[6450-01-P]

DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

[Docket No. EERE-2013-BT-BC-0036]

DOE Activities and Methodology for Assessing Compliance with Building Energy Codes

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy

ACTION: Request for Information (RFI)

SUMMARY: The U.S. Department of Energy (DOE) is soliciting public input on the methodology developed by DOE to assist in assessing compliance with building energy codes at the local, state, and national levels. To provide technical assistance for states implementing building energy codes, DOE developed and piloted a compliance methodology across several U.S. states. The experiences of those participating in these pilot studies have led to a number of recommendations and potential changes to the DOE methodology. DOE is interested in receiving broad public input on not only this methodology, but also on fundamental assumptions and approaches to measuring compliance with building energy codes. This notice identifies several areas in which DOE is particularly interested in receiving information; however, any input and suggestions considered relevant to the topic are welcome.

DATES: Written comments and information are requested on or before [INSERT DATE, 30 DAYS AFTER DATE OF PUBLICATIONIN THE FEDERAL REGISTER].

ADDRESSES: Interested persons are encouraged to submit comments electronically. However, comments may be submitted by any of the following methods:

- *E-mail to the following address:* STCodeCompliance2013BC0036@ee.doe.gov. Include docket number **EERE-2013-BT-BC-0036** in the subject line of the message.
- *Federal eRulemaking Portal:* www.regulations.gov. Follow the instructions for submitting comments.
- *Postal Mail:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, Mailstop EE-2J, Request for Information for Methodology for Energy Code Compliance Evaluation, Docket No. **EERE-2013-BT-BC-0036**, 1000 Independence Avenue, SW, Washington, DC 20585-0121. Phone (202) 586-2945. Please submit one signed paper original.
- *Hand Delivery/Courier*: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, 6th Floor, 950 L'Enfant Plaza, SW, Washington, DC 20024. Phone: (202) 586-2945. Please submit one signed paper original.

Instructions: All submissions received must include the agency name and docket number.

Docket: The docket is available for review at www.regulations.gov. All documents in the docket are listed in the index. A link to the docket web page can be found at http://www.regulations.gov/#!docketDetail;D=EERE-2013-BT-BC-0036. The Regulations.gov website contains instructions on how to access all documents, including public comments, in the docket.

FOR FURTHER INFORMATION CONTACT:

Ms. Kym Carey, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Mailstop EE-2J, 1000 Independence Avenue, SW, Washington, DC, 20585, Telephone: (202) 287-1775, E-mail: Kym.Carey@ee.doe.gov.

Ms. Kavita Vaidyanathan, U.S. Department of Energy, Office of the General Counsel, Forrestal Building, Mailstop GC-71, 1000 Independence Ave, SW, Washington, DC, 20585, Telephone: (202) 586-0669, E-mail: Kavita.Vaidyanathan@hq.doe.gov.

For information on how to submit or review public comments or view the docket, contact Ms. Brenda Edwards, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, Mailstop EE-2J, 1000 Independence Avenue SW, Washington, DC 20585. Telephone: (202) 586-2945, Email: Brenda.Edwards@ee.doe.gov.

SUPPLEMENTARY INFORMATION:

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I. Statutory Background

DOE is directed to provide technical assistance to states to support implementation of state residential and commercial building energy efficiency codes (42 U.S.C. 6833(d)).

II. Evaluating Compliance with Building Energy Codes

Building energy codes are commonly utilized to establish minimum levels of energy conservation in residential and commercial buildings, and greater compliance with code requirements ensures the intended efficiency measures are achieved. To assist states in their efforts, DOE developed a methodology that states could use to evaluate and measure compliance (See http://www.energycodes.gov/sites/default/files/documents/MeasuringStateCompliance.pdf). At the highest level, the evaluation methodology for code compliance entails 4 steps:

1) Identify building sample
2) Gather input from local jurisdictions
3) Evaluate via plan review and on-site inspections
4) Compile results and generate compliance rates.

For each of these four steps, DOE provided guidance, as well as supplemental tools and resources (See http://www.energycodes.gov/compliance/evaluation). In 2010 and 2011, the methodology was tested in a series of eight pilot studies funded by DOE. Individual studies were conducted in the states of Georgia, Iowa, Massachusetts, Montana, Utah, and Wisconsin. The remaining two studies were conducted in a group of Northwest states (Washington, Oregon, Idaho, and Montana). The studies were conducted over a 10-month period, with final reports from individual pilots submitted in June 2011. A number of recommendations for changes to the methodology resulted from these pilot studies, as well as were expressed by additional states conducting their own compliance evaluation activities.

One common observation from states that participated in the pilot studies was that the methodology can be costly and time-consuming. More specifically, the methodology required

significant effort to secure a valid building sample, numerous visits to each building, and extensive verification of individual code requirements. Revisions suggested to DOE in order to reduce state cost and time burden include the following examples:

1) Make the building sample selection process easier and/or less time consuming.
2) Reduce the number of site visits that must be made to each building.
3) Reduce the number of checklist items that must be evaluated at each building.
4) Reduce the number of buildings evaluated.

However, each of these could have a potentially negative impact on the statistical significance of the results of the code compliance evaluation.

Supporting energy code compliance is core to the DOE mission; providing technical assistance to states to implement building energy codes (42 USC 6833), including verifying and increasing compliance to ensure consumer benefits. As such, DOE seeks stakeholder input on fundamental questions related to how compliance should be defined, evaluated, and implemented, and has issued this Request for Information (RFI). This RFI seeks public input not only on the DOE methodology, but also on a number of questions related to general energy code compliance. DOE will consider these comments as it seeks to revise its approach to energy code compliance evaluation and guide future programmatic efforts.

Summary of the DOE Compliance Evaluation Methodology

DOE has developed a number of resources for states to use to evaluate compliance with building energy codes. These resources may be found at the DOE Building Energy Codes Program Compliance Evaluation page (See http://www.energycodes.gov/compliance/evaluation). A Step-By-Step Companion Guide (See http://www.energycodes.gov/sites/default/files/documents/Step_by_Step_Companion_Guide.pdf

) to the compliance process summarizes the steps in effective evaluation. The document *Measuring State Energy Code Compliance* ("methodology report")(See http://www.energycodes.gov/sites/default/files/documents/MeasuringStateCompliance.pdf), contains a detailed methodology for states to determine an overall state metric for building energy code compliance. Interested parties should consult the full text of the methodology report, however, for convenience the key points of the methodology are listed below with the relevant section numbers from that document noted in parentheses:

- Evaluate buildings using second-party evaluators for self-assessments (a second-party evaluation would be performed by local code officials) (4.1)
- Evaluate buildings using third-party evaluators for formal evaluations (a third-party evaluation would be performed by a party that has no direct relationship to the buildings being evaluated) (4.1)
- Evaluate buildings using the DOE-developed checklists for the 2009 IECC (residential) and ASHRAE Standard 90.1-2007 (commercial)(For checklists, see http://www.energycodes.gov/compliance/evaluation/checklists).
    - States which have adopted the 2009 IECC for commercial buildings should use the ASHRAE 90.1-2007 checklists to determine compliance. (2.1)
    - Low-rise multifamily buildings are to be evaluated against the 2009 IECC Chapter 4 requirements instead of the commercial code. (2.3)
- Generate a statistically valid sample across four distinct market segments (populations): new residential construction, new commercial construction, residential renovations, and commercial renovations.

- A statistically valid sample size was determined to be approximately 44 buildings in each population. (5.2.1)
- The compliance results for the four populations should not be combined for the overall state compliance score and rather should be reported separately. (5.1)
- It is recommended that a formal evaluation of a given population be completed within a 1-year time period. (5.1)
- New commercial buildings are further separated into the following size strata definitions: (5.2.1.2, 5.2.1.3)
    - *Small*: 1-2 stories, single zone, up to 25,000 ft^2 in conditioned floor area
    - *Medium*: Larger than 25,000 ft^2 and up to 60,000 ft^2
    - *Large*: Larger than 60,000 ft^2 and up to 250,000 ft^2
    - *X-Large*: Larger than 250,000 ft^2 and up to 400,000 ft^2
    - *XX-Large*: Larger than 400,000 ft^2.
- The sample size derivation for commercial buildings assumes that 44 samples will be drawn from small, medium, and large, but this sample size may increase for states with X-large and XX-large buildings, and may decrease for states with less new commercial construction. (5.2.2.1)
- For all four categories, if a state has multiple climate zones, distribute the sample across climate zones based on the average number of building starts over the previous 3 years. (5.2.2.2)
- Vary the building samples to include a mix of use type, size, complexity, etc. For example, include mixed use residential/commercial buildings; townhouses and

multifamily structures three stories or less above grade (residential); and vary sample by building type, size, ownership, etc. (commercial). (5.1, 5.2)

To assist states in generating a statistically significant sample, DOE provided the State Sample Generator tool (See https://energycode.pnl.gov/SampleGen). This tool contains building permit data for the years 2008 through 2010 from McGraw Hill Dodge ("Dodge") construction dataset for new commercial construction and renovations (See http://www.dodgeprojects.construction.com), and building permit data from the U.S. Census Bureau ("Census") for new residential construction (See http://www.census.gov/construction/nrc). Residential renovation data is not included in the Sample Generator, as there is no known significant nationwide source of data available. The sample generator can be used to identify which counties should be sampled within each climate zone within a particular state, and in what proportion to generate statistically significant samples for each market segment population (i.e., new residential construction, new commercial construction, and commercial renovations). Note that if no commercial renovations permits were identified in a state, for example, then no commercial renovation sample can be determined using the Sample Generator tool. Examples of the use of the State Sample Generator may be found in Section 5.2.2.2 of the methodology report.

The methodology report describes the structure of the compliance evaluation checklists. Residential and commercial checklist items are each assigned to one of three tiers in an effort to emphasize the most important code requirements. Each tier is given a different weight in determining the overall building metric. Tier 1 requirements are worth 3 points. Tier 2 requirements are worth 2 points. Tier 3 requirements are worth 1 point. (5.3.2)

The methodology report also explains that while the checklists are based on the prescriptive requirements found in the designated codes and standards, the checklists can also be used for buildings that demonstrated compliance using a trade-off approach or whole-building performance approach, as long as the appropriate documentation is available at the time of plan review and inspection. (6.1) The checklist items are grouped into sections corresponding to the phase of construction where the checklist item is typically inspected.

While it is not explicitly stated in the methodology, a single building is ideally used to complete a compliance evaluation checklist. However, the methodology also allows for multiple buildings to represent a single evaluation by compiling partial checklists for similar buildings into a single representative building. Different buildings can be used for different phases of construction; this is referred to as the "construction phases approach" in the methodology. (6.3) The "primary" building approach can be used as an alternative to evaluate observable checklist items, with a separate (but similar) building used for items that were not observable in the primary building (e.g., due to timing of the evaluation within the construction process). (6.4)

- If multiple buildings are used, they must be from the same jurisdiction and type.
- If multiple commercial buildings are used, they must also fall in the same size stratum.

The checklists can also be used to gather data during different stages of construction on different buildings that have the same general attributes in order to yield a resulting single composite building in lieu of evaluating a single building throughout construction. For example, several houses in a new subdivision where there are homes in various stages of construction might be evaluated. The same cautions regarding multiple buildings as noted for the "primary" building applies to this approach as well. (6.3)

DOE developed the Score + Store tool (See https://energycode.pnl.gov/ScoreStore/login) to help states and local jurisdictions determine and report compliance rates for both individual buildings and at the state-level in order to meet compliance and efficiency goals. A compliance rating of 0-100% for each evaluated building is assigned based on the proportion of code requirements met applying the tiered weighting system. Scores are then averaged within a state to derive an overall compliance metric.

- The overall state compliance metric for residential new construction is derived by taking a simple average of all individual building scores within the population. (5.4.1)
- For the overall state compliance metric for commercial new construction, weighted individual scores for new commercial construction are used to estimate average compliance rates for each building size stratum within the state. These average compliance rates are then rated according to the proportion of total square footage constructed within each stratum. (5.4.1)
- Overall state compliance metrics for residential and commercial renovations are derived by taking the total number of weighted checklist items evaluated for all buildings in the sample as the divisor and the number of those weighted items that are in compliance as the numerator, multiplied by 100. This does not result in an individual metric being assigned to each building, but does provide a state-wide metric that takes into account the varied number of code requirements against which each observed renovation is evaluated. (5.4.2)

The methodology report also describes a number of pre-evaluation information gathering and training activities that could be undertaken by a state before it attempts to determine the state compliance rate. These activities include (3.1):

1) Establish a compliance working group to help plan the code evaluation process and to improve communications between stakeholders.
2) Perform self-assessments using building department staff to evaluate buildings.
3) Evaluate results of self-assessments to identify potential code compliance issues.
4) Train and educate stakeholders to address identified code compliance issues and barriers.
5) Launch third-party compliance evaluation only after the previous activities.

The methodology also suggests two other possible activities prior to full compliance evaluation:

1) Survey the jurisdictions regarding local energy code plan review, inspection, and administration to assess the policies and processes that are currently established. DOE has provided a Jurisdictional Survey (See https://www.energycodes.gov/compliance/evaluation) that may be used as a sample. (3.2)
2) Conduct "spot checks" of code requirements considered problematic to ensure that those requirements are being met. (3.3)

Summary of findings from the Compliance Pilot Study conducted by DOE

The DOE methodology was pilot tested in nine U.S. states through eight distinct studies funded by DOE under the Recovery Act. In addition, three other states utilized parts of the methodology in separate, but concurrent, efforts, and are also discussed in the *90% Compliance Pilot Studies* final report ("pilot study report")(See http://www.energycodes.gov/compliance-pilot-studies-final-report). The primary purpose of these pilot studies was to assess the effectiveness of the DOE guidelines and tools developed under the Recovery Act, and to provide

suggestions for their improvement. The pilot studies should not be interpreted to represent national or state compliance rates.

The pilot study report summarizes observations and comments received by the participants regarding code compliance evaluations. Some of the observations and comments were the following:

- State compliance measurement studies can be costly and may require multiple visits to the building while under construction. Post-construction evaluations were implemented in one study in an effort to reduce these costs, but many code requirements cannot be evaluated post-construction.
- Data sources for generating sample sets of buildings to be evaluated are not always accurate and, in some cases, are not available (e.g., residential renovations). Generating valid sample sets was further complicated by the economic climate and the fact that new housing starts were significantly lower than past data predicted.
- Timing onsite visits to observe all code requirements is difficult for third-party evaluators.
- Access to buildings under construction is a barrier in some locations.
- Consistency is difficult to obtain across studies and among individual evaluators.

States may choose to address these issues by engaging in alternative, less costly measurement activities, some of which are discussed in Section 10 of the pilot study report. Despite problems in accurately measuring compliance, the pilot studies provided several insights into where states might focus their efforts in increasing compliance rates, including the following observations:

- The top barrier to compliance continues to be lack of training, followed by lack of resources and lack of compliance information on plan submissions. While training is an

ongoing effort, and lack of resources may be difficult to address, states can work with local enforcement jurisdictions to ensure adequate documentation is received and to provide training.

- Buildings that demonstrated compliance using software tools showed a strong correlation with higher compliance rates. Software reports provide additional documentation of compliance, which might partially account for the correlation with higher compliance rates.

Other Recent DOE Activity Related to Energy Code Compliance

Since the methodology was published in 2010, DOE has taken steps to improve not only the methodology, but also the supplemental resources to assist states in raising compliance levels. These include the pilot studies, as well as enhancements to DOE code compliance software tools to make the process of code compliance and evaluation more seamless. DOE is currently adding functionality to the RES*check* (See http://www.energycodes.gov/rescheck) and COM*check* (See http://www.energycodes.gov/comcheck) software to augment compliance information pertaining to a specific building:

- A Requirements Screen was added to capture information about code requirements not currently addressed in RES*check* and COM*check*.
- Checklists for specific RES*check* and COM*check* buildings are being incorporated into the software compliance reports and include the information gathered in the Requirements Screen.

DOE is also providing a way for the Score + Store tool to generate checklists that are customized for specific buildings based on RES*check* and COM*check* projects. These custom

checklists will include information entered into RES*check* and COM*check*, and remove code requirements that do not apply to that specific building. They can be used to evaluate a specific building's compliance rate in the same way that the generic checklists have been used in previous studies. Such changes serve to improve interoperability between the DOE compliance software tools and associated resources.

III. Request for Information and Comments

DOE has also revisited the methodology for measuring compliance in light of the pilot studies with the goal of identifying potential enhancements. DOE has received comments from various interested parties. Based on feedback already received, potential enhancements are incorporated into the list of questions for which DOE is seeking input in this Request for Information.

DOE is particularly interested in receiving information on the following questions. The questions are sorted into five categories: Defining and Achieving Compliance, Costs and Benefits, Compliance Targets, Evaluating Compliance, and DOE Compliance Evaluation Resources and Actions.

Defining and Achieving Compliance

- How should DOE define compliance with energy codes?
- What are the barriers to achieving compliance?
- How can those barriers to achieving compliance be overcome?

Costs and Benefits

- What state and national policy benefits are related to compliance?
- What consumer benefits are related to compliance?

- What are the most cost-effective compliance mechanisms?
- What methodology or assessment provides the highest energy savings in the market?
- What is the minimum cost to do a valid compliance study?

Compliance Targets

- How should compliance be measured (i.e., methodology)?
- Should DOE emphasize achieving a particular rate of compliance (e.g., 90%) similar to what was specified in ARRA?
- How frequently should compliance be evaluated?
- Should compliance be measured as documentation of energy savings associated with energy codes?
- What metric should be used for measuring compliance?
- How should progress be tracked and at what level (i.e., national, regional, state, local)?

Evaluating Compliance

- Who should evaluate compliance? (e.g., local building department, state building code authority, State Energy Office, contractors hired by the state/locality, etc.)
- What are the barriers to evaluating energy code compliance?
- How can those barriers to evaluating compliance be overcome?
- Are there other approaches to energy code compliance measurement (different from the existing DOE methodology) that have been used successfully?
- How much emphasis should DOE put on statistical significance of compliance evaluation results?
- Do residential and commercial compliance evaluation studies require fundamentally different sampling plans and research methodologies?

- Are there ways to encourage owners and developers of poorer performing buildings to participate in compliance evaluation studies?
- How should DOE address buildings that are better than or above code in compliance evaluation?
- Are there other approaches to energy code compliance that have involved public utility commissions and public utilities?
- What roles do public/private utilities have or could take in improving energy code compliance? Can evaluation of energy code compliance could be considered similarly to evaluation of utility "above code" programs.
- Are there approaches to energy code compliance that have the potential to be financially self-sustaining (i.e., approaches to energy code compliance that do not require direct government funding)?
- What is the proper way to attribute energy savings from compliance programs to various stakeholders?

DOE Compliance Evaluation Resources and Actions

- Should DOE provide resources for compliance evaluation, such as software tools, methodologies, checklists, training templates, etc.?
- Are there additional resources DOE should be providing for energy code compliance that are not currently available?
- How could incentive funding be used to facilitate states to increase energy code adoption and compliance efforts?
- Is there a role DOE could play to support third-party evaluators?

- What other suggestions would you have for DOE to consider, in working with states, municipalities, and the construction community to better understand, track, and assist with energy code compliance?

Issued in Washington, DC, on July 31, 2013.

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