U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

# Saving Energy and Money with Building Energy Codes in the United States

## Overview

Building energy codes have a more than 20-year history in cost-effectively improving the energy efficiency of American homes and businesses, as well as providing significant energy, economic, and environmental benefits. Today's energy codes are providing 30% savings compared to those of less than a decade ago. Savings to consumers from building energy codes are estimated at about $5 billion annually (as of 2012), and total about 4 quads and over $44 billion since 1992.[1] Annual carbon savings reached 36 million tons in 2012, with an estimated 300 million tons cumulatively since 1992.

Building energy codes set minimum efficiency requirements for new construction and renovations, providing significant energy savings and emissions reductions over the life span of residential and commercial buildings. Building energy codes overcome many typical market barriers, leveling the playing field for energy efficiency, and ensuring cost-effective measures are included in the upfront design. Buildings built to code are also more resilient, comfortable and economical to operate.

The U.S. Department of Energy (DOE) participates in code development, adoption, and implementation processes; it contributes to new model energy codes through valuable research and by creating proposals for future model energy codes. DOE conducts technical analyses to assess energy and cost savings, and supports code adoption and implementation by providing technical assistance to states and localities. This includes the development and distribution of a variety of tools, materials, and other resources.[2]

Building energy codes are projected to save 46 quads cumulatively by 2040, more energy than the United States uses in an entire year. *Photo credit: iStock/7427853*

States and localities are ultimately responsible for energy code adoption and implementation. A total of 41 states have adopted the 2009 edition of the residential energy code, the International Energy Conservation Code (IECC), or better, while 43 states have adopted the 2007 edition of the commercial energy code, Standard 90.1, or better.

## The Next Building Energy Code Cycle

Additional cost savings and other benefits will be achieved through ongoing and future code cycles. Upon publication of a new edition of the IECC or 90.1, DOE is required to review the updated code, and issue a determination as to whether the updated edition will result in increased energy efficiency in residential and commercial buildings, respectively. Most recently, DOE has issued affirmative determinations for ASHRAE 90.1 2013—the current national model energy code for commercial buildings—which estimates savings of 8.5% greater than the prior version (Standard 90.1-2010), as well as for the 2015 IECC—the current national model energy code for residential buildings—which estimates savings of 1% greater than the prior version (2009 IECC). In addition, DOE has review both current model codes, and found them to be cost effective across all U.S. states and climates.

Whenever a new edition of the model codes is published, and DOE issues an affirmative determination, states are required to review and/or update their energy codes (based on the updated model codes), and to certify to DOE that they have adopted the most up-to-date building energy codes.[3]

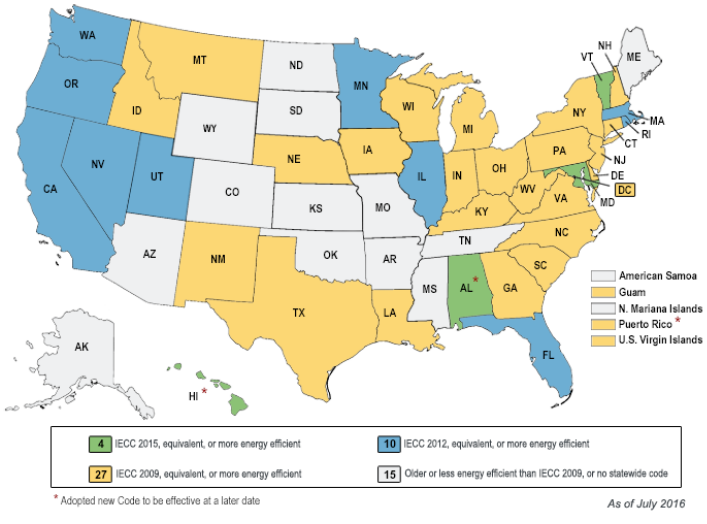
## Long-term Energy, Cost, and Carbon Savings

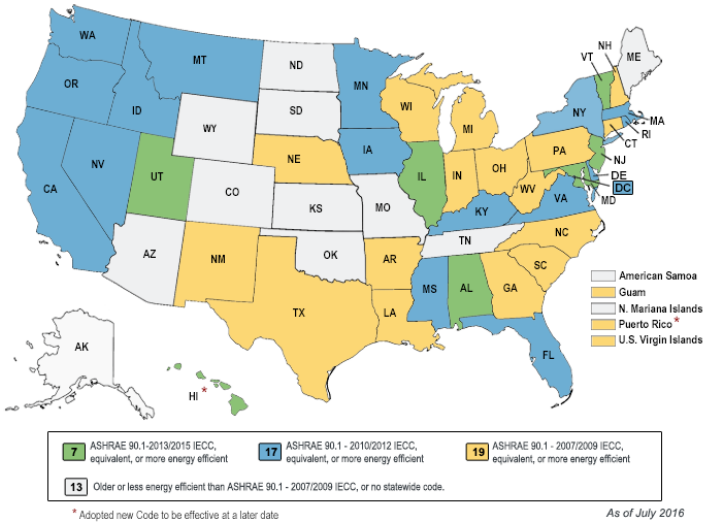
The benefits resulting from building energy codes are expected to grow substantially in the coming years Projected energy savings attributed to building energy codes total nearly 46 quads of full-fuel-cycle energy cumulatively by 2040, which is equivalent to more than an entire year's worth of primary energy consumption from the U.S. residential and commercial

1 Building Energy Codes Program: National Benefits Assessment, 1992–2040. Pacific Northwest National Laboratory, prepared for the U.S. Department of Energy. March 2014. http://www. energycodes.gov/sites/default/files/documents/BenefitsReport_Final_March20142.pdf. These savings are additive to energy savings estimated from DOE's appliance standards program.

2 DOE provides technical assistance as outlined in the statute.

3 States must also certify to DOE that they have reviewed and updated their building energy codes, as appropriate, once the Department has determined that an updated model building energy codesaves energy relative to the prior code.




sectors at current consumption rates Consumer savings on utility bills total up to $230 billion cumulatively by 2040.[4] In addition, substantial environmental benefits are expected to be achieved, with cumulative $CO_2$ reduction of 4 billion tons by 2040.[5] Approximately 60% of these benefits are expected to result from commercial codes and about 40% from residential codes.

Recent updates to the commercial and residential building codes have added significantly to these savings totals. DOE estimates that the 2015 IECC yields 32% energy savings in residential buildings (relative to the 2006 IECC), which equates to $500 in average annual homeowner utility cost savings.[6] In commercial buildings, Standard 90.1-2013 yields 29% energy savings relative to the 2004 edition, with average cost savings of $0.54 per square foot across prominent commercial building types.[7] Future code cycles will add additional savings.

## The Role of Federal Government

DOE's Building Energy Codes Program supports the development, adoption, and implementation of market-based model energy codes[8] with the goals of improving the model codes themselves, encouraging states to update their energy codes, and increasing compliance with codes to ensure that the intended benefits are realized. In addition, the federal government references the most recent model energy codes in establishing requirements for federally owned buildings, ensuring that these facilities lead by example.[9] DOE catalyzes larger changes in the market through four categories of activities:

- Empowering those who seek to improve energy codes by providing research, analysis, tools, and other materials
- Establishing a leadership position and encouraging sharing of information amongst stakeholders by convening public forums
- Participating in public processes through which codes are developed, and submitting technically-based and cost effective code change proposals
- Helping to achieve intended energy savings by providing technical assistance to states and localities, as well as by creating and implementing methodologies to measure compliance and associated energy, cost, and carbon savings

## Status of State Code Adoptions

To date, 44 U.S. states and territories have adopted energy codes as a means of ensuring energy efficiency in both residential and commercial buildings.[10] The two maps above show the status of state adoption across the United States. Some states are "home rule," meaning that local municipalities are responsible for code adoption as opposed to the adoption of a single statewide code.[11] ■

4 Building Energy Codes Program: National Benefits Assessment, 1992–2040

5 Ibid.

6 Residential Cost Analysis TSD (national weighted average compared to the 2006 IECC): http://www.energycodes.gov/development/residential.

7 Energy Savings Analysis of Standard 90.1-2010 (national weighted average compared to Standard 90.1-2004): http://www.energycodes.gov/development/commercial.

8 As administered by the International Code Council and American Society of Heating, Refrigerating and Air-Conditioning Engineers [42 USC 6833].

9 Federal energy efficiency standards: http://www.energycodes.gov/regulations.

10 Status of State Energy Code Adoption: http://www.energycodes.gov/adoption.

11 Home-rule states may have certified based on number of municipalities having adopted the code or the percentage of statewide construction covered under local adoptions. DOE will be developing a formal policy to cover these situations.