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 regional and national energy, economic, and environmental benefits. Today's energy codes are providing savings of more than 30% compared to codes of less than one decade ago. Energy cost savings to consumers from building energy codes are estimated at about \$5 billion annually as of 2012, and total about 4 guads cumulatively, with more than \$44 billion dollars in cost savings since 1992.1 Annual carbon savings reached 36 million tons in 2012 with about 300 million tons cumulatively since 1992.

Building energy codes set minimum efficiency requirements for newly constructed and renovated buildings. providing energy savings and emissions reductions over the lengthy life spans of buildings. Building energy codes overcome market barriers, such as the builder typically not paying the energy bill for the building or not having an incentive to include cost-effective measures that have a higher upfront cost. Buildings built to code are more comfortable and cost effective to operate. The U.S. Department of Energy (DOE) participates in code development. adoption, and implementation processes; it contributes to new model energy codes by creating proposals based on publicly



Building energy codes are projected to save 46 quads cumulatively by 2040, more energy than the U.S. buildings use in an entire year. Photo credit: iStock/7427853

reviewed cost and technical analyses and then contributes to code adoption and implementation by providing technical assistance to states and localities, which includes the development and distribution of tools, materials, and analyses.²

States and localities are responsible for building energy code adoption and implementation. A total of 27 states have adopted the 2009 version of the residential building energy code or better, while 22 states have adopted the 2007 version of the commercial building energy code or better. As of March 2015, 21 states have certified to DOE that they have adopted the most up-to-date commercial building energy code— ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) 90.1 2010—as required by law, and 13 states have certified that they have met their obligations for the most recent residential building energy code—2012 International Energy Conservation Code (IECC).3

The Next Building Energy Code Cycle

Additional cost savings and other benefits will be achieved with ongoing and future code cycles. DOE has released a

final determination for ASHRAE 90.1 2013—the commercial national model energy code—which estimates savings of 8.5% greater than the prior version. DOE has also released a draft determination for the 2015 IECC—the residential national model energy code—which estimates savings of 1% greater than the prior version. With these determinations, states will begin another cycle of code review and adoption. DOE plans to provide detailed analysis of the costs and benefits of these model codes at the state level in 2015.

Long-term Energy, Cost, and Carbon Savings

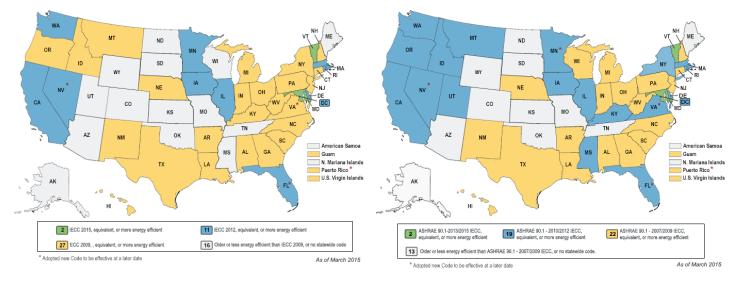
The benefits resulting from building energy codes are expected to grow substantially in the coming years. Projected energy savings attributed to building energy codes total nearly 46 quads of full-fuel-cycle energy cumulatively by 2040, which is equivalent to more than an entire year's worth of primary energy consumption from the U.S. residential and commercial sectors at current consumption rates. Consumer savings on utility bills total up to \$230 billion cumulatively by 2040.⁴ In addition, substantial environmental

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.

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



benefits are expected to be achieved with cumulative CO₂ reduction of 4 billion tons by 2040.⁵ Approximately 60% of these benefits are expected to result from the commercial codes and about 40% from the residential codes.

Recent updates to the commercial and residential building codes have added significantly to these savings totals. DOE estimates that the 2012 IECC yielded 32% energy savings in residential buildings relative to the 2006 IECC, which equates to \$500 in annual homeowner utility cost savings on average.6 In commercial buildings, Standard 90.1-2010 yields 23% energy savings relative to the 2004 edition, with average cost savings of \$0.40 per square foot across prominent commercial building types.⁷ These two updates alone represent about 14% of the benefits expected by 2040. 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 codes⁸ with the twin goals of increasing cost-effective minimum requirements in the codes themselves and increasing compliance rates after codes are adopted. 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 materials, as well as by developing cost-effective, technically evaluated code change proposals
- Establishing a leadership position and encouraging sharing of information by convening public forums

- Participating in processes and forums in which energy codes are developed, discussed, or approved
- 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 the 2006 versions or better of the 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 The home-rule states are Arizona, Colorado, Kansas, Missouri, South Dakota, and Wyoming.

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.



For more information, visit: buildings.energy.gov

⁵ Ibid.

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

Fig. 2. 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.