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

Current Activities in Support of Building Energy Codes

March 2, 2012

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Purpose

***Purpose**: To provide an update on DOE activities related to the development of proposed code changes and deployment of existing codes:*

- Goals and direction
- Activity updates
- Available resources

Goals and Direction

Energy Codes Work with Stakeholders:
Improve the Model Codes

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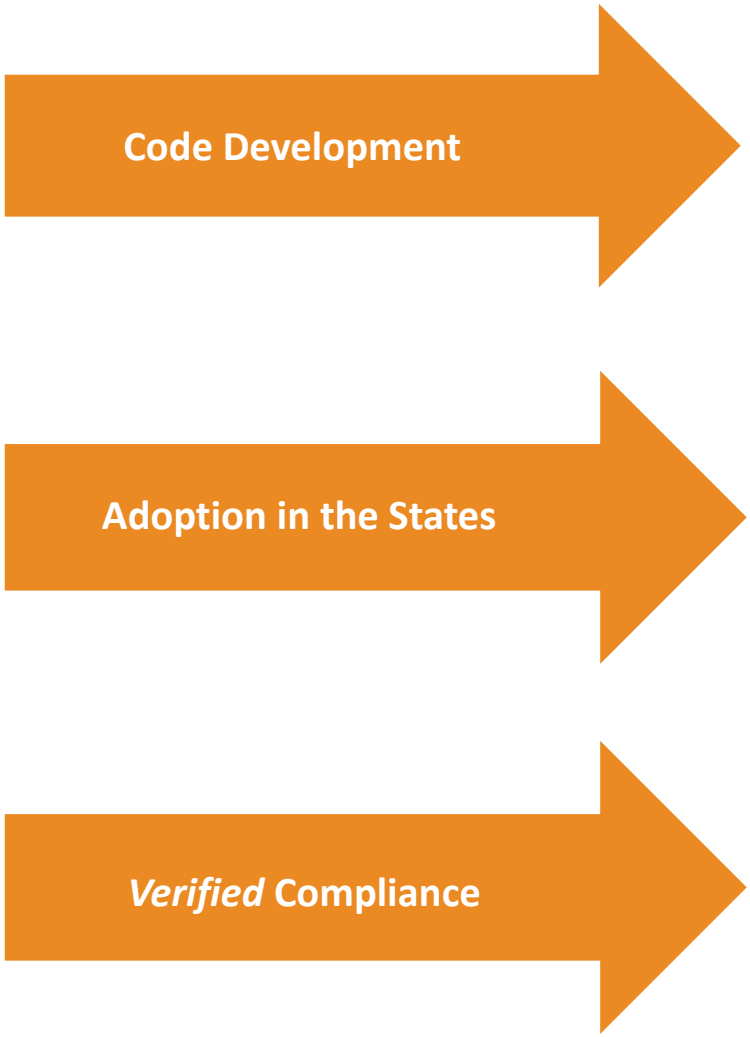
Model Energy Codes: Accomplishments

30% Initiative for Increased Energy Savings

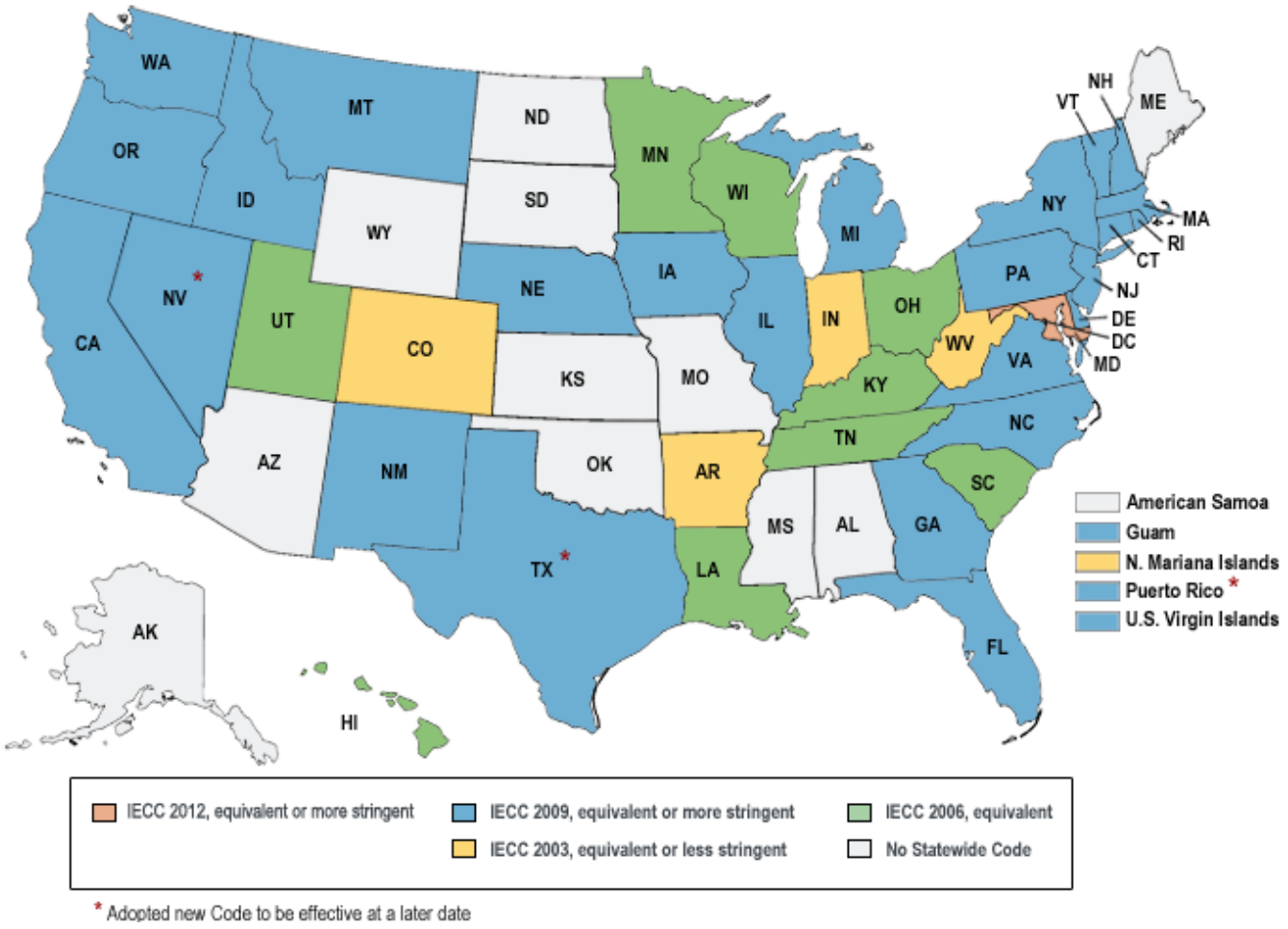
- **Commercial**—Published in 2010
  - ANSI/ASHRAE/IESNA Standard 90.1—2010 with savings of approximately 25% compared to 90.1—2004
  - Savings of up to 30% in the 2012 IECC commercial energy code
- **Residential**—Published in 2011
  - 2012 IECC with savings of approximately 30% compared to the 2006 IECC residential code



Status of Residential Code Adoption

Status of Code Adoption: Residential

Overview of the currently adopted residential energy code in each state.



* Adopted new Code to be effective at a later date

As of January 1, 2012

DOE Future Direction:
Goals and Strategies

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Model Energy Codes: 50/70/90 Goals

50% Goal for Increased Energy Savings:

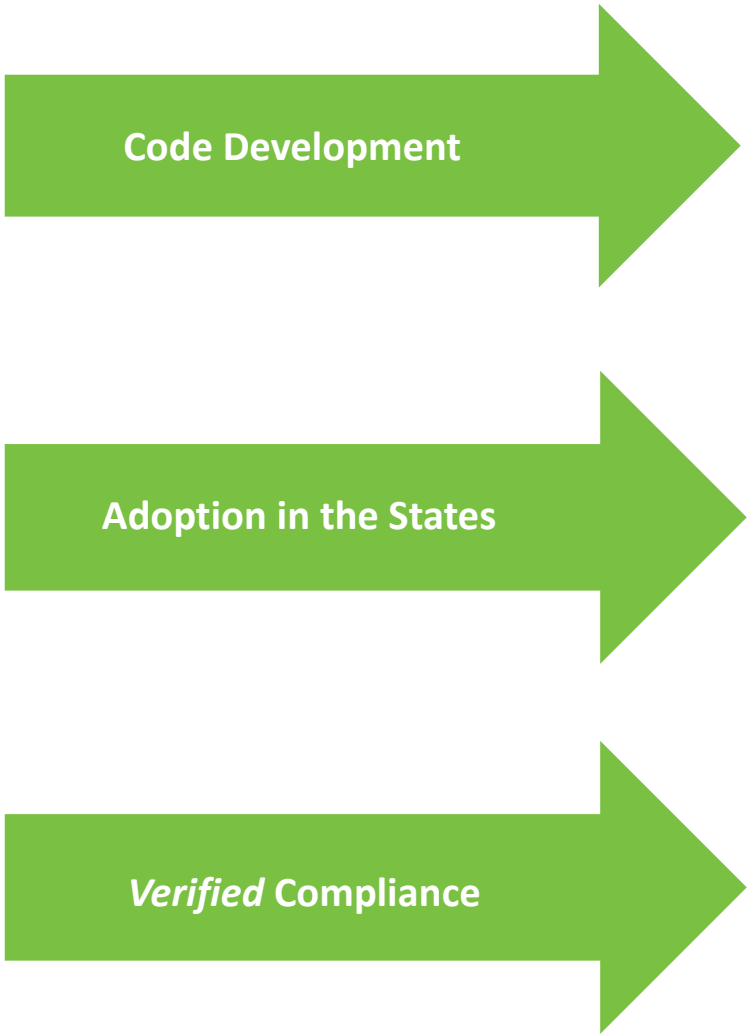
- Cost-effective energy savings for 2015 and future
- Need to go beyond simple prescriptive approaches
- Exploring performance-based options
- Alternative paths to compliance

70% Initiative for Increased Adoption:

- 40 states and territories to adopt ARRA target codes or most current model codes by 2015
- 2012 IECC and Standard 90.1—2010

90% Compliance by 2017:

- Demonstrated compliance with ARRA requirements
- Increase the number and availability of compliance guides, field measurement tools, and resources



Activity Updates

Determinations of Energy Savings

Energy Conservation and Production Act (ECPA), as amended by EPACT 1992

Sect 304: DOE is required to make a ***Determination*** within one year of publication of the revised model energy code, States then have *two years* to adopt the Commercial code and review the Residential code

- Final Determination for 90.1-2007 & 2009 IECC published July 2011
- Final Determination for 90.1-2010 published in October 2011
- Preliminary Determination for 2012 IECC published in October 2011

Residential Code Proposals

Objective: *Improve Energy Efficiency in a Cost Effective Manner*

DOE Goal for next three years: Codes and standards aimed at additional savings compared to the 2006 IECC:

- End-uses traditionally covered in residential codes/standards: heating, cooling, and water heating
- Additional savings through updated federal standards (equipment and lighting)
- Interaction with the IECC and Standard 90.2 processes

Cost-effective improvements:

- Life-cycle economic perspective

It's not only about *energy*—efficiency should not compromise indoor air quality, health, building durability, or occupant comfort.

Residential Code Proposals

An open and transparent process:

- Solicit and consider stakeholder input on proposed methodology
- Publish final methodology documenting approach, data sources, and assumptions
- Publicly available EnergyPlus simulation runs and results
- Incorporate cost into DOE code proposal development
  - DOE construction cost database

All posted to *Code Development* section of www.energycodes.gov

Residential Code Development

Residential Cost Methodology RFI

Published September 13, 2011

- Published in the Federal Register—comments due November 2011
- DOE sought input on how it might improve its methodology for assessing cost-effectiveness for changes to residential building energy codes
- Public input on the overall methodology, preferred data sources, and parameter assumptions—proposed Life-cycle approach
- Affects the assessment of published codes and code change proposals
- Challenge: Cost of codes have not been uniformly calculated or explicitly stated—need for increased transparency and process duplication
- DOE will publish final methodology for code proposal development

Residential Cost Methodology

Public Input:

- 35 Public comments received and processed
- Key topics: First costs, replacement measures, maintenance costs

Modifications:

- Additional first cost considerations
- Replacement of features
- Reference cities
- Multi-family prototype size

Federal Register

Original comments available: *Docket EERE 2011 BT-BC 0046*

Residential Cost Methodology

Life-cycle economic approach:

- 30 year period of analysis
- Account for replacements of equipment and features
- Based on a typical mortgage with fixed interest rate
- EIA fuel prices and escalation rates

Reported Results:

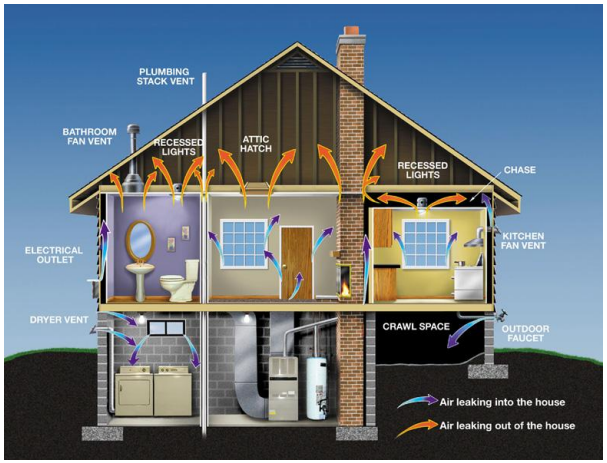
- Results reported at national, climate zone and state levels
- Simple payback and cash flow analyses also included to aid state adoption

Final methodology to be published in March 2011 on:
www.energycodes.gov

Initial Residential Concepts

The Challenge:

- Traditional code formats are being strained
- Need for increased code compliance



Residential Proposal R+D:

- Concepts have been analyzed for optimal efficiency based on associated energy savings
- DOE proposed concepts include a test of cost-effectiveness
- Accepting comments on residential concepts

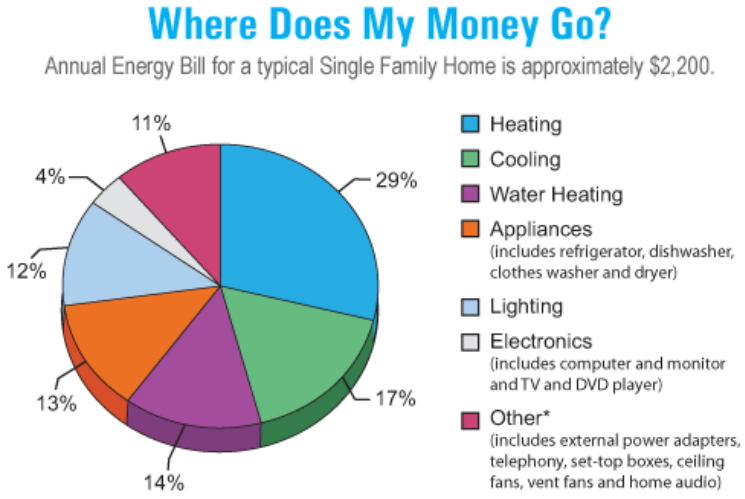
Reviewing the following potential areas:

- Equipment, fenestration, radiant barriers, quality testing & verification

Initial Residential Concepts

Potential future DOE residential energy efficiency concepts:

- Envelope insulation levels
  - Comparable to 2012 IECC levels
- Verified tightness of building envelope
  - Mechanical ventilation
  - Heat recovery in cold climates
- Fenestration U-factor and SHGC
- Cool roof design or radiant barrier in hot clim[illegible]
- High-efficiency equipment and appliances



Methods of assuring increased compliance with the energy code.

Available Resources

Compliance Tools

Support states as they work to demonstrate 90% Compliance with the Target Energy Codes

BECP guidelines and tools to use in measuring compliance with building energy codes:

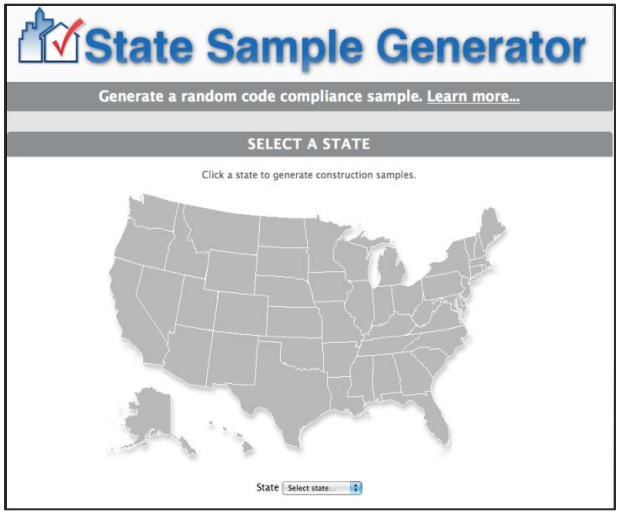
- ✓ Foster uniformity and objectivity in measuring compliance rates
- ✓ Eliminate need for each state to develop their own procedures and tools
- ✓ Provide tools that states can adapt for their own preferred use

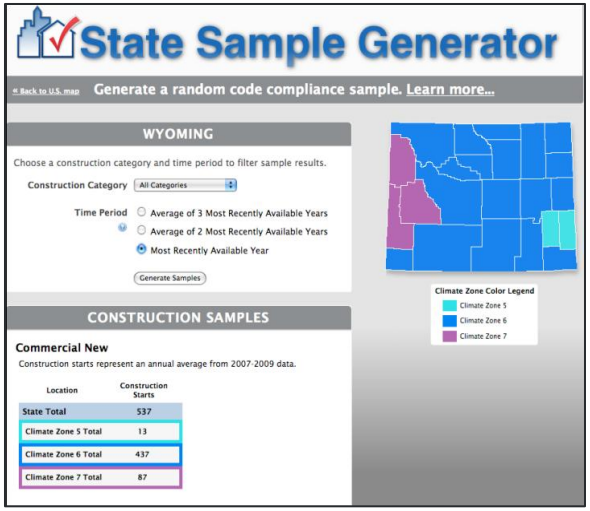
Compliance Guidance

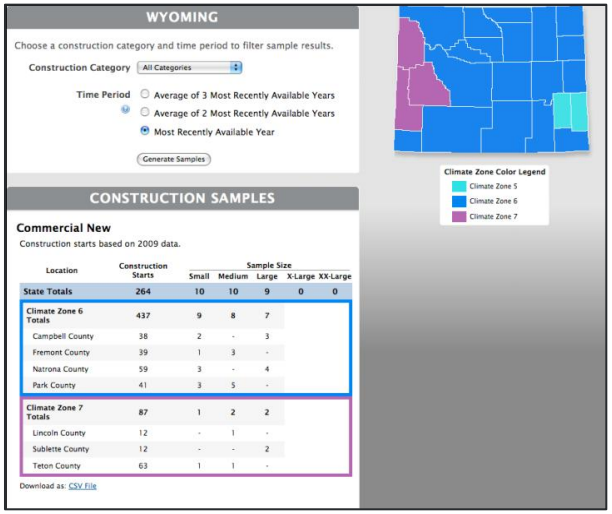
Package of Integrated Compliance Resources:

- **Procedures** for measuring compliance – *"Measuring State Energy Code Compliance" (March 2010 report)*
- A short companion step-by-step **"quick-start" guide** summarizing procedures
- **Informational flyers** to help states schedule onsite evaluations
- A **jurisdictional survey** for evaluating compliance related processes
- The **Sample Generator online tool** to be used for generating a valid sample set
- Compliance evaluation **checklists and instructions** tailored to various codes
- The **Score + Store online tool** for collecting, storing, and analyzing the resulting onsite evaluation data, and for calculating state-wide scores

State Sample Generator







Online web application that provides statistically valid random sampling guidance for states by county based on construction start data:

1. Choose your state and building type
2. Generate statistical sample by project location (county)

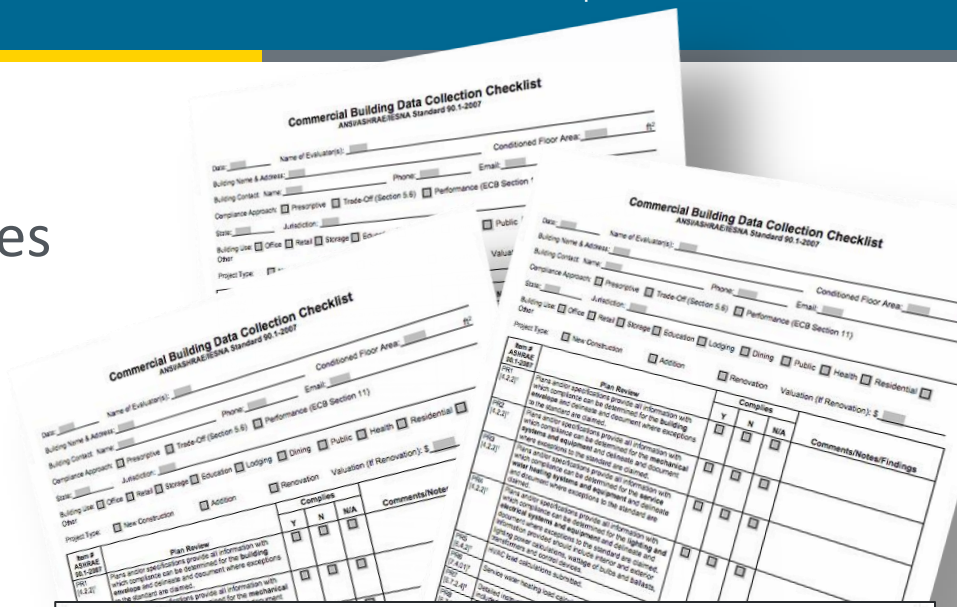
http://energycode.pnl.gov/SampleGen/

Compliance Checklists

- Record results of a compliance check and verify installed features comply:
- Structured based on typical construction progression and inspections
  - Plan review, foundation, framing, mechanical, final

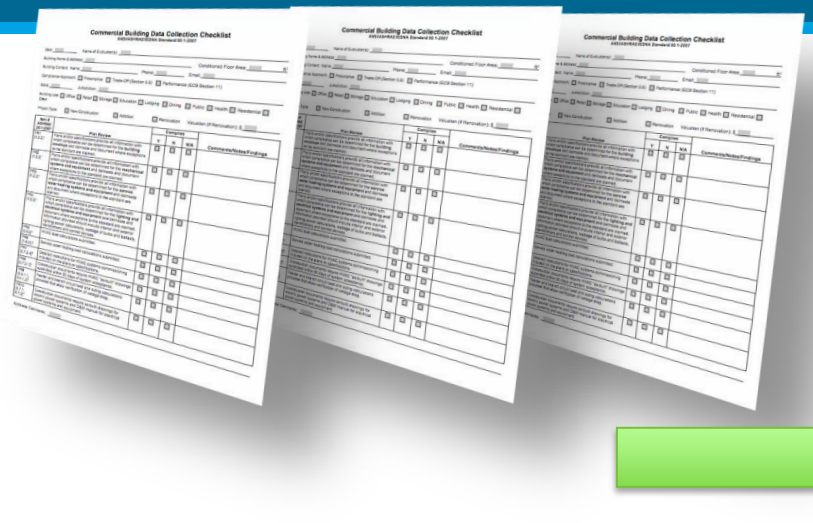
Developed and available for:

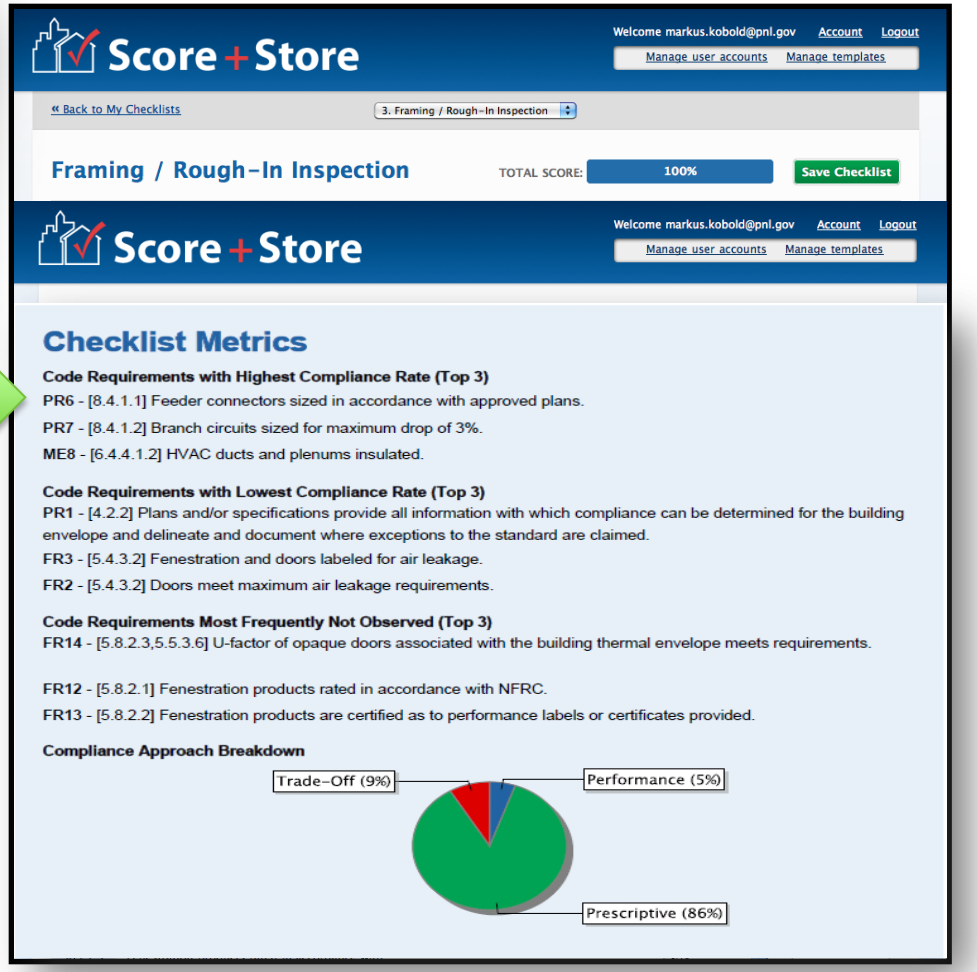
- ASHRAE Standard 90.1-2004 and 2007
- IECC 2009 (Residential – each climate zone)
- IECC 2006 (Residential – each climate zone)
- IECC 2009 (Commercial)
- IECC 2006 (Commercial)



Item Number	Pre-Inspection/Plan Review
PR1 [103.2] [1]	**Documentation.** Determine if a complete set of plans/construction drawings, specifications, and energy code compliance documentation is available in the building department. If there is no building department or the locality does not conduct plan review, this information should be obtained from the registered design professional or builder having responsibility for the project. If documentation indicating a trade-off or performance approach is not provided, a prescriptive approach must be assumed for verifying compliance. Construction documents should sufficiently demonstrate energy code compliance, including but not limited to the following information: • The location and R-values of insulation materials • U-factors and SHGC values for windows, doors, skylights, and other fenestration products • Information related to duct and piping location, insulation type and R-value, and means of sealing Under the assumption that only state or local government with a responsible enforcement and/or permitting agency are included in compliance evaluations, plans and documentation are expected to be held by the responsible agency. If this is not the case, mark this code requirement and the next (PR1 and PR2) as non-compliant, unless there is another entity responsible for enforcement identified (e.g. utility, contractor licensing board, etc.) in which case they should be contacted to review PR1 and PR2 information.
PR2 [403.6] [2]	**HVAC Load Calculations.** Verify that HVAC load calculations have been completed and submitted. Verify the methodology used in the load calculations. List the resultant heating and/or cooling loads as applicable in the Verified Value column.

Score and Store™





- Web application stores building evaluation data gathered as part of a state compliance evaluation
- Scores the data (both individual building and state scores) and allows analysis of data collected across states

www.energycodes.gov/ScoreStore/login

Common Barriers to Compliance

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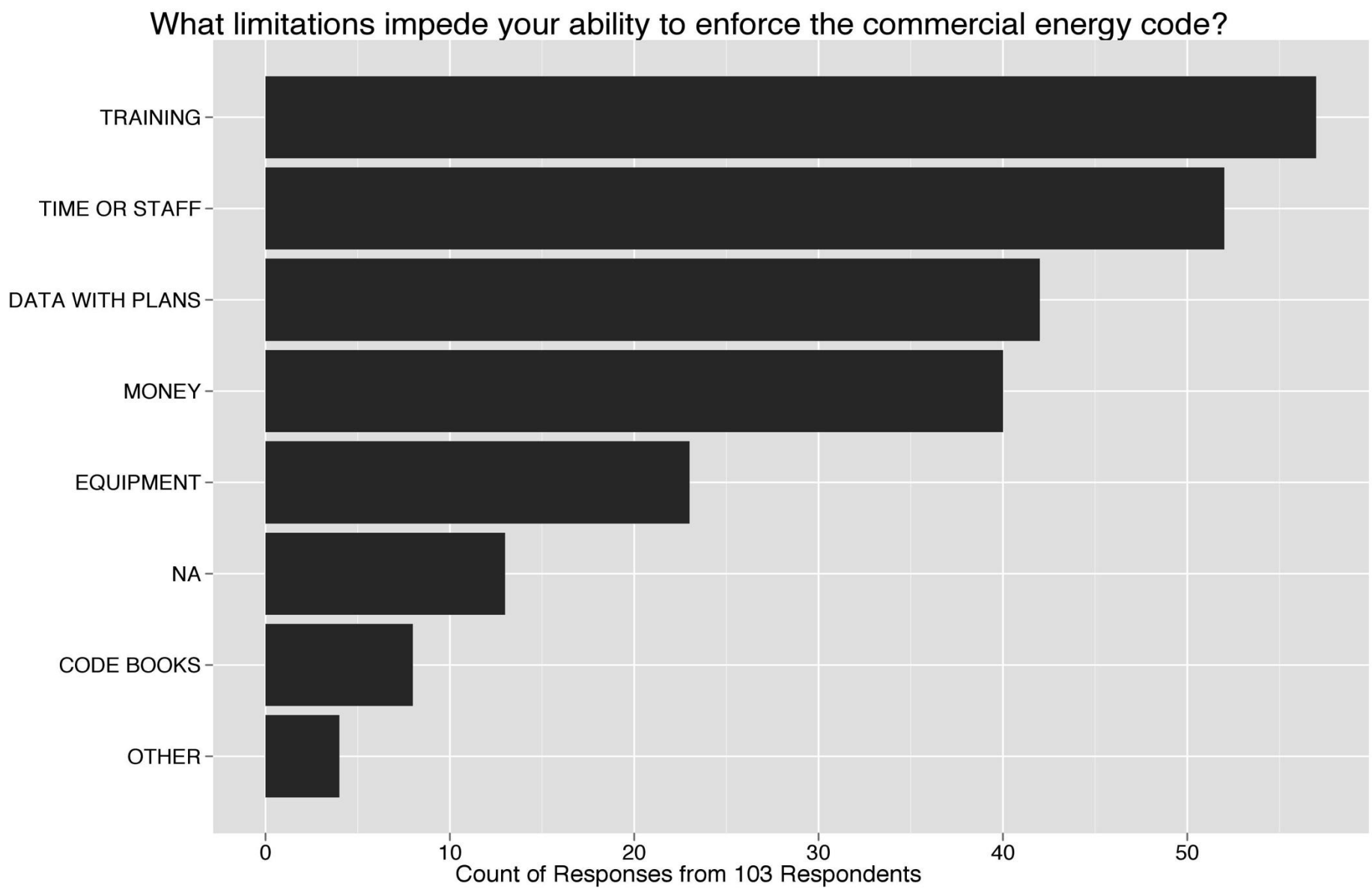

Integration with COM*check* inspection checklist:

Air Leakage, Insulation, and Component Certification:

✓ 3. [502.4.3] Sealing of the building envelope. Openings and penetrations in the building envelope are sealed with caulking materials or closed with gasketing systems compatible with the construction materials and location. Joints and seams are sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials spanning joints between construction materials allow for expansion and contraction of the construction materials.

Plans reference page/section: *Elevation view*

✓ 4. [502.4.1 +] Window and door assemblies. The air leakage of window and sliding or swinging door assemblies that are part of the building envelope are determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, or NFRC 400 by an accredited, independent laboratory, and labeled and certified by the manufacturer.

Exception applies: Site-constructed windows and doors that are weatherstripped or sealed in accordance with Section 502.4.3.

Plans reference page/section: _____

✓ 5. [502.4.2 +] Curtain wall, storefront glazing and commercial entrance doors. Curtain wall, storefront glazing and commercial-glazed swinging entrance doors and revolving doors are tested for air leakage in accordance with ASTM E 283. For curtain walls and storefront glazing, the maximum air leakage rate is 0.3 cubic foot per minute per square foot of fenestration area. For commercial glazed swinging entrance doors and revolving doors, the maximum air leakage rate is 1.00 cfm/ft2 of door area.

Exception applies: Requirement is not applicable.

Plans reference page/section: _____

☐ 6. [303.1.1 +] Building thermal envelope insulation. An R-value identification mark is applied (by manufacturer) to each piece of insulation 12 inches or greater in width. Alternately, the insulation installers have provided a signed, dated and posted certification listing the type, manufacturer and R-value of insulation installed. Refer to code section for blown or sprayed insulation installation/settling depths and marker requirements.

☐ 7. [303.1.2] Insulation mark installation. Insulating materials are installed such that the manufacturer's R-value mark is readily observable upon inspection.

☐ 8. [303.1.4] Insulation product rating. The thermal resistance (R-value) of insulation has been determined in accordance with the U.S. FTC R-value rule.

☐ 9. [303.2] Installation. All material, systems and equipment are installed in accordance with the manufacturer's installation instructions and the International Building Code.

COM*check* Plus

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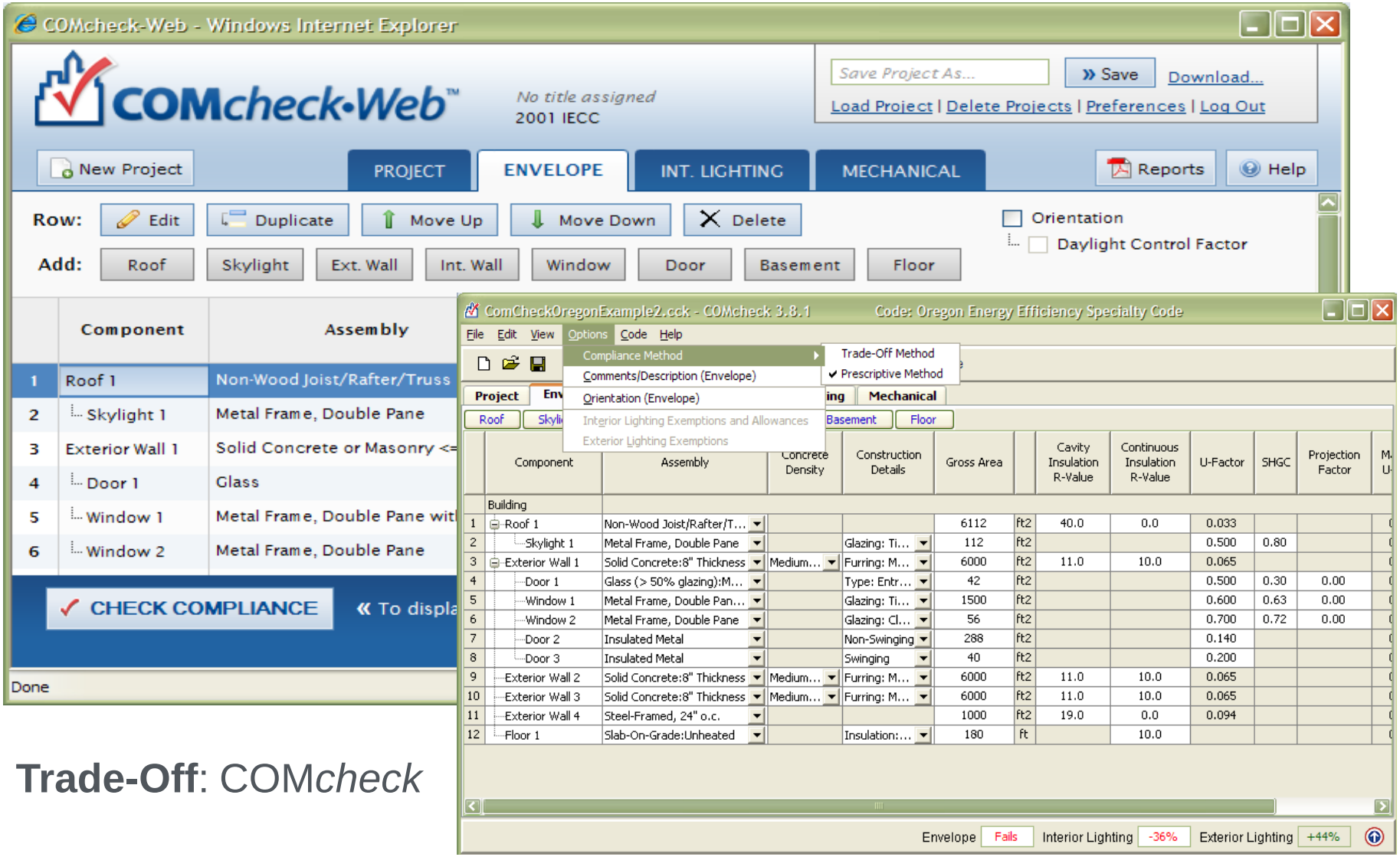

Trade-Off: COM*check*

Additional Resources

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- Prescriptive drill down
- Software
- Web-based tools
- COMcheck Plus
- Technical support
- Publications
- Code notes
- Resource guides
- Training programs

DOE's Building Energy Codes Program is resource on compliance with building energy codes and standards – tell us how we can be help you with your energy codes programs.

Visit us at: *www.energycodes.gov*

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