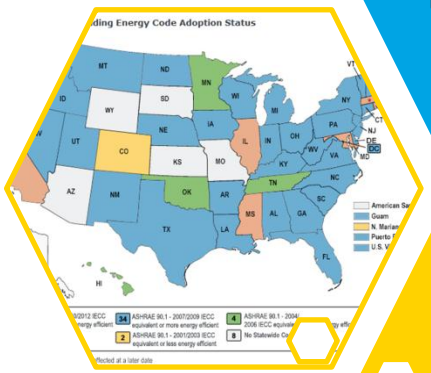
Building Energy Codes Program Overview

2014 Building Technologies Office Peer Review

DEVELOP



COMPLY

ADOPT

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

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Pacific Northwest National Laboratory

Program Summary

Timeline:

Multi-year program in support of DOE statutory requirements

Key Milestones:

1. Update Building Energy Codes Cost-Effectiveness Methodology (Aug 2014)
2. Revised Compliance Methodology (Sept 2014)
3. 90.1-2013 Cost Analysis (Oct 2014)
4. RES*check* Update Including Enhancements (Aug 2014)
5. COM*check* Update Including Support for Standard 90.1-2013 (Jan 2015)

Budget:

Recent DOE programmatic funding:

FY12	FY13	FY14
$6.8M	$4.8M	$4.0M

Expected future funding: TBD

Target Market/Audience:

Policymakers, code officials, designers, engineers, industry, builders, home and building owners

Key Partners:

Codes and standards development (e.g., ANSI/ASHRAE/IES, and ICC)
Code implementation stakeholders (e.g., states, national/regional organizations)

Program Goal:

Near-term goal is to assist states and localities in adopting, complying with, and enforcing the model energy codes resulting in higher-performing buildings that maximize cost-effective energy savings.

Mid-term goal is to achieve primary energy savings of 1.1 quads annually by the year 2020, representing a cumulative savings of 10.2 quads.

PNNL's Technical Support

Development

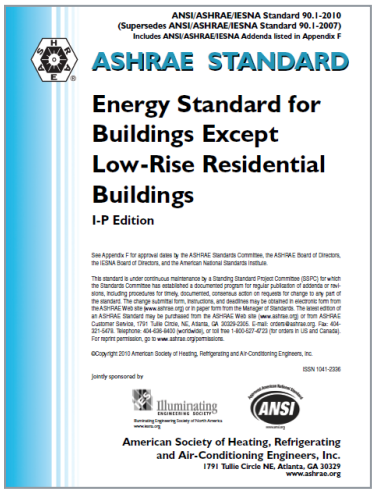
- Standard 90.1
- International Energy Conservation Code (IECC)
- Analysis supporting DOE code proposals and Determinations

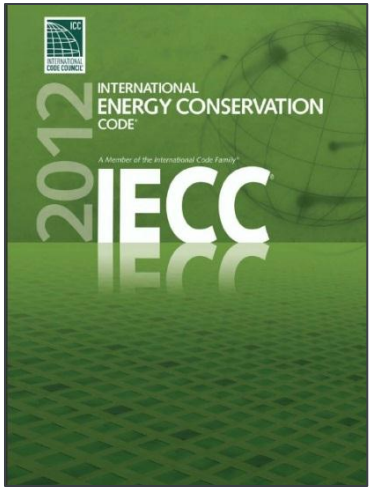
Adoption

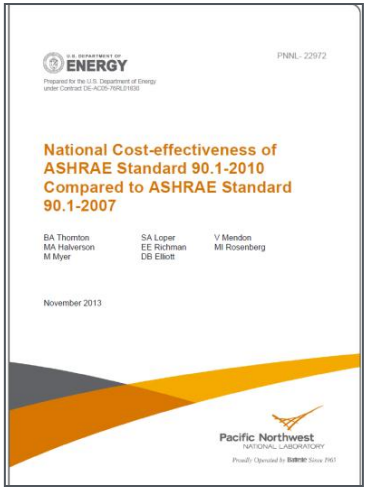
- Collaboration with stakeholders
- State technical assistance
- State-level energy & cost analysis
- Code impacts analysis

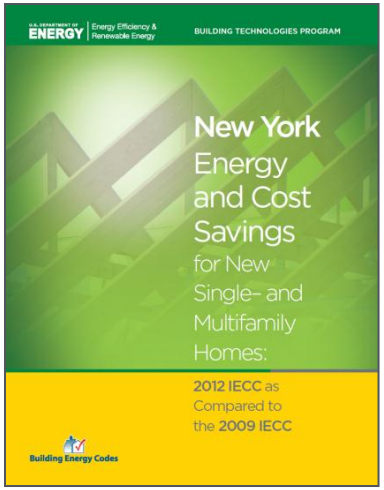
Compliance

- Guidance to states
- Compliance software tools & resources
- Help Desk
- Online and in-person trainings









PNNL's Approach

Deliver Impact

- Developing tasks to directly support DOE's codes program mission
- Delivering impact for DOE and the country

Demonstrate Technical Leadership

- Looking at challenges that go beyond the current scope of work in order to break down barriers to further success for DOE
- Understanding the challenges, analyzing various facets, and providing meaningful and relevant solutions
- Maintaining necessary personnel and expertise to support DOE's needs

Disciplined Product Delivery

- Planning staff and resources at a detailed level
- Developing Product Delivery Plans for each deliverable to align with expectations
- Ensuring that the products have high technical quality

Key Issues Currently Being Addressed

Development:

- Exploring the performance-based metrics to unlock the additional energy savings beyond current and traditional approaches.
- Determining energy savings impact of the latest model codes in a timely fashion and understanding further potential savings.

Adoption:

- Completed a comprehensive and first-of-its-kind cost-effectiveness analysis of ASHRAE Standard 90.1-2010 to bolster and accelerate commercial energy code adoption.
- Demonstrating to states and local jurisdictions the benefits of adopting the latest model codes.

Compliance:

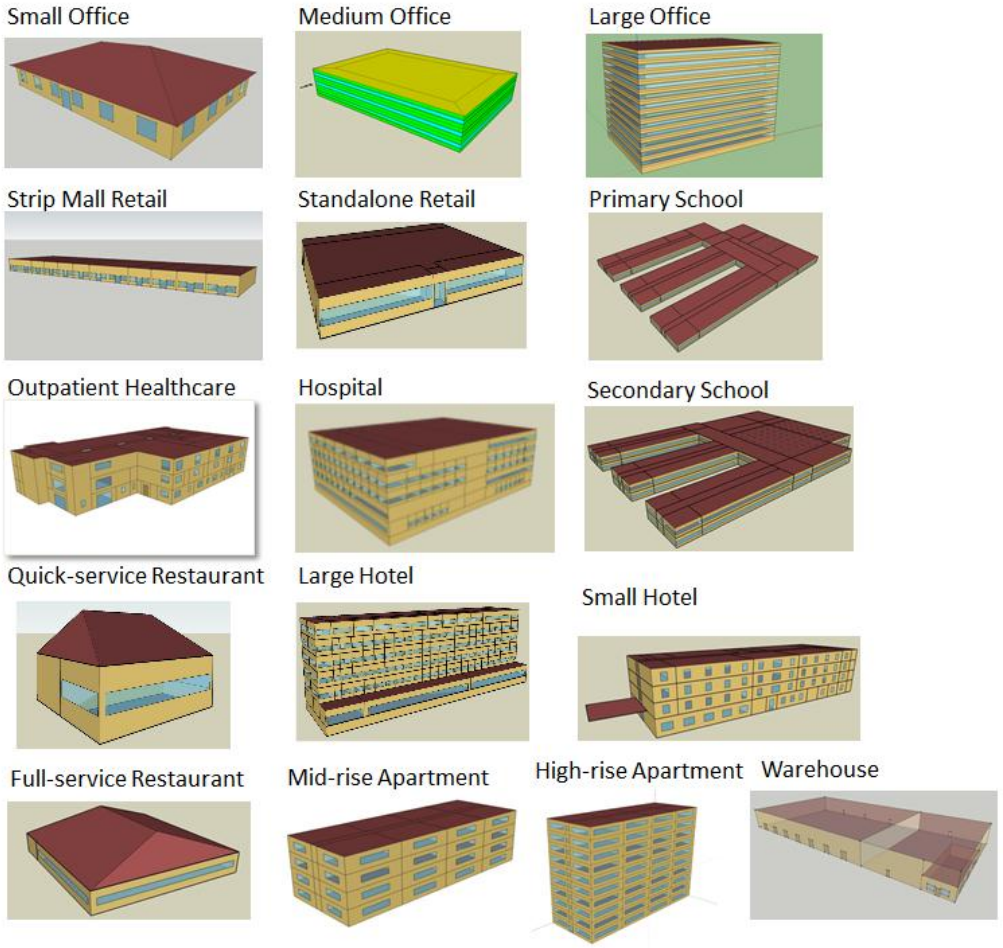
- Developing a tool to assist utilities in quantifying potential energy savings through code compliance.
- Publishing guidance, tools, and resources and providing ongoing technical assistance to states.

Distinctive Characteristics

Robust and Transparent Analyses:

PNNL developed an innovative building energy simulation platform called the ***Progress Indicator***:

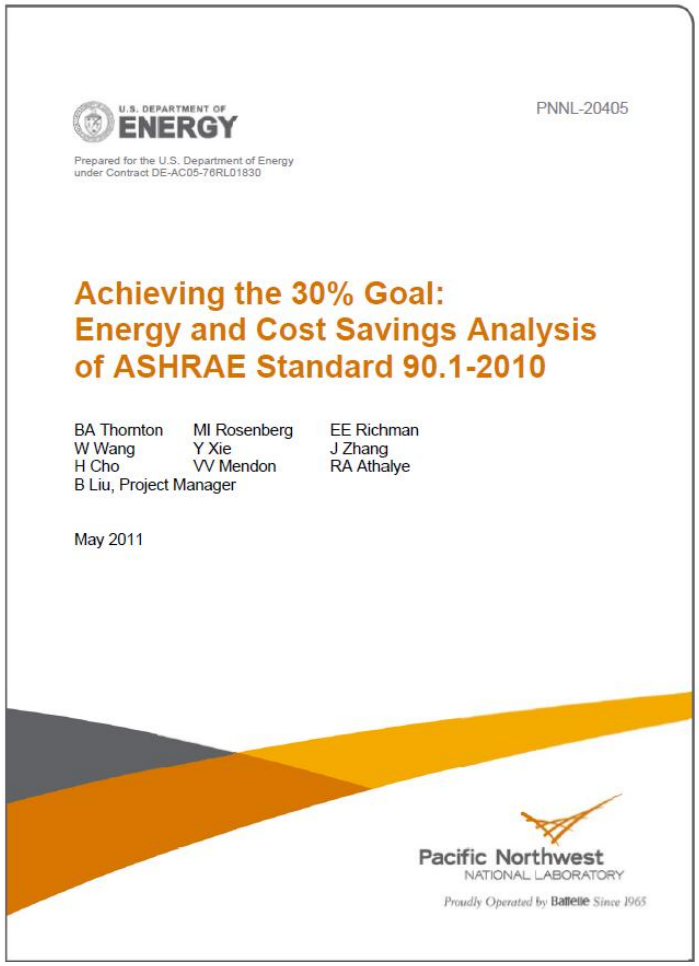
- To quantitatively measure progress in Standard 90.1 during the 3-year code development cycle
- To conduct energy analysis for substantive code change proposals supported by DOE and 90.1 committee members
- To conduct analysis that supports DOE's Determination



Distinctive Characteristics – Progress Indicator

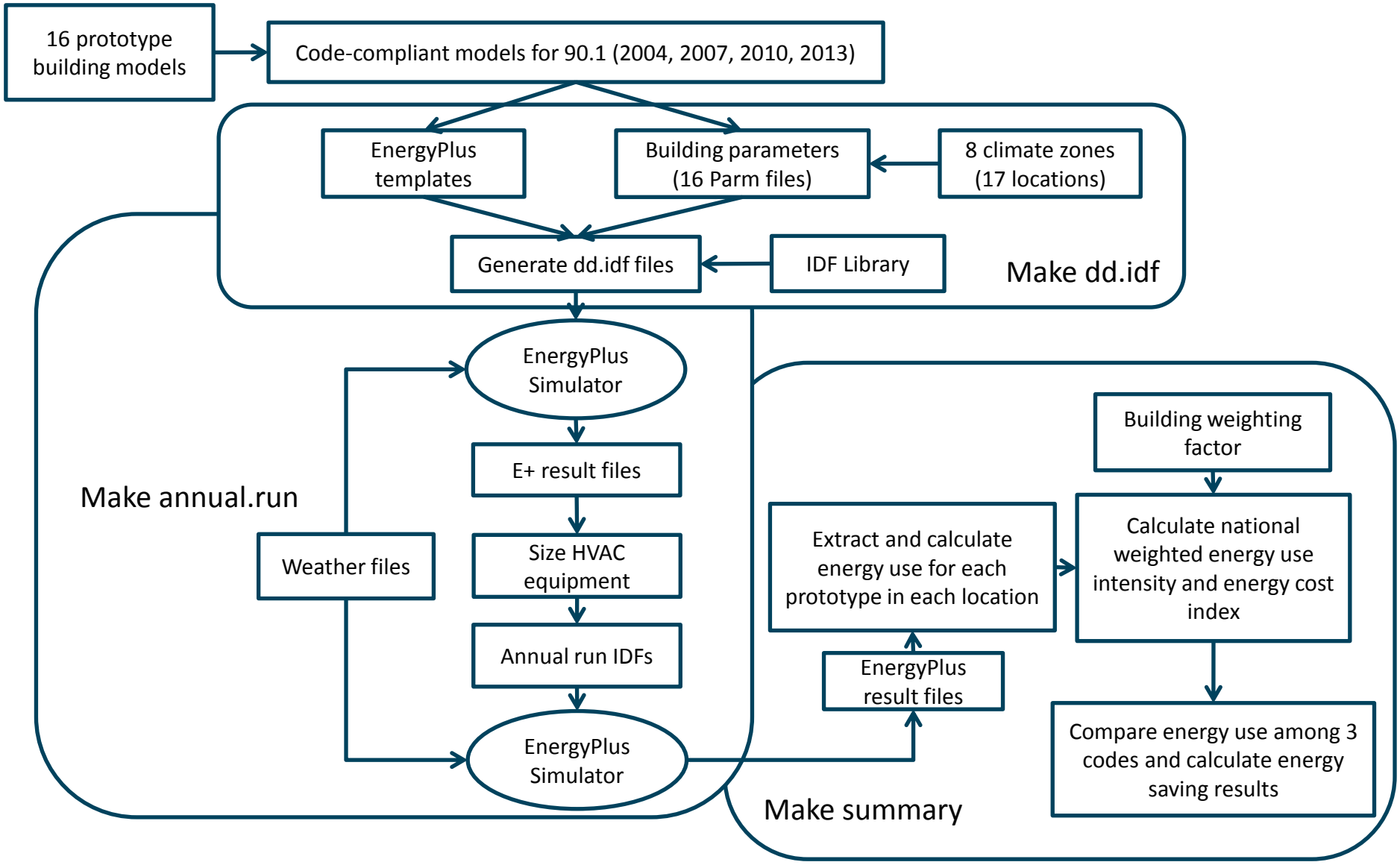
Robust and Transparent Analyses:

- Consists of a suite of over 1,000 building models based on 16 prototype commercial buildings in all US climate zones, representing 80% of the U.S. commercial building stock.
- Models were peer reviewed by industry, documented in a technical report, and published online for easy public access, demonstrating analysis that is robust, transparent, and reproducible.
- Approach has been adopted by other researchers to evaluate the energy savings potential of emerging technologies and to develop code proposals at the state or local level.

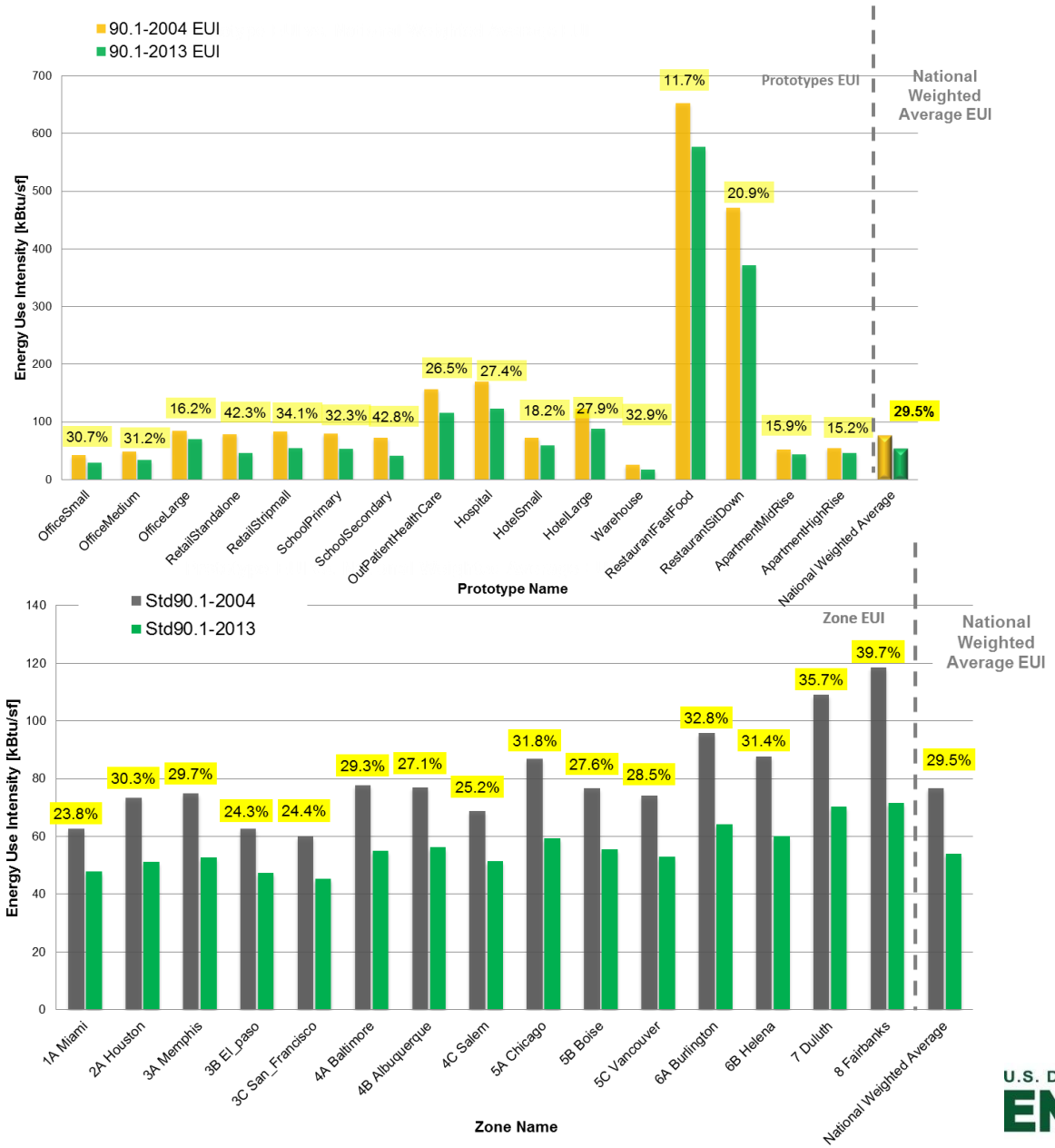


http://www.energycodes.gov/development/commercial/90.1_models

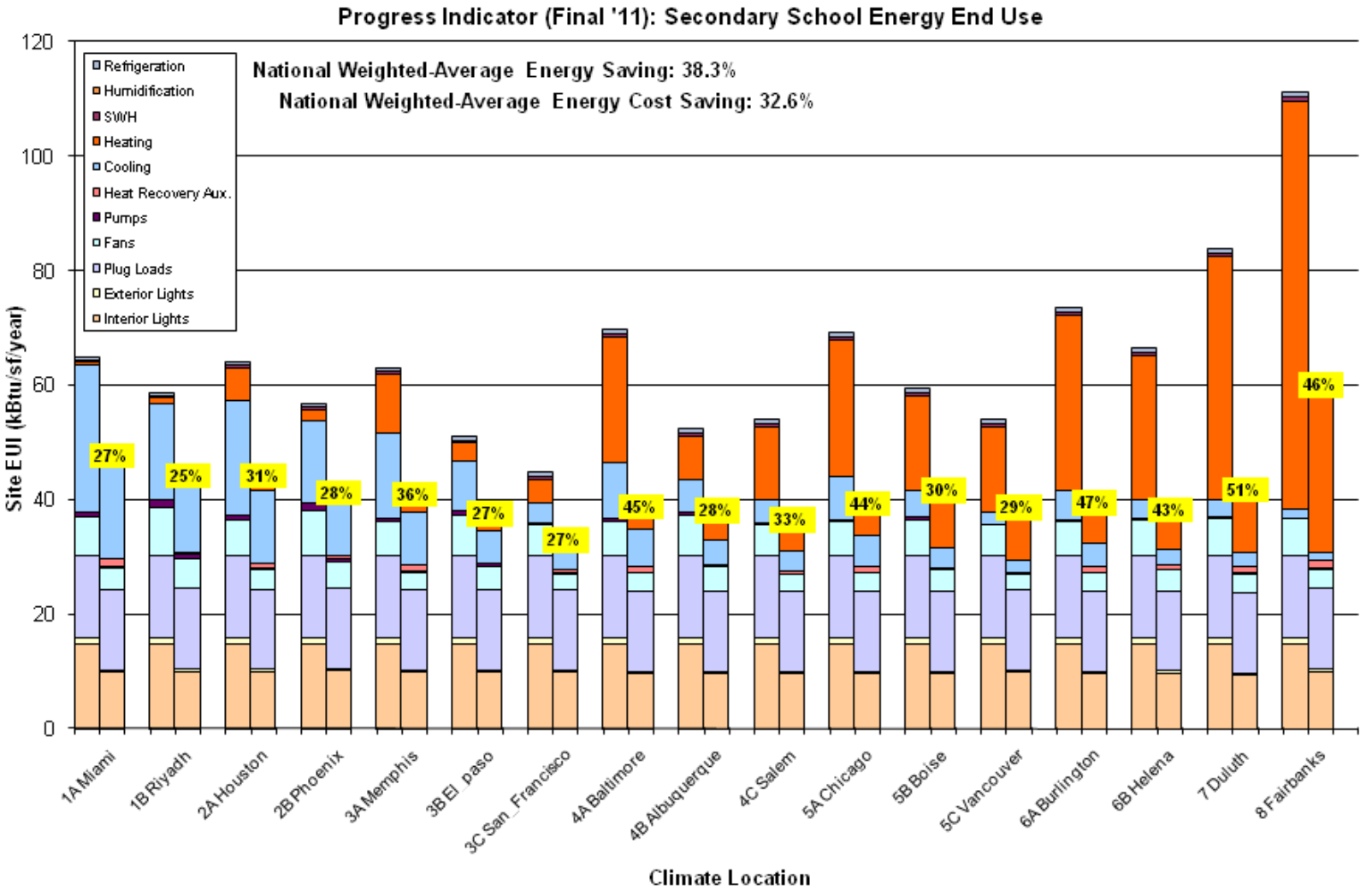
Distinctive Characteristics – Progress Indicator



Distinctive Characteristics – Progress Indicator



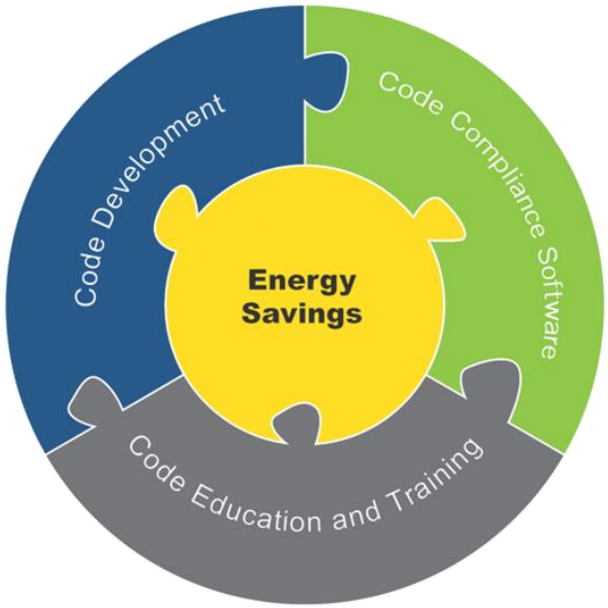
Distinctive Characteristics – Progress Indicator



Distinctive Characteristics (continued)

PNNL Codes Ecosystem:

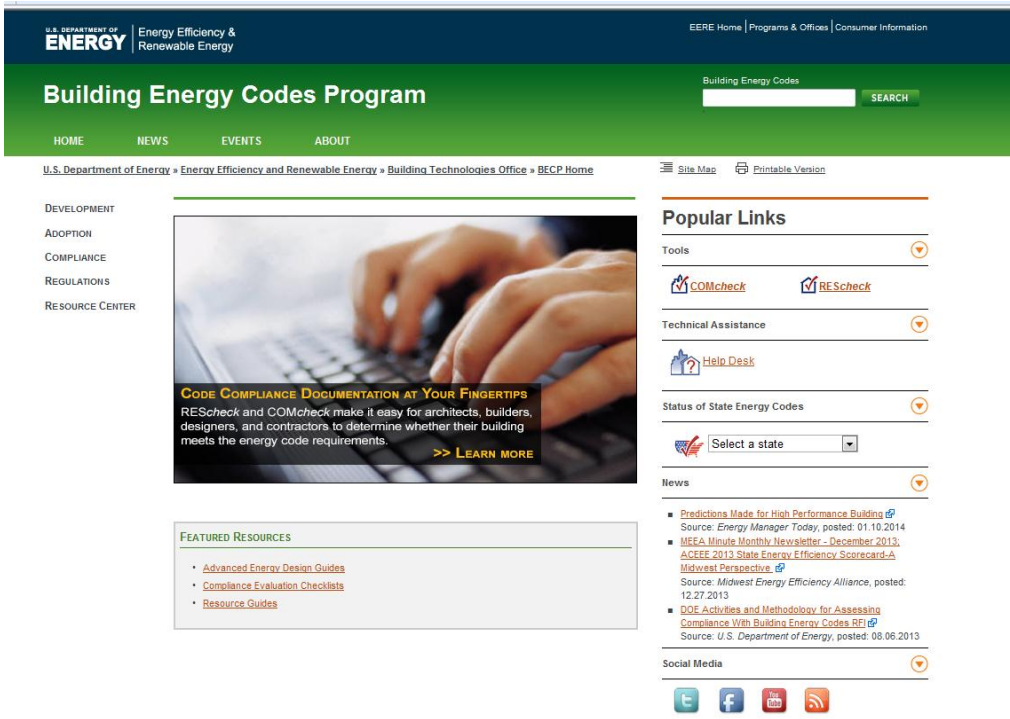
- Domain knowledge in codes carries to compliance software development, resulting in more efficient software implementation.
  - Code knowledge assisted implementation of difficult code requirement, including intent of requirement
  - Makes requirement more understandable for designers and more enforceable for code officials
- User feedback through technical support on the tools and trainings also loops back to the codes development team.



Distinctive Characteristics (continued)

Supporting Trusted DOE Brands:

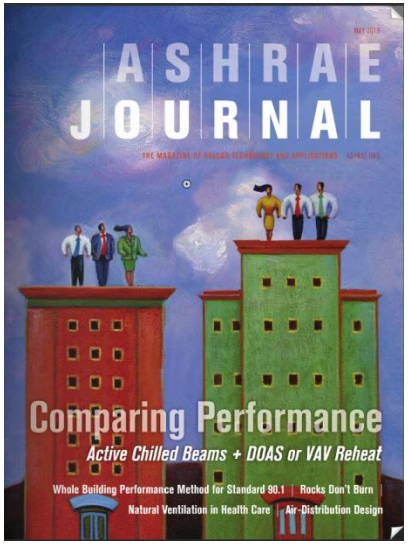
- Availability of free software is a key adoption and compliance driver.
- Several states have accelerated code adoption because of state-customized versions of COM*check* and RES*check*.
- Compliance is a legal process that requires assurance of consistency/quality.
- Software used as ‘de facto’ code in many jurisdictions.

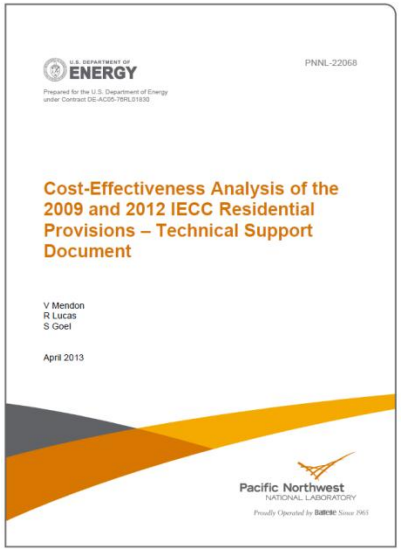


Recent Accomplishments

Strong Record of PNNL's Technical Leadership:

- In-depth knowledge in buildings and code development process that leads to the success in advancing the code development
  - Led and supported 35 of 110 addenda to Standard 90.1-2013
  - Developed language and supporting analysis for 60 proposals to the 2015 IECC with over 85% approval rate
- Published 4 journal articles and 5 technical reports
- 4 conference papers to be published at the ACEEE Summer Study and ASHRAE/IBPSA Energy Modeling Conference





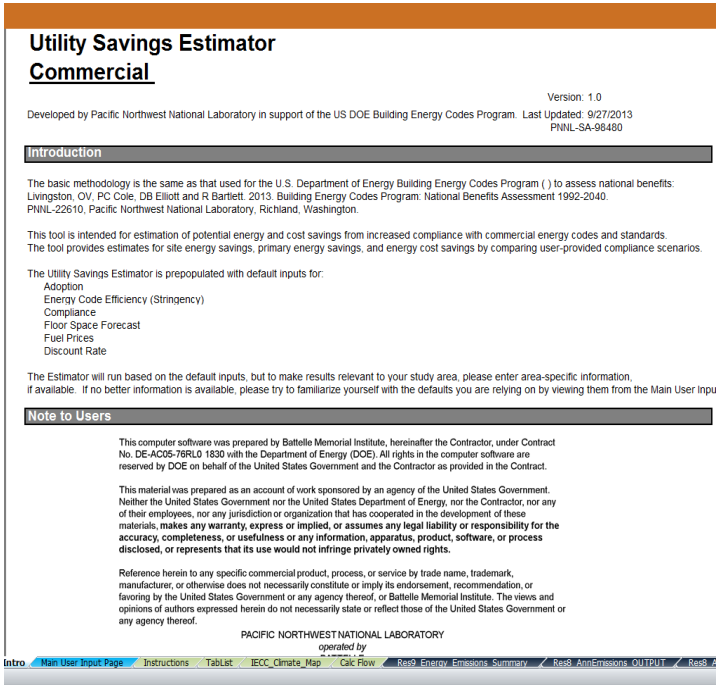
Deliver High Quality and Impactful Products:

- Completed 49 deliverables since FY13
- All deliverables completed on time, within budget

Recent Accomplishments (continued)

Provide resources, tools, and methodology to unlock savings from code compliance:

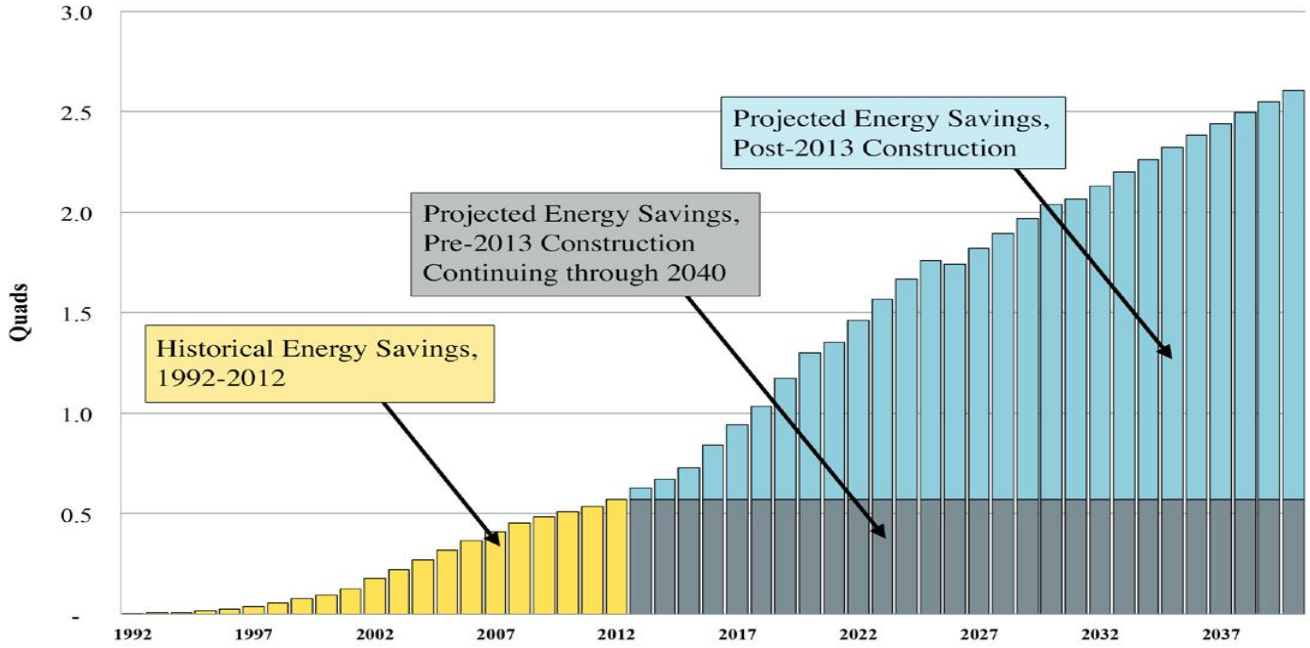
- Developed a model to quantify DOE Codes Program impact and published code benefit assessment report (http://tinyurl.com/m5uqddf)
- Developed compliance methodology and assisted DOE in issuing the Request for Information in the *Federal Register*
- Developed and released a new Utility Savings Calculator Tool that quantifies savings from improved code compliance for use by utility programs



https://www.energycodes.gov/resource-center/utility-savings-estimators

Market Impact

- Frequent reference to and use of PNNL's commercial prototype building models in the energy efficiency community
- Over 300,000 project uploads per year that use COM*check* and RES*check* to support code compliance
- More than 20,000 unique visitors per month to the website (energycodes.gov); one of the most popular sites



Recognition

PNNL's code team technical analysis was highlighted by *ASHRAE News*.

ASHRAE
Shaping Tomorrow's Built Environment Today

ASHRAE/IES Energy Standard Gains 30 Percent Savings Over 2004 Standard
Feb 19, 2014

Contact: Jodi Scott
Public Relations
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ATLANTA – The requirements of the 2013 revision of an energy standard recently published by ASHRAE and IES will result in buildings that could achieve six to eight percent more efficiency than buildings built to the 2010 standard.

Published in October 2013, ANSI/ASHRAE/IES Standard 90.1-2013, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, provides minimum requirements for the energy-efficient design of buildings except low-rise residential buildings.

Pacific Northwest National Laboratories (PNNL), in support of the Department of Energy's Building Energy Codes Program, conducted the energy savings analysis on 110 addenda included in the standard.

PNNL's analysis shows that the site and energy cost savings are 37.7 percent and 37.8 percent, respectively, by using the 2004 standard as baseline for the regulated loads only. For the whole building energy consumptions, national aggregated site energy savings are 29.5 percent and energy cost savings are 29.0 percent.

On a nationally aggregated level, building-type energy savings range from 19.3 percent to 51.9 percent and energy-cost savings from 18.6 to 50.6 percent. These figures include energy use and cost from the whole building energy consumptions including plug and process loads.

"ASHRAE is committed to continually improving building energy performance, so we are pleased with this confirmation that the 2013 standard achieves significant energy savings over its predecessor," William Bahnfleth, ASHRAE president, said. "As we approach the 40th

Fierce Energy featured PNNL's report on DOE's Building Energy Codes Program cost benefit.

FierceEnergy

February 28, 2014
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3. Building code energy efficiency dollar savings

By Barbara Vergetis Lundin Comment | Forward | Twitter | Facebook | LinkedIn

New research from Pacific Northwest National Laboratory (PNNL) quantifies the financial savings from increased energy efficiency through building codes by evaluating the federal funding for the Energy Department's Building Energy Codes Program, and comparing it to the energy savings over the past two decades.

Credit: Ccyyrree/Wikimedia Commons

For every $1 the DOE spent on building energy codes, $400 in energy cost savings resulted, according to PNNL.

The program was started in 1992 in response to the Energy Policy Act of 1992, which requires DOE to participate in the development of national building energy codes and standards. While the program received about $110 million in federal funding between 1992 and 2012, its efforts resulted in about $44 billion in energy cost savings, PNNL found. Those savings come from reducing national energy use by 4.8 quads or enough to power nearly 130 million U.S. homes for one year.

At the end of 2012, 41 million tons of carbon emissions had also been saved annually.

Between 2013 and 2040, the program could result in an additional 53 quads of energy savings, or the equivalent of more than an entire year's worth of energy consumption from all U.S. residential and commercial buildings, PNNL projects. Through 2040, the program's efforts could cumulatively result in 3,995 million fewer tons of carbon emissions and reduce the nation's electric bill by up to $240 billion, the research concludes.

For more:
- see this report

Recognition (continued)

I want to thank you and your staff for an excellent source document[1]*. This is most helpful in moving our rulemaking in New York State.*

- Joseph Hill, Assistant Director for Energy Services
  New York State Department of State

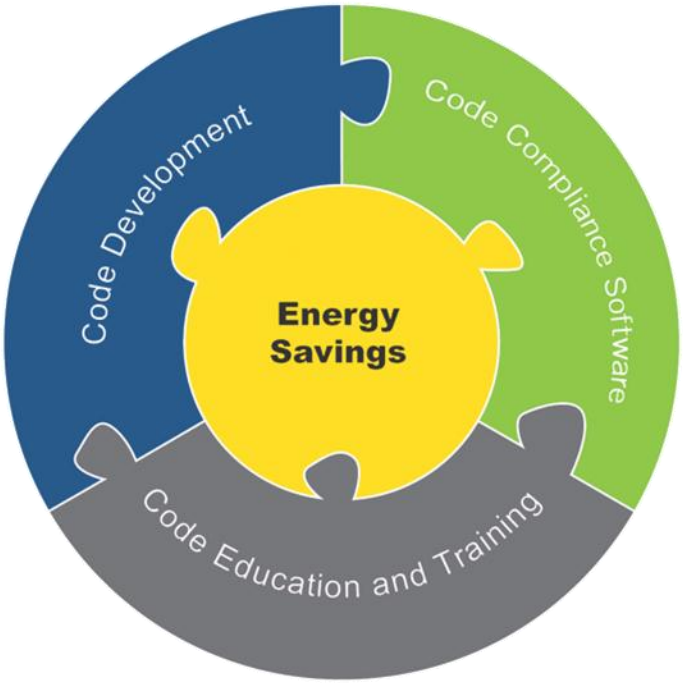
The assistance you and PNNL have provided for our work in Nebraska has been invaluable. As part of the team that is investigating the scale and source of demand savings available through increased code compliance, I appreciate the resources, experience and insights PNNL has brought to the table. They have been of great benefit to both the working group and the entire Nebraska Energy Code Compliance Collaborative.

- Chris Burgess, Technical Manager for Codes Compliance
  Midwest Energy Efficiency Alliance

Note 1: PNNL's report on 90.1-2010 Cost-Effectiveness Analysis

Integration and Collaboration

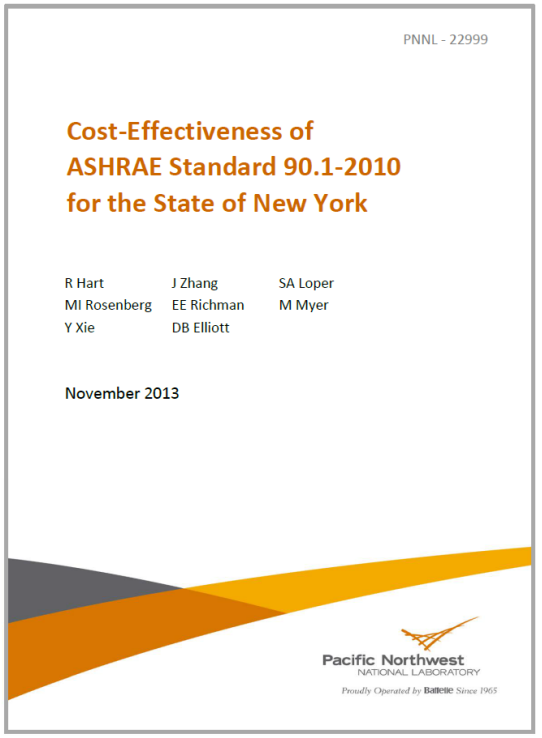
- Participate in the national codes and standards development processes to ensure the model codes provide the most energy efficient and cost-effective benefits to the consumer.
- Collaborate through the National Energy Codes Collaborative, including NASEO, REEOs and BCAP.
- Actively engage stakeholders through workshops and webinars to get immediate market feedback.
- Collaborate with the Commercial and Residential Building Integration Programs to carry the ready-for-the-mainstream technologies to code process.



Integration and Collaboration (continued)

- Provide objective information resources and technical guidance to states and localities to accelerate adoption and increase code compliance.

Commercial Codes Cost-Effectiveness Analysis			
Alabama	Georgia	New Jersey	Texas
Arkansas	Iowa	New York	Utah
Colorado	Kentucky	North Carolina	Virginia
Connecticut	Massachusetts	Oklahoma	Wisconsin
Delaware	Montana	Rhode Island	
DC	Nebraska	South Carolina	

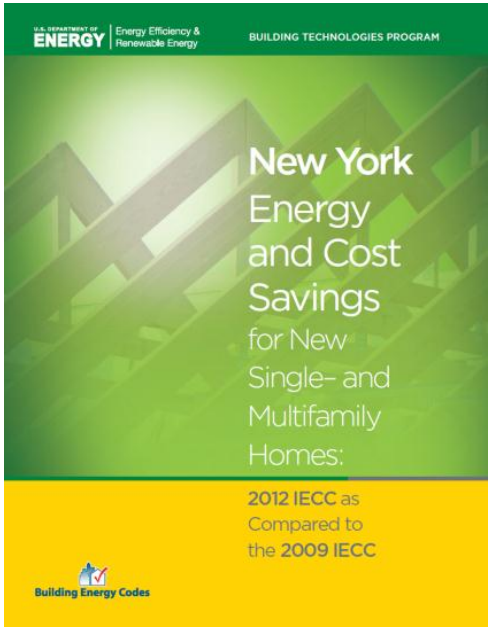


http://www.energycodes.gov/development/commercial/cost_effectiveness

Integration and Collaboration (continued)

Residential Codes Cost-Effectiveness Analysis

Alabama	Alaska	Arizona	Arkansas
Colorado	Connecticut	Delaware	District of Columbia
Georgia	Hawaii	Idaho	Indiana
Iowa	Kansas	Kentucky	Louisiana
Maine	Massachusetts	Michigan	Minnesota
Mississippi	Missouri	Montana	Nebraska
Nevada	New Hampshire	New Jersey	New Mexico
New York	North Dakota	Ohio	Oklahoma
Pennsylvania	Rhode Island	South Carolina	South Dakota
Tennessee	Texas	Utah	Vermont
Virginia	West Virginia	Wisconsin	Wyoming



http://www.energycodes.gov/development/residential/iecc_analysis

Next Steps and Future Plans

Development

- Roadmap to explore the next generation of codes and standards
- Release 90.1-2013 prototype building models and supporting documentation
- Technical support for the development of Standard 90.1-2016 and 2018 IECC

Adoption

- Consumer benefits analysis of adoption of the 90.1-2013 standard
- State technical assistance
- Technical analyses to support the publication of DOE Determinations on the latest model codes (90.1-2013 and 2015 IECC)

Compliance

- Streamline compliance process by leveraging RES*check*/COM*check* software
- Develop Codes training curriculum for 90.1-2013 and 2015 IECC
- Support DOE compliance efforts and associated technical analysis
- Implement 90.1-2013 and 2015 IECC in RES*check* & COM*check*
- Continue technical assistance to code officials and designers

REFERENCE SLIDES

Project Budget

Project Budget: see table below

Cost to Date: $1.65M (October 2013 through March 2014)

Budget History					
FY2013 (past)		FY2014 (current)		FY2015 (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
$4.8M	$0	$4.0M	$0	TBD	$0

Project Plan and Schedule