Building Energy Code Advancement through Utility Support and Engagement

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DOE Code Compliance Technical Meeting

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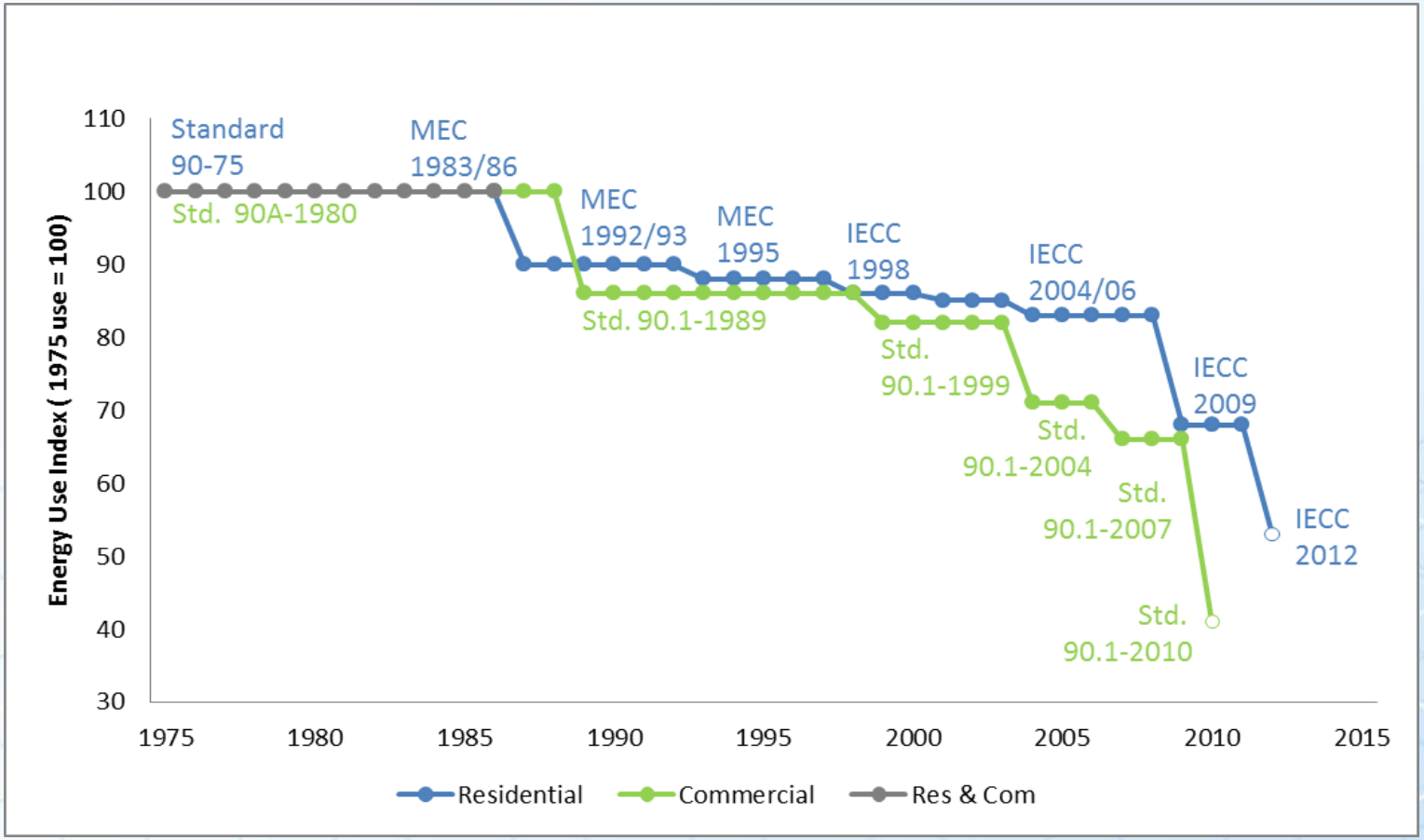
Today's Topics

- Review findings and recommendations from ACEEE report
- Discuss stakeholder interests from Utility Codes Working Group
- Recommend next steps and elements of an effective outreach and state targeting plan

Topics Addressed in ACEEE Report

- Benefits of Building Codes for Utilities and Energy Efficiency Portfolios
- Obstacles and Barriers
- Policy Justification
- State Experience with Energy Codes in Efficiency Program Portfolios
- Evaluation Measurement and Verification
- Estimating Lost Energy Savings due to Compliance Shortfalls
- Pilot Program Concepts
- Activities in the Code Cycle Deemed Appropriate for Utilities
- Policy Recommendations

Recent Successes with Model Energy Codes Have Changed Business As Usual!



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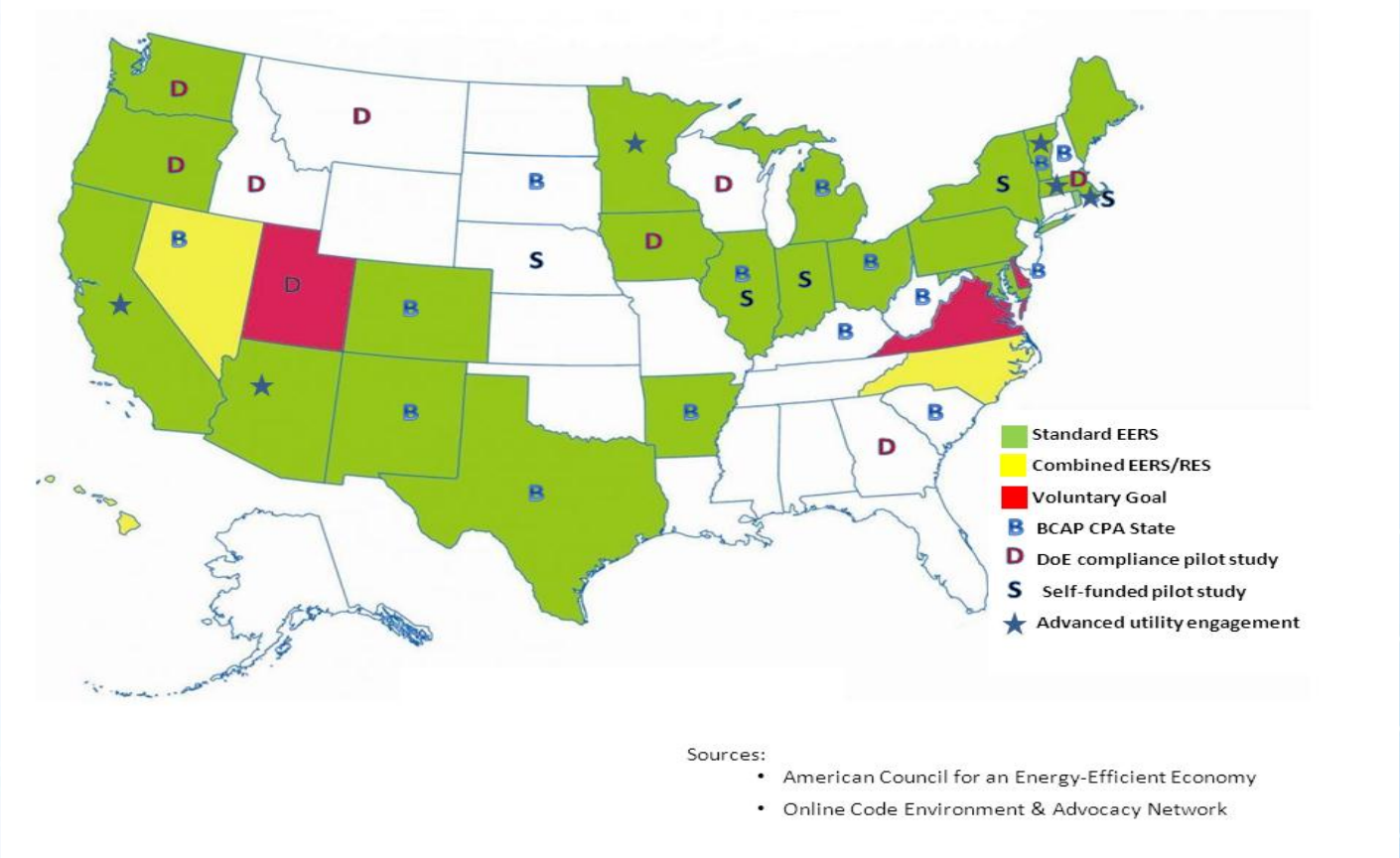
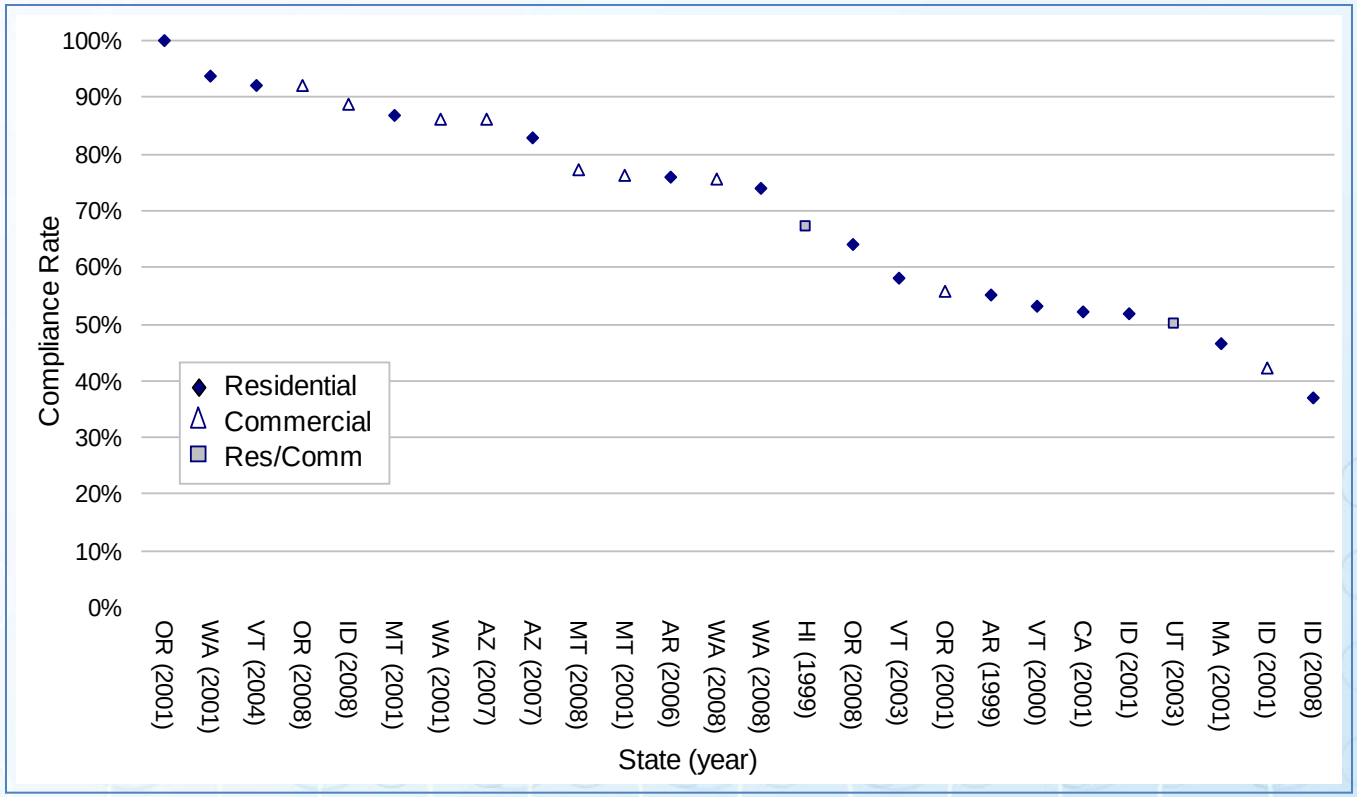
Parameters in State Activity Survey

- Regulatory developments and active proceedings
- Utility participation with energy codes development and adoption
- Number of utilities active with new construction programs (CEE data)
- Level of utility EE activity with code-related efforts (Exploratory or Advanced and Compliance Collaboratives)
- EERS Score is the state score on Energy Efficiency Resource Standards as assessed by the ACEEE State Scorecard
- Current building energy code adopted by the state (or local jurisdictions in case of a home rule state)
- Pilot program study of code compliance rates

Overlay of EERS and Energy Code Efforts in Different States



Building Energy Code Compliance Rates by State and Year of Study



Building Energy Code Compliance Metrics – Difficulties in Prior Studies

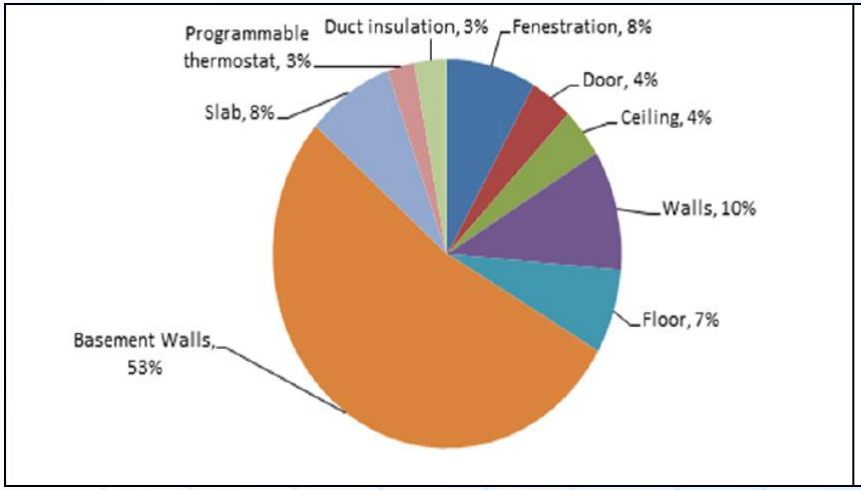
- One-off efforts intended to meet a short-term need
- Little consistency in the design of studies or in the presentation of results.
- Lack of uniformity has made comparing the results of compliance studies very difficult.
- ARRA and DOE/PNNL ***Measuring State Energy Code Compliance*** can provide consistency

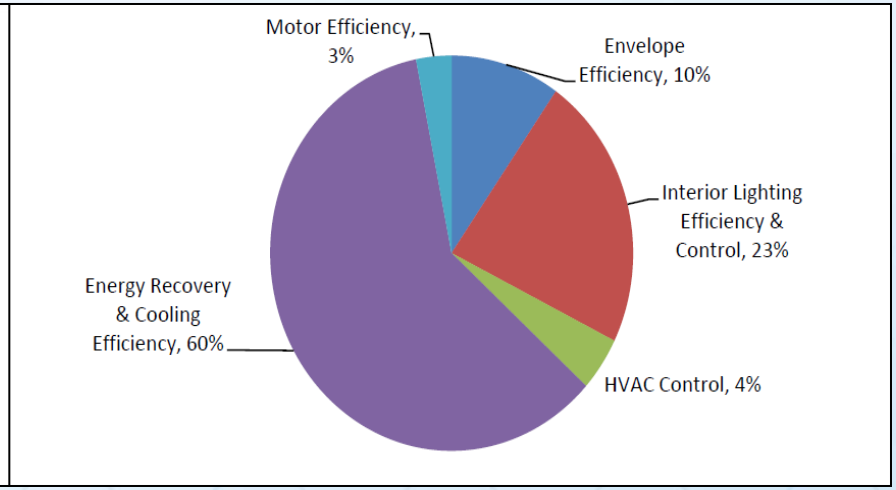
Energy Code Compliance Metrics	Commentary
Percent of buildings meeting *all* code requirements (pass/fail)	Most common metric in studies. Considers all code measures equal in impact. Associated with low compliance rates.
Percent of individual code requirements met in each building	More realistic metric in that code measures can be separated into high, medium and low energy impacts. Recommended for use in BECP methodology.
Net-to-gross ratio	Limited to use in some utility programs as part of program evaluation.
Percent above or below modeled energy use comparison to code	This is an energy performance metric that can estimate energy consumption impacts of code compliance. Used in very limited number of studies.
Envelope “UA” or overall heat loss	Metric using engineering calculations based on building envelope values found on building plans as compared to code requirements.
Home Energy Rating (HERS) scores	Metric uses HERS design analysis and field tests to score subject building. Score compared to energy code minimum baseline. Sometimes an alternative code compliance path tied to Energy Star homes in certain states.
Percent above or below code using DOE REScheck or similar	DOE code compliance software developed for versions of IECC and ASHRAE codes with some custom state applications. Calculates code compliance percentages from building plan data.
Percent of code officials enforcing code (survey)	Surveys of these types are useful for directional information rather than quantitative data on code compliance. Participants often self-selected. Useful for targeting code support activities such as training.

Lost Energy Savings Opportunities by Residential and Commercial Building Components in NY State (Harper et. al 2012)

Cumulative lost energy code savings estimated at **$300 million** in the **residential** sector over a 5-year construction code cycle.

Cumulative lost energy code savings estimated at **$960 million** in the **commercial** sector over a 5-year construction code cycle





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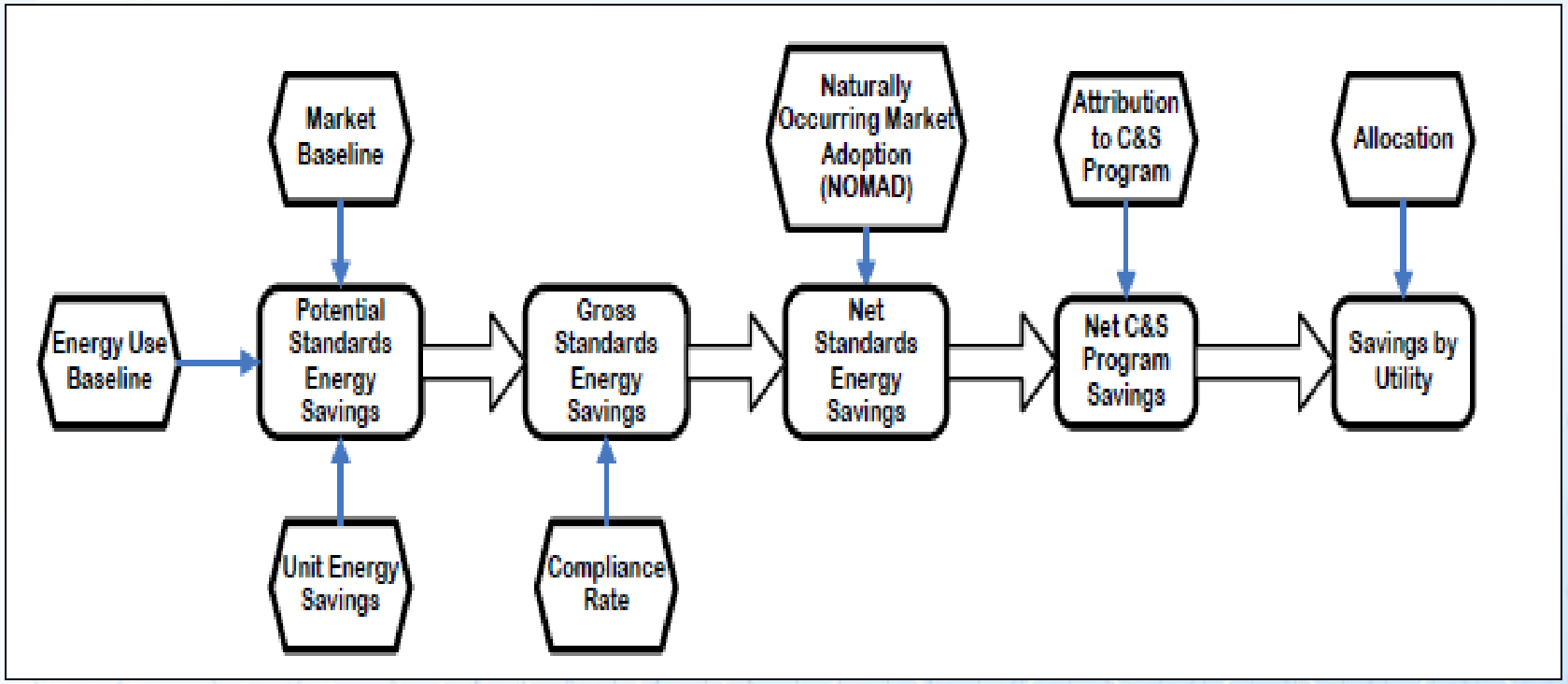
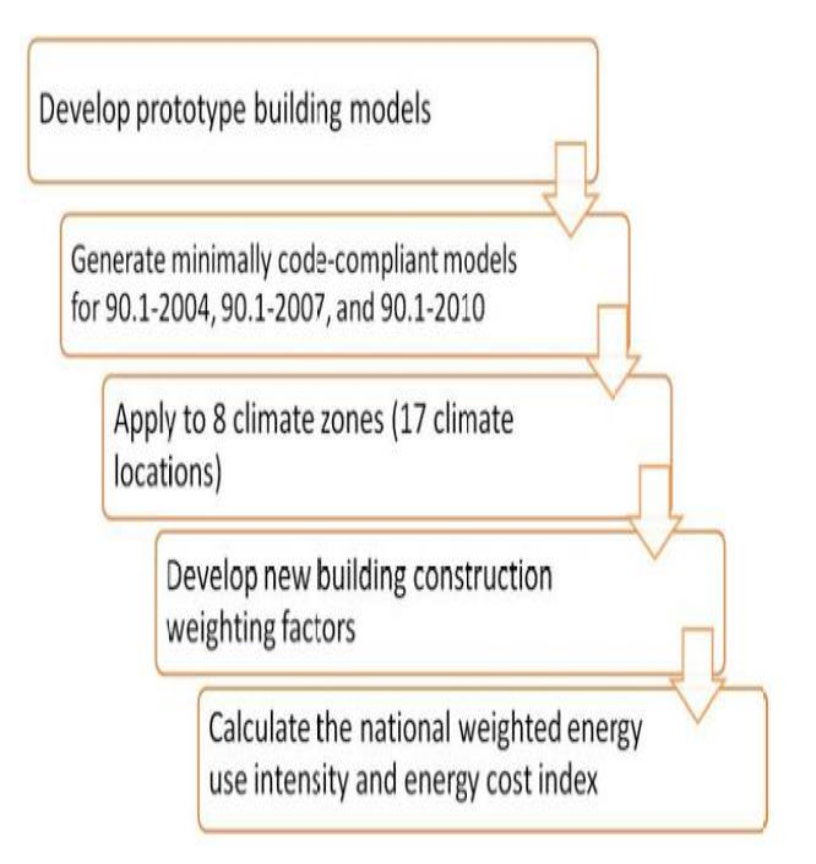
California Codes and Standards Evaluation Methodology

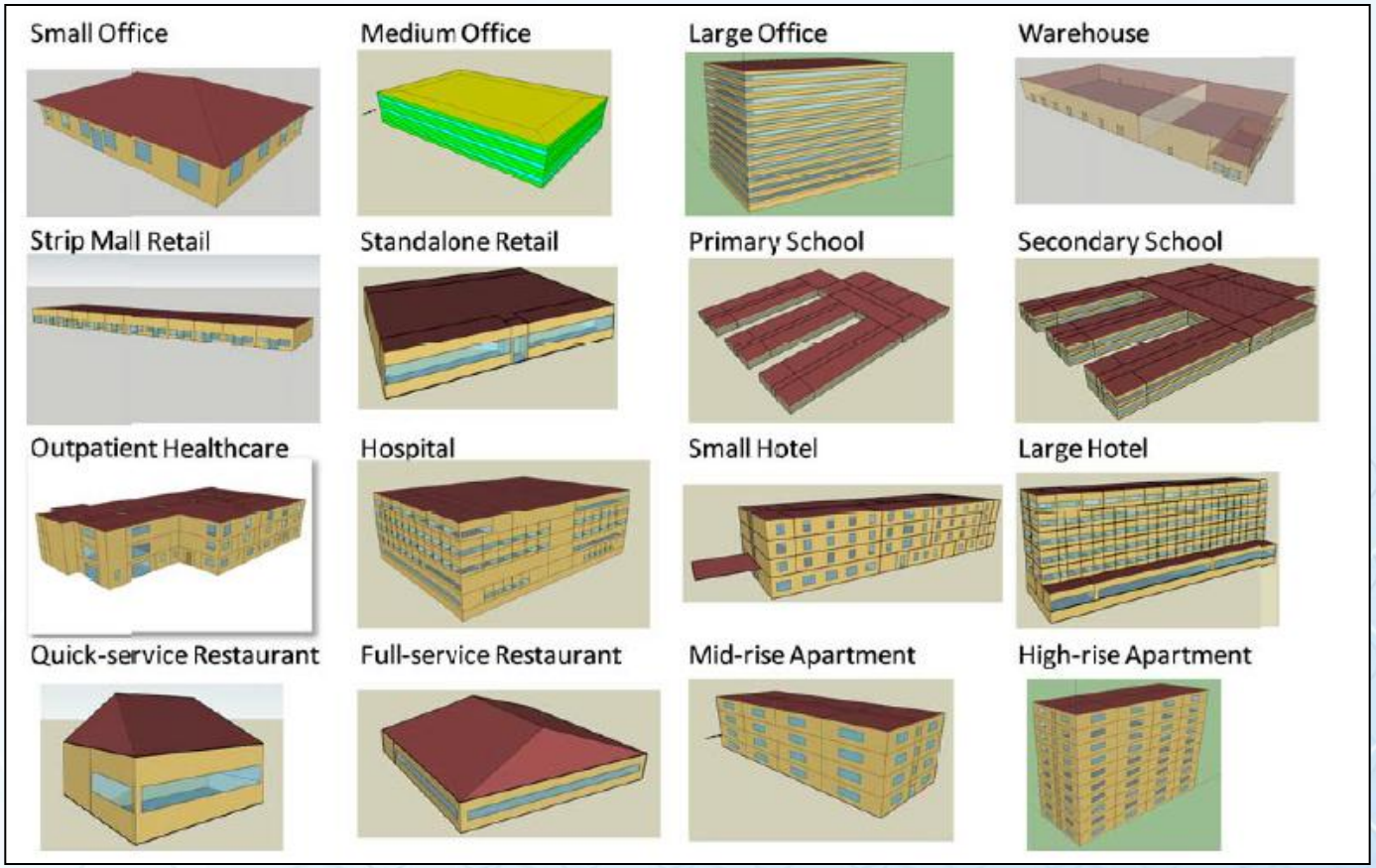


ASHRAE 90.1/PNNL Progress Indicator Process

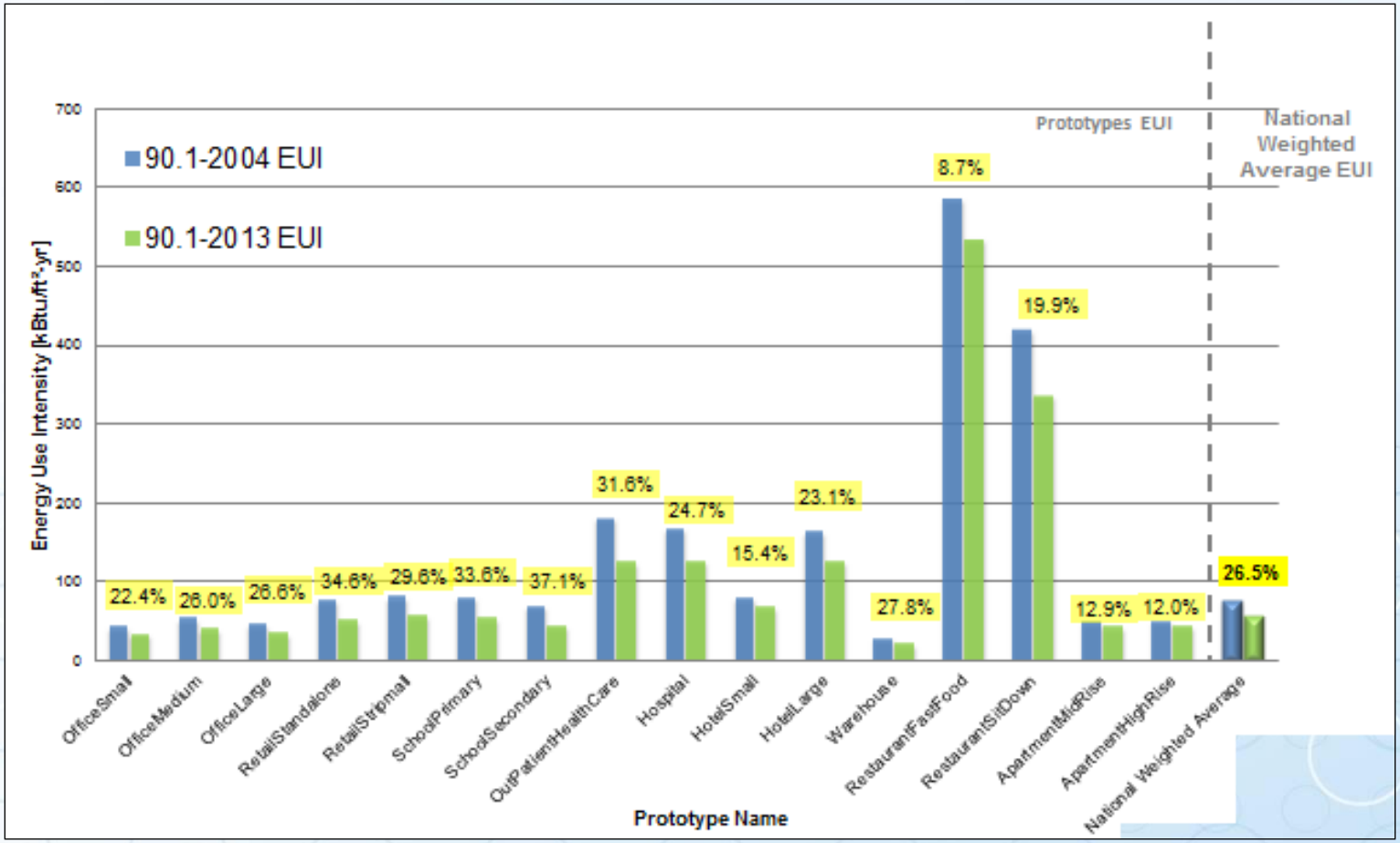
- Building models well vetted by DOE, PNNL, NREL, ASHRAE, etc.
- Prototypes represent 80% of floor space and 70% of electricity use
- Residential prototypes developed for ASHRAE 90.2
- Can be used to estimate compliance shortfalls



Prototype Buildings for Progress Indicator System



Example Progress Indicator Results for ASHRAE Standard 90.1-2013



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Adaptation of Progress Indicator to Quantify Compliance Shortfalls

General Features and Capabilities of ASHRAE Progress Indicator	Adaptation to Quantifying Compliance Shortfalls
Prototype Reference Buildings	Prototypes are well developed for new construction analysis. Prototypes for existing buildings for code compliance (additions, alterations, etc.) are available but need further development. Residential prototypes are in a similar stage of development.
Code-Compliant Data Sources	Prototypes configured for exact compliance with ASHRAE model codes are available. Prototypes configured for exact compliance with the IECC need additional development work. These would be the baseline buildings to which the code compliance shortfalls are compared.
Code Compliance Shortfall Parameters	The DOE/PNNL code compliance methodology is intended to report quantified numerical differences between energy code requirements and actual conditions observed on construction documents and through in-the-field building inspection surveys. These data would be the inputs used in the simulation models to estimate energy lost to energy code compliance shortfalls by comparing energy results to the baseline. It is analogous to modeling proposed changes to a model energy code or standard.
Simulation in Climate Zones and Climate Locations	The building simulations would be run with standard weather data from the climate zones in question as provided in the IECC or Standard 90.1. Climate zones may be further subdivided into utility service areas if appropriate.
Apply Construction Weighting Factors	The DOE/PNNL energy code compliance methodology also includes a sample generator and a scheme for weighting the results according to new construction volume. It is likely that this weighting scheme can be adapted to this use since the weighting scheme is based on the one used in the Progress Indicator.

Appropriate Code Cycle Activities and Pilot Program Concepts

- **Code Cycle Activities**
  - Development
  - Adoption
- **Implementation**
  - Compliance Support
  - Training and technical assistance, 3rd party inspections
- **Evaluation**
  - Code compliance baseline studies
  - Savings estimates for attribution and allocation

Program Elements Under Consideration

- Training (Traditional and Role Based)
  - Breaking up Training by Sectors
- Webinars (Individual Issues in More Depth)
- Circuit Riders
- Establishment of 3rd Party Inspector Program
- Equipment Leasing Program
- Using Stretch Code as Basis for Above Code Programs

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Conclusions and Recommendations

- Model energy codes and standards are reaching levels associated with beyond-code and advanced energy design programs, but potential is hampered by compliance shortfalls
- Efficiency PA's and utility regulators should look closely at energy codes as a potential resource in their portfolios and strongly consider use of the DOE BECP energy code compliance evaluation method for comparable national results
- DOE and the National Labs should provide technical support for consistent lost savings calculations
- The transformational potential of modern energy codes is such that they should be an integral part of the energy policy of any jurisdiction

Notes on Stakeholders, Outreach Planning and the Utility Codes Working Group

- An informal Utility Codes Working Group has been convened and has met twice to:
  - Identify next steps to add energy code compliance support in utility-sponsored energy efficiency program portfolios
  - Identify and produce educational fact sheets on code compliance topics as:
    - Benefits to utility program portfolios and system planning
    - Program descriptions for code compliance support and pilot program concepts
    - Case studies or descriptions/lists of EE program code compliance efforts around the country
  - Identify and evaluate new locations for regulatory advocacy
  - Prepare an outreach plan for stakeholder community
  - Prepare overall strategic agenda for promotion of concept

Stakeholder Buy-In

New Type of Program

- Utilities
- Advocates (Environmental/Consumer)
- Public Utility Commissions
- State Agencies
- Program Evaluators

Outreach and Discussion of Aims and Methods of Program Essential

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More on Outreach

- Reach out to Association of Energy Services Professionals (AESP)
  - Conference papers and program
  - Short course
  - Literature table
  - Implementation Committee participation
  - Brown Bag seminars
- Reach out to Program Evaluation Conference Community
  - Conference papers and program
  - Short course
  - Literature table
  - Code compliance savings calculations
- ACEEE Annual State Energy Efficiency Scorecard
  - Add code compliance criteria to energy codes chapter score?

Recommendations for DOE on Utility Codes Topics

- Engage with the Utility Codes Working Group for stakeholder input and program guidance
- Working Group can also serve as peer reviewers for DOE/PNNL calculation tools
- Collaborate with stakeholders to develop a strategic agenda, state targeting and outreach program
- Highlight utility codes topics at DOE Energy Codes Summit

Thank You for Your Attention!

Questions
And
Discussion