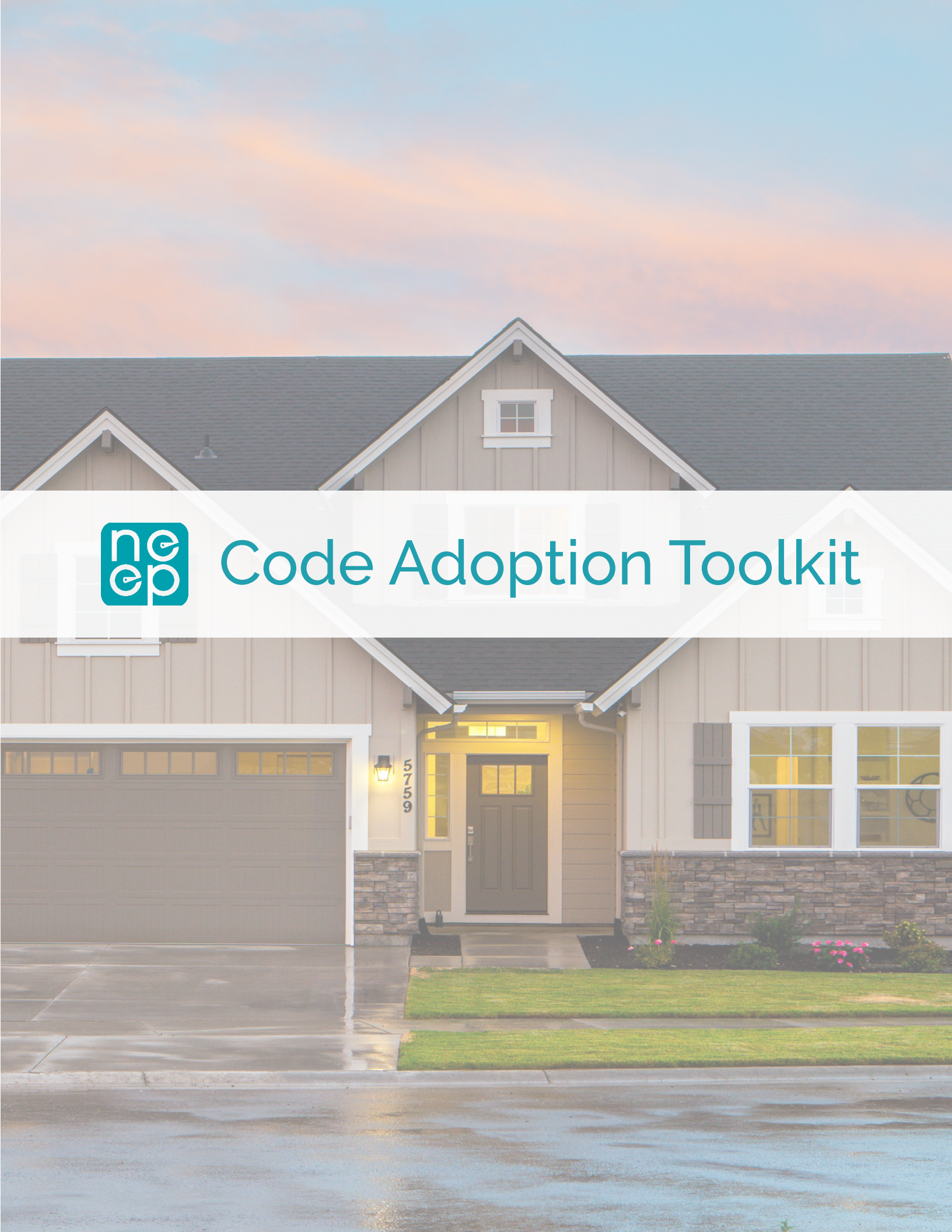


Code Adoption Toolkit

Table of Contents

Introduction

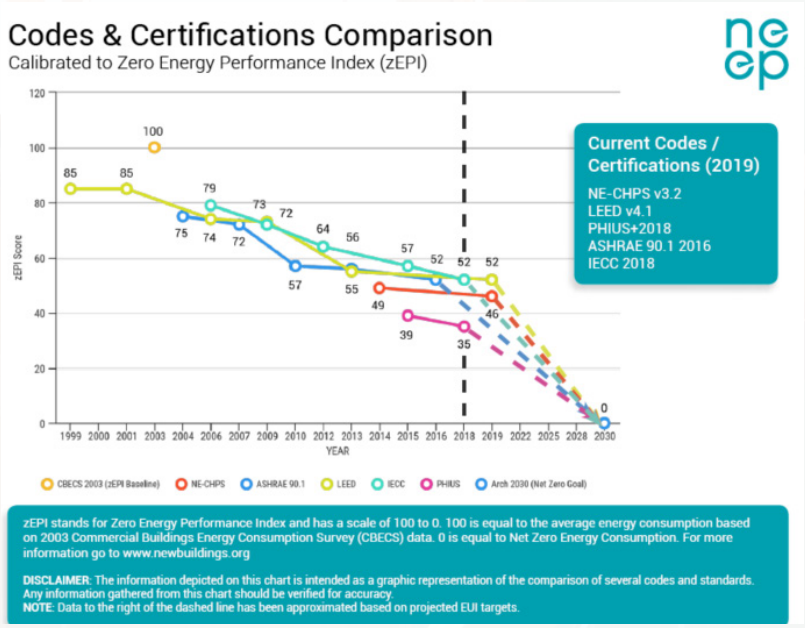
NEEP's Code Adoption Toolkit is a collection of state, regional, and national resources to help inform the adoption of building energy codes. This document provides an overview of the benefits of energy codes along with guidance and tools to help municipalities and states through the process of adopting their energy code and achieving high compliance rates (see NEEP's Code Compliance Toolkit).

Resources in this document can help inform energy code adoption and ensure the adoption of an efficient, healthy, and energy- and cost-saving code. These include links to model codes, state-specific base/stretch codes, cost analyses, and U.S. Department of Energy (U.S. DOE) energy efficiency gains and cost-effectiveness determinations, code comparisons, exemplars, case studies, documents discussing the benefits of energy codes.

Summary

Energy codes are a type of building code that provide opportunities to reduce the amount of energy a home or building consumes. Energy codes do this by prescribing energy efficiency standards for home or building components – such as its envelope, HVAC system, and insulation – that lower the overall energy use, energy costs, and carbon emissions of a home or building while simultaneously improving their safety and resilience. As homes and buildings in the U.S. account for over 40 percent of all energy consumption and over 33 percent of all carbon emissions,[3] energy codes are an essential tool for helping states reduce their overall energy use and realize their climate goals.

Adopting energy codes occurs at the state and municipal level. There are two primary energy codes adopted in the U.S.: the International Energy Conservation Code (IECC) and the ASHRAE standards.[4] The energy codes are updated every three years with the other model codes, such as the fire and plumbing codes, to reflect evolving industry best practices and technologies. The energy efficiency of the energy code has also increased by an average of eight percent each update from 2006 to 2021.[5]



To achieve even greater energy efficiency, states sometimes promulgate an additional "stretch" or "reach" energy code to supplement their base code, giving communities the option to enforce a code that can be as much as 15-20 percent more energy efficient than the state's base energy code. Stretch codes take many forms, from amended versions of a state's base code to original high-efficiency codes written by states themselves. Some states and local municipalities require stretch codes for certain types of buildings or municipally-financed projects, but most are voluntary and meant to encourage energy savings beyond the state's base energy code. Also, standards and initiatives such as the International Green Construction Code (IgCC), DOE Zero Energy Ready Homes, Passive House, and other high-performance building programs are adoptable as a complement to or basis for a stretch code.

---

[1]Determinations by the U.S. Department of Energy are analyses on new model codes that quantify the impacts of the code changes on energy efficiency and cost-effectiveness at the national, regional, and state levels. Learn more about DOE determinations here.
[2]A building's "envelope" describes the components that separate the indoors from the outdoors, including walls, insulation, windows, basement slabs, and roofs.
[3]See https://www.energy.gov/sites/prod/files/2017/03/f34/qtr-2015-chapter5.pdf and also https://www.eesi.org/topics/built-infrastructure/description
[4]Other ASHRAE standards include 189.1, 100, 62, and 140, that pertain to the green construction of buildings and more specific components like ventilation, mechanical systems, and appliances.
[5]See https://www.iccsafe.org/wp-content/uploads/ICC_Executive_Summary_Energy_Efficiency.pdf. Some years saw greater gains in energy efficiency than others.

Adopting new base energy codes as they are published is the best way to realize their benefits. A few leading states have auto-adoption legislation requiring them to adopt within a year of publication (see below). Newer energy codes increase energy efficiency requirements, include additional compliance pathways, and add clarifying language. ICC, U.S. DOE, and others – including the Regional Energy Efficiency Organizations (REEOs) – offer various training materials and software (REScheck, COMcheck) to assist with compliance.

Energy codes are also the only codes that pay for themselves by reducing load demand for utilities and operational costs for owners, putting money in the pockets of consumers. Adopting new energy codes as they are published helps standardize industry practices, improves building energy efficiency, performance, and resilience, saves homeowners and states energy and money, and enhances job growth through the implementation of new technologies, construction methodologies, and third-party compliance options.

Questions? Contact NEEP

This toolkit is updated regularly. Be sure to visit NEEP's Building Energy Codes page for the latest version, and contact Moses Riley with any inquiries. See NEEP's Code Compliance Toolkit for information on trainings and workforce development, compliance pathways, utility engagement, state code websites, and more.

- Moses Riley, Energy Policy Associate
- mriley@neep.org, (781)-860-9177 ext. 171

I. Code Adoption Checklist

Interested in adopting a new energy code? Great! Follow this step-by-step guide to inform your process:

- ☐ Reach out to NEEP and form a codes collaborative group to support code initiatives. This helps holistically analyze your specific situation from several perspectives, engage relevant industries and groups, and ensure the outcomes are equitable.
- ☐ Determine your baseline. Does your state/municipality follow an energy code already? If so, what is it? Does it need an update? If not, why not? This can clue you in to potential opposition.
- ☐ Set goals. Why do you want to adopt an energy code? What are you hoping to achieve? Make sure your goals are clear and amicable to a wide audience; not just to energy efficiency or climate change advocates, but the legislature, building industry, code inspectors, and local officials.
- ☐ Do some research. Are there existing state or local regulations surrounding building codes, such as publication waiting periods or community restrictions? Are communities required by law to follow the state energy code, or are they able to adopt an alternative code of their choosing? Are communities able to adopt a more efficient stretch code? Are communities able to "opt-out" of the energy code? Is the state required to wait for codes to be published for one, two, or more years? If so, this can give you a clear timeline for your adoption strategy. Are their existing climate, energy, or emissions goals at state or local levels that the energy code could align with?
- ☐ Make a plan. Identify your timeline and target audiences you need to convince, including potential opposition you might face. When is the next opportunity to adopt a base code? Which code will work best for your state or municipality? What about a stretch code?
- ☐ Identify and create partnerships to support your effort. Engage with relevant stakeholders – understand their needs, questions, concerns, and desires. Strive to address potential issues with adopting a new code and to broaden your consortium of supporters. Compile resources and information on energy codes - their benefits, enforcement, and administration - consolidate dates for proposal deadlines, public hearings, and other relevant regulatory events and attend prepared. This is critical to define your platform and achieve your goals.

Following these steps will ensure that your code adoption process is comprehensive, achieves your goals, and is equitable to all involved and affected. If you have questions, please feel free to contact NEEP directly: Moses Riley: mriley@neep.org, 781-860-9177 x171

Stakeholder Engagement

Having a group of diverse stakeholders with varying views and opinions will ensure the code adoption is comprehensive and equitable to all involved and all that will be affected. Stakeholders that should be part of this process include code officials and inspectors; builders, contractors, and construction professionals; architects and design professionals; state and utility representatives; realtors and real estate professionals; energy code advocates; home and building owners and managers; engineers and building science experts; equity experts; and consumers.

There will always be opponents to energy code adoption. It is important not to isolate them, but instead listen to their concerns and address them directly – in the end, there are few drawbacks to adopting a new energy code and most can be solved with related trainings.

II.Model Codes and Resources

Latest Model Codes

The two primary model energy codes adopted at the state level are the International Energy Conservation Code (IECC) and ASHRAE Standards. These codes are developed through an extensive collaboration process by experts in building durability, building science, construction, architecture, engineering, code inspection, and more. A few states decide to adopt the International Green Construction Code (IgCC) in addition to the energy code to regulate additional parameters like environmental site assessment and waste. We recommend starting here and using the additional resources below to inform your effort. Be sure to also visit NEEP's Model Codes webpage for more information.

International Codes Council (ICC):

- 2021 IECC
- 2018 IECC
- 2015 IECC
- International Green Construction Code (IgCC)
  - IgCC 2018
  - IgCC 2015

ASHRAE Commercial Standards

- 2019, 2016, and 2013 ASHRAE 90.1, 189.1, 62.1, and 62.2 Codes

NEEP/U.S. DOE Introductory Resources

- NEEP:
  - Building Energy Codes for a Carbon Constrained Era
  - Model Progressive Building Energy Codes Policy
  - State Code Tracking
  - Energy Codes are Life Safety Codes
- DOE Energy Code Adoption Toolkit

Cost Determinations/Analyses

U.S. Department of Energy conducts code cost-effectiveness analyses and efficiency determinations for new model codes following their publication. These include both nation-wide and state-specific analyses. Click on the headings below to browse the catalog of residential and commercial analyses.

Residential 2018, 2015, 2012 IECC studies

- 2018 IECC
  - Determination Regarding Energy Efficiency Improvements
  - Energy Savings Analysis
  - Preliminary Cost Effectiveness
- 2015 IECC
  - Determination of Energy Savings
  - Energy Savings Analysis
  - Cost Effectiveness
- 2012 IECC
  - Final Determination
  - Energy Savings
  - Cost Effectiveness

Commercial 2018, 2015, 2012 IECC or Matching ASHRAE codes studies

- IECC Codes
  - 2015 IECC Commercial Cost Effectiveness
  - 2012 IECC Commercial Cost Savings
- ASHRAE 90.1 Standards
  - 2019 Determination
  - 2016 Determination
    - Technical Analysis
  - 2013 Determination
    - Qualitative Analysis
    - Quantitative Analysis

State-Specific Analyses:

- DOE Residential Energy and Economic Analyses
- DOE Commercial Energy and Economic Analyses

More on Benefits

Energy codes also lead to non-energy and non-cost benefits, such as health, life safety, and resilience. Below are some resources discussing these benefits and how you might communicate them to your stakeholders.

- Energy Codes are Life Safety Codes
- Energy Efficiency and Resiliency Webinar
- IMT: Non-Energy Benefits of Energy Codes

Code Comparisons

See how model codes compare to one another as they are updated.

NEEP
- 2021 IECC Information
  - 1 Pager
  - Overview
  - Residential
  - Commercial

DOE
- What's New in the Residential Provisions of the 2021 IECC
- What's New in the Commercial Provisions of the 2021 IECC

Other
- 2018 IECC summary of changes and efficiency gains
- 2018 IECC What's New? Presentation
- 2015 IECC summary of changes and efficiency gains

Case studies
- District of Columbia
  - USGBC: DC Green Code Case Study
  - D.C. Energy Omnibus
- Massachusetts
  - Stretch Code case study
  - MA Electric and Gas Program Administrators: Stretch Code Market Effects Study
- Rhode Island
  - RI IgCC vs LEED v4 Comparison Checklist
- Vermont
  - Blog: Vermont Stretches for Energy Efficiency

III. State Code Adoption

Amendments and State Energy Codes

States amend model energy codes to meet state and other priorities before adopting them. These amendments take many forms and can weaken or strengthen a code's efficiency or modify its administration or enforcement. Though amendments can make it easier for compliance, they also decrease its energy efficiency requirement, thereby lowering or eliminating other benefits like energy, cost saving, resilience, and health benefits. Codes are also designed to work as a system; sometimes, amendments to the energy code create conflicts with other model codes (IRC, IBC, mechanical), which can cause confusion over which code to follow. Check out NEEP's Energy Code Tracker for current state-specific energy codes.

Amendments: Examples

Weakening:

When **New Hampshire** updated their base energy code from the 2009 IECC to the 2015 IECC, they included values from the 2009 tables in their new code. This included 2009 values for wall insulation R value, duct leakage, and an increased air changes per hour allowance over the 2009 level of 5 to 7[6] ACH at 50 Pa, weakening the thermal envelope. These amendments lower energy efficiency, cost savings, and the resilience of these homes and buildings.

Strengthening:

In **Vermont's** most recent energy code, they adopted an amended 2018 IECC with additional, original compliance pathways that often included efficiency values that are more efficient than those in the model code. Depending on which compliance "package" you choose, this code includes lower U-factors for fenestration, ceilings, floors, basements, and slabs and offers much more flexibility and options for builders to comply with the code.

In **Massachusetts'** newest code update to the 2018 IECC, they added several new regulations, including mechanical verification by a HERS rater, a subsection to reserve electric vehicle charging spaces, alternative energy performance methods using ENERGY STAR Homes or Passive House Institute US software, lower overall ERI value for ERI-based compliance, and additional mandatory efficiency packages regarding HVAC performance, HRV systems, and water heating.

Aligning Buildings with State Climate Goals

Increasingly, states are adopting statewide climate goals regarding energy, carbon, and resilience to transition their energy portfolios to renewable and sustainable alternatives. As buildings continue to be one of the largest users of energy in the United States – accounting for approximately 41 percent of all energy consumption, 72 percent of electricity usage, and over 33 percent of greenhouse gas emissions – energy codes become a powerful tool for states to lower their energy use and carbon consumption. States with climate goals will not be able to attain them without addressing their building stock; building codes provide the best pathway to do this.

[6]The 2015 IECC model code sets ACH levels at 50 Pa at 3 ACH

Automatic Energy Code Updates

Leading states have legislation requiring the auto-adoption of an energy code as updates are published. This keeps them on the newest model code, helping them realize benefits such as energy savings and improved resilience.

In states with stretch codes, aligning base and stretch code adoptions and updates is critical to ensure that the stretch code continuously offers an option for those who want to achieve greater energy efficiency. You'll notice below that Massachusetts – which was the first state to adopt a stretch code – has auto-update language for its base code but not for its stretch code. Since its latest stretch code update set its efficiency levels to those of 2018 IECC, when Massachusetts adopted the 2018 IECC in 2020, its stretch code became moot. Now, communities do not have a state-promulgated above-code option to adopt.

Massachusetts IECC Auto-Adoption Legislation Language:

Section 55 (o): To adopt and fully integrate the latest International Energy Conservation Code as part of the state building code, together with any more stringent energy-efficiency provisions that the board, in consultation with the department of energy resources, concludes are warranted. The energy provisions of the state building code shall be updated within 1 year of any revision to the International Energy Conservation Code.

Maryland IECC Auto-Adoption Legislation Language:

(a) Adoption required. –
(1) The Department shall adopt by regulation, as the Maryland Building Performance Standards, the International Building Code, including the International Energy Conservation Code, with the modifications incorporated by the Department under subsection (b) of this section
(2) The Department shall adopt each subsequent version of the Standards within 18 months after it is issued.

Diversity, Equity, Inclusion, and Justice

When adopting policies that impact housing, equity must be incorporated into policies by design. Energy efficiency policies innately impact equity by lowering utility bills for home and building owners. But while lower utility bills benefit all households, they have a much greater impact on low-income households, which disproportionately include people of color and women given their higher rates of poverty compared to white males.[7] Energy burden – the percentage of income spent on home energy bills – can lead to energy insecurity in households when energy costs are so high people must pick between paying for energy or other essential costs. Energy insecurity impacts almost one-third of households – but for some populations (Native American, African-American) this rate jumps to 62 percent and 52 percent nation-wide, respectively.[8] Extreme energy insecurity restricts low-income households from supporting their health and well-being, often leading to costs elsewhere, such as healthcare, and limits their ability to participate in local economies. Nationaly, New England and the Mid-Atlantic have the highest rates of energy burden in the country, and these rates are 2-3 times higher among Black, Hispanic, Native American, and low-income households.[9]

When adopting building energy codes, it's important to remember the huge impacts they can have by lowering monthly utility bills. But building energy codes aren't enough – one must consider complementary policies, such as retrofit programs that prioritize low-income areas and offer on-bill financing with bill-neutrality, making energy efficiency retrofits more affordable.[10] Check out NEEP's Code Compliance Toolkit for more information.

High-Efficiency Codes, Programs, and Policies

Stretch Codes

Some states also adopt a "stretch" or "reach" code that requires higher energy efficiency levels. Stretch codes are usually optional, voluntary codes municipalities can adopt if they wish to achieve greater energy and cost savings in their building stock. While most are optional, some do require specific buildings, such as state-owned buildings, to comply. Check out NEEP's Energy Code Tracker for current state stretch codes.

In the NEEP region, Massachusetts, Vermont, New York, Washington D.C., Maryland, and Rhode Island currently have voluntary stretch codes that municipalities may adopt to achieve energy efficiency and savings beyond their state base energy code, while others are looking at adopting their first stretch codes. Some states and local municipalities require stretch codes for certain types of buildings or municipal financed projects, but most are voluntary and meant to encourage deeper energy savings. Some, like the stretch code in Massachusetts, are tied to incentives through state programs – see Massachusetts Green Communities Program. Check out NEEP's Code Tracker to learn more about state-specific stretch codes.

Sample Stretch Code Adoption: Model Language

States adopt stretch codes through legislation, often as an amendment to the base energy code that is optional for communities to adopt. Typically, stretch codes are 10-15 percent more energy efficient than base energy codes. Some states, like Washington D.C., adopt stretch codes that will be come the base energy code in one of the following update cycles, helping to prepare the industry for future code changes. Check out the language used for stretch code adoption by some states in the region:

- Rhode Island EO
- Vermont Bill H0520, 2013
- MA 2019 Zero Energy Legislation
- Maryland Bill HB972
- Maine LD1543 2019

[7]https://ips-dc.org/report-energy-efficiency-with-justice/
[8]See 6
[9]https://www.aceee.org/sites/default/files/pdfs/ACEEE-01%20Energy%20Burden%20-%20National.pdf
[10]https://www.ncsl.org/research/energy/on-bill-financing-cost-free-energy-efficiency-improvements.aspx

Zero Codes

Model building energy codes are rapidly approaching zero energy levels. The 2021 version of the IECC will include zero energy appendices for both residential and commercial homes and buildings and some states are developing their own zero energy codes to reduce energy use and carbon emissions.

Annual zero energy use is the future of building energy consumption and achievable today. Several model zero energy codes and programs exist that states and municipalities can adopt and states can even define their own zero energy provisions. Zero energy homes and buildings bring about massive energy savings, carbon emission reductions, and are a market driver towards a cleaner grid and grid-interactive efficient buildings.

Though there are different approaches to zero energy, the important thing to remember is this: zero energy codes must be low-load codes, meaning the demand from the home or building on the utilities must be as low as possible; the remainder of its energy consumption is then generated through renewables. Whether renewable energy is generated on or off-site, the general rule of thumb is that however much energy a building annually consumes from the grid, it must produce an equal amount of energy through renewables. Check out NEEP's Zero Energy Buildings Page for more information and resources.

Model High-Performance Guidelines

Adopting model high-performance codes or programs helps states or municipalities achieve even greater energy efficiency, energy and cost savings, and resilience. The organizations listed below have standards, specifications, rating programs, or guidance resources that assists states or municipalities looking to adopt high-performance codes or participate in high-performance building programs. These all have unique focuses and scopes – Passive House, for example, emphasizes the building envelope and is often used in colder climates for residential buildings, while the 189.1 standard emphasizes site regulation and waste management, so make sure you pick one that fits your needs.

Be sure to check out NEEP's code tracker to see how states amend these codes to fit their needs. NEEP also maintains our own model commercial and residential stretch codes – reach out if you're interested.

Model Programs and Codes

- Northeast Collaborative for High-Performance Schools Criteria (NE-CHPS)
- NEEP EZ Code
- CALGreen
- NY Act 97
- Passive House
- LEED Zero Energy/LEED Zero Carbon
- DC – Appendix Z Commercial Energy Efficiency
- DOE ZERH
- NBI Building Decarbonization Code
- NBI Zero Code (2021 appendix, Residential)
- AIA Zero Code (2021 appendix, Commercial)
- ZERO CODE

Strategic Electrification, Decarbonization, and Energy Codes

Decarbonization is a holistic approach to reducing reliance on carbon-based energies in the transportation, manufacturing, and building industries. Decarbonization can be achieved, in part, through strategic electrification – powering end uses (homes, buildings, and appliances) with electricity instead of fossil fuels in a way that increases energy efficiency, reduces pollution, and encourages distributed energy production.

As statewide climate goals are created and implemented, states must directly address strategic electrification and decarbonization in the building sector. Strategic electrification and building decarbonization can most effectively be achieved by implementing energy codes and stretch energy codes with provisions that electrify homes and buildings. Including electrification provisions as amendments to the energy code, such as solar-panel readiness, electric appliance-readiness, requiring electric vehicle parking infrastructure, and encouraging water heating efficiency, will improve energy efficiency, reduce reliance on carbon-based energies, and lower pollution. It also gives consumers the flexibility to choose the appliances and the vehicle(s) they own while avoiding federal preemption. As the grid starts to shift towards renewable energy sources, this will also save consumers' annual utility bills.

The 2021 IECC nearly included electrification provisions. Even though they were taken out of the final model version, they are still adoptable as amendments. If you're interested, be sure to reach out to NEEP and check out NEEP's Strategic Electrification and Codes Brief to learn more.

Synergistic Building Energy Policies

States can also pass legislation and ordinances that include language around home and building energy use. Whether it be emission reductions, benchmarking, or disclosure ordinances, several states have passed synergistic policies separate from code that address energy use and carbon in their home and building stock. These can also include or be related to larger programs, such as U.S. DOE's Better Buildings Challenge. And as always, be sure policies address equity directly and prioritize the needs of vulnerable, low-income communities. See NEEP's Code Compliance Toolkit to learn more about these types of programs.

Model Policies, Programs, and Related Resources

- DOE Better Buildings Challenge
- Living Building Challenge
- DC Energy Omnibus
- NY Local Law 97
- MD Clean Buildings Jobs Act 2020
- NEEP Public Policy Framework
- NEEP Green Zoning Report
- Boston Building Energy Reporting and Disclosure Ordinance (BERDO)
- Cambridge Building Energy Use Disclosure Ordinance (BEUDO)

Technical Assistance: please contact NEEP directly
Moses Riley: mriley@neep.org, 781-860-9177 x171