Model Progressive Building Energy Codes Policy

2012 Update

Northeast Energy Efficiency Partnerships

November 2012

NEEP Building Energy Codes Project

NEEP's Building Energy Codes Project is helping the region reduce its carbon emissions and energy usage by providing states with resources to develop, implement and comply with building energy codes throughout the Northeast and Mid-Atlantic.

Acknowledgments

The combined efforts and expertise of many individuals brought about the 2012 update to the *Model Progressive Building Energy Codes Policy* and NEEP would like to recognize their involvement.

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About NEEP

Northeast Energy Efficiency Partnerships (NEEP) is a non-profit organization that works to accelerate energy efficiency in the Northeast and Mid-Atlantic states. NEEP provides support to the region in four key areas: speeding the adoption of high-efficiency products, reducing building energy use, advancing knowledge through best practices and generally increasing the visibility of the benefits of efficiency.

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Executive Summary

Buildings in the United States continue to be one of the largest users of energy, accounting for approximately 41 percent of all energy consumption, 72 percent of electricity usage, and over one-third of U.S. greenhouse gas (GHG) emissions. As expenditures on energy efficiency programs in the Northeast and the Mid-Atlantic are expected to climb to nearly $2.5 billion through 2013 - tripling investment levels from five years ago - policies focused on advanced building energy codes and building energy rating not only complement and enhance energy efficiency programs, but ensure a better return on investment.

Unlike automobiles, appliances or other consumer devices, buildings, by their very nature, are meant to last (meaning that a building built today will have an impact on U.S. energy use for 50 to 100 years or even more). Building energy codes are particularly effective at improving the energy efficiency of the built environment by setting minimum efficiency requirements for new and renovated buildings. Advancing these codes over time to make them more energy efficient and easier to enforce, as well as comply with, is a sure strategy for cutting energy use and saving money over the life of the building.

NEEP's 2012 update to its *Model Progressive Building Energy Codes Policy*, which was originally published in March 2009, provides a set of updated, interconnected recommendations aimed at ensuring that states throughout the Northeast and Mid-Atlantic region adopt and achieve compliance with progressively more efficient building energy codes as a means of achieving large scale energy and GHG emissions savings. The recommendations in the updated Model Policy are concentrated into three areas:

- Building Energy Code Adoption
- Building Energy Code Compliance
- Building Energy Rating

The updated Model Policy also includes new sections that address developments in energy codes that have emerged since the publication of the original white paper. These include sections on retrofitting existing buildings and developing and adopting outcome-based codes; pathways for utility claimed savings for code support; new case studies on stretch code implementation; pathways to zero net energy buildings; and the important role of third party energy specialists and energy code collaboratives to enhance code compliance.

NEEP's *2012 Model Progressive Building Energy Code Policy* delineates comprehensive measures to maximize the energy savings potential of building energy codes in the Northeast and Mid-Atlantic states. Effective regional implementation of the policies and best practices laid out in the 2012 Model Policy will assist the nation in reaching its aggressive building energy reduction targets, as outlined by the U.S. Department of Energy (DOE)'s Building Energy Codes Program (BECP):

- 1.7 quadrillion Btu in energy saved annually by 2030
- Cumulative savings from 2009 to 2030 estimated at 14 quadrillion Btu
- Estimated cumulative carbon savings of 800 million metric tons or 156 million cars off the road

Summary of NEEP's Model Progressive Building Energy Codes Policy Recommendations

Building Energy Code Adoption

- Regularly Update the State Building Energy Code
- Establish a Plan for Retrofitting Existing Buildings
- Adopt and Implement Stretch Building Energy Codes
- Establish a Pathway to Zero Net Energy Buildings (ZNEBs)

Building Energy Code Compliance

- Establish Building Energy Code Infrastructure that Ensures Compliance
- Implement Known Strategies to Enhance Enforcement of Building Energy Code
- Enhance Funding for Code Compliance Efforts

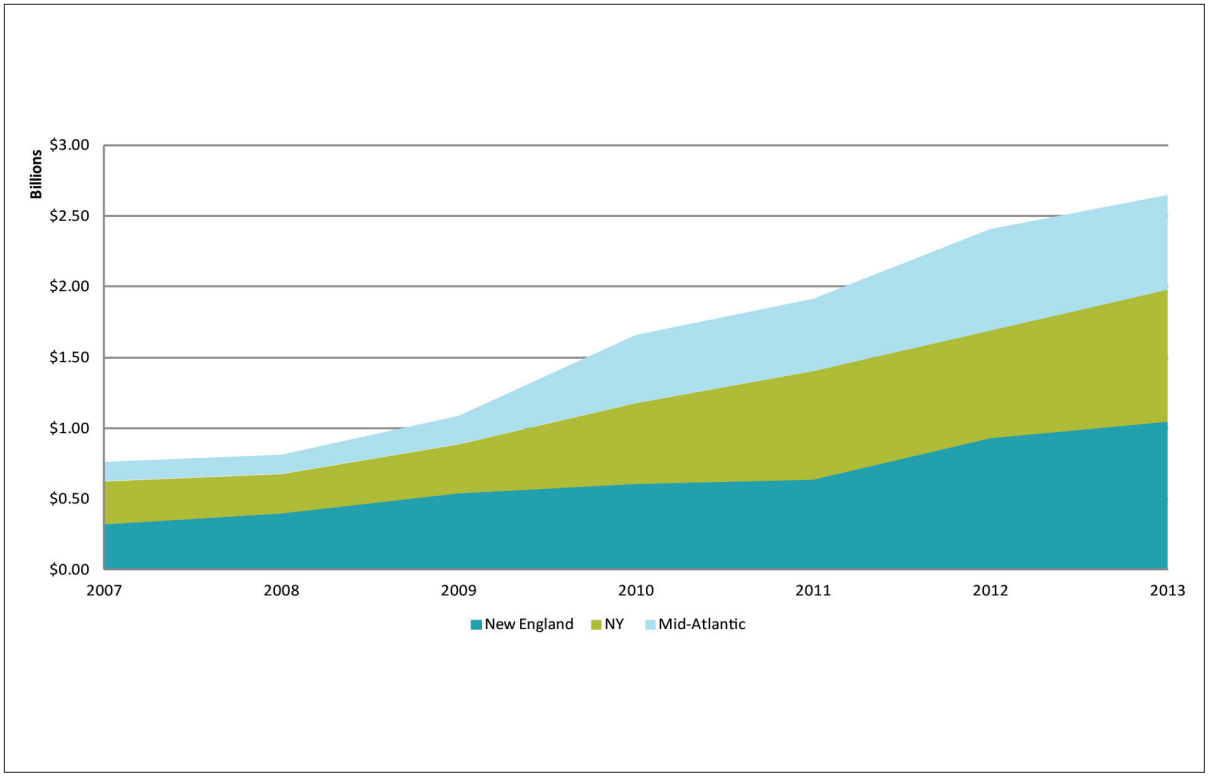
Building Energy Rating

- Implement Mandatory Building Energy Rating and Disclosure Policies
- Follow the "Top 5" Keys to Building Energy Rating Success
- Enhance Code Compliance through Building Energy Rating

Introduction

The Northeast and Mid-Atlantic states plan to invest over $2.5 billion dollars in energy efficiency through 2013 – three times the investment level compared to five years ago.[1] This level of expenditure has allowed states to capture higher levels of savings, but a number of jurisdictions are striving for even higher levels of electricity savings in the coming years, with many having already set targets near 2 percent of annual retail sales.[2]

Energy Efficiency Investments in the Northeast and Mid-Atlantic, 2007-2012



Source: NEEP 2010 Potential Study

Policies focused on advanced building energy codes and building energy rating not only complement and enhance energy efficiency programs, but ensure a better return on investment. According to the U.S. Department of Energy (DOE), the national model building energy codes have increased their energy savings potential by nearly 30 percent from 2006 to 2012. As the Northeast and Mid-Atlantic region[3] ramps up its energy efficiency goals, states recognize that advanced energy codes present a cost-effective savings opportunity. Maryland was the first state in the nation to adopt the latest, and most energy efficient, model energy code (2012

1 Expenditures include all electric and natural gas ratepayer funding and funding from RGGI and wholesale markets like the Forward Capacity Market. It does not include federal funding from the American Recovery and Reinvestment Act (ARRA) and the Weatherization Assistance Program (WAP) or any customer contributions. Data is taken from state annual efficiency reports from 2007 to 2011 which are available through the NEEP website. 2007 to 2011 are year-end reported data while 2012 expenditures are forecasted data that are subject to change.

2 http://www.aceee.org/sites/default/files/publications/researchreports/e12c.pdf

3 The Northeast and Mid-Atlantic region comprises Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New York, New Jersey, Pennsylvania, Rhode Island and Vermont.

The average U.S. home spends over $180 a month on utility costs, or $2,175 per year.[4] Buildings designed according to the national model energy codes use less energy, saving consumers money and putting less stress on the grid.[5]

According to a national survey[6] conducted by Consumer Reports and BCAP in 2011, a majority of consumers agreed with the following statements:

- Homeowners should have a right to a home that meets national energy standards (82 percent)
- Energy codes would help my energy bills be more affordable and predictable (71 percent)
- Energy codes help make homes more comfortable to live in (68 percent)

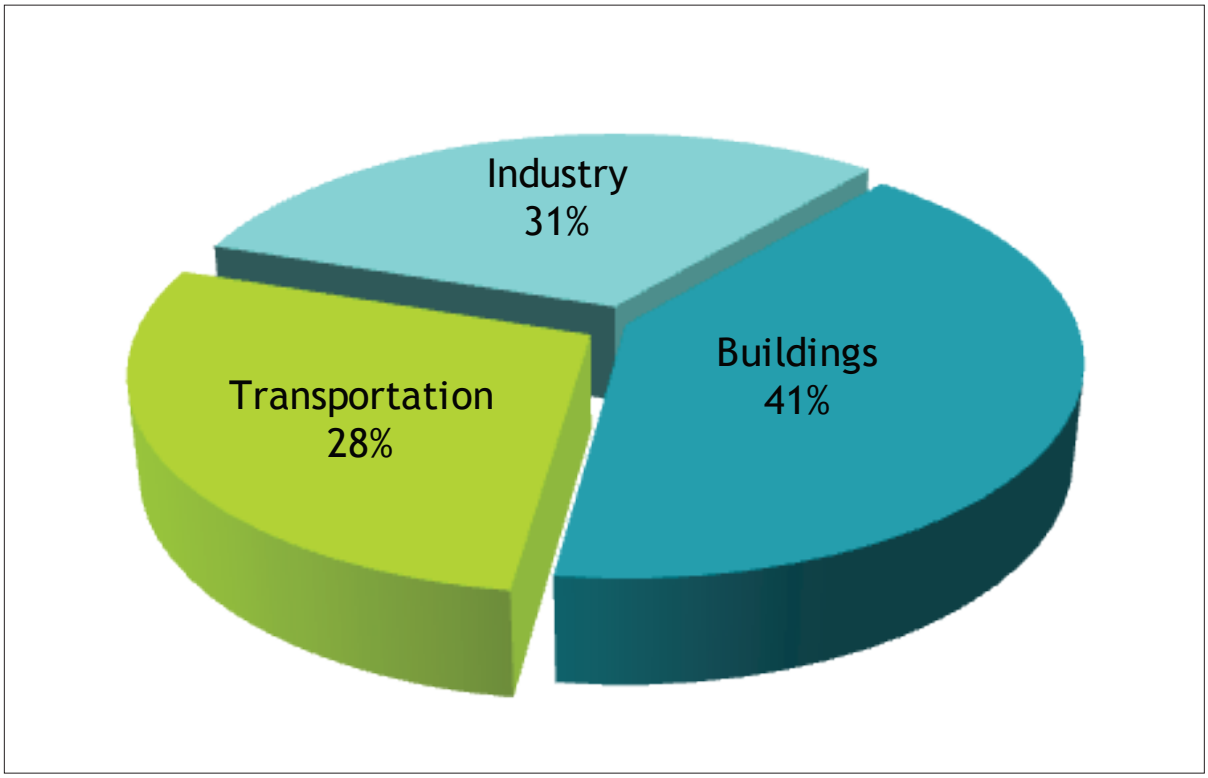
International Energy Conservation Code, or IECC) and most states in the region have updated to the 2009 IECC, with plans for 2012 IECC adoption.

The Role of NEEP's 2012 Model Progressive Building Energy Codes Policy

Buildings in the United States continue to be one of the largest users of energy, accounting for approximately 41 percent of all energy consumption, 72 percent of electricity usage, and over one-third of U.S. greenhouse gas (GHG) emissions.[6] Because this sector represents such a significant portion of cities and states' energy use, the way and extent to which buildings use energy must be addressed by energy policy. NEEP's *2012 Model Progressive Building Energy Codes Policy* provides guidance to code officials, advocates, utilities and any other energy codes related stakeholders interested in implementing building energy policies that will lead to large-scale energy and carbon emissions savings in the built environment across the region.

4 http://bcap-energy.org/why-energy-codes-matter/
5 http://ourgreenenergyfuture.org/wordpress/wp-content/uploads/2012/04/Survey.pdf
6 http://www.eia.gov/electricity/annual/html/table7.2.cfm

2011 United States Energy Consumption by Sector



Source: U.S. Energy Information Administration, Annual Energy Review

Unlike automobiles, appliances or consumer devices, buildings, by their very nature, are meant to last — meaning that a building built today will have an impact on U.S. energy use for 50 to 100 years or even more. Building energy codes are particularly effective at improving the energy efficiency of the built environment by setting minimum efficiency requirements for new and renovated buildings. Advancing these codes over time to make them more energy efficient and easier to enforce, as well as to comply with, is a sure strategy for cutting energy use and saving money over the life of the building.

Building energy codes set minimum requirements for efficient design and construction in new and renovated residential and commercial buildings. Buildings constructed to meet the required national model energy code use less energy for heating, cooling and water-heating and provide better protection against cold, heat, drafts, moisture, pollution, and noise. This means occupants stay warmer in the winter and cooler in the summer, but spend less money on utility bills, adding up to greater comfort, affordability and durability over the life of the building.

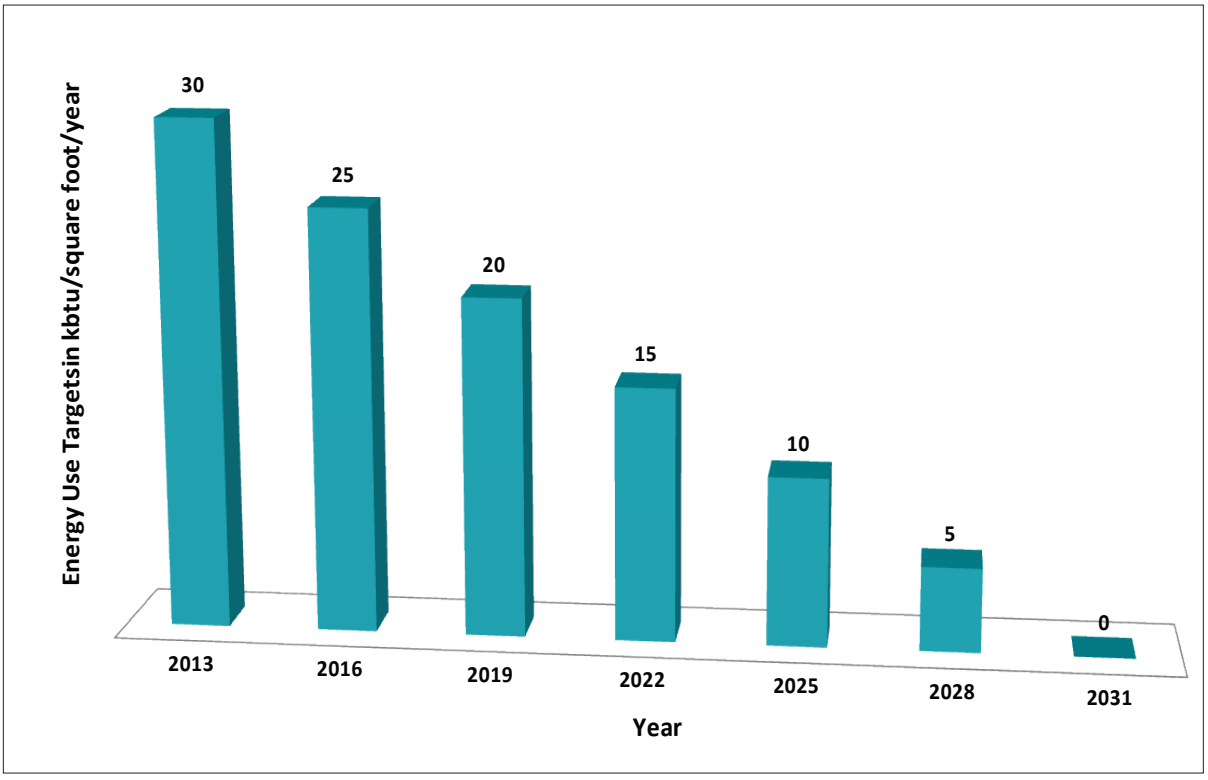
Advanced building energy codes can dramatically improve the energy efficiency of both new and existing buildings. As energy efficiency requirements in the code are continually enhanced, zero net energy buildings (ZNEBs), or buildings that can produce as much energy as they consume,[7] can become the recognized standard of new construction. NEEP is committed to the region's

7 http://neep.org/uploads/policy/zne-public-buildings-neep-2012.pdf

success in laying the foundation for a future in which all homes and buildings achieve zero net energy through incremental yet aggressive improvements to building energy policies and programs. To realize the goal of ZNEBs states must adopt progressively stronger building energy codes. These codes will lead to continual improvements in building practices such that by 2030, zero net energy buildings should comprise the majority of new construction.

Other organizations are also committed to similar progress in improving building energy efficiency. In 2008, the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) — which sets the international model commercial energy code that is broadly adopted in states throughout the U.S. — approved the following energy use targets for its code-intended standards in route to the final goal of ZNEB by 2031.

ASHRAE Standards on Target for Zero Net Energy by 2031



Source: ASHRAE Vision 2020

NEEP's *2012 Model Progressive Building Energy Code Policy* delineates comprehensive measures to maximize the energy savings potential of building energy codes in the Northeast and Mid-Atlantic region. Effective regional implementation of the policies and best practices laid out in the 2012 Model Policy will assist the nation in reaching its aggressive building energy and carbon emissions reduction targets, as specified below.

The DOE's Building Energy Codes Program (BECP)[8] is committed to 70 percent of the U.S. states and territories adopting the 2009 IECC for residential buildings and ASHRAE Standard 90.1-2007 for commercial buildings by 2015, as well as achieving a 90 percent compliance rate with both

8 http://www.energycodes.gov/about/

by 2017. The BECP also has targeted the national model energy codes and standards to reach 50 percent energy saving over the 2006 IECC for residential and ASHRAE 90.1-2004 for commercial buildings. Achieving those goals would amount to significant reductions in energy and GHG emissions. DOE estimates that if these goals were to be achieved, the result would be 1.7 quadrillion Btu in energy saved annually by 2030, with cumulative savings from 2009 to 2030 estimated at 14 quadrillion Btu. These numbers translate into an estimated cumulative carbon savings of 800 million metric tons – the equivalent of taking 156 million cars off the road.[9] It is the goal of this paper to guide the region and the country in a similar direction, with targets set beyond those of BECP, where 100 percent compliance becomes a reality and zero net energy is the standard for the future building energy codes.

NEEP's *2012 Model Progressive Building Energy Codes Policy*, originally published in March 2009, provides a set of updated, interconnected recommendations aimed at ensuring states adopt progressively more efficient building energy codes and achieve large scale energy and GHG emissions savings throughout the region.

The updated Model Policy is broken down into three primary areas of concentration: **Building Energy Code Adoption, Building Energy Code Compliance, and Building Energy Rating**. Implementing any one of the recommendations discussed within would improve building energy code policy. However, to ensure the ultimate goal of buildings that consume no more energy than they produce, policymakers must pursue a comprehensive approach to building energy codes, one that prioritizes not just the adoption of the latest code, but also achieving full code compliance.

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 building 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.

The 2012 Model Progressive Building Energy Code Policy explores the path to tomorrow's advanced building energy codes and revisits best practices for achieving the highest levels of compliance with today's code, while always bearing in mind the following success criteria:

- States adopt and implement latest model building energy codes
- States adopt and implement a voluntary stretch code appendix
- A qualified and robust building energy code workforce exists
- Ratepayer-funded energy efficiency programs support energy code development, adoption and compliance
- States accurately verify and report energy code compliance rates

9 http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results

Building Energy Code Adoption

1. Regularly Update the State Building Energy Code
2. Establish a Plan for Retrofitting Existing Buildings
3. Adopt and Implement Stretch Building Energy Codes
4. Establish a Pathway to Zero Net Energy Buildings (ZNEBs)

1. Regularly Update the State Building Energy Code

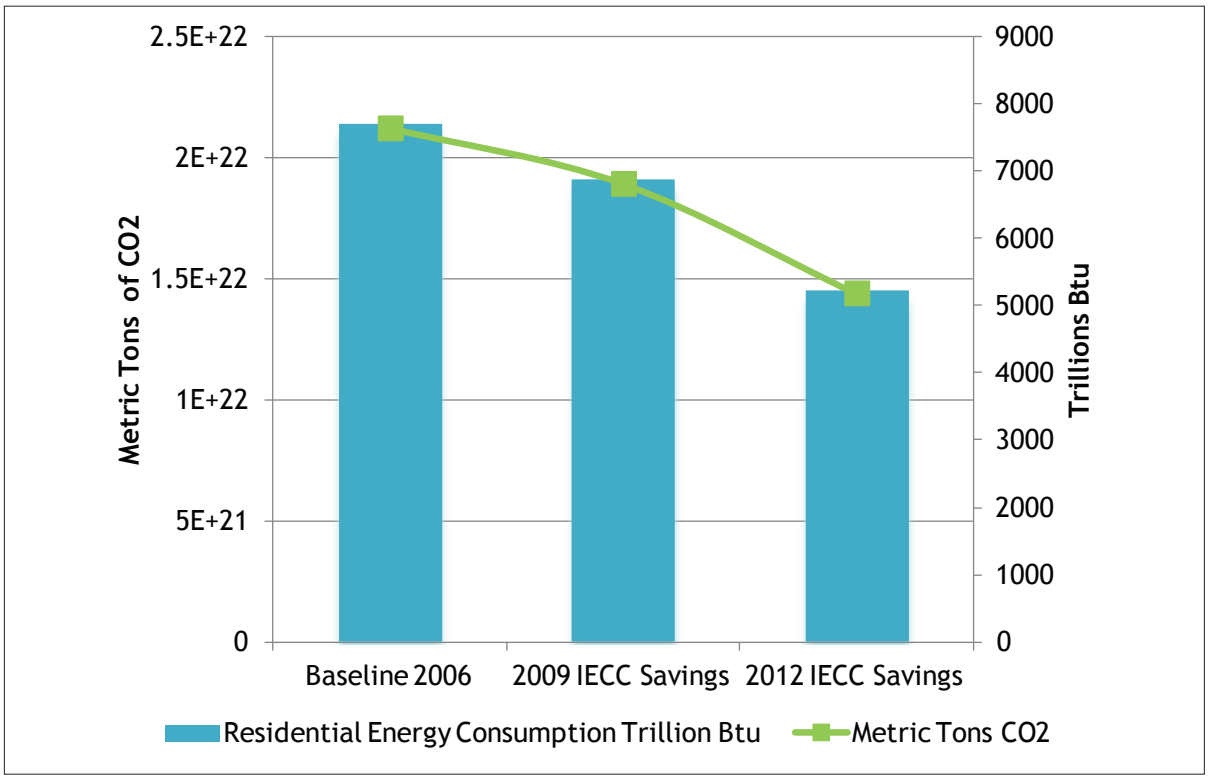
Policy Recommendations:

- Adopt the latest national model energy code at least every three years.
- Participate in national model energy code update processes to advance energy efficiency.
- Maintain a Technical Advisory Committee to inform updates to the state building energy code.
- Restrict state amendments that decrease the stringency and energy savings of the reference national model energy code.

Adopt the latest national model energy code at least every three years.

States should commit to adopting and complying with the latest residential and commercial building energy codes. The surest way to align a state building energy code with the latest developments in building technologies and practices is to update the state building and energy codes at least every three years, corresponding with the International Code Council's (ICC) update cycle. This trigger is also consistent with regular adoptions of the American Society of Heating, Refrigerating and Air Conditioning Engineers' (ASHRAE) standard. Regularly updating the state building energy codes to reflect the most recent editions of national model building energy codes – specifically, the International Energy Conservation Code (IECC), and ASHRAE 90.1 where utilized as the energy code for commercial buildings – can lead to large-scale energy and GHG emissions savings across the region. The following figure depicts trillions of BTUs in energy savings and millions of metric tons of carbon emissions reductions achievable with the advancement of the residential code.

U.S. Residential Sector Energy Consumption Estimates



Source: Consumption estimates from U.S. Energy Information Administration (EIA)[10] and percent decrease projections come from U.S. DOE.[11]

Why the International Energy Conservation Code (IECC)?

The following states automatically adopt the latest model code corresponding to the ICC's three-year cycle: MA, MD, RI.

CT recently revised its State Building Code (Sec. 29-256a) requiring incorporation of the 2012 IECC, "not later than eighteen months after the publication of said code."

States should seek to automatically consider adoption of the latest version of the IECC as an integral part of a comprehensive codes adoption process, and coordinate any disparities between it and the Energy Conservation chapter of the International Residential Code (IRC).

The IECC is the nationally recognized model energy code, developed by the International Code Council (ICC) through a rigorous code development process that ensures all changes are subject to open public comment and debate. For the same reasons, NEEP also recommends that states automatically consider adoption of the complementary International Existing Building Code (IEBC).

10 http://www.eia.gov/state/seds/sep_use/notes/use_print.pdf
11 http://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf

The ICC code development process guarantees a formal procedure to propose amendments for committee review and recommendation, and a final vote by code officials and other state representatives from across the United States. Furthermore, the IECC and IEBC work in concert with the other ICC codes, such as plumbing, fire, and mechanical codes, to assure 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 greenhouse gas emissions reduction. In the end, automatic adoption of the IECC allows the Authority Having Jurisdiction (AHJ) to allocate its resources more effectively and to concentrate on other important functions, such as improved compliance. The three-year ICC cycle allows time for states to incorporate new technological advances into practice and to update energy code training and enforcement materials.

Maintain a Technical Advisory Committee to inform updates to the state building energy code

To provide for well-informed building code adoption processes, state code offices should maintain Technical Advisory Committees (TAC), such as those found in New York, Maine, Massachusetts and Rhode Island 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.

Participate in the National Model Code Update Processes to Advance Energy Efficiency

States and local governments are encouraged to actively participate in national model energy code update processes to advance energy efficiency in their buildings, and help shape an important part of U.S. national energy policy. Each year, state and local government employees and elected officials have the opportunity to help develop the next generation of building energy codes and related provisions of other building, residential, mechanical, plumbing and existing structures codes at the ICC Final Action Hearings. Depending on the size of the jurisdiction between four and twelve voting representatives, are eligible to attend as an ICC Government Member to vote in support of the latest national model energy code (IECC).

Learn how to join as an International Code Council (ICC) Government Member and participate at future ICC Final Action Hearings – http://www.iccsafe.org/Membership/Pages/join.aspx

A Building Energy Code Technical Advisory Committee (TAC) should be staffed by state/jurisdiction agency (AHJ) and include representation from the following stakeholders:

- State/jurisdiction Code Board (as Chair)
- Local code official
- Design professional proficient in energy efficiency and conservation
- Design engineer proficient in energy efficiency and indoor air quality
- Commercial and/or home builder
- Mechanical trades
- Advocacy groups
- Utility Program Administrators (PAs)
- Energy Services Company (ESCO)

The process of 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. Sometimes this results in an extended process that leaves the energy code out of date, unnecessarily complex and inconsistent with codes from nearby states (particularly important in areas where building professionals work in multiple states, a common occurrence throughout the region). In addition, state code offices are often forced to complete the updates with limited resources and staff. A Technical Advisory Committee can help lessen the burden on understaffed code offices and provide an invaluable technical advisory role during the state building energy code update and adoption process.

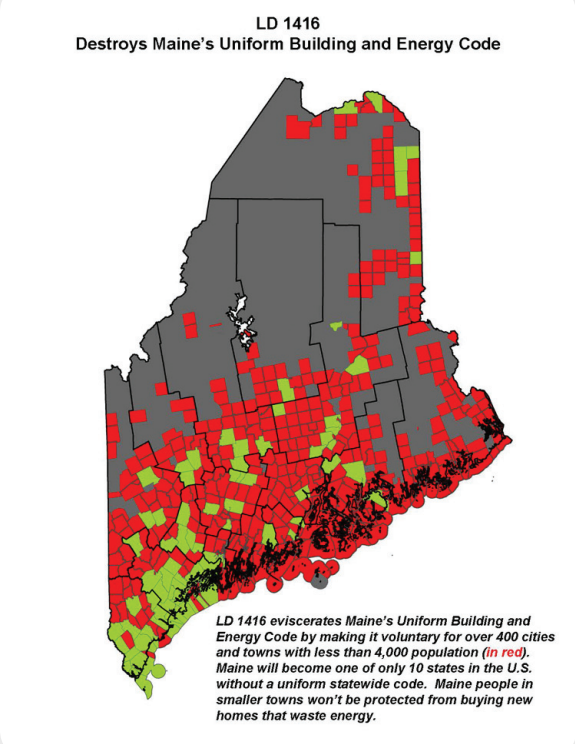
Restrict state amendments that decrease the stringency and energy savings of the national model energy code.

State amendments and statutory language should restrict adoption of less stringent technical building energy code provisions. This was particularly important prior to the release of the 2012 IECC, as previous versions of the IECC and the International Residential Code (IRC) diverged in terms of energy efficiency measures through a separate IRC code which adopted weaker energy efficiency standards. An option to adopt both codes, or one over the other, is unnecessarily complicated and reduces potential energy savings if the less efficient code is enforced. The 2012 ICC code revisions have since removed the source of confusion and now IRC's energy efficiency requirements (Chapter 11) simply reference the residential requirements of the 2012 IECC.

A better process for updating the state building energy code would require automatic adoption of the latest edition of the national model codes as an ongoing regulatory requirement (see example language on page 16), and to pursue cooperative participation in the national code change cycles with similarly-minded jurisdictions to influence the efficiency requirements of the model energy code.

BUILDING ENERGY CODE ADOPTION IN MAINE — LESSONS LEARNED

In 2008, the state of Maine passed their first statewide building energy code, the Maine Uniform Building and Energy Code, or MUBEC. MUBEC set the 2009 IECC and ASHRAE 90.1-2007 as the mandatory energy standards for residential, commercial, and public buildings statewide. Exempted from this legislation were towns with populations less than 2,000 people. In 2011, however, the state effectively repealed MUBEC by passing LD 1416, which makes the code optional to communities with populations under 4,000, or more than 400 Maine towns with 40 percent of the state's population. According to the Natural Resources Council of Maine (NRCM), the exempted towns can "opt in" to the code, with the added burden of local code enforcement and administration, an option that historically is rarely utilized. The Bangor Daily News reported that Maine received $27 million of federal ARRA funds to adopt a mandatory statewide building energy code, as well as to develop weatherization and renewable energy projects. But by effectively repealing MUBEC, Maine jeopardizes future potential funding and DOE assistance, and most importantly, the state passes up potential energy savings that the 2009 IECC and ASHRAE 90.1-2007 could have created for the state and its residents. Instead, LD 1416 maintains the current patchwork system of codes in the state. Maine's USGBC chapter opposed LD1416, stating that the setback of MUBEC would result in higher costs for consumers and a confusing regulatory environment for builders. The following statistics derived from the Building Codes Assistance Project (BCAP) offer a look at the potential savings that could be accomplished by adopting and implementing the 2009 IECC and ASHRAE 90.1-2007 statewide:



Source: Natural Resources Council of Maine

- Save $30 million annually by 2020;
- Avoid 5.5 trillion Btu of primary annual energy use by 2030, the equivalent of removing over 80,000 cars off the road;
- Avoids annual emissions of more than 0.39 million metric tons of CO2 by 2030, th equivalent energy use of nearly 34,000 homes for one year.

A Step Backward for Maine

According to George Terrien of American Institute of Architects, MUBEC was voted by a previous legislature and strongly supported by the previous governor. So what went wrong? Terrien explained that creating the infrastructure within which to implement the new standards proved to be problematic for Mainers. Despite the hard work of a dedicated group of public servants and volunteers, and partly because of a shortage of funds, the education, training and local preparation required for smooth code implementation was insufficient, and the resulting fears, unknowns and unbudgeted expense led to the passage of LD 1416.

Opposition to MUBEC

Representative Gary Knight explained that some of the opposition to MUBEC concerns issues such as the practicality of a locally controlled state regulation and the difficulty for contractors and builders to comply with the code cost-effectively. Additionally, MUBEC's opposition voices concern for a potential disproportionate impact on low income Mainers. However, NRCM estimated that low-income Mainers spend at least 14 percent of their income heating their homes, and that every dollar spent on weatherizing and retrofitting generates $2.72 in savings over the life of a home. Furthermore, the stimulus funding aims to create and save jobs by expanding and promoting energy efficiency in the state. Without a statewide building energy code, Consumers Union explains, Mainers are vulnerable to unsafe new construction, higher energy bills, less comfortable homes, and an unequal playing ground for builders and developers.

Steps in the Right Direction

To raise awareness about the value of statewide building energy codes and to help promote local adoption of MUBEC, NEEP and Consumers Union partnered with Maine organizations such as Natural Resources Council of Maine, GrowSmart, and Cool Communities, to create the MUBEC Community Action Toolkit. The MUBEC Community Action Toolkit was designed specifically for Mainers who believe in their right to a safe, affordable, and comfortable home.

"The issue is standardization. It's making the builder's job easier, because it's just one code. It's not 50 different codes throughout the state. It will increase the cost of the house by about 3 percent, but you're going to recognize those savings in 2-3 years, just in efficiency." – Assistant State Fire Marshal Richard McCarthy in *"Building Code Takes Effect Next Month"*

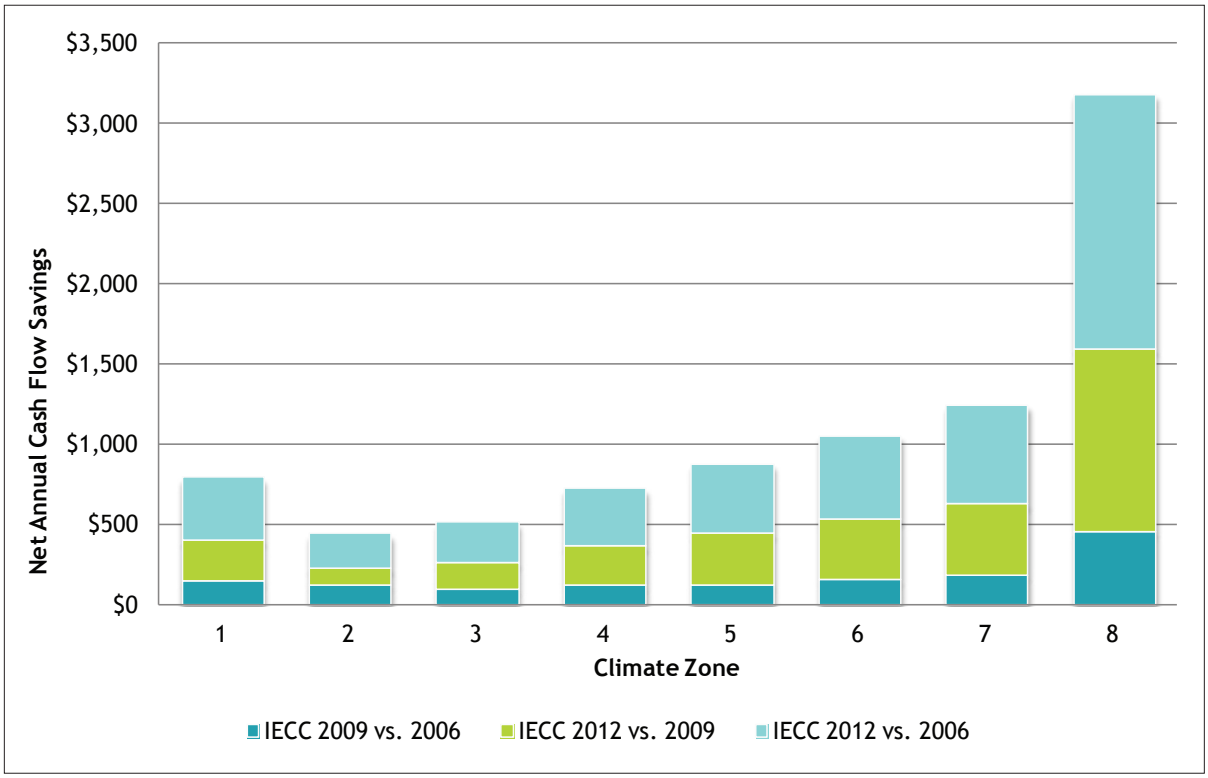
"Going backwards on Maine's uniform code won't be good for our economy or good for my members. It was a very disappointing vote for businesses that want to see uniformity and predictability in Maine."
– Charlie Huntington, President of the Maine Contractors and Builders Alliance in *"House votes to roll back building code"*

Not only does the toolkit help raise awareness about the benefits of MUBEC, but it equips and empowers individuals with the tools they need to lead a successful grassroots campaign in support of MUBEC adoption in their community. The toolkit contains printable handouts on the value of MUBEC, a template power point presentation to raise awareness on MUBEC for use at local events and special town meetings, model ordinance language for a smooth adoption process, and even a template press release for sharing a town's success upon adoption. The Toolkit also includes testimony from local businesses, citizens, and policymakers in support of MUBEC as well as frequently asked questions about MUBEC that debunks common code misconceptions. As of early June 2012, 34 towns exempted from MUBEC under LD 1416, voluntarily adopted MUBEC as their local code, thanks to the advocacy, outreach, and support of Mainers across the state. Thanks to the Community Action Toolkit resources, these towns understand that MUBEC ensures safe, healthy, energy-efficient construction and reduces citizens' energy costs and dependence on heating oil. The MUBEC Community Action Toolkit will help small communities adopt MUBEC and generate the needed momentum to re-enact MUBEC as Maine's statewide uniform building energy code.

Suggested Statutory Language: The Authority Having Jurisdiction (AHJ) shall be required to adopt, at least every three years, the latest edition of the International Energy Conservation Code (IECC), published by the International Code Council (ICC), together with any other energy efficiency provisions and other related building codes that the AHJ concludes are warranted. Statute shall provide that no amendments to the energy conservation code or other existing building codes shall be adopted that will result in a net increase in energy consumption in buildings without sound, technical justification and lifetime cost analysis data.

As demonstrated in the following figure, considerable savings are experienced across all climate zones as states adopt progressively more stringent codes. The Northeast and Mid-Atlantic states comprise climate zones four through seven, with a small northern section of Maine in climate zone eight, exhibiting energy cost savings from several hundred to several thousand dollars annually.

Total Annual Energy Cost Savings across Climate Zones 1-8



Source: DOE's National Comparison Report of the 2006-2012 Editions of the IECC[12]

12 http://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf

2. Establish a Plan for Retrofitting Existing Buildings

The overwhelming majority of the country's building stock is comprised of existing real estate, with commercial buildings an average of 41.7 years old and 80 percent of residential buildings being 15 years and older.[13] Within this aging building stock there is significant potential for energy savings through building retrofits and renovations, as additions, alterations and renovations could trigger mandatory energy conservation measures under the building energy codes and standards. However, these potential savings are largely untapped because of the lack of guidance and awareness surrounding how national model codes and standards apply to existing buildings, and relatively few requirements in the codes specific to existing buildings energy use.

Building energy codes are largely designed for new construction; it can be unclear both how and when requirements apply to construction in existing buildings. The complexity of building energy codes and a rigid regulatory structure has resulted in reduced compliance rates for additions, alterations and repairs in most jurisdictions. The building community often finds it difficult to understand how to achieve compliance for a project, thereby discouraging building energy retrofits and improved building energy performance. Potential solutions must allow for flexibility within the code requirements in order to maximize the savings potential of building energy codes within the existing real estate market.

The following recommendations are the result of preliminary findings from research conducted by Brit/Makela Group (BMG) and Northwest Energy Efficiency Alliance (NEEA) in an effort to address the regulatory structure affecting energy efficiency in existing commercial buildings. More detailed recommendations will be made available in 2013; visit NEEP's Building Energy Codes webpage for more information.

Policy Recommendations:

- Develop code change proposal(s) for the IEBC, the IECC and the IRC, focused on increasing the usability of the codes as they relate to existing building energy use
- Develop flexible approaches for demonstrating compliance with the code (prescriptive options, outcome-based/performance-based codes)
- Develop legislation that would require disclosure and energy ratings that would act as a trigger for upgrades in existing buildings

The national model codes have not yet been focused on the opportunities that may exist during simple, ongoing maintenance of existing buildings. For example, roof replacements that involve more than just recovering the existing membrane almost never consider an increase in insulation. Using, rather than losing, this opportunity can mean a small addition to the contract that is much less expensive than putting more insulation onto the roof as a separate project.

13 http://www.imt.org/codes/existing-buildings

Since individual projects are often unique, a requirement to consider energy retrofits with renovations is as far as a minimum standard of performance code can legitimately achieve. When coupled with disclosure and building energy ratings however, it can be both a strong incentive and an opportunity for utility incentive programs to promote and reward.

3. Adopt and Implement Stretch Building Energy Codes

A "Stretch Code" Informative Appendix:

- Provides one, state-sanctioned building standard for local jurisdictions wishing to adopt a code beyond the baseline state energy code.
- Informs architects, engineers and other building and design professionals looking to build energy efficient buildings with an appropriate reference.
- Synchronizes criteria for ratepayer funded energy efficiency new construction and renovations 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 national model codes.

States committed to aggressive energy efficiency goals and GHG emissions reductions are showing increased interest in adopting a so-called "Stretch Code" for both residential and commercial buildings that goes beyond the energy efficiency requirements of the current national model code and/or the adopted state building energy code. Alternatively referred to as "Beyond Code" or "Above Code," these advanced building energy code policies are becoming very popular throughout the nation both as informative guides and as sound policy measures to promote state and community commitments to reduced energy use.

Policy Recommendations:

- Include a "Stretch Code" Informative Appendix to the State Building Energy Code.
- Within the Stretch Code Informative Appendix, follow recommended best practices.
- Integrate the Stretch Code with other state energy efficiency programs.

Include a "Stretch Code" Informative Appendix to the State Building Energy Code.

As more and more states consider adopting a Stretch Code, careful regional coordination is encouraged to avoid market confusion and maintain consistency when defining the criteria of the stretch code. To address this confusion and provide consistent guidance, states or the AHJ should adopt an "Informative Appendix" that contains a listing of acceptable energy efficiency criteria and building guidelines that meet advanced energy performance requirements of a Stretch Code. Such adoption assures that a single, consistent, interpretable set of statewide standards are in place to inform and direct energy conservation in projects.

A CLOSER LOOK AT PERFORMANCE AND OUTCOME-BASED CODES

Performance-based codes use energy modeling software to demonstrate that a building's predicted energy consumption or cost is equal to or lower than a baseline target that has been specified by prescriptive code requirements. This baseline reference value is generated from prescriptive code components such as materials and systems, together with inputs from the proposed building, such as building orientation and occupancy schedules. The Cascadia Green Buildings Council explained that performance-based codes are expressed in terms of "percent better than" energy use in comparison to the baseline. Code officials review energy efficiency results to verify compliance, a strategy that allows for greater flexibility because the energy modeling is capable of evaluating a variety of design strategies, components, and technologies. In this way, new buildings benefit from modeling efforts that determine the means by which to achieve the greatest energy savings for the least cost. Performance-based codes can be strengthened further with mandatory minimum requirements that make compliance verification easier. In a paper entitled, *Re-Inventing Building Energy Codes as Technology and Market Drivers*, the authors explain that a small number of mandatory minimum prescriptive requirements for certain components can help address issues that computer models may not fully capture when using a performance code path. If any of these major requirements are left off, inspectors, during a site visit, would be in the position to ensure it is corrected.

Oregon's Whole Building Approach (WBA) was developed to comply with Section 506 of the Oregon Energy Efficiency Specialty Code (OEESC). The WBA is a performance-based compliance path which requires an applicant to demonstrate that the simulated whole building energy consumption cost for the proposed design is not greater than the minimum code-compliant building designed to prescriptive requirements of the OEESC. The WBA is intended to provide flexibility for complying with the OEESC. Oregon's WBA is a helpful way to apply the New Buildings Institute's (NBI) explanation of performance-based codes, which describes the strategy as a modeled compliance path within a prescriptive-based code. Like prescriptive requirements, performance-based codes are proxies for actual building energy outcomes- they do not measure actual performance. They depend on underlying assumptions, which might leave gaps between them and actual performance. Outcome-based codes are intended to address this gap.

Outcome-based codes regulate actual building energy performance by considering the whole building's energy use over a consecutive 12-month period. Outcome-based codes would require that buildings not exceed a maximum annual operating energy use per square foot or cubic foot. An NBI publication entitled The Future of Energy Codes, explains that an individual building's actual energy use goes far beyond prescriptive code

components. In reality, energy consumption reflects siting, building/system design, construction quality, commissioning, operations and maintenance, interior design, tenant behavior and plug/process loads. Outcome-based codes measure holistic building energy consumption, accounting for whole building energy uses including plug loads, for the lifetime of a building. The measured performance, or outcome, would then be compared to whatever compliance standard that is set by the code, whether the code is prescriptive- or performance-based. Currently, code compliance is determined at the time retrofits are designed and permitted, with no post-construction accountability for actual performance. Outcome-based codes may take on this post-occupancy challenge, through means other than code enforcement, such as tax credits and rebate strategies, to verify compliance with actual performance targets. An often referenced difficulty relates to obtaining actual energy consumption data, which requires coordination between building departments and utilities. This challenge will have been tackled, however, by progressive cities and states already mandating building energy rating and disclosure. With this policy infrastructure in place, energy consumption data will be more readily available.

The city of Seattle, WA is currently in the process of implementing an innovative pilot study for outcome-based codes. A description of the project explains that the new model for energy codes for existing and historic buildings will pair accountability for actual performance outcomes with complete flexibility in how owners of these buildings can conduct energy retrofits. The City of Seattle's Priority Green Permitting Program partnered with NBI and the National Trust for Historic Preservation's Green Preservation Lab to test how the flexibility of the outcome-based performance path can improve the energy efficiency of existing buildings by shifting the code's requirements to overall energy use reduction. Outcome-based compliance will be based on meeting actual post-occupancy energy use targets. Once met, a pre-negotiated compliance bond will be released. However, if energy efficiency targets are not met, penalties based on percentage variations from the established target are applied.

Link to Building Energy Rating: Outcome-based energy codes can be linked to building energy rating and disclosure. NBI recognizes that better data about actual building performance is needed in order to make outcome-based energy codes possible. Building performance data must be made available to policymakers, code jurisdictions, and the market so that realistic building performance targets can be set. Disclosure ordinances, such as LL84 in NYC and Philadelphia's Bill Number 120428-A, provide current building energy performance information to interested parties in a leasing or sale transaction. With these policies in place, cities such as New York, Philadelphia, Washington DC, Burlington, Austin, and Seattle, are better prepared to make performance and outcome-based codes a reality.

Link to Zero Net Energy: Once the relatively easy savings are achieved prescriptively through efficient envelope and equipment measures, it is the opinion of Harris et al and many others that the remaining savings can only come through careful systems-level design. These measures that go beyond the current status quo may include building orientation, daylighting, thermal mass, natural ventilation, and integration of appliances and HVAC, all of which may be difficult to specify prescriptively in codes. This reasoning lies behind the impetus for the Seattle pilot project, which found that prescriptive codes are going to "hit a wall" in terms of the diminishing returns in energy savings yield compared to the funds necessary to incorporate them into the construction. When thinking long-term, as Seattle is, it is important to consider the role that model energy codes will play in combating climate change and contribute to the market push toward net-zero buildings.

Including an Informative Appendix effectively limits the number (and inevitable confusion and difficulty to building professionals) of multiple stretch codes or standards being adopted and used within a state and provides a consistent set of requirements that can be interpreted, and adapted for curricula development for public and construction industry education. This can be especially beneficial to progressive local governments wishing to adopt building energy codes more stringent than the national model code and the state base code wherever local adoption is allowed by state law. In some states, legislation may be needed to allow local governments to adopt energy code requirements other than the state minimum code requirements. For example, Massachusetts established a performance-based Stretch Code for local adoption as an appendix to the state building code that individual local governments can elect to adopt (see case study).

Within the Stretch Code Informative Appendix, follow recommended best practices.

NEEP recommends a Stretch Code include 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. 15-20 percent.
- The code or standard must be written in code-enforceable language, and ***NOT***, for example, as a building energy rating model or guideline, i.e., USGBC's LEED (see call out box on page 23), Green Globes, etc.
- Building officials must be able to verify that the buildings meet the new code. 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 being tied to, but not limited to, Home Energy Rating System [HERS] that can provide documentation to the building official that the building meets the requirements of the code being used.)
- The AHJ must specify within its adopted code that a building complying with a code listed in the Informative Appendix would comply with the state energy code.
- State policymakers must also clarify that adoption of a stretch energy code would not disqualify building owners in that jurisdiction from being eligible for the incentives or other benefits offered through that state's ratepayer-funded energy efficiency programs.

Energy Impact of USGBC's Leadership in Energy and Environmental Design (LEED)

LEED is a voluntary, consensus based national standard for developing high-performance, sustainable buildings. LEED has established rating systems for nine different types of buildings and is not written in code enforceable language, and is thus NOT an appropriate substitute for a building energy code, nor a mechanism to implement an 'beyond code' appendix. LEED's energy efficiency requirements are comparable to 10 percent greater efficiency than ASHRAE 90.1-2007.

Integrate the Stretch Code with other state energy efficiency programs.

There are two ways that the Stretch Code Informative Appendix can interact with energy efficiency programs. First, an Informative Appendix should at a minimum be consistent with, and, ideally, be synchronized with the technical specifications included in the energy efficiency programs covering new construction. Otherwise, in places where a municipality is allowed 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 for that community the Informative Appendix is the code. Utilities should also be able to provide incentives, education and training efforts on the stretch code requirements.

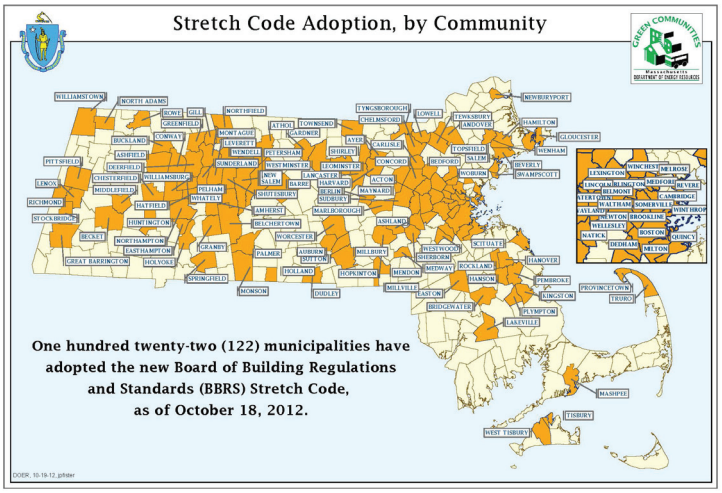
NEEP is available to provide assistance and technical guidance to states interested in developing their own version of a Stretch Code. NEEP has model stretch code language available for state adaptation, based off of the Massachusetts Stretch Code but with updated elements surpassing the energy efficiency of the 2012 IECC. Please contact NEEP's Building Energy Codes Team for more details.

With enough advance notice, stretch codes can strategically influence other building industry market actors involved in state energy efficiency programs. Stretch codes can be a powerful motivator for manufacturers and distributors looking to compete for future market share of products that will be required under the latest stretch code. This results in lower prices for builders and savings that are passed on to developers, as well as consumers who ultimately become those home and building owners. Besides providing consistency to previously uncoordinated state energy efficiency efforts, stretch codes ensure higher compliance rates as the latest model energy codes are adopted since a larger share of market actors will already be familiar and have experience with the new requirements.[14]

14 http://www.newbuildings.org/stretch-codes

MASSACHUSETTS STRETCH ENERGY CODE

Prior to 2008 in Massachusetts, according to Massachusetts General Law chapter 143, section 98, any municipality that wanted to adopt a more stringent code had to demonstrate to the state Board of Building Regulations and Standards (BBRS) that it was "reasonably necessary because of special circumstances." However, upon the creation of the Green Communities Act in 2008, a program which provides funding to qualified municipalities for energy efficiency and renewable energy initiatives, Massachusetts communities began expressing greater interest in the appeals process to adopt more stringent building energy codes. This pressure from Massachusetts' cities and towns led to the state's first beyond code appendix, the 120 AA "Stretch" Energy Code, in May of 2009. The Stretch Code (now the 8th edition, Appendix 115 AA) gives jurisdictions a straight forward path to adopt a more stringent enforceable code that is approximately 20 percent more energy efficient than the base state code. Massachusetts now implements the 2009 IECC with a voluntary Stretch Code, designed with the following criteria and stringencies:



"From tiny towns to major cities and suburbs in all regions of the state, Massachusetts communities recognize the benefits, for the economy as well as the environment, of making clean energy choices."
- MA Governor Deval Patrick

- 40 percent carbon emission reductions compared to the 2006 IECC/ASHRAE 90.1-2004;
- Approximately 20 percent more efficient than the base energy code – the IECC 2009 for new construction;
- Greater emphasis on performance testing and prescriptive requirements, requiring that new residential construction achieve a HERS score of 65 or less for homes 3,000 SF and larger, and 70 or less for those smaller than 3,000 SF;
- It requires compliance with the ENERGY STAR® Qualified Homes Thermal Bypass Inspection Checklist.

The Stretch Energy Code is a voluntary code; towns and cities in Massachusetts may choose to remain on the base energy code or to adopt the Stretch Code as their mandatory energy code requirement. As of October 2012, 122 communities in Massachusetts have voluntarily adopted the Stretch Energy Code. These communities range in size from Rowe, MA with a population of 351 people, to larger cities like Springfield and Boston. These adoptions show that Massachusetts is aggressive and forward thinking concerning energy savings and building codes. Although voluntary codes typically result in low implementation rates, Massachusetts has proven otherwise, and acts as a model for other states interested in pursuing advanced energy codes in their communities.

Lessons Learned From Massachusetts

There was no shortage of training for building code officials, designers, builders, and contractors in the years following the drafting of the Stretch Code. Massachusetts' Department of Energy Resources' (DOER) Ian Finlayson explained the outreach efforts, which occurred in 40 trainings focused on the 2009 IECC and the Stretch Code. The Center for EcoTechnology's training program expanded, offering 40 builder-focused trainings, 20 codes-focused trainings, 15 HVAC-focused trainings, and five Deep Energy Retrofits-focused trainings in 2011. Collaboration was also a crucial factor in the adoption of the Stretch Code. The Stretch Code was created by the BBRS with the assistance of key state energy personnel and NEEP. NEEP provided expertise while working on New Buildings Institute (NBI)'s Core Performance, which served as the framework for the Stretch Code's commercial requirements. And finally, because the Green Communities Act includes building energy efficiency as a prerequisite for grants, the adoption of the Stretch Code was further incentivized for cities and towns across the state.

The progress seen in the state of Massachusetts demonstrates a rapid adoption of beyond code legislation. As Mark Lyles of NBI notes in his article *A Chance Encounter with the Massachusetts Stretch Energy Code*, jurisdictions of all sizes in Massachusetts adopted the Stretch Code, suggesting a readiness of the market to adopt energy efficiency improvements many thought impossible before. This leadership should speak to other states across the country as it continues to save homeowners money, reduce carbon emissions, and create jobs for the Commonwealth – achievements that are possible for any jurisdiction ready to make energy efficiency a priority.

What Are The Savings?

The following figure represents a cash flow analysis for building a home to the 2009 IECC, the Stretch Code, and the Stretch Code with ENERGY STAR. Although the Stretch Code home has an increased up-front cost of $2,949, both Stretch Code homes have annual cash flows between $293 and $389, with energy savings of over $500 each year.

Massachusetts Stretch Code Improvement - Cash Flow

Baseline Home (2,672 SF)			
	2009 IECC	**Stretch Code**	**Stretch Code with ENERGY STAR**
HERS Index Modeled in REM/Rate	**86**	**70**	**70**
Improvement Measures (changes relative to baseline)	• Unconditioned basement • Floor (R30) • Walls (R21) • Ceiling (R38 G2) • Heating (80 AFUE) • Cooling (13 SEER) • Water Heating (.59 EF) • Duct Leakage (8%) • Infiltration, (7 ACH50) • Efficient Lighting (50%)	• Ceiling (R38 G1) • Heating (94 AFUE) • Water Heating (.62 EF) • Infiltration (4ACH50) • Efficient Lighting (75%) • Exhaust Only Ventilation	• Ceiling (R38 G1) • Heating (94 AFUE) • Water Heating (.62 EF) • Duct Leakage (6%) • Infiltration (5 ACH50) • Efficient Lighting (80%) • Exhaust Only Ventilation
Improvement Costs		**$2,049**	**$2,155**
HERS Rater Fee[1]		**$900**	**$900**
HERS Rater Reimbursement[2]			**$650**
ENERGY STAR Incentive[3]			**$650**
Total Improvement Costs		**$2,949**	**$1,755**
Mortgage Interest Rate		**6%**	**6%**
Loan Term (years)		**30**	**30**
Annual Incremental Mortgage Payment		**$214**	**$127**
Annual Energy Costs[4]	**$3,970**	**$3,463**	**$3,454**
Annual Energy Savings from Baseline		**$507**	**$516**
Annual Cash Flow		**$293**	**$389**

1 Estimated MA ENERGY STAR Homes Program HERS Rater Fee (range is $750-$1500, but typically closer to $750), includes cost of Thermal Bypass Inspection.
2 HERS Rater Fees are reimbursed by the MA ENERGY STAR Homes Program by $650-$900 per unit, depending on the HERS rating achieved.
3 MA ENERGY STAR Homes Program may receive a minimum incentive of $650
4 Annual energy costs based on November 2009 fuel costs. Costs for heating are based on natural gas prices, the least expensive heating fuel. With oil, savings would increase.

4. Establish a Pathway to Zero Net Energy Buildings (ZNEBs)

In recent years, a number of dedicated and resourceful practitioners have shown that constructing buildings that use no more energy than they are able to produce on-site - "zero net energy buildings" (ZNEBs) - is not only possible, but a practical and tangible example of the region's collective commitment to a clean energy future. Through the use of regular code updates and advanced code guidelines, the path to zero net energy has never been clearer.

Policy Recommendations:

- Implement a Stretch Code to establish a strong foundation for zero net energy buildings.
- Incorporate regulatory changes to building energy codes that facilitate ZNEBs.
- Lead by example – construct all new public buildings as ZNEBs.

Implement a Stretch Code to establish a strong foundation for zero net energy buildings.

Implementation of a stretch energy code builds market capacities to design and construct buildings with advanced energy efficiency features. Developing such market "know how" supports the eventual adoption of strategies that result in zero net energy buildings. Adoption of a Stretch Code 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, Stretch Codes work hand in hand within the context of a state's pursuit of zero net energy buildings.

Massachusetts is a leader in the development, adoption, and implementation of stretch code language as an appendix to the adopted energy code, which is made available to municipalities for local adoption. For municipalities that adopt the Stretch Code in Massachusetts, buildings will be required to be designed to use significantly less energy than they would have otherwise. This will bring energy efficiency further into the mainstream in the building design and construction community, providing practitioners with greater experience in producing efficient buildings. And finally, as codes are updated and adopted, and the stretch code becomes the baseline code, building codes will become more predictable, providing design and construction teams more lead time to acquire the skills and knowledge needed to meet the challenges of tightening requirements – all the way to zero net energy.

Incorporate regulatory changes to building energy codes that facilitate ZNEBs.

On the pathway to net-zero energy, energy codes will need to incorporate the following changes:

- Progressively lower energy use over the next 20 years so that codes are eventually strict enough to facilitate ZNEBs;
- Focus on outcome-based rather than prescriptive requirements to allow for innovative approaches to lowering energy use;
- Require continuous commissioning to ensure that buildings are performing as expected;

- Address all energy used in the building, including plug loads, i.e. the energy consumed by devices plugged in to electrical outlets.
- To support these regulatory changes, it will also be necessary to get building tenants more actively involved in taking responsibility for their energy use.

Lead by example – construct all new public buildings as ZNEBs.

Recognizing the leadership potential of the public sector, the road to a full-scale deployment of zero net energy buildings starts with the facilities our states and communities construct with public funds. In 2012, NEEP developed a report in collaboration with a group of regional building energy stakeholders and outlines key steps the public sector can take to facilitate the eventual broad adoption of zero net energy building practices throughout the Northeast and Mid-Atlantic states. NEEP's *Roadmap to Zero Net Energy Public Buildings*[15] focuses on new construction in the public sector because it provides the greatest opportunity for immediate action with the added benefit of substantial long term energy and cost savings. The Roadmap presents five steps states and municipalities can take now to make zero net energy public buildings a reality across the region within the next 15 years. These critical steps are:

Massachusetts

Massachusetts has been a clear leader in the ZNEB movement. In 2008, Governor Deval Patrick convened a ZNEB Task Force to identify a path to move the public, commercial, and residential building sectors towards zero net energy use by 2030. Massachusetts took action on several of the Task Force's recommendations, including developing two ZNE pilot building projects and pursuing a building asset labeling initiative.

John W. Olver Transit Center Greenfield, Mass.

First Zero Net Energy Transit Center in the Country

Built with federal stimulus funds, this 24,000 sq. ft transit center will produce the energy it uses in a sustainable way: through solar and geothermal sources, and a boiler on site fueled by wood pellets, a lumber-industry by-product. The transit center, which had a construction budget of $12.8 million at the time Governor Patrick broke ground for the project in April 2009, came in at $10.8 million, according to Charles Rose Architects.

15 http://neep.org/uploads/policy/zne-public-buildings-neep-2012.pdf

- **Develop a Path to Highest Performance of Exemplary Public Buildings** - A comprehensive public campaign is needed to convey a consistent message to the broadest public audience.
- **Promote the Continued Development of Exemplary Public Buildings** - States should continue to construct ZNE buildings each year.
- **Prioritize Measurement and Reporting of Public Building Energy Performance** - The region needs to establish a standardized system for measuring and reporting building energy performance.
- **Implement Stretch Building Energy Codes** - States should establish a performance -based stretch energy code for public buildings, complete with a comprehensive program of technical and informative education that expresses the strong value placed upon all construction becoming more energy efficient and economically sustainable.
- **Create a Mechanism to Provide Capital for Energy Investments** - Lack of capital funding is probably the single most important financial barrier to greater investment in efficiency and renewable energy programs, and the knowledge and education to achieve them.

Building Energy Code Compliance

1. Establish Building Energy Code Infrastructure that Ensures Compliance
2. Implement Known Strategies to Enhance Enforcement of Building Energy Code
3. Enhance Funding for Code Compliance Efforts

1. Establish Building Energy Code Infrastructure that Ensures Compliance

Policy Recommendations:

- Establish an Energy Code Compliance Collaborative.
- Conduct state code compliance baseline studies and gap analyses.
- Develop robust training and certification requirements for code inspectors, plan reviewers and building industry professionals.

Establish an Energy Code Compliance Collaborative.

An Energy Code Compliance Collaborative can help ease the burden on state energy offices by bringing together key stakeholders into a collaborative process and establishing a forum to support common interests around energy code adoption and compliance. In a number of states, collaboratives have already proven successful for creating an open dialogue and clearinghouse for ideas and conversation concerning energy codes. In the Northeast and Mid-Atlantic, NEEP and BCAP have assisted states such as New Hampshire and Delaware with the establishment of code collaboratives, tasked with tackling everything from broad code adoption issues to specific compliance problems.

Designed to assist states that are struggling with declining budgets, resources, and staff, collaboratives excel by assembling a team of local experts to assist the state in reaching its compliance goals. Collaboratives ideally are made up of a diverse group of state and local stakeholders and take on the responsibility of advising the AHJ on energy code implementation, infrastructure, and updates, as well as carrying out the tasks necessary to ensure greater compliance with the energy code. Collaboratives can also play an important role in communicating the value of codes and standards to the greater public.

Develop a roadmap for achieving full compliance with the state building energy code.

Collaboratives can play a lead role in the development of a strategic compliance plan, which will serve as a critical roadmap for energy code implementation efforts in future years. The plan will recommend tasks within various focus areas that state agencies, local jurisdictions, and other stakeholders can complete to achieve full compliance with the required energy code. See the case study on New Hampshire and Delaware's Code Collaborative experience.

Conduct state code compliance baseline study and gap analysis.

Only after a baseline code compliance rate is established, can states be equipped to make fully-informed policy decisions for improving energy efficiency in the state's building stock. Determining a state's current code compliance level is also important for identifying opportunities for increasing compliance and code savings, and identifying specific gaps in code knowledge and implementation that can be addressed through training and education. Lack of compliance with the energy code undermines the potential energy savings the code is expected to deliver.

Once a baseline compliance rate and gap analysis is determined, a comprehensive program can be designed to verify that buildings actually comply with the code. This can help ensure that code inspectors, whether local, state or third party, are correctly assessing code compliance in 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 continually modify and improve their training programs. The baseline study will help determine the current level of compliance, identification of specific areas where compliance is weak and recommendations on how to address these weaknesses. Regularly scheduled compliance studies are strongly encouraged in order to monitor changes in state code compliance over time and reassess code efforts. Importantly, all initial baseline compliance studies should have frequent follow-up studies to gauge the effectiveness of implemented policies.

ENERGY CODE COLLABORATIVES IN DELAWARE AND NEW HAMPSHIRE

TAKE AWAY POINTS:

- State Energy Code Collaborative efforts bring together diverse stakeholders to promote transparency and dialogue concerning energy code adoption and compliance.
- The Delaware Division of Energy and Climate (DE&C) created the Delaware Energy Code Coalition in November of 2011 to achieve 100 percent code compliance in the state by 2017.
- The New Hampshire Building Energy Code Compliance (NHBECC) Forming Group began meeting with stakeholders in fall 2012 in preparation for the Collaborative's official launch anticipated for early 2013.

Background

In order to meet the requirements of Section 410(a) of the American Recovery and Reinvestment Act (ARRA), states must achieve at least 90 percent compliance rates with the national model energy code (2009 IECC or higher) by 2017. The Building Codes Assistance Project's (BCAP) Compliance Planning Assistance (CPA) Program worked with the Department of Energy (DOE) to assist certain states with completing a gap analysis report to document existing energy code infrastructure, as well as a strategic compliance plan, which develops targeted action items for states to move towards full energy code compliance. These resources encouraged and supported the development of Energy Code Compliance Collaboratives. Energy Code Collaboratives, also referred to as "Compliance Coalitions," create an open dialogue and clearinghouse for ideas and conversations concerning energy codes in a number of states already. According to the American Council for an Energy Efficient Economy (ACEEE), a Compliance Collaborative is designed to assist states that are struggling with declining budgets, resources, and staff by assembling a team of diverse stakeholders to ensure greater compliance with the energy code. It is a proven best practice in New Hampshire and Delaware, as well as Idaho, Nevada, Colorado, and Texas.

Delaware benefited greatly from BCAP's CPA Program which resulted in the development of both a Gap Analysis Report and a Strategic Compliance Plan for the state. The Delaware Division of Energy and Climate (DE&C), which is the legislative authority that reviews and adopts updated energy codes every three years, created the Delaware Energy Code Coalition in November of 2011, following the first recommendation in its Strategic Compliance Plan. It

was the first CPA state to create a Code Coalition. The Coalition consists of a diverse group of state and local stakeholders responsible for advising DE&C on energy code implementation, infrastructure, updates, and compliance. ACEEE's State Energy Efficiency Policy Database indicates these stakeholders represent homebuilders, building code officials, contractors, and representatives from the American Institute of Architects (AIA), Delaware Sustainable Energy Utility (SEU), ASHRAE Delaware, NEEP and BCAP. The Coalition will use the state's Strategic Compliance Plan to achieve 100 percent code compliance by 2017, as well as join BCAP and NEEP in advising DE&C on code adoption and implementation. In a NASEO webinar, Delaware energy planner Bahareh Van Boekhold explained that in addition to advising DE&C, Delaware's Energy Code Coalition will work with the SEU and other utilities to encourage ratepayer funded building energy code programs.

New Hampshire's Energy Code Challenge supports efforts to strategize and measure the state's progress toward reaching ARRA's 90 percent energy code compliance requirement. The Code Challenge is an ongoing state campaign that seeks to make New Hampshire one of the most energy efficient places in the country. Since 2009, New Hampshire's Office of Energy and Planning (OEP) has worked with GDS Associates to develop the goals and resources of the Code Challenge, outlined in the NH Building Energy Code Compliance Roadmap, released in April of 2012. Additional efforts and materials to help assist the state's energy code compliance goals were developed by BCAP in both the Gap Analysis Report and Strategic Compliance Plan. One of the many accomplishments to date of the Code Challenge efforts, and a direct result of the Compliance Roadmap, is the establishment of the New Hampshire Building Energy Code Compliance (NHBECC) Forming Group. The mission of the NHBECC project is to form a stakeholder collaborative that will advance building energy code compliance in the state and serve as a reliable and unbiased centralized source of information on building energy codes in New Hampshire. This group will be responsible for presenting the knowledge and tools that builders, lenders, appraisers, buyers, and state and local regulators need to evaluate and assign value to building energy efficiency. To date, the Forming Group is still in the process of developing its goals, key issues, and agenda items, but held its first meeting in the fall of 2012. The Forming Group will invite new and continuing energy code compliance players to participate in the Collaborative, which will make achieving 90 percent compliance with the 2009 IECC its primary goal.

Reasons for Low Compliance Rates

As demonstrated in the following case study, no state has successfully reached 100percent energy code compliance, leaving a significant amount of work to be done if states are to stay true to their 2017 ARRA commitments. A number of factors result in the low compliance rates and will need to be addressed in order to maximize compliance rates and their associated energy and cost savings - these include:

- **Funding**: Local building offices suffer from chronic underfunding with respect to most of their required energy code related functions – including implementation, administration and enforcement, as well as time budgeted for training and education. As a result, too few code officials (either plan reviewers or inspectors) exist in relation to the amount of construction that must be reviewed, permitted, inspected and approved for occupancy.

- **Priorities**: Given limited time to check and inspect construction, officials must prioritize which elements of the building code they are able to administer and enforce. Consequently, officials deal first with life safety and public health issues (such as structural, fire and sanitation), often leaving out checks for compliance with the energy code.

- **Training**: Code officials and practitioners do not receive sufficient mandated training on energy code issues in comparison with other important aspects of the code such as structural, health or fire safety requirements.

- **Lack of Awareness**: Architects, engineers, contractors, builders and others may not understand or be fully knowledgeable of the energy code and its requirements, nor is professional development tied to ongoing energy code training.

- **First Cost versus Life-Cycle Cost**: Owners and developers, concerned with first cost and wanting to get buildings constructed in a timely manner to generate income and protect time and money invested, may choose to ignore new energy requirements of the building code, particularly since the life-cycle cost/ value of energy-saving investments are not generally recognized in property valuations.

- **Lending Institutions**: Lenders may not send appropriate messages about the importance of energy code compliance and the consequent impact of ongoing energy costs when reviewing loan applications for construction or for purchase of new homes or buildings. Appraisers are additionally hampered by traditional prescribed methods that do not value energy improvements to a building.

STATE BUILDING ENERGY CODE COMPLIANCE STUDIES — LESSONS LEARNED

What is Building Energy Code Compliance?

States must develop and implement a plan, including training and enforcement provisions, to achieve at least 90 percent compliance with the national model energy code (2009 IECC or greater) by 2017, in order to comply with Section 410(a) of the American Recovery and Reinvestment Act (ARRA). Code compliance refers to training, outreach, implementation support, and enforcement, of building energy codes. The Institute for Market Transformation (IMT) has shown that for every dollar spent on code compliance and enforcement efforts, there is a six dollar return in energy savings. Compliance with energy codes is essential for reaching their intended, potential energy savings. Effective compliance and enforcement unlocks deeper energy savings, reduced costs, higher building resale value, and minimized environmental impacts. According the U.S. Department of Energy (DOE), the single most important step to reducing energy use in buildings is to implement and enforce compliance with building energy codes. In order to achieve at a minimum 90 percent compliance, jurisdictions and states must first develop a baseline compliance rate. This case study presents lessons learned from these efforts.

Efforts to Address Building Energy Code Compliance

The key to realizing the full benefits associated with building energy codes is through compliance verification. The DOE's Building Energy Codes Program (BECP) developed guidelines, training materials, and tools to help states meet the code-compliance requirements of ARRA, and to ultimately improve energy efficiency. These tools, such as COMcheck, REScheck, Score + Store, and State Sample Generator tool, among others, help the building industry document and verify compliance with energy codes. The DOE funded pilot studies in several states to measure their baseline code compliance rates. The DOE works with five of the regional energy efficiency organizations (REEOs) and Pacific Northwest National Laboratory (PNNL) to test methodologies for evaluating state energy code compliance. According to the BECP 2011 Annual Report, since 2010, BECP has launched nine state and regional compliance pilot studies (Georgia, Idaho, Iowa, Massachusetts, Montana, Oregon, Utah, Washington and Wisconsin), which included comprehensive training on conducting a compliance assessment using BECP developed software tools. The scope of work completed in these states include surveying building code officials, field inspections, plan reviews, outreach to building officials, energy use intensity comparisons, inspector interviews, PNNL checklists, and HERS ratings. The following lessons learned were gathered from participants of the DOE Pilot Compliance studies, as well as participants in state funded compliance studies, such as New York, New Hampshire, and Maine.

Lessons Learned

Code compliance levels remain relatively low due to a variety of reasons. The most common barriers identified by DOE's Technical Assistance Program are due to the main responsibility of Code Officials—that is life-safety issues; many states adopting the latest model codes outright; the increasing complexity of energy codes; and the lack of resources and training. Although code development and adoption efforts have been the focus in the past, IMT explains that compliance initiatives such as training, outreach, implementation, and enforcement, have long been severely underfunded.

The following table provides a snapshot of the DOE Pilot Studies, including the approximate cost of conducting a baseline study in each participating state:

State	Building Sample	Cost	Study Scope	Code Evaluated
Utah Phase 2	42	$$	New residential	2006 IECC
Iowa	50	$$	New residential	2009 IECC
Massachusetts	100	$$$$	Post-construction residential	2006 IECC
Montana	125	$$	New residential	2009 IECC
Georgia	69	?	New commercial	90.1-2007
Wisconsin	44	$$	New commercial	90.1-2007/2009 IECC

Cost Key	
$	<$50K
$$	$51-250K
$$$	$251-500K
$$$$	$501-750K

The following anecdotal observations are derived from testimony from code compliance study participants. They represent lessons learned from Maine, Massachusetts, and New York.

- Maine found the variability of construction practices, likely due to the lack of a mandatory statewide uniform code, to be a barrier, according to its Commercial Baseline Study Results.
- The value of an assistance program, such as High Performance Schools Program, or a mandatory code, was observable among the building community and its compliance rates and participation.
- Massachusetts found that results varied based on methodology and recommends involving a variety of stakeholders in the process.

- Homeowners are often wary of being contacted and/or visited, despite incentive attempts with gift cards, baseball caps, etc.
- The New York study explained that the sample is self-selecting, i.e. only the "A" students raised their hands to participate.

> *"We think the barriers to code compliance are poor planning and lack of knowledge. Although some builders will say cost is a barrier, the ones who do it right are often not paying any more to build. The solution is education and more and better inspections. The trainings sponsored by the DOER go a long way to help educate builders and code officials."*
> – Massachusetts HERS Rater, as sited in NMR Group, Inc. MA Energy Code Pilot Report

The following observations are lessons learned from DOE pilot studies, providing insight into measuring compliance using the BECP procedures and tools:

- State compliance measurement studies can be costly.
- Post-construction evaluations were implemented in one study in an effort to reduce costs, but the BECP procedures were designed to be used during building construction and did not work well as written in a post-construction situation.
- Data sources for generating sample sets are not always accurate and, in some cases, are not available (e.g., residential renovations). Generating valid sample sets was further complicated due to the economic climate and the fact that new housing starts are significantly lower than past data predicts.
- Access to buildings under construction is a major problem in some locations. Early engagement of state and local governmental agencies is important in securing their cooperation.
- Timing onsite visits in order to observe all code requirements is difficult for third-party evaluators.
- Consistency is difficult to obtain across studies and across individual evaluators.
- Additional guidance and instructions may be needed for BECP procedures and tools, including suggestions for quality assurance of information submitted by evaluators.
- The checklists developed by BECP for third-party evaluators were deemed valuable tools for state and local staff involved in code compliance during their normal course of code enforcement.
- The top barrier to compliance is training, followed by lack of resources and lack of compliance information on plan submissions.
- Software tools, such as REScheck and COMcheck, which are associated with trade-off and performance-based compliance approaches, demonstrated a strong correlation with higher compliance rates.

Develop robust training and certification requirements for code inspectors, plan reviewers and building industry professionals.

Having strong building energy codes does not guarantee energy efficient buildings. High levels of code compliance require education and training of building professionals among both the regulated and regulator communities - from students, designers and builders, to code officials and plan reviewers, on both the state and local levels. 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. Encouraging building departments, design professionals, builders and trades to take advantage of existing training tools, for example those provided free of charge by the U.S. Department of Energy (DOE) (i.e. COMcheck, REScheck, Score + Store™, and the State Sample Generator tool), will also help enhance compliance levels and boost energy savings.

A well-crafted code training program should include mentoring and compliance tools for code officials and building professionals. As part of the continuing re-certification of inspectors and plan reviewers, energy code modules should be a specific requirement. Also, the state should seek to increase opportunities for training and certification and use state agencies and tools to market these opportunities.

Many states do not specifically require energy code training for code inspectors and plan reviewers, 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 ICC's certification programs and testing. Or, if states so choose, they could establish and fund similar education and certification programs providing a valuable resource to their municipalities.

Best Practices in Energy Code Training:

- Establish a state-level training committee to oversee the development, promotion, and delivery of robust energy code training curriculum for the entire building community, including state code officials, local inspectors, and the regulated community—the 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 opportunities), as well as consult with building officials' education committees to ensure their support and compliance.
- 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/inspection candidates conducted

through the International Code Council's certification programs and testing. Some 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.

- Consider various means of financial support to ensure the training program is well funded. Training could be funded through a number of resource frameworks, including tuition, grants, and state ratepayer-funded energy efficiency programs.

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

- Building energy 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 with developed checklists
- Stretch code optional programs and strategies
- Measurement tools and criteria (such as blower door and duct blaster testing)

The Important Role of Utility Program Administrators

Utility Program Administrators (PAs) can play an important role in code training and education. Below is a summary of instances where PAs have been active in code development, adoption, enforcement and compliance, as well as additional suggestions of activities PAs could undertake to support building energy codes. States involved in the various PA supported code activities are listed in parentheses at the end of each description below.*

Enforcement and Compliance

- **Assess compliance with the existing code**: It is important to determine what the current code compliance level is for at least two reasons: (1) establishing baseline for energy savings from new building efficiency programs; and (2) identifying opportunities for increasing compliance and code savings, particularly when it comes to informing training opportunities or gaps for utility-led training programs (see below). Many PAs and others have conducted code compliance studies recently. PAs also can conduct regularly scheduled compliance studies to monitor changes in code compliance. [CA, NY, MA, RI, CT, GA, UT]
- **Conduct training of code officials and industry**: PAs and others have delivered training programs to code officials and the building industry to increase their understanding of the codes, leading to improved enforcement and compliance. [CA, CT, NY, AZ, MA, RI, VT, CO]
- **Provide technical assistance, materials, and equipment to code officials and industry**: PAs have provided various technical assistance (including hotlines) and materials (such as code books or builder manuals) to help code officials and practitioners (including trade groups) better understand and enforce energy codes. They also have provided equipment, in some cases, such as blower doors. In some cases, similar equipment and services are made available to the building industry to enhance compliance. [GA, IA, VT, MA]
- **Support third-party enforcement**: In some cases, PAs have funded third-parties to provide code enforcement assistance to building officials. HERS raters are one example. [GA, IA, WA]

State Code Development and Adoption

- **Participate in national model code processes**: PAs have worked with national organizations on model codes, which then influence state codes. Organizations PAs have worked with include the ICC, ASHRAE, DOE, and others.
- **Interact with building industry on code development**: PAs have worked with builder associations and builders to assess feasibility of code upgrades and gain cooperation or minimize opposition of industry. [CA]

- **Provide technical information and assistance to state entities**: PAs have conducted technical analyses or provided technical assistance to state code adoption entities. Technical support has included analysis of potential code changes, feasibility assessments, and estimates of costs and energy savings. PAs have assisted with prioritizing code revisions. [CA, NY, AZ, MA]
- **Participate in formal state code adoption process**: PAs have provided testimony and been an active participant in the code adoption process. Where codes originate legislatively, PAs can participate in the hearings or drafting of legislation. [CA]
- **Advocate for state code adoption**: PAs public support state code adoption by advocating in the policy arena, joining coalition groups, signing onto support documents, etc. [MA]

Enabling Activities

- **Advocate for regulatory recognition of savings from code program**: PAs can work in the state policy arena to support recognition of savings from code programs. [CA, AZ, MA]

Define Methods for Crediting Savings to Specific PAs and Utilities

- **Support development of an attribution framework**: PAs have recognized the need for this critical step that allows savings to be assigned to specific utilities. To date, California is the only state in which the attribution method has been applied to distribute savings between the IOUs that sponsor the statewide program. [CA, MA, AZ]

Develop Method for Quantifying Compliance Savings

- **Support development of methods for quantifying savings from changes in compliance**: Although compliance is factored into savings as measured by the California Protocol, methods for determining savings from changes in compliance are not well defined. PAs in several areas are working to define better methods. [CA, MA]

Additional Activities and Strategies

The following list presents this wider range of activities for consideration:

- **Integrate code adoption and compliance efforts into energy-efficiency resource planning**: Codes and their energy savings are integrated into some integrated resource planning and energy-efficiency potential study efforts, but not in all cases and not consistently. Codes are often assumed to be the baseline for estimating acquisition program savings, without knowing the compliance level or looking at opportunities for increasing code stringency or compliance levels.

Energy-efficiency portfolios can benefit by viewing code activities from an integrated perspective with emerging technology and incentive programs.

- **Advocate for legislation that requires state to adopt latest national model codes automatically**: By getting on the model code cycle, states can be guaranteed to have frequent code updates. PAs can work with others to advocate for legislation setting such requirements. In states where such updates are not automatic, utilities that successfully influence a change in policy could establish a claim to the savings that result from each successive update.
- **Advocate for legislation that allows local governments to adopt codes exceeding state code**: Legislation allowing local adoption of so-called "stretch" or "reach" codes permits local governments code flexibility; by requiring the local code to exceed the state code, PAs can work to achieve more savings in the jurisdictions they serve.
- **Implement a variable rate schedule based on a building's code compliance rating**: PAs could design a rate structure that rewards more efficient buildings with a lower utility rate. This approach has been discussed in California and has been suggested by experts. It would require some type of rating system.
- **Require builders/owners to prove code compliance as a requirement for utility service and for program participation**: A utility service requirement exists in Iowa for new one- and two-family residential construction and is on the books in Maryland, and possibly other states. This approach integrates the requirement into the process of completing a construction project. Some utilities require buildings participating in new construction programs to demonstrate code compliance. Enforcement can be simplified by establishing a requirement that a professional architect or engineer certify that the building comply with the code; Wisconsin has such a requirement for the architect.

* NEEP's Regional Evaluation, Measurement and Verification (EM&V) Forum is currently managing a research project to examine various code related activities being undertaken by energy efficiency program administrators, and make recommendations for how regulators can both assess savings from these activities and attribute those savings to the program administrators. The inventory of current code related activities, as well as the list of prospective activities above, is drawn from early drafts of this report. This project is scheduled for completion in the first quarter of 2013, at which point the research results will be made public via a written report. To learn more about the role of PAs in supporting building energy code work visit NEEP's EM&V Forum.

2. Implement Known Strategies to Enhance Enforcement of Building Energy Code

Policy Recommendations:

- Utilize third party energy specialists to increase compliance.
- Adopt commissioning requirements as part of the commercial building energy code.

Utilize third party energy specialists to increase compliance.

In the absence of available building inspectors and/or other appropriate checks and balances to assure energy compliance, or in instances where local inspectors are unable to inspect for or otherwise ignore the energy code, one of the more effective ways to address compliance is the use of third party energy specialists. Building departments do not directly hire these individuals but, with the approval of the building department, they are contracted directly by the permit applicant (under the rubric of special inspector). Third party energy specialists undertake the energy code review and inspection role that may not happen internally due to lack of local government resources. Their work can be accepted as a report of compliance by the local official.

Third party specialists that perform plan review and/or inspection of buildings for code compliance function as an additional resource to ensure that the energy code provisions get adequate attention by supplementing the role of the code officials. Regular building code inspectors can then spend more time on life/safety issues, and can rely on energy code reviews and inspections by the third party specialist performing this task. Secondly, with the establishment of a mandated training and certification program (for municipal building officials, building contractors and trades, and third party specialists) the group of people specifically trained and knowledgeable in the energy code increases.

Clear guidance needs to be established to ensure that municipalities can properly integrate third party plan review and/or third party energy specialists into the code enforcement process. Such guidance should include:

- Specifying the procedure within code/law that allows a municipality to establish a program that allows for the use of third party plan reviewer/specialist to supplement existing staff;
- Separately specifying the qualifications that third parties must satisfy to be licensed to act as an agent in reviewing and recommending approval of construction;
- Specifying the type of documentation required to determine a given project's compliance with the code, where not already in the currently implemented codes;
- Specifying in the codes how a municipality will make its final determination as to the compliance of a building "approved" by a third party specialist;
- Establishing "no conflict of interest" criteria for the role of the third party specialist.

Adopt commissioning requirements as part of the commercial building energy code.

Commissioning consists of a process that confirms, with 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 commercial building systems become more complex, the need to ensure that all of those systems (such as heating, cooling and lighting) function optimally and in a complementary way 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 its multiple objectives of safety, health and welfare and energy efficiency.

With respect to the code, the local officials' work ends upon the issuance of the Certificate of Occupancy (CO). However, proper commissioning requires the commissioning agent to review and inspect building systems during construction, as well as 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 commissioning mechanism, whether a regulatory requirement or as part of an energy efficiency program, should be incorporated. Code language must provide a requirement for commissioning work to take place prior to occupancy and 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 and Massachusetts' Green Communities Act requires commissioning to be completed before the issuance of a certificate of occupancy.

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. No non-residential buildings less than 50,000 square feet shall be subject to such regulations. Initial operation and testing commissioning must be completed and approved before issuance of a permanent certificate of occupancy shall be made. Such regulations shall utilize an approved, nationally accredited standard.*

3. Enhance Funding for Code Compliance Efforts

Policy Recommendations:

- Institute a fee for service structure that sets aside dedicated funding for plan review and inspections of energy code.
- Invest in IT to streamline the building permit process.

Institute a fee for service structure that sets aside dedicated funding for plan review and inspections of energy code.

Municipal budgets alone are often not able to support the costs of attaining better building energy code compliance. Instead, a user "fee for services" should be established and collected as a portion of building permit fees, thereby 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 funds generated by these fees should be separate from state general funds, deemed a "fee for services" and impose no burden on municipal governments. The fund would, nevertheless, be under the control of either the municipal AHJ building department or the relevant authority by law. Alternatively, responsibilities for plan check reviews and inspections should lie on special inspectors to be hired by the owner in fee or permit holder.

How Connecticut Funds its Training and Certification Infrastructure

In Connecticut, a surcharge of $0.26 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.

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 {$ XXX} at the end of any fiscal year, such excess funds shall be deposited in the General Fund.*

Invest in IT to streamline the building permit process.

The national model building energy codes have increased energy saving potential by nearly 30 percent from 2006 to 2012. Unfortunately, compliance rates with building energy codes remain low. By streamlining permitting and inspections processes, cities and states can support code compliance more effectively and efficiently, applying the efforts of Code Collaboratives and the goals of Strategic Compliance Plans with greater ease and accurate results. In addition to higher compliance rates, streamlining of the building permit process—including permit submission and processing, plan submission, review and tracking, inspections, and issuing certificate of occupancy—will put building departments, cities, and states in a better position economically, attracting economic development by reducing the process time by up to 80 percent annually, and reducing energy costs for consumers by increasing energy efficiency. These savings mean more money in the pockets of building owners, homeowners, and tenants, and more money going back into the local economy.[16]

Streamlining this process not only benefits building departments, but it also improves customer services, provides financial savings for the local government, its citizens and private industry, and enhances compliance with building energy codes.[17]

Moreover, electronic code filings have the added benefit of allowing local building data to be uploaded to a central state repository of information, which can help state code officials to better plan training and education activities, and inform overall state energy planning processes. More research is needed concerning the barriers and potential benefits of streamlining the permit process; however, it is clearly a best practice for jurisdictions on the path toward full compliance.

Ventura County, California

An investment of $160,000 for a permits and inspections software package has saved the County over $1 million in costs over a six-year period, despite staff size shrinking by three people and workload increasing by 80 percent. Digitizing the process of receiving and reviewing building permits, plans, and inspections removes overlap and duplication, and creates more efficient administrative procedures.

16 http://www.imt.org/uploads/resources/files/CaseStudy5.pdf
17 http://www.aceee.org/files/proceedings/2012/data/papers/0193-000112.pdf

Building Energy Rating

As states ramp up their energy and carbon savings goals, energy efficiency leaders must find new and innovative ways to improve energy efficiency in the stock of existing homes and buildings. One key tool—building energy rating and disclosure (BER&D)—seeks to transform markets by requiring that meaningful information about building energy performance be disclosed to potential buyers, renters and the public. The following section reviews best practices in BER&D policy taken from NEEP's 2009 report entitled, "*Valuing Building Energy Efficiency through Disclosure and Upgrade Policies: A Roadmap for the Northeast U.S.*" and incorporates new findings and key lessons learned featured in the 2012 companion report available on NEEP's Building Energy Rating webpage.

1. Implement Mandatory Building Energy Rating and Disclosure Policies
2. Follow the "Top 5" Keys to Building Energy Rating Success
3. Enhance Code Compliance through Building Energy Rating

1. Implement Mandatory Building Energy Rating and Disclosure Policies

Policy Recommendations:

Though building energy rating and disclosure policies involve a wide array of specific policy and design choices, they coalesce around a few key concepts:

- Require disclosure of building energy information at time of sale/rental.
- Require energy performance benchmarking of all commercial buildings.

Require disclosure of building energy information at time of sale/rental.

When selling a home or building, owners should be required to disclose a valid energy rating to potential buyers. The same process should also apply at the time of rental (this requirement may be phased in at a subsequent stage).

A home or building energy rating indicates current performance and potential improvements regarding the structure's energy use, providing meaningful information to consumers and empowering them to consider energy performance in their decision-making. Armed with information, some consumers will give preference to more energy efficient homes and buildings, enabling markets to value energy performance, and providing a greater return on investment to projects aimed at improving building energy performance.

Time of sale/rental 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 sig-

nificant 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 at the time of sale or lease create market incentives for both builders and current owners to make energy saving improvements in both new and existing dwellings and commercial buildings.

Building energy ratings can also help confirm compliance with energy code as well as help track compliance across a state or given jurisdiction (see below). Energy rating requirements can be used with respect to the sale of newly constructed homes and buildings as well. In this case, rating and disclosure policies can help ensure that the homes and buildings up for sale actually meet the energy 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).

Building Operational Rating	Operational ratings are based on measured energy use (i.e. energy billing data) in a building. For example, EPA's ENERGY STAR Portfolio Manager tool calculates an 'operational' benchmark score.
Building Asset Rating	Asset ratings evaluate the energy performance of a building based on the thermal envelope (e.g. insulation, windows) and mechanical and electrical systems, irrespective of tenant behavior.

Require energy performance benchmarking of all commercial buildings.

State should require the energy performance benchmarking of all commercial buildings, using ENERGY STAR's Portfolio Manager or some equivalent program. 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.

Benchmarking (much like building energy rating) can help determine whether individual buildings comply with the state code as well as help track compliance across the state. State policy should seek to tie policies such as retro-commissioning[18] to benchmarking. By using benchmarking, a building's actual energy 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.

18 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 that are hindering energy performance.

Who Benefits From Building Energy Rating?

By enabling markets to value energy efficiency, energy performance disclosure policies unleash a broad array of added value for both society as a whole and for individual stakeholders.

OWNERS: Home and building owners gain the knowledge needed to improve their energy performance through renovations, retrofits or improved building management practices. Just as importantly, owners obtain greater certainty that they will secure a return on investment even if they choose to sell before utility bill savings have a chance to recover the full initial costs.

BUYERS AND RENTERS: By receiving timely and meaningful information, prospective buyers and renters can make more informed decisions, and avoid the "surprise" of higher-than-expected energy bills that comes with poorly-performing homes and buildings. Beyond consumer protection, they will also benefit over time from a broadly improved building stock. This benefit is particularly important to overcome the so-called "split incentive," where tenants may pay the energy bills, but have no say into the building systems, structure or equipment that determine energy use.

BUILDING MANAGERS: Under scheduled public disclosure, commercial building managers obtain additional information on their performance, enabling benchmarking with other buildings and encouraging continuous improvements.

REAL ESTATE BROKERS/SALESPEOPLE: Real estate brokers and salespeople benefit from increased consumer understanding of the building stock and the opportunity to distinguish high-performing buildings from their peers. Mandatory disclosure also increases the value of listing aggregation sites by giving consumers more information to compare.

ENERGY AUDITORS: Energy auditors gain a substantial, sustained new business opportunity. Furthermore, as standards for energy raters are established, the profession as a whole will benefit from a uniform framework for comparing services, which should in turn drive cost containment and innovation.

CONTRACTORS: Renovation and retrofit contractors will see sustained market demand for energy efficiency retrofits, creating a stable, long-term demand for their services that is insulated from energy efficiency programming cycles.

DEVELOPERS: Developers receive added value for building to and beyond energy codes, as well as an additional opportunity to distinguish and up-sell their homes and buildings.

ENERGY SERVICES COMPANIES (ESCOs): In the commercial market, scheduled public disclosure will allow ESCOs to identify and market to owners of buildings with the biggest opportunities for savings.

UTILITIES: Utility energy efficiency programs will benefit from increased participation due to the powerful natural incentives created by mandatory disclosure. As with ESCOs, they will also gain valuable information to target-market their voluntary incentive programs in the commercial buildings sector.

SOCIETY: As market valuation of energy efficiency takes hold, society will benefit from decreased energy dependence, lower utility bills, reduced greenhouse gas emissions, and an upsurge in "green" and local jobs associated with energy efficiency retrofits.

2. Follow the "Top 5" Keys to Building Energy Rating Success

A review of existing and planned policies points to several keys to ensuring success in the region, as described in NEEP's report, *Valuing Building Energy Efficiency through Disclosure and Upgrade Policies: A Roadmap for the Northeast*.[19] Indeed, when considering either triggered disclosure (required at the time of sale or lease, for example, of homes or commercial buildings) or scheduled disclosure (required at regular intervals; applicable to commercial buildings only), an effective policy will require, above all else, five key ingredients:

- **A Trusted Rating System**: At a minimum, market actors must believe that ratings reflect the relative performance of homes or buildings, and trust that these ratings have been produced honestly. This does not mean that energy audit models need be perfect, but that the system as a whole is considered a meaningful indication of the relative performance of buildings.
- **Clear Messaging**: The information disclosed, especially the overall building rating, must be clearly and easily understood by the average consumer. It must also allow prospective homes and buildings to be easily compared or, in the case of scheduled disclosure (commercial buildings), must allow building owners and operators to measure their performance over time.
- **Strong Enforcement**: Mandatory disclosure policies are predicated on the ratings being ubiquitous; as such, high compliance rates are considered key to the policy's effectiveness. A combination of strong incentives, credible enforcement and dissuasive penalties are essential to ensuring success.
- **Timely (Early) Disclosure**: For triggered disclosure policies, such as time of sale, ratings must be displayed early in the process, i.e., in all advertising. If buyers only receive the information toward the end of the process – after having made an offer, for example, or when notarizing a sale, they will not be able to use that information effectively, and the policy will have forfeited its opportunity to influence the marketplace. Europe is in the process of correcting its initial error in this respect. Fortunately, MLS systems in the Northeast and the Mid-Atlantic are already beginning to offer this option.
- **Link to Action**: Rating and disclosure policies are an important tool in the toolbox to promote cost-effective energy savings, but are only a means to an end. To lead to action, the rating or audit report should assist consumers by recommending appropriate energy efficiency improvements, providing financial analyses, referring to government or utility incentives, referencing financing opportunities and providing options for more detailed analysis, such as investment grade audits for commercial buildings.

19 http://neep.org/uploads/policy/NEEP_BER_Report_12.14.09.pdf

3. Enhance Code Compliance through Building Energy Rating

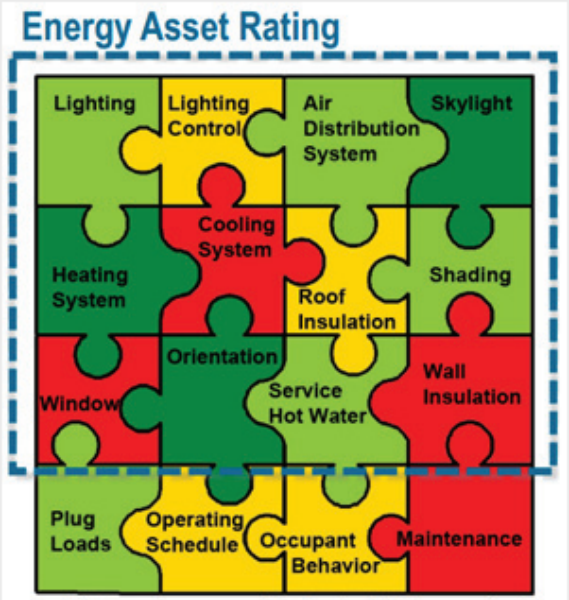
Building energy rating and disclosure policies encourage compliance with energy codes, by providing a 'check' on whether buildings meet the baseline energy code, as well as by rewarding higher performance buildings, further emphasizing the importance of the energy code. They also facilitate code enforcement, since most or all new buildings will receive energy ratings. This is particularly useful where states have adopted a performance-based compliance track for energy codes.

Similarly, mandatory upgrade policies create a powerful motivation for consumers to participate in retrofit and financing programs, which in turn reduce the burden of compliance by lowering costs. Disclosure policies also reduce the compliance burden via the additional value attributed to energy performance. In an ideal world, a single energy rating and building audit would be used to ensure code compliance, allow disclosure, and lead to voluntary programs and financing.

Read more about recent real-world experience across the United States, as well as key lessons learned for successful BER&D implementation in NEEP's 2012 Building Energy Rating Companion Report available on the NEEP building energy rating webpage.

BUILDING ENERGY RATING REGIONAL ROUNDUP - LESSONS LEARNED FOR POLICYMAKERS

Building energy performance disclosure gives consumers the tools they need to make informed choices and protect themselves against inefficient buildings, higher-than-anticipated energy bills, discomfort, and unplanned renovation needs. Building energy labeling also provides a market-based mechanism for creating a common currency regarding home or building energy use.



Building energy use is affected by many factors.

Source: U.S. Department of Energy

In addition to reducing energy consumption, mandatory disclosure and upgrade policies create jobs from an increased demand for energy efficiency services and technology. An Institute for Market Transformation (IMT) analysis estimates net new jobs created from a national building energy rating and disclosure policy, and the reinvestment of energy cost savings by consumers and businesses as a result, to exceed 59,000 jobs in 2020. As the market's value of building energy performance increases, society as a whole will benefit from greater energy independence, lower utility bills, decreased greenhouse gas emissions, increased real estate values and stronger local economies. The same IMT analysis estimates that energy costs for building owners, consumers, and businesses will be reduced by approximately $18 billion through 2020. Energy disclosure is a new frontier, currently requiring more than four billion square feet of commercial and multi-family residential floor space annually, more than twice the volume of commercial space that has been LEED certified. More and more cities are valuing the transparency of energy efficiency in their building stock, whether it requires large buildings to be rated and publicly disclosed, or for building owners to release energy performance information to prospective tenants.

Here's a quick look at building energy rating efforts in Burlington, VT; New York, NY; Washington, D.C.; and Philadelphia, PA.

Burlington, VT: The Residential Rental Housing Time of Sale Energy Efficiency Ordinance (TOS) requires rental housing meet minimum energy efficiency standards. Since 1997, TOS has promoted the wise and efficient use of energy in rental dwellings by mandating cost-effective minimum energy efficiency standards enforced when buildings are sold. It is applied upon transfer of a rental property at the time of sale. The seller and the buyer negotiate who is responsible for compliance. Some buildings offer substantial energy savings

if work is done beyond minimum ordinance requirements. Burlington Electric provides technical assistance, project management incentives, and financing packages for property owners to take advantage of these additional savings.

The range of energy consumption by New York City's buildings indicates a high potential for immediate, very cost-effective energy efficiency improvements.

New York, NY enacted Local Law 84 (LL84) in December of 2009. The benchmarking and disclosure of energy use in buildings is the first law of the City's Greener, Greater Buildings Plan (GGBP). The GGBP is a key policy in achieving citywide emission reduction target goals of PlaNYC (30 percent by 2030). Benchmarking requires annual energy and water benchmarking for nonresidential and multifamily buildings, and the annual public disclosure of benchmarking information. LL84 standardizes the benchmarking process and captures information with Portfolio Manager. The LL84 Benchmarking Report 2012 explains the 2011 energy benchmarking results for 2,065 large commercial properties covering more than 530 million square feet of space. The report communicates various findings and analyzes an enormous data set. Benchmarking those properties that could be rated using Portfolio Manager ENERGY STAR, resulted in a median score of 64 as compared to the national average of 50, indicating greater efficiency. Benchmarking results will continue to be an annual occurrence for all large buildings, with large residential buildings being posted for the first time in the fall of 2013.

Washington D.C.: The Green Building Act of 2006 (GBA) and the Clean and Affordable Energy Act of 2008 (CAEA) established requirements for the District Government to annually measure and report the energy use of all public buildings 10,000 gross square feet or larger. The GBA also requires private building owners measure and annually report the energy performance of buildings over 50,000 gross square feet. To streamline this process of benchmarking, the District has selected the United States Environmental Protection Agency's (EPA) free, industry-standard online tool, ENERGY STAR Portfolio Manager, as the required benchmarking tool. The District released the results from public buildings benchmarked in 2009. On July 20, 2012, DDOE published a second proposed rulemaking on energy benchmarking of private buildings, which is accompanied by guidance documents, public comments, and frequently asked questions on the District's Department of the Environment website.

Philadelphia, PA: Bill No. 120428-A, passed in June of 2012, requires commercial buildings in Philadelphia over 50,000 square feet to benchmark and disclose their energy and water consumption to the City on an annual basis. The bill also calls for the use of Portfolio Manager. The benefits of this legislation in Philadelphia were presented by Energy Efficient Buildings Hub (eeBHUB). This bill will retrofit approximately 5.3 million square feet of office space for a total cost of $1.9 million. It will create 157 direct jobs and up to 2,230 indirect jobs, and add a total of $3.5 million in economic value to Philadelphia's economy. According to a press release from IMT, EEB Hub plans to work with the City, Philadelphia Electric Company (PECO), and other utilities as well as building owners and service providers to implement the legislation, and predicts economic development opportunities and jobs to follow.

Conclusion

Investing in efficiency has meant growing good jobs in the region and keeping energy dollars circulating in our local economy, instead of going overseas. It's not a coincidence that states in the Northeast and Mid-Atlantic with some of the most aggressive goals and a stable climate for energy efficiency are seeing big job gains.[20] Policies focused on advanced building energy codes and building energy rating not only complement and enhance the region's energy efficiency programs, but ensure a better return on investment.

Advanced building energy codes and building energy rating policy provide an important means for reducing energy use in the Northeast and Mid-Atlantic. Pursuing a comprehensive building energy codes policy will deliver increased energy efficiency/savings, improved compliance rates, and more effective tools to measure and verify energy savings.

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 innovate and ensure substantial energy savings for years to come, or to continue to 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.

Building energy rating and disclosure policies that encourage smarter, greener, and innovative buildings send clear signals to the market that efficiency makes long-term financial sense. It is NEEP's hope that the *2012 Model Progressive Building Energy Codes Policy* will help states recognize this opportunity for savings and forward-thinking in a way that supports the construction and maintenance of more efficient, sustainable and affordable homes and buildings across the Northeast and Mid-Atlantic.

20 In Massachusetts, clean energy jobs are up 11% over 2011: http://masscec.com/index.cfm/page/2012-Massachusetts-Clean-Energy-Industry-Report/cdid/13909/pid/11170.

Glossary of Terms and Resources

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

ACEEE: American Council for an Energy-Efficient Economy

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.

ASE: Alliance to Save Energy

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

BECP: Department of Energy's Building Energy Codes Project

BCAP: Building Codes Assistance Project

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/her designated representative authorized to act on behalf of the authority having jurisdiction.

COMCheck: Department of Energy compliance software for energy conservation in all buildings other than low-rise (under four stories high) 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.

Home Energy Rating Service (HERS) Index: The HERS Index is a nationally recognized evaluation of efficiency for homes, established by the Residential Energy Services Network (RESNET), featuring a 1-100 scoring system. The lower a home's HERS Index, the more energy efficient it is in comparison to a HERS Reference Home (i.e. standard home scores 100, ENERGY STAR home scores < 85, net zero home scores a zero).

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

ICC: International Code Council

IEBC: International Existing Building Code

IECC: International Energy Conservation Code

IgCC: International Green Construction Code

IRC: International Residential Code

IMT: Institute for Market Transformation

NASEO: National Association of State Energy Offices

NBI: New Buildings Institute

NFRC: National Fenestration Rating Council

NWWDA: National Wood Window and Door Association

Performance Energy Code: A performance approach to the building energy code (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 Energy Code: A prescriptive approach to the building energy code 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.

Program Administrators (PAs): Utility administrators of ratepayer funded energy efficiency programs.

RECA: The Responsible Energy Codes Alliance

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.