How Building Energy Codes Can Support State Climate and Energy Planning

energy.gov/eere/slsc/EEopportunities

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This short presentation is intended give states and their stakeholders a vision for what it would look like to include building energy codes in their climate and energy plans.

Building Energy Codes as an Emission Reduction Approach

Possible Leads
- State code administrator
- State energy office
- Utility
- NGO

E-Savings
- # new code or beyond code built bldgs. X reduction in kWh per bldg. from code in 2012

Potential Program Components
- Stretch Code Programs
- ENERGY STAR New Homes
- Zero Energy Ready Homes

Potential Savings in 2030
140-170 million MWh
80-97 million short tons CO2

Activities	EM&V
Energy Savings Approaches	
• State energy office, utility, or NGO generate energy savings from: - Education - Training - Enforcement	Recent resources provide guidance, including: - DOE Building Energy Codes Program (BECP) - *Achieving Energy Savings and Emission Reductions from Building Energy Codes: A Primer for State Planning* - *BECP multi-state residential energy code field study*
State Policy Options	
• Could include: - Legislation to require adoption of latest national model energy code upon update - Legislation to require reduction in building energy use by date (e.g., 70% by 2030)	
Low Income Opportunities	
• Building code adoption and compliance in low income neighborhoods	

Why Building Energy Codes?

How Building Energy Codes Work

- Energy codes set minimum efficiency requirements for new and renovated buildings to achieve reductions in energy use and emissions over the life of the building.
- Energy codes are a subset of building codes, which establish baseline requirements and govern building construction.
- Code-built buildings are more comfortable and cost-effective to operate, in addition to generating energy, economic, and environmental benefits.

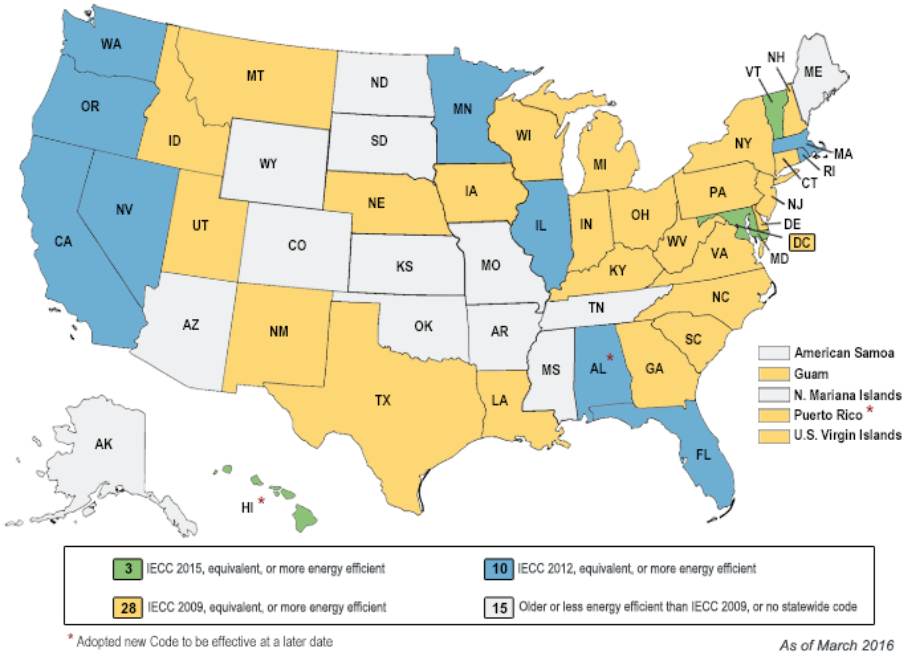
Benefits of Building Energy Codes

- Building energy codes save U.S. building owners about $5 billion annually in energy costs, and many times that amount over the lifetime of the buildings.
- It is much less expensive to incorporate energy efficiency features into a building while it is being constructed—energy codes present a unique opportunity through efficient building design, technology, and construction.
- Making investments in energy efficiency at construction will pay dividends to owners and occupants for years into the future.

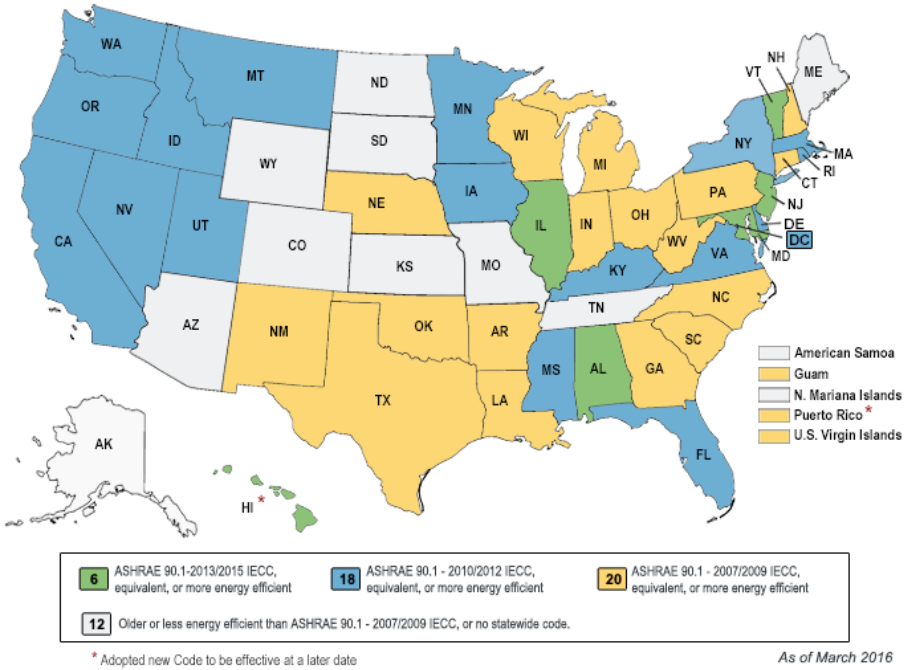
More information on building energy codes is available at http://www.energycodes.gov/.

Current Status of Building Energy Codes

The vast majority of states have adopted an energy code. The most recent editions of the IECC and Standard 90.1 provide in excess of 30% energy savings.



Residential Code Adoption Status



Commercial Code Adoption Status

Current adoption status is available on https://www.energycodes.gov/.

Some states are “home rule,” meaning that local municipalities are responsible for code adoption as opposed to the adoption of a single statewide code. The home-rule states are Arizona, Colorado, Kansas, Missouri, South Dakota, and Wyoming.

State and Local Role in Building Energy Codes

Building energy codes require state and local action:

- Model energy codes, such as the IECC and Standard 90.1, are developed at the national level, and then adopted and implemented at the state and local levels.
- A designated state agency (e.g., energy office), local government agency (local building departments), or both are responsible for code development, adoption, and enforcement.

Policy Actions:

- Adoption of new building energy codes can occur directly by legislative action or through authorized regulatory agencies.
- The most effective state adoption processes include legislation triggering an automatic review and update process when new codes are available.

Implementation Actions:

- Actual energy savings are only assured through code compliance, not solely code development or adoption.
- States & localities must educate, train and support local stakeholders complying with code (e.g., designers, builders and code officials).
- State & local building officials enforce the code by verifying that what is built actually complies with the energy code.

More information on energy code implementation is available at www.energycodes.gov.

Best Practices in Code Implementation

- Compliance/enforcement is the critical element that leads to realizing actual energy savings. Codes can be developed and adopted but if they are not complied with, the energy savings do not materialize.
- Training and technical assistance on compliance and enforcement for builders, contractors, and local code officials is necessary to achieve savings.
- Compliance is the responsibility of builders and contractors. Best practices include:
  - Understanding the requirements of the energy code
  - Meeting the established building energy requirements
  - Demonstrating that these requirements have been satisfied
- Enforcement is the responsibility of local code officials. Best practices include:
  - Knowing the requirements of the energy code
  - Identifying the code compliance paths used for the building
  - Reviewing the design and inspecting the building during and after construction
  - Observing, reviewing, and ensuring testing, commissioning, and documentation
  - Getting help when needed

Complementary / Related Programs

Several options exist for going *above* code:

- Many states & localities implement programs that successfully reach beyond minimum energy-efficiency requirements:
  - Stretch code programs
  - ENERGY STAR for Homes
  - Zero Energy Ready Homes
- When implementing codes, consider these additional programs to encourage greater energy savings and sustainability.
- These programs can also help better link minimum codes to broader or more advanced energy conservation policies.

National Savings Estimates

Current: In 2014 alone, building energy codes produced approximately 47 million MWh of savings from:

- 1.046 million new or renovated residential housing units meeting energy codes
- 1.307 million ft^2 of new or renovated commercial building floor space meeting energy codes

Future: In 2030, building energy codes could produce 140-170 million MWh and 80-97 million short tons CO_2 of savings if:

- Future editions of the residential IECC and commercial standard 90.1 continue to see similar improvements in energy consumption as past editions
- States continue to update their codes based on historic trends
- States achieve an compliance rates of 70-90%

Sources: DOE determinations and supporting analysis; PNNL Codes Impact Analysis; EPA eGRID 2012

Savings Examples from Select States

Following are rough estimates of projected annual energy savings in million MWh and trillion BTUs in 2030 for several high-potential states if they adopt the latest national model codes (2015 IECC and ASHRAE 90.1- 2013) in 2017.

State	Annual Electricity Savings in 2030 (million MWh)	Annual Total Energy Savings in 2030 (Trillion BTUs)
Texas	5.82	25.9
Florida	4.99	20.1
Massachusetts	2.24	13.5
North Carolina	2.40	12.3
New York	2.05	11.0
Georgia	2.54	10.7
Pennsylvania	1.97	10.2
Virginia	1.92	9.6
Arizona	1.72	7.3
Illinois	1.42	7.2

Source: DOE, 2015, Achieving Energy Savings an Emission Reductions from Building Energy Codes: A Primer for State Planning

Building Energy Codes Are Cost-Effective

- Codes are one of the most cost-effective EE investments:
  - Adoption costs are primarily salaried employees managing code adoption process
  - Compliance costs are borne by local government and supported by permit fees

- DOE provides each state an estimate of expected cost savings resulting from the adoption of each new published model code (assumes 100% compliance with both the old and the new code)
  - Example: *Energy cost savings from adopting the 2015 code for Indiana are estimated to be on the order of nearly $240 million annually by 2030.*

- Incremental construction costs to implement recent building energy codes are cost effective:
  - Residential buildings: Life-cycle cost savings range from $4,418 to $24,003 per house based on climate zone (2015 vs. 2009 IECC)
  - Commercial buildings: Life-cycle cost savings range from $0.53/ft² to $5.38/ft² based on climate zone and building type (90.1-2013 vs. 2010)

EM&V Methods for Building Energy Codes

Compliance with building energy codes has been evaluated through a number of approaches in past studies. The results have been inconsistent, and not easily equated to energy use or the potential for increased savings.

In 2014, DOE began working to establish projected savings through field-based research on a statistically valid sample of residential and commercial buildings in multiple states. The resulting new approaches and more reliable methods for determining energy savings from building codes will be available in 2017.

Residential: Piloting a new research protocol to investigate potential energy savings in newly constructed homes:

- Designed for states & utilities to adopt and adapt
- Focus on individual code requirements within new single-family homes
- Based on current state energy codes
- Designed with statistically significant results in mind
- Results to be based on an energy metric and reported at the state-level

Commercial: Development of a comprehensive strategy to inform future compliance initiatives:

- Currently testing a protocol and gathering data through an initial pilot study in limited regions
- Initial data and feedback will assist in the development of a formal research methodology
- A broader program scheduled for 2016 to deploy the new approach

DOE Support for Building Energy Codes

DOE's Building Energy Codes Program (BECP) supports the development, adoption and implementation of market-based energy codes with the goals of:

- increasing cost-effective minimum requirements in the model codes
- encouraging state and local adoption of model energy codes
- helping to ensure compliance and successful implementation

BECP fills these roles by working closely with energy efficiency organizations, code development bodies, building design and construction representatives, the code enforcement community, product manufacturers, and the general public.

BECP empowers 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.

Resources for States

BECP provides a full suite of resources:

- **Compliance software** and **tools**
- Various forms of **technical assistance**, such as:
    - Comparative analysis of future code options
    - Status of state energy code adoption
    - A collection of educational & training materials
    - *Pro Desk* to assist individuals with questions
- **Resource Center** featuring guides and other publications

Featured Publication:

Achieving Energy Savings And Emission Reductions From Building Energy Codes: A Primer For State Planning

Provides a basic methodology for calculating savings and highlights effective state/local approaches to codes

Get More Information on This Pathway and Others

Visit: energy.gov/eere/slsc/EEopportunities

How Energy Efficiency Programs Can Support State Climate and Energy Planning

Overview and individual presentations on features and benefits associated with including energy efficiency in climate and energy plans, covering:

- National electricity savings potential estimates for 2030
- Current activity at the national and state levels, best practices, energy savings examples, cost-effectiveness, measurement approaches, and DOE support for:
  - Building energy codes
  - City-led efficiency efforts
  - Combined heat and power
  - Energy savings performance contracting
  - Industrial efficiency, including superior energy performance
  - Low income energy efficiency
  - Ratepayer-funded programs
- Technical assistance available

Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution, and Meet Energy Needs in the Power Sector

State and Local Energy Efficiency Action Network (SEE Action) resource presents pathways thru:

- Case studies of successful regional, state, and local approaches
- Resources to understand the range of expected savings from energy efficiency
- Common protocols for documenting savings
- Sources for more information