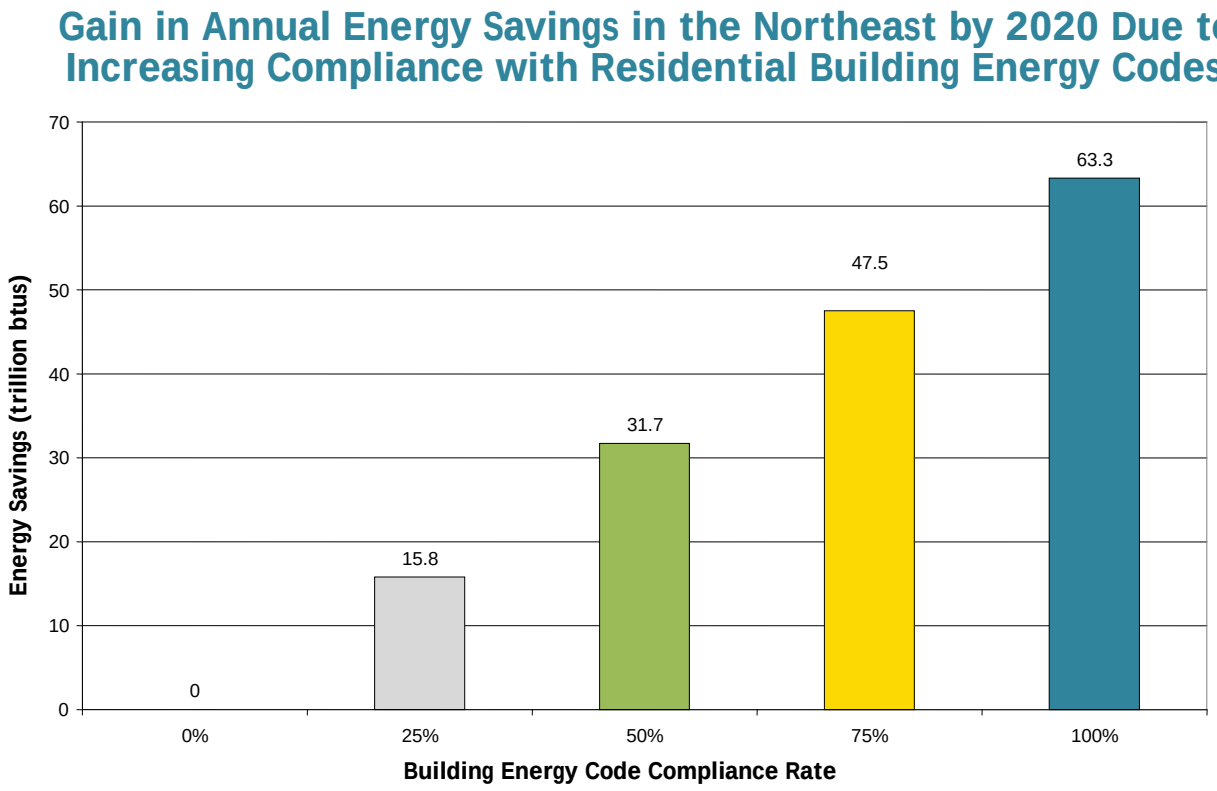
[15] The Core Performance Guide is currently a standard but has been translated into code-enforceable language. See: www.neep.org for more information.
[16] It should be noted that Title 24 requirements are keyed to California specific climate zones. Prior to any other state or municipality adopting Title 24, the appropriate climate zones should be specified.
[17] The full set of proposals from the EECC is found as proposal EC-154 in the latest round of technical amendments to the IECC. The 30% improvement would not apply to jurisdictions that adopt the 2009 IECC as this code already partially incorporates the proposals in EC-154.
[18] Energy Star for Homes is roughly equivalent in stringency to the 2004 Supplement of the IECC (roughly a Home Energy Rating System score of 100). For it to function as an Informative Appendix, a jurisdiction should specify that the dwellings meet a HERS Index of no more than 70. Each point decrease in the HERS Index roughly equals a 1 percent improvement in energy efficiency.
[19] See the Glossary for definition of HERS.

c. Establish a program to measure code compliance and building energy performance.

d. Establish a training committee to oversee the development, promotion, and delivery of training on building codes to state code officials

Policy Explanation: Having a strong energy code does not guarantee energy efficient buildings. Municipalities need adequately trained and certified inspectors to ensure that buildings comply with the energy code. Mandating energy code training, supplemented by updated procedures, would improve compliance and increase energy savings.

To understand the importance of compliance, the following chart, based on energy savings derived from analysis by the Building Codes Assistance Project, shows how simply improving the level of compliance with the building energy code markedly increases the energy savings.



Typically, energy codes compliance rates range from 40 to 60 percent, though compliance rates have gone as low as 16 percent in some jurisdictions[20].

[20] A 2008 report by Efficiency Maine documented a compliance rate of 16 percent with the building energy code. Report on LD 1655 Building Energy Codes by the Maine Public Utilities Commission and MaineHousing.

Many states do not specifically require energy code training for code inspectors, although it is often offered as a part of their continuing education opportunities. Legislation should be crafted to specifically require the AHJ to implement or develop an energy training and certification program for inspectors to assure technical comprehension and increase code compliance. Certification of candidates who will perform commercial and residential plan review/inspections is available through the International Code Council's certification programs and testing. Or, if states so chose, they could establish and fund similar education and certification programs providing a valuable resource to their municipalities.

Integration with Programs: Program administrators could help fund and administer training and certification programs if the related regulatory constructs are modified to exclude such costs from the standard cost-effectiveness considerations and/or a methodology for attributing savings to the programs for code compliance efforts are developed.

Best Practices: The AHJ should establish a training committee to oversee the development, promotion, and delivery of training on building codes to state code officials, local inspectors, and the regulated community, such as architects, engineers and other building professionals, construction trades and facilities directors. The training committee should have the authority to approve and develop training materials and delivery options (which may include a combination of face-to-face and online training), as well as consult with building officials' education committees to ensure support and compliance. The AHJ would be charged with the responsibility for administering such programs.

The training committee should also develop an annual plan for building code training and technical support – what, where, when, who, how – that leverages resources and knowledge. One available means is through certification of commercial and residential plan review/inspections candidates conducted through the International Code Council's certification programs and testing. Training could also be accomplished through established training venues, such as community colleges and professional associations. For example, the Boston Society of Architects conducts a series of trainings throughout the state each time the Massachusetts Board of Building Regulations and Standards updates the building codes. Such training could be funded through a number of resource frameworks, including tuition, grants, and through a state's ratepayer funded energy efficiency programs.

Energy code training classes or seminars should be developed, through a regulatory process, which would cover at a minimum, the following topics:

- Energy Code and Residential Code plan review issues;
- Interpreting energy software program results;
- Integration of plan review results into inspection tasks;

- Inspection procedures based on integration of energy issues into individual site visits;
- Field inspection issues of envelope and systems components;
- Above-code optional programs and strategies; and
- Measurement tools and criteria (such as blower door and duct blaster testing).

A well-crafted code training program should include mentoring and inspection tools development for code officials and building professionals. As part of the continuing certification of inspectors, energy conservation code modules should be a specific requirement. Also, the state should seek to increase opportunities for training of the regulated community and use state agencies and tools to market this training.

Finally, financial resources should be allocated directly to funding for energy code training, the activities of the training committee, and for the resources to fully implement training programs. Proper training and certification must have an adequate and secure source of funding; however, it does not have to be expensive.

Third Party Inspectors: The AHJ can establish a code training and certification program modeled after Washington State's SPE/I program. This program, run by a non-profit corporation formed by the state's utilities, developed and funded a training and certification program.[21] The Washington Association of Building Officials maintained a list of all qualified inspectors and made the list available to any interested party, such as builders or municipal officials, in order to provide municipalities or other interested parties a means to find the certified personnel. The program included supporting materials such as a guidebook showing how municipalities and/or builders could use the services of the inspector. Funding for such third-party inspectors could be realized from a portion of the building permit fee. States may also consider allowing existing local building inspectors to "opt in" to such a system, whereby the existing inspector could qualify as the specialized building energy code inspector, provided he/she secured the appropriate levels of training and was certified as such. In such a case, the fee for the specialized inspection would revert to the municipality. See Section 2 below for a more detailed discussion of funding options.

A second type of third party inspection could involve the use of HERS raters. A robust training and certification program already exists for the development of HERS raters. Consequently, a growing pool of qualified raters already exists. Using HERS raters fits in well with the accelerating trend of states and municipalities adopting energy codes tied to the federal ENERGY STAR program (or the use of the HERS Index directly as one way to meet code), which employs HERS raters to assure compliance. Among the strengths that energy raters bring is detailed knowledge of how to inspect for such items as duct leakage, which is an important part of the newly adopted 2009 edition of the IECC, along with generalized knowledge of the energy code and above code energy standards. Care must be taken, however, in the incorporation of energy raters (or SPE/I inspectors) into the state and local code inspection system, particularly where the possibility exists for conflicts with existing state laws when private contractors are introduced into a public function.

Establishing Baseline Studies: Finally, to ensure that code inspectors, whether municipal or third party, correctly assess code compliance in buildings, the AHJ should develop a comprehensive program designed to verify compliance of both residential dwellings and commercial buildings. Knowing the actual numbers of compliant buildings as well as the specific requirements that builders do and do not comply with will help state agencies

[21] Although the Washington State ran on utility funding with a utility based group designing the program, the structure laid out at the beginning of the "Best Practices" section, using a state agency to design the training and certification can also work.

continually modify and improve their training programs. This work should consist of a baseline study to determine the current level of compliance, identification of specific areas where compliance is weak and recommendations on how to address these weaknesses. An example of such a study was done for the Massachusetts Board of Building Regulations and Standards in 2000.[22] Importantly, all initial baseline compliance studies should have frequent follow-up studies to gauge the effectiveness of implemented policies.

The New York State Energy Research and Development Authority (NYSERDA) plans to conduct a baseline study as part of its energy portfolio standard.[23] This study aims to identify areas of low compliance, the reasons for the low compliance and use this information in the agency's effort to train code officials. It also calls for follow up studies.

Compliance Policy: Best Practices Examples

State	Statute
Massachusetts	"Green Communities Act" Section 94 of Chapter 143; item (p) http://www.mass.gov/legis/laws/mgl/143-94.htm
Summary: This legislation requires the state's Board of Building Regulations and Standards (BBRS) to work collaboratively with the Department of Energy Resources to adopt regulations for the training and certification of energy code inspectors. It also mandates that all new construction and major renovations pass inspections by certified energy code inspectors. The statute allows for the establishment of third party inspectors.	
Maine	LD 2179 30A MRSA Section 4451 http://www.bcap-energy.org/files/ME%20LD2179.pdf
Summary: Maine's code training mandate incorporates the need for the Maine Community College System, the Department of Environmental Protection, the Department of Health and Human Services, state energy efficiency programs, and the office to all work collaboratively to establish the continuing education program. The mandate also requires that the program provide basic and advanced training in the technical and legal aspects of code enforcement necessary for certification. The legislation explicitly allows for the use of third	

[22] *Impact Analysis of the Massachusetts 1998 Residential Code Revisions,* Prepared by XENERGY, Inc. *May 14, 2001.*
[23] See Best Practices Box Below for a link to the New York State proposal.

party inspectors.	
New York	A Strategy for Enhanced Energy Codes and Appliance Standards in New York Prepared by The New York Energy Research and Development Authority October 15, 2008 http://www.dps.state.ny.us/NYSERDA_Codes_and_Standards_Strategy_15_October_2008_FINAL.pdf
Summary: Section 4 contains a description of the plans for the training program called, *Development and Delivery of Advanced Training, Tools, Strategies, and Resources*. This section gives a detailed description of the program designed to develop training courses and find training service providers. The purpose is to provide exhaustive training to building professionals including code inspectors, architects and homebuilders. The section also gives a detailed discussion of how the agency plans to implement its baseline study.	
Washington	SPE/I Program: The Washington State Energy Code: Certification for Inspectors and Plan Reviewers for the Non-Residential Energy Code. January 1997 http://www.energycodes.gov/implement/documents/case_certify.doc
Summary: This report gives a broad overview of the third party inspection program developed and implemented by Washington State, including descriptions of successful and unsuccessful aspects of the program. It also includes important recommendations helpful to any other jurisdiction contemplating the adoption of a similar program.	

Suggested Statutory Language: *The AHJ, in consultation with [relevant state agency(s)] shall develop requirements and promulgate regulations for the training and certification of building code enforcement officials that incorporate the energy provisions of the state building code. The AHJ shall also require that all construction, reconstruction, alteration or repair[24] of all buildings be approved by inspectors certified in the state building code energy provisions.*

[24] During the rulemaking process, the implementing agency will have to set (if it has not already done so) specific rules on what constitutes a major alteration or repair.

2. Provide Adequate and Stable Long Term Funding for Code Agencies

Policy Recommendations:

a. The AHJ should institute a fee for service structure that sets aside dedicated funding for plan review and inspections of energy code.

b. Permit applicants should contract directly with special energy code inspectors.

c. A stable source of funding for training and certification, technical support for the regulated community for code adoption, for code development including the Informative Appendix and for compliance reviews should be established.

Policy Explanation: Requiring inspections without supplying adequate funding for these inspections raises the issue of unfunded local mandates. Municipalities should not have to shoulder alone the financial burden of achieving better building energy code compliance. Instead, a user "fee for services" should be established and collected as a portion of building permit fees immunizing this function from budget shortfalls and allowing trained and certified energy code inspectors to supplement the work of local building inspectors. This fee could accomplish two important functions.

1. First, the fees should sufficiently fund proper review of construction drawings and inspection services of buildings during and after construction.

2. Second, a small portion of the fee could be allocated to assist the state in providing the infrastructure for code inspection training and certification, code adoption and development as well as technical support to the regulated community.

The fund generated by these fees are separate from state general funds and impose no burden on municipal governments. The fund would, nevertheless, be under the control of the municipal building department or the relevant local authority. Alternatively, responsibilities for plan check reviews and inspections should lie on special inspectors hired by the permit holder.

How Connecticut Funds its Training and Certification Infrastructure

In Connecticut, a surcharge of $0.16 per $1,000 value of permit work raises over $1 million per year for education programs. It supports training staff at the state level, outside instructors, training materials and aids, and venues where training is conducted. Such an education/certification program should embrace all code officials, building and fire, as well as other licensed and non-licensed professionals and trades on the basis of what their statutory needs are for continuing education. Those members of the building community required to attend to maintain licensure or certification are guaranteed space. These sessions can be held at local community centers. One caveat to this approach is that the fee typically applies to all aspects of building code work. Since energy code training is typically a lower priority, it is likely that only a small portion of this fee will be dedicated to energy codes.

Best Practice: Funding for plan check reviews and inspections could come directly from building permit fees. However, the jurisdiction should make sure to dedicate a certain percentage of the building fee to the energy code

to make sure it is not overlooked. On the other hand, the AHJ could simply direct the developer/owner to contract directly for the energy code plan check and inspection. This approach is appealing because it makes it more likely for the energy aspects of the project to receive attention. (See SPE/I model below) Whichever funding model is used, it should also be flexible enough to allow for instances where small, rural communities need to pool resources to allow for qualified energy code inspectors to be hired on a shared basis, with compliance responsibilities based on a population formula.

Special Plan Examiner/Inspector Program

The Washington State SPE/I program provides an alternative funding strategy. Once the special inspectors were trained and certified, Washington State allowed for the permit holder (or their representative) to contract directly with the special inspector to perform the proper reviews. Section 1704 of the International Building Code provides the requisite language for enabling this function. At the end of the process, the special inspector must provide a report(s) to the building official in charge and the ultimate approval will remain with the building official.

Funding for the training and certification functions of the SPE/I program described in Section B1 was provided by the utilities in Washington. Ultimately, this funding model proved unsustainable, as once the utilities ended their funding, the program ceased to exist. Therefore, while using utility funding to start up such a program may make sense, there should a guarantee that funding will continue if (or when) utilities stop funding the program. The amount of funding needed should drop as the template for the training and certification program is established. It should be noted that the funding required for the SPE/I training and certification program was relatively minor, roughly $5 million over the three-year life of the program.

Funding for Informative Appendix

Beyond the typical work in code development, an important and non-traditional use for the building fees would be to help in the development of the Informative Appendix. Development of the Informative Appendix on a regular basis would help ensure that the state provides the necessary support to stakeholders looking to build dwellings and buildings that are more stringent than code. To the extent, that utilities or program administrators use the Informative Appendix as the basis for the new construction programs,

Inspector Funding Policy: Best Practices Examples	
Connecticut	Chapter 541 part 1A section 29-522a http://www.cga.ct.gov/2007/pub/Chap541.htm#Sec29-252a.htm
Summary: See Description Box, Page 25.	

New York	A Strategy for Enhanced Energy Codes and Appliance Standards in New York Prepared by The New York Energy Research and Development Authority October 15, 2008 http://www.dps.state.ny.us/NYSERDA_Codes_and_Standards_Strategy_15_October_2008_FINAL.pdf
Summary: This training program (described in the previous section) would be funded out of program funds that come from the energy efficiency portfolio standard. Going through a program administrator provides money but is subject to the continuation/renewal of funding.	

Suggested Statutory Language: *Local jurisdictions shall, in accordance with statute, incorporate into the building permit fee a fee structure sufficient to provide for the dedicated plan check and inspection of the energy code. The Commissioner of (XXX) shall adopt, in accordance with requirements of [statute] a schedule of fees to be added to local permit fees, adequate to defray the direct and indirect costs for administration of a training and certification program for code enforcement officials, design professionals, and building construction trades, to be known as the Codes Enforcement Training Fund. Such fee schedule shall carry forward to each subsequent fiscal year. Should the fund balance of such Fund exceed {$XXXXX} at the end of any fiscal year, such excess funds shall be deposited in the General Fund.*

3. Require Commissioning for Commercial Buildings

Policy Recommendations

a. The AHJ should adopt commissioning requirements as part of the building energy code. The commissioning requirements should cover work prior to and after the achievement of a certificate of occupancy.

b. Commissioning should include all building systems including HVAC, lighting.

Policy Explanation: Commissioning consists of a process that confirms, with extensive documentation, that building systems are planned, designed, installed, tested, operated and maintained in accordance with design requirements established at the beginning of a project.

As the technology required to construct highly efficient commercial and industrial buildings becomes more complex (particularly with the increasing use of whole building strategies), the need to ensure that all building systems (such as heating, cooling and lighting) function optimally becomes paramount. Requiring a fully integrated commissioning process from the beginning of a project assures a building owner that the building will perform as designed and will generate the designed level of energy efficiency.

The full scope of commissioning extends beyond the purview of the building codes. Many of the requirements affect not only energy, but overall performance of equipment and systems. Thus, the scope of requirements covered by the national model codes is incorporated within the mechanical code to address issues of systems design, load, sizing, control, operation and maintenance. This is a clear illustration of how energy code adoption must be comprehensive and coordinated to achieve the multiple objectives safety, health and welfare and energy efficiency. Care must be taken when trying to incorporate commissioning requirements into code for another reason. With respect to the code, the inspector's work ends upon the issuance of the Certificate of Occupancy (CO). However, proper commissioning requires the commissioning agent to review and inspect building systems after the building goes into use to ensure that all systems are, in fact, functioning properly under real load conditions. This implies that some sort of mechanism, whether a requirement or as part of a energy efficiency program, should be incorporated. Code language must provide a requirement for commissioning work to continue after the building goes into use. For example, the Washington State energy code requires that construction drawings require post construction commissioning to be provided to the building owner and provides details as to what post construction commissioning entails.

Integration with Programs: Commissioning is a part of ratepayer-funded commercial new construction programs in New York and Massachusetts. The fact that commissioning is an integral requirement of state SBC programs as well as for such programs as the Collaborative for High Performance Schools (CHPS) has meant that market actors in the field of energy efficient construction have become more familiarized and comfortable with the use of commissioning. This will facilitate the implementation of commissioning because best practices along with a growing number of practitioners already exist. Consequently, it can be an efficient use of SBC program funds if attribution of savings related to correction of deficiencies identified by program-funded mandatory commissioning is resolved. However, care must be taken to avoid having commissioning lead to relaxed implementation of SBC program requirements. It should not function as a backstop for poor construction. Instead, commissioning should function as a guiding framework, continual check and final confirmation on buildings systems.

Best Practices: Clearly, no "one size fits all" process exists for building commissioning. However, certain guidelines should be used to help maximize the benefits of commissioning. Such guidelines should adhere to some common and accepted principles in their technical application such as developing and implementing an appropriate testing program or continuously documenting all commissioning activities. See, for example, a sampling of industry best practices as developed by Portland Energy Conservation, Inc.:[25]

[25] For a more complete description, see guidance as developed by Portland Energy Conservation Inc. at http://www.peci.org/CxTechnical/resources.html#construction

Commissioning Policy: Best Practices Examples

State	Statute
California	California Green Building Standards Code Section 504.4 http://www.document.dgs.ca.gov/bsc/prpsd_stds/2007/2007_cgbsc_9-23-08.pdf
Summary: Provides detailed instructions on how to properly conduct the Title 24 acceptance requirements.	
Washington State	Washington State Energy Code WAC-51-11-1416 http://apps.leg.wa.gov/WAC/default.aspx?cite=51-11-1416
Summary: Provides a complete set of code requirements for commissioning. Includes post-construction commissioning requirements.	

Suggested Statutory Language: The AHJ, in consultation with the [relevant state agency], shall develop requirements and promulgate regulations, requiring a process to ensure that all new non-residential buildings and any major reconstruction, alteration, or repair of all non-residential buildings perform as designed with respect to energy consumption by undergoing building commissioning. Non-residential buildings less than 50,000 square feet shall not be subject to such regulations. Initial operation and testing commissioning must be completed and approved before issuance of a permanent certificate of occupancy. Such regulations shall utilize a nationally accredited standard.

C. Measuring and Reporting Energy Baseline

1. Require the Disclosure of Home Energy Use at Time-of-Sale

Policy Recommendations:

a. States should require the measurement and labeling of residential dwelling and commercial building (both new and existing) energy performance prior to sale of the building.

b. States should require the labeling of all buildings with information on energy performance.

c. States should require improvements in energy performance at the time of sale.

Policy Explanation: Time of sale requirements address the reality that regulations governing new construction make up only one opportunity for energy savings that can be realized from residential and commercial buildings. Energy improvements to existing buildings can also generate significant savings as the number of existing buildings far outnumbers new construction. Even modest improvements spread widely among existing buildings can generate large energy savings. Unfortunately, building codes typically only address new construction or extensive renovation, as the existing building stock is grandfathered through law. Thus, mandatory time of sale energy use ratings and disclosures are a reasonable and effective way to address the energy use of existing homes and commercial buildings. Requiring energy ratings for new construction and the disclosure of energy usage of existing buildings at the time of sale creates market incentives for both builders and current owners to make energy saving improvements in both new and existing dwellings and commercial buildings. Home energy ratings can also help confirm compliance with energy code as well as help track compliance across a state or given jurisdiction.

The use of time of sale requirements can be used with respect to the sale of newly constructed homes and buildings as well. In this case, time of sale policies would help ensure that the homes and buildings up for sale actually meet code and perform as they have been designed.

Time of sale policies introduce information into the marketplace. This information, the actual energy use for a home or building, helps the market place a value on energy efficiency. This can help buyers (or sellers) finance efficiency improvements before or after properties are leased or sold (e.g., through energy efficiency mortgages for example).

Integration with Programs: Programs can help implement time-of-sale requirements if the construct is developed in such a way that savings can be attributed to the related building performance or retrofit energy efficiency programs that are typically offered in Northeast states. Time-of-sale requirements can be related to programs such as Home Performance with ENERGY STAR and commercial retrofit programs. For example, if the analysis goes beyond simple disclosure of energy bills and requires identification of cost-effective efficiency opportunities via an audit, program administrators can establish a program to help defray the cost of the audit ("test-in," in Home Performance with ENERGY STAR terms), incentivize the efficiency-related work undertaken and then fund follow-up audits ("test out," in Home Performance with ENERGY STAR terms) to ensure that any improvements actually result in energy savings.

Best Practices: Through regulatory proceedings, typically through the state department of consumer affairs (or equivalent) a state should establish guidelines for the building energy rating scoring, implementation, evaluation, labeling as well as training of inspectors for time of sale disclosure. Any effective program would cover new and existing residential dwellings and commercial buildings. In addition to the disclosure of the property's energy bills, an effective scoring guideline should include a home energy audit by a qualified energy rater and be based on an

accepted home energy rating system such as HERS. Disclosure of energy conservation aspects of the property (such as envelope insulation, window u-factor, and HVAC efficiency) should be included. Historical energy use, recent energy upgrades and evaluation of proper installation should be mandated information for existing buildings. Tools such as ENERGY STAR Yardstick[26] provide even more accurate detailing of energy use without going all the way to energy audits.

While vital, the disclosure of utility information needs to be supplemented with a simple system of labeling the dwelling or building so that both sellers and buyers have a simple reference (much like miles per gallon for cars) upon which to compare buildings. The European Union currently has draft regulations in place that will require the use of "Building Energy Ratings." According to the regulations, each dwelling, whether newly constructed, sold or rented out, will include an energy performance certificate (EPC) that will indicate its energy performance (See example of certificate below). Unsurprisingly, this regulation is coupled with requirements to develop a methodology to determine energy performance (such a disclosure of energy bills, HERS or ENERGY STAR Yardstick) along with a requirement to perform an energy performance analysis[27].

To go beyond simple disclosure of energy bills and engage in home energy audits, a sufficient pool of trained and licensed certifiers or building raters within the area will be needed. A number of professionals could potentially serve in this role, but all would need proper training in order to accurately identify and relay the energy efficiency of the property to the potential buyers. In conjunction with proper training, a system should be implemented for registering the data so that all property energy efficiency disclosures are identical.

Finally, while an effective disclosure policy will lead to more efficient homes, its effect is necessarily limited, unless it is also linked to additional policies. To generate truly significant savings a home energy rating disclosure policy will probably have to be coupled to a requirement that existing buildings meet a minimum home energy performance level. The city of Berkeley, California, for example, administers an ordinance that includes this requirement. Importantly, the Berkeley ordinance does not require improvements designed to make the residence meet code. Instead, it delineates a set of energy efficiency measures that must be installed, but also contains a cost ceiling that limits the number of required measures.

The following figure gives an example of the Energy Performance Certificate used in the European Union. It provides information on both the building energy use and its greenhouse gas emissions. The energy rating is done on a graduated scale from A to F supplemented by color coding to simplify the ability to interpret the label.

[26] To find a link to Energy Star Yardstick, go to: http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_index_tools

[27] The European Union directive allows member states to develop their own methodologies.

DEAP Version X.Y

Building Energy Rating (BER)

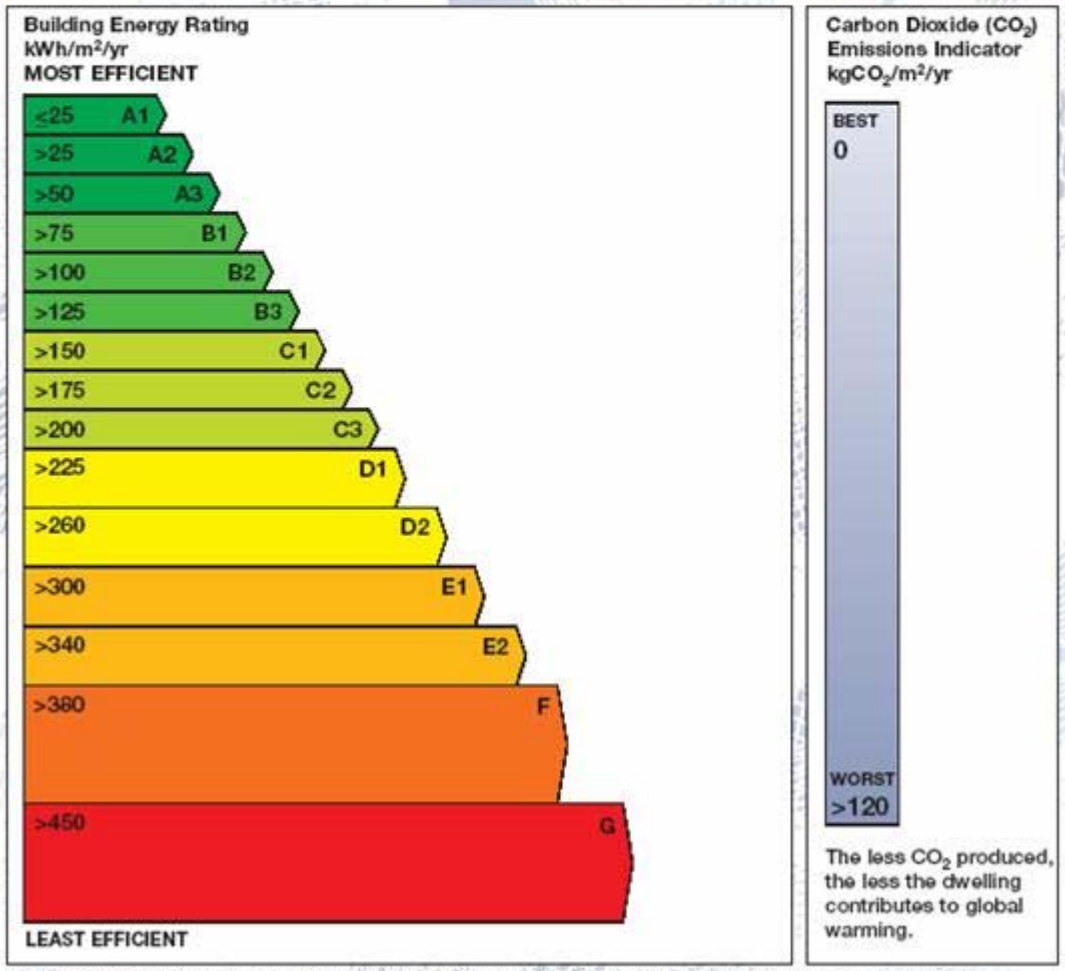
BER for the building detailed below is:

Name of House,
Street Name One, Street Name Two,
Town name One, Town Name Two,
County name One, County name Two,

BER Number:	XXXXXXXXXX
Date of Issue:	Day Month Year
Valid Until:	Day Month Year
BER Assessor No.:	XXXX
Assessor Company No.:	XXXX

The Building Energy Rating (BER) is an indication of the energy performance of this dwelling. It covers energy use for space heating, water heating, ventilation and lighting, calculated on the basis of standard occupancy. It is expressed as primary energy use per unit floor area per year (kWh/m^2/yr).

'A' rated properties are the most energy efficient and will tend to have the lowest energy bills.



IMPORTANT: This BER is calculated on the basis of data provided to and by the BER Assessor, and using the version of the assessment software quoted above. A future BER assigned to this dwelling may be different, as a result of changes to the dwelling or to the assessment software.

Disclosure of Home Energy Use at Time of Sale Policy: Best Practices Examples

State	Directive/ Legislation
European Union	Article 7 Directive 2002/91/EC of the European Parliament and of the Council of 16 December, 2002 on the energy performance of buildings. http://www.eco.public.lu/attributions/dg3/d_energie/energyefficient/info/directive_en.pdf
Summary: This directive gives requirements on the use of Energy Performance Certificates (EPC) as part of a labeling requirement. The EPCs are given to the buyer at the time of sale.	
Nevada	Chapter 509, 2007 Session http://www.leg.state.nv.us/74th/Bills/SB/SB437_EN.pdf
Summary: This statute gives requirements for disclosure. It, however, allows a transaction to occur without being subject to disclosure if both the seller and buyer agree to waive the requirements.	
Montgomery County, Maryland	Bill No. 31-07 http://www.montgomerycountymd.gov/content/council/pdf/bill/2008/20080804_31-07.pdf
Summary: This ordinance, which goes into effect on January 1, 2009, requires the disclosure of energy bill information over the preceding 12 months. The original legislative proposal actually required a HERS rating, but that provision was dropped prior to enactment.	
Berkley, California	Chapter 19.16 http://www.ci.berkeley.ca.us/uploadedFiles/Clerk/Level_3_-_BMC/BMC-Part1-T1-22--120808.pdf
Summary: This ordinance requires the seller of a property to install certain energy conservation measures such as (but not limited to) installing ceiling insulation, replacing incandescent light bulbs, and sealing ducts. The seller must receive a certificate of compliance prior to completing the sale.	

Suggested Statutory Language: *The [relevant state agency- one having jurisdiction over consumer protection], in consulting with the [Authority Having Jurisdiction] shall develop requirements and adopt regulations for evaluating and disclosing the energy consumption of residential dwellings and commercial buildings at the time of sale of such dwellings and buildings.*

The regulations must include, without limitation: (a) standards for evaluating the energy consumption of the residential dwellings and commercial buildings, (b)

The seller of a property shall have the energy consumption evaluated per the program established by section xx prior to the sale of the dwelling. The [relevant state agency- one having jurisdiction over consumer protection] shall establish regulations for labeling or providing a readily accessible means of disclosure by the seller.

Subsection () does not apply to a sale or intended sale of residential property:

(a) Between any co-owners of the property, spouses or persons related within the third degree of consanguinity.

(b) By a person who takes temporary possession or control of or title to the property solely to facilitate the sale of the property on behalf of a person who relocates to another county, state or country before title to the property is transferred to a purchaser.

If an evaluation of a residential property was completed not more than 5 years before the seller and purchaser entered into the agreement to purchase the residential property, the seller may serve the purchaser with that evaluation.

2. Require Benchmarking for Commercial Buildings

Policy Recommendations:

a. State should require the energy performance benchmarking of all commercial buildings.
b. For benchmarking, the state should require the use of the EPA Portfolio Manager or equivalent.

Policy Explanation: Benchmarking consists of developing a record of the baseline energy use and rating of commercial buildings in order to develop data for comparison between comparable building types and sizes. Benchmarking can help guide the development of public policies that seek to maximize building energy efficiency, as well as to evaluate the efficacy of these policies. To properly develop benchmarks states need to gather data

from commercial building owners and establish an easily accessible database that contains the energy consumption information.

An effective building energy codes policy requires the accurate accounting of building energy use to track the potential savings from implementing energy efficient codes and other state policies. By having access to the data provided by benchmarking, building owners, lenders and potential buyers can make informed decisions regarding building energy use. For example, a building owner could use the information to lower energy use and make the building more commercially attractive to buyers or tenants. A potential buyer, on the other hand, can use the information to press for improvements in energy use on the part of the current building owner. Benchmarking should also help policymakers achieve energy gains by tracking the progress of policies such as building energy codes.

It should be noted, however, that benchmarking can function as a building energy rating system such as the ones described in the previous section. However, it can differ in that it compares building energy use to similar buildings and therefore cannot tell how far along a building is toward a specific building energy related goal such as net zero energy status. When used effectively, benchmarking and building energy rating systems can complement each other in moving toward a common goal of maximizing building energy efficiency.

Finally, benchmarking (much like home energy ratings) can help determine whether individual buildings comply with the state code as well as help track compliance across the state.

Integration with Programs: SBC energy efficiency programs can use benchmarking as a way of establishing a baseline from which to guide clients as to the most effective ways to reduce energy use. Some programs typically use benchmarking as among the first actions when working with customers.

Best Practices: A benchmarking policy should aim for the most comprehensive and accurate energy use data possible. The state of California, which mandates building energy benchmarking for non-residential buildings, employs the Environmental Protection Agency's Portfolio Manager (PM) as the basic database tool. The PM has the ability to provide summary reports on the full universe of buildings as well as subsets to help track energy use. PM does have limitations, however, as it is unable to cover the full universe of buildings.[28]

Any building benchmarking policy should include both publicly- and privately-owned commercial buildings. Publicly-owned buildings (state and local) should be addressed first to allow officials to work out any unforeseen problems that may potentially arise, such as difficulty in determining the extent of information required from a given property.

Unlike other building related policies that involve utilities as discussed in this paper, benchmarking requires the participation of both investor owned and municipal utilities. The participation of both is crucial to get complete coverage of the building stock in the state.

[28] Portfolio manager only benchmarks those buildings that are included as part of Commercial Building Energy Consumption Survey (CBECS). The types of buildings include: banks/financial institutions, courthouses, hospitals, hotels, K-12 schools, medical offices, offices, residence halls, retail stores, supermarkets, warehouses, wastewater treatment plants.

A benchmarking policy should feature a system for ensuring that all stakeholders, buyers, owners and lenders have access to the gathered information; should offer easy identification of building types; and organize energy use data by month. The responsible agency or organization must also work with utilities to create the appropriate disclosure forms that will provide the necessary information and protect the confidentiality of customer information.

Just as with commissioning, benchmarking is a part of SBC programs in some states as well as actual policy in California and the District of Columbia. This means that benchmarking is not a "new", untested policy but that many of the stakeholders already have experience implementing the policy and therefore, there is already a level of market expertise.

Finally, state policy should seek to tie policies such as retro-commissioning [29] to benchmarking. By using benchmarking, a building's actual use can be compared to its predicted energy use. Consequently, the use of retro-commissioning can help reduce discrepancies between a building's predicted energy use and its measured energy use.

Benchmarking Policy: Best Practices Examples

State	Statute
California	Section 25402.10 of the Public Resources Code (Enabling Language) http://www.leginfo.ca.gov/cgi-bin/displaycode?section=prc&group=25001-26000&file=25400-25405.6
Summary: This statute requires electric and gas utilities, as defined, on and after January 1, 2009, to maintain records of the energy consumption data of all nonresidential buildings to which they provide service. The statute would require, on and after January 1, 2010, that a non-residential building owner or operator disclose ENERGY STAR Portfolio Manager benchmarking data and ratings, for the most recent 12-month period, to a prospective buyer, lessee, or lender.	
Washington D.C.	Clean and Affordable Energy Act of 2008 http://www.dccouncil.washington.dc.us/images/00001/20080804150618.pdf

[29] Retro-commissioning refers to the practice of commissioning a building after it has been in operation for a certain period of time. It is a particularly useful practice if evidence, such as from benchmarking, indicates that the building is not meeting energy performance goals. Because retro-commissioning is done to an operational building, the commissioning is much more likely to identify and correct the problems tha t are hindering energy performance.

Summary: The statute will first require the benchmarking, using the ENERGY STAR Portfolio Manager tool, for all city buildings greater than 10,000 square feet. Starting in 2010 until 2013, the city will require energy use information for all private buildings between 50,000 and 200,000 square feet to benchmark these buildings.	
Massachusetts Department of Energy Resources	Energy Information Reporting System http://www.mass.gov/Eoeea/docs/doer/gca/energy-information-reporting-system.pdf
Summary: The state energy agency has implemented a voluntary reporting system to help cities and towns implement energy management initiatives. The reporting system provides a means for cities and towns to benchmark their municipal buildings and therefore monitory and verify the energy performance of their buildings.	

Suggested Statutory Language: *(a) On and after January 1, 20XX, electric and gas utilities shall maintain records of the energy consumption data of all nonresidential buildings to which they provide service. This data shall be maintained, in a format compatible for uploading to the United States Environmental Protection Agency's ENERGY STAR Portfolio Manager or similar system, for at least the most recent 36 months.*

(b) On and after January 1, 20XX, upon the written authorization or secure electronic authorization of a nonresidential building owner or operator, an electric or gas utility shall upload all of the energy consumption data for the account specified for a building to
The ENERGY STAR Portfolio Manager. The electric or gas utility shall maintain information in a manner that preserves the confidentiality of the customer.

(c) In carrying out the requirements of this section, an electric or gas utility may use any method for providing the specified data in order to maximize efficiency and minimize overall program cost, and is encouraged to work with EPA and customers in developing reasonable reporting options.

(d) On and after January 1, 20XX, an owner or operator of a nonresidential building over 10,000 square feet shall disclose the ENERGY STAR Portfolio Manager benchmarking data and ratings for the most recent 24-month period to a prospective buyer, lessee of over 2,000 square feet of the building, or lender that would finance over 2,000 square feet of the building. On and after January 1, 20XX, an owner or operator of a nonresidential building over 10,000 square feet shall annually disclose the ENERGY STAR Portfolio Manager benchmarking data and ratings for the most recent 24-month period to lessees of the building. If the data is delivered to a prospective buyer, lessee, or lender, a property owner, operator, or their agent is not required to provide additional information, and the

information shall be deemed to be adequate to inform the prospective buyer, lessee or lender regarding ENERGY STAR Portfolio Manager benchmarking data and ratings for the most recent 24-month period for the building that is being sold, leased, financed, or refinanced.

(e) Notwithstanding subdivision (d), nothing in this section increases or decreases the duties, if any, of a property owner, operator, or his or her broker or agent under this chapter or alters the duty of a seller, agent, or broker to disclose the existence of a material fact affecting the real property.

(f) Beginning one year after the effective date of this Act all nonresidential buildings over 10,000 square feet owned or operated by the _____ government or any of its instrumentalities shall be publicly benchmarked annually using the Energy Star Portfolio Manager benchmarking tool.

(g) All privately-owned nonresidential buildings shall be benchmarked annually using the Energy Star Portfolio Manager benchmarking tool as designated by the schedule in paragraph

(h) of this subsection; benchmarking data and ratings for the most recent 24-month period each building shall, by January 1 of the following year, be made available to [government agency]. [Government agency] shall, upon the receipt of the 2nd annual benchmarking data for each building, make the data accessible to the public via an online database.

(i) The schedule shall be as follows:
(A) All buildings over 150,000 square feet of gross floor area beginning in 2011 and thereafter; (B) All buildings over 50,000 square feet of gross floor area beginning in 2012 and thereafter.

(j) A project that has submitted the first construction building construction permit after January 1, 2011, for new construction or substantial improvement shall, prior to construction, estimate its energy performance using the Energy Star® Target Finder Tool and shall subsequently be benchmarked annually using the Energy Star® Portfolio Manager benchmarking tool; provided, that the building is over 10,000 square feet. Benchmark and Target Finder ratings and data for each building shall, within 60 days of being generated, be made available to [government agency], which shall make the data accessible to the public via an online database.

4. **Conclusion**

Progressive building energy codes and other public policies related to energy codes provide an important means for reducing energy use in the Northeast. Pursuing a comprehensive building energy codes policy will result in codes that are more energy efficient, more buildings that comply with code and more effective tools to measure and verify the energy savings that occur.

Energy efficient buildings result in multiple benefits: financial savings that accrue to both owners and occupants; fewer emissions of greenhouse gases, and less stress on the electricity grid. It cannot be emphasized enough that newly-constructed and substantially renovated buildings represent a limited window of opportunity to either ensure substantial energy, environmental and economic savings for years to come, or miss that opportunity and live with buildings and homes that are wasteful and inefficient. Lack of a strong building energy code policy will permit buildings to use more energy than they should, to saddle occupants with unnecessary and unpredictable costs, and to make compliance with aggressive air quality and climate change policies much more difficult. It is NEEP's hope that this Model Progressive Building Energy Codes Policy will help states recognize that opportunity and act upon it in a way that supports the construction of more efficient, sustainable and affordable homes and buildings across the Northeast.

5. **Appendices**

D. Potential Energy Savings and Potential Reductions in Carbon Emissions Resulting From More Efficient Building Energy Codes

The following four tables highlight the energy and environmental benefits of improving energy codes in the Northeast. Tables 1 and 2 show potential energy savings in the residential and commercial sectors, respectively, while Tables 3 and 4 show the potential carbon dioxide emissions avoided in those same sectors.

The levels of code improvement in these tables coincide with the major policy aims established by agencies such as the U.S. Department of Energy. The DOE has made the improvement of the national model code (2006 Edition of the IECC and the ASHRAE 90.1-2004) by 30 percent (toward the eventual realization of net-zero energy buildings) as an explicit policy goal. The next milestone for which code savings are analyzed – 70 percent more efficient than the 2006 IECC – is derived from the DOE defined target of 70 percent energy savings necessary to attain net zero energy building status, with the remaining energy to attain neutrality resulting from on-site or building-integrated renewable energy mechanisms.

To give a basis of comparison, the average home in New England uses approximately 120 million BTUs of energy per year. Therefore, the Massachusetts energy savings in 2011, for example, are equivalent to the energy consumption of 1,600 New England households. By 2050, the annual energy savings total about 135,000 households.

An average automobile emits roughly 12,100 lbs of carbon dioxide per year. Therefore, the avoided annual carbon dioxide emissions in 2050 in the Northeast roughly equates to removing over 16 million cars off the road. (See Figure 6)

Table 1

Energy Savings from Implementation of Improved Residential Energy Codes in Northeast States[30] (Trillion BTUs)

	Annual Immediate Savings from Improving the Code by 30% in 2011	Annual Savings in 2019 as Result of Cumulative Gains from 30% Improvement in Code in 2011	Annual Savings in 2029 as Result of Cumulative Gains from Improving the Code by 70% in 2020	Energy Supplied by On-site Renewable Energy in 2030 to Reach Net-Zero Energy	Annual Savings in 2030 as Result of Cumulative Savings from 30% and 70% Improvement in Codes.[31]	Annual Savings in 2050 as Result of Cumulative Savings from 30% and 70% Improvement in Codes.	Annual Savings in 2050 as Result of Cumulative Gains Supplied by On-Site Renewable Energy 2030-2050
Connecticut	0.38	3.42	11.93	0.33	12.73	6.06	26.10
District of Columbia	0.04	0.32	1.13	0.03	1.20	0.57	2.47
Delaware	0.21	1.87	6.53	0.18	6.96	3.32	14.28
Maine	0.57	5.05	17.60	0.49	18.76	8.94	38.48
Maryland	0.94	8.38	29.22	0.81	31.16	14.84	63.90
Massachusetts	0.19	1.70	5.94	0.16	6.34	3.02	13.00
New Hampshire	0.22	1.98	6.90	0.19	7.36	3.50	15.09
New Jersey	1.10	9.80	34.17	0.94	36.44	17.35	74.72
New York	1.41	12.59	43.89	1.21	46.80	22.29	95.98
Pennsylvania	1.30	11.53	40.21	1.11	42.88	20.42	87.93
Rhode Island	0.08	0.71	2.49	0.07	2.65	1.26	5.44
Vermont	0.67	5.93	20.67	0.57	22.04	10.50	45.20
Total	**7.11**	**63.29**	**220.69**	**6.10**	**235.32**	**112.07**	**482.59**

[30] The totals for Tables 1-4 come from computer models developed by the Building Codes Assistance Project.
[31] As noted earlier, the 30 percent improvement occurs in 2011 and the 70 percent improvement occurs in 2020.

Table 2

Energy Savings from Implementation of Improved Commercial Energy Codes in Northeast States (Trillion BTUs)

	Annual Immediate Savings from Improving the Code by 30% in 2011	Annual Savings in 2019 as Result of Cumulative Gains from 30% Improvement in Code in 2011	Annual Savings in 2029 as Result of Cumulative Gains from Improving the Code by 70% in 2020	Energy Supplied by On-site Renewable Energy in 2030 to Reach Net-Zero Energy	Annual Savings in 2030 as Result of Cumulative Savings from 30% and 70% Improvement in Codes.[32]	Annual Savings in 2050 as Result of Cumulative Savings from 30% and 70% Improvement in Codes.	Annual Savings in 2050 as Result of Cumulative Gains Supplied by On-Site Renewable Energy 2030-2050
Connecticut	0.57	5.21	19.10	0.61	20.52	13.11	49.69
District of Columbia	0.24	2.21	8.09	0.26	8.69	5.55	21.04
Delaware	0.37	3.37	12.35	0.39	13.26	8.48	32.13
Maine	1.00	9.09	33.35	1.06	35.81	22.89	86.75
Maryland	1.33	12.10	44.40	1.41	47.69	30.47	115.50
Massachusetts	0.29	2.61	9.59	0.30	10.30	6.58	24.95
New Hampshire	0.34	3.12	11.43	0.36	12.28	7.85	29.74
New Jersey	2.06	18.72	68.69	2.18	73.77	47.14	178.68
New York	3.08	28.09	103.06	3.27	110.68	70.73	268.09
Pennsylvania	1.91	17.43	63.95	2.03	68.68	43.89	166.35
Rhode Island	0.12	1.09	4.00	0.13	4.30	2.75	10.41
Vermont	0.10	0.90	3.30	0.10	3.55	2.27	8.59
Total	**11.41**	**103.94**	**381.31**	**12.09**	**409.52**	**261.69**	**991.92**

[32] As noted earlier, the 30 percent improvement occurs in 2011 and the 70 percent improvement occurs in 2020.

Table 3

Carbon Dioxide Emissions Avoided Through Improvements in Residential Energy Code in Northeast States (million metric tons)

	Annual Immediate Savings from Improving the Code by 30% in 2011	Annual Savings in 2019 as Result of Cumulative Gains from 30% Improvement in Code in 2011	Annual Savings in 2029 as Result of Cumulative Gains from Improving the Code by 70% in 2020	Energy Supplied by On-site Renewable Energy in 2030 to Reach Net-Zero Energy	Annual Savings in 2030 as Result of Cumulative Savings from 30% and 70% Improvement in Codes.[33]	Annual Savings in 2050 as Result of Cumulative Savings from 30% and 70% Improvement in Codes.	Annual Savings in 2050 as Result of Cumulative Gains Supplied by On-Site Renewable Energy 2030-2050
Connecticut	0.02	0.22	0.75	0.02	0.80	0.38	1.64
District of Columbia	0.00	0.02	0.07	0.00	0.07	0.03	0.14
Delaware	0.01	0.11	0.38	0.01	0.41	0.19	0.84
Maine	0.04	0.32	1.10	0.03	1.18	0.56	2.42
Maryland	0.06	0.48	1.70	0.05	1.82	0.87	3.74
Massachusetts	0.01	0.11	0.37	0.01	0.40	0.19	0.82
New Hampshire	0.01	0.12	0.43	0.01	0.46	0.22	0.95
New Jersey	0.06	0.57	1.99	0.06	2.13	1.02	4.37
New York	0.08	0.67	2.40	0.07	2.63	1.25	5.38
Pennsylvania	0.08	0.67	2.34	0.07	2.51	1.20	5.15
Rhode Island	0.01	0.05	0.16	0.00	0.17	0.08	0.34
Vermont	0.04	0.37	1.29	0.04	1.39	0.66	2.84
Total	**0.42**	**3.70**	**12.98**	**0.36**	**13.97**	**6.65**	**28.65**

[33] As noted earlier, the 30 percent improvement occurs in 2011 and the 70 percent improvement occurs in 2020.

Table 4

Carbon Dioxide Emissions Avoided Through Improvements in Commercial Energy Code in Northeast States (million metric tons)

	Annual Immediate Savings from Improving the Code by 30% in 2011	Annual Savings in 2019 as Result of Cumulative Gains from 30% Improvement in Code in 2011	Annual Savings in 2029 as Result of Cumulative Gains from Improving the Code by 70% in 2020	Energy Supplied by On-site Renewable Energy in 2030 to Reach Net-Zero Energy	Annual Savings in 2030 as Result of Cumulative Savings from 30% and 70% Improvement in Codes.[34]	Annual Savings in 2050 as Result of Cumulative Savings from 30% and 70% Improvement in Codes.	Annual Savings in 2050 as Result of Cumulative Gains Supplied by On-Site Renewable Energy 2030-2050
Connecticut	0.03	0.24	0.86	0.03	0.95	0.61	2.30
District of Columbia	0.01	0.11	0.43	0.01	0.46	0.30	1.12
Delaware	0.02	0.18	0.65	0.02	0.71	0.45	1.71
Maine	0.05	0.43	1.50	0.05	1.66	1.06	4.01
Maryland	0.07	0.63	2.35	0.07	2.54	1.62	6.15
Massachusetts	0.01	0.12	0.43	0.01	0.48	0.30	1.15
New Hampshire	0.02	0.15	0.51	0.02	0.57	0.36	1.38
New Jersey	0.11	0.97	3.63	0.12	3.93	2.51	9.52
New York	0.13	1.21	4.71	0.16	5.38	3.44	13.04
Pennsylvania	0.10	0.91	3.38	0.11	3.66	2.34	8.86
Rhode Island	0.01	0.05	0.18	0.01	0.20	0.13	0.48
Vermont	0.00	0.04	0.15	0.00	0.16	0.10	0.40
Total	**0.56**	**5.03**	**18.78**	**0.61**	**20.70**	**13.23**	**50.13**

[34] As noted earlier, the 30 percent improvement occurs in 2011 and the 70 percent improvement occurs in 2020.

E. Glossary of Terms relating to Building Energy Codes

Following is a list of terms that are commonly used in relation to building energy codes.

Administrative Amendment: A change to a model code requirement that brings the adopted regulation into compliance with state and/or local laws.

Adopting Authority: The agency or agent that adopts the energy code in a state.

ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers.

ASHRAE Standard 189.1: An ASHRAE standard for minimum requirements for sustainable construction. Standard 189.1 aims for a 30% improvement in energy efficiency over ASHRAE 90.1-2004

ASHRAE/IES Standard 90.1-2007: The latest American Society of Heating, Refrigerating and Air-Conditioning Engineers/Illumination Engineering Society Standard for construction of commercial buildings.

ASHRAE/IES Standard 90.1-2004: The ASHRAE Standard that has been adopted by most states in the Northeast. Every northeast state except Massachusetts and Delaware currently enforces this standard.

Building Codes Assistance Project [BCAP]: Organization that assists states in adoption and implementation of energy codes.

Building Energy Code: Minimum requirements for the building envelope, mechanical systems and lighting for energy efficiency/conservation.

Building Inspector: The official responsible for the compliance of construction documentation with the adopted building codes.

Building Official: The officer or his designated representative authorized to act on behalf of the authority having jurisdiction.

COMCheck: Department of Energy compliance software for energy conservation in buildings other than low-rise residential buildings.

Energy Performance Rating: The energy use of the proposed building under actual operating conditions. Projected energy use targets can be used for buildings in the design or construction process. Examples include kBTU/sf/yr, dollars/square foot/yr, dollars/gross sales, Energy Performance Rating Score (US EPA), or like expressions of energy performance.

HERS Index: The HERS Index is a scoring system established by the Residential Energy Services Network (RESNET) in which a home built to the specifications of the HERS Reference Home (based on the 2006 International Energy Conservation Code) scores a HERS Index of 100, while a net zero energy home scores a HERS Index of 0. The lower a home's HERS Index, the more energy efficient it is in comparison to the HERS Reference Home. Each 1-point decrease in the HERS Index corresponds to a 1% reduction in energy consumption compared to the HERS Reference Home.

Home Energy Rating Service [HERS}: HERS provide a standardized evaluation of a home's energy efficiency and expected energy costs.A home energy rating involves an analysis of a home's construction plans and onsite inspections. Based on the home's plans, the Home Energy Rater uses an energy efficiency software package to perform an energy analysis of the home's design. This analysis yields a projected, pre-construction HERS Index.

I-Code Family: The compendium of separate, integrated model building codes published by the International Code Council and which include codes that govern energy use. .

ICAA: Insulation Contractors Association of America.

ICC: International Code Council

IEBC: International Existing Building Code

IECC: The International Energy Conservation Code formerly known as the Model Energy Code. The IECC was published in 1998, 2000, 2003, and 2006 with amendments adopted in the intervening years. The IECC is on an eighteen month cycle.

IRC: The International Residential Code**.** This code covers one and two family dwellings, including attached townhouses.

NCSBCS: The National Conference of States on Building Codes and Standards members include state code administrators and officials.

NEBCA: The Northeast Building Code Association, an organization founded in New England in 1966 to promote adoption of uniform building codes throughout the region.

NFRC: National Fenestration Rating Council. Adopts standards for window and door performance.

NWWDA: National Wood Window and Door Association.

Performance Approach: A performance approach (also known as a systems performance approach) compares a proposed design with a baseline or reference design and demonstrates that the proposed design is at least as efficient as the baseline in terms of annual energy use. This approach allows the greatest flexibility but may require considerably more effort. A performance approach is often necessary to obtain credit for special features such as a passive solar design, photovoltaic cells, thermal energy storage, fuel cells, and other nontraditional building components. This approach requires an annual energy use value. There are several commercially available software tools that perform this analysis.

Prescriptive Approach: A prescriptive approach lists minimum R-value/maximum U-factor requirements for building envelope components, such as windows, walls, and roofs. It lists lighting systems prescriptive performance in commercial buildings as the allowable watts per square foot of interior space for various building uses. Minimum required equipment efficiencies for mechanical systems and equipment are not prescriptive by code, but by Federal standards.

RECA: The Responsible Energy Codes Alliance, dedicated to adoption of the latest energy conservation codes by all jurisdictions with no technical amendments.

REScheck: Department of Energy compliance software for energy conservation in low-rise residential buildings, including detached residences and townhouses.

Technical Amendment: A revision or waiver of a building quality, efficiency or performance standard requirement in a model code.

Third Party Inspectors: Qualified, approved inspection agencies and individuals responsible for inspection of specialized construction work under the authority of an approved design professional in responsible charge of a special inspections program.

Time-of -Sale Energy Code Requirements: A local law setting either a reporting or energy upgrade requirement on transfers of property.

Trade-Off Approach Energy efficiency compliance achieved for an entire building or structure by allowing decreased energy efficiency in one component against increased efficiency in another component, thereby offsetting each other and maintaining a prescribed level of efficiency/energy loss. These trade-offs typically occur within major building systems (e.g. envelope, mechanical) or in commercial lighting, but may not be allowed between systems unless by exception.