



*A Division of the Home Performance Coalition*

## **The Role of Home Energy Performance Improvements in Meeting State Requirements in Forthcoming CO2 Emissions Standards for Existing Power Plants**

### **(Comments on Clean Air Act Section 111d)**

There has been a great deal of discussion about the inclusion of energy efficiency as a compliance mechanism for meeting the state requirements for carbon dioxide standards under Clean Air Act Section 111d. As representatives of the home performance community, we look forward to providing detailed comments on the June 2014 draft compliance options. In advance of this public comment period, we wish to express our strong support for the use of energy efficiency as a compliance option.

Further, to ensure that the contribution that energy efficiency can provide to meeting compliance goals is accurately quantified, we urge you to include energy performance-based metrics among the compliance tools. Significant technological advancements that allow the collection and analysis of much larger quantities of energy consumption-related data, the development of national data standards, and new training methods are all contributing to a new context that allows quantification of energy efficiency in a way that was not possible only a few years ago. These advancements in our understanding of residential energy use will provide the evaluation, measurement, and verification necessary for the more than 130 million housing units<sup>1</sup> to participate in carbon reductions in a meaningful and measureable way.

The National Home Performance Council (NHPC), a division of the Home Performance Coalition, is a national non-profit organization that works with federal governmental agencies, utilities, state programs, contractors, and others to strengthen and advance the whole-home energy efficiency upgrade industry through standards development, stakeholder engagement, policy analysis, and research. Efficiency First (EF) is a national nonprofit trade association that unites the Home Performance workforce, building product manufacturers and related businesses and organizations in the escalating fight against global warming and rising energy costs through the promotion of quality residential energy improvements.

NHPC and EF believe that energy efficiency should be treated as a clean resource and that by reducing demand (and its resulting emissions) is as effective a clean compliance mechanism as producing energy from renewable energy or reducing emissions from the power plant through emissions abatement technologies<sup>2</sup>. In particular, we would appreciate the ability for states to include performance-based energy efficiency in their plans for compliance.

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<sup>1</sup> <http://quickfacts.census.gov/qfd/states/00000.html>

<sup>2</sup> RAP, "Further Preparing for EPA Regulations," David Farnsworth, January 2014

## Where to Regulate

NHPC and EF support the comments submitted by the Alliance to Save Energy and ACEEE<sup>3</sup>, the Regional Energy Efficiency Organizations,<sup>4</sup> and the Advanced Energy Economy<sup>5</sup> in their assertion that each state should be given the latitude, under a broad framework, to achieve targeted emission reduction values either through source reduction or through valuation of “outside the fence” actions. We support the recommendations that EPA adopt a system-wide approach versus a facility-per-facility standard approach to allow more opportunities for market-based instruments, including emissions trading and offsets within the power sector to be included in compliance planning. This will help existing homes, if there is the opportunity to aggregate savings among homes.

A balance between standardization and flexibility is critical for the guidelines, particularly as it pertains to evaluation, monitoring and verification. We recommend that a menu of options be provided to the states that allow for possible compliance actions (policies or technology areas) accompanied by a set of evaluation, monitoring and verification standards. In addition, we urge the EPA not to avoid including options because the standards have not yet been established. New standards and methodologies for tracking and measuring energy efficiency continue to emerge and will provide a significant EM&V resource.

## Home Performance Measurement

The decrease in energy consumption and the associated carbon emission reductions that results from energy efficiency upgrades in residential buildings are inherently challenging to measure. These energy savings and carbon reductions must be quantified by estimating the energy consumption that would have taken place if the retrofit had not occurred and comparing this expected consumption to the building’s actual consumption.

One approach to quantifying energy savings is the “deemed savings” approach: the assumption that a given intervention in a home, such as an increase in attic insulation, will reduce energy savings by a specific amount. Such deemed savings are useful as a guide, but they are not reliable for quantifying energy savings with any real precision, because each home has different characteristics that affect the energy saving value of the measure, and because measures interact with one another.

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<sup>3</sup> ASE and ACEEE “Response to EPA: Considerations in the Design of a Program to Reduce Carbon Pollution from Existing Power Plants,” December 5, 2013

<sup>4</sup> Regional Energy Efficiency Organizations, “Incentivizing and Providing Appropriate Credit for Energy Efficiency Improvement in Forthcoming CO2 Emissions Standards for Existing Power Plants,” November 2013

<sup>5</sup> Advanced Energy Economy “Recommendations on EPA’s Forthcoming Proposal To Reduce Carbon Emissions from Existing Power Plants,” February 2014

A second method is to predict savings using modeling software, which predicts the potential savings to be realized by proposed energy efficiency measures on the basis of information about the measures and the home's other characteristics. The suite of RESNET Existing Residential Building Tax Credit Software tests provides a base level of certainty that a given modeling tool will make reasonably accurate predictions. And a recent study has been shown that modeling tools can achieve a 92% "realization rate" (the ratio of predicted to actual savings) when the baseline of the home is calibrated to utility bills using the national BPI-2400 standard, as described later in this document.

A third and more effective method for quantifying energy and carbon savings generated as a result of energy efficiency measures involves comparison of the "pre-" and "post-retrofit" energy consumption of the homes that were upgraded, together with comparison of data from the same time periods from a group of comparable homes that did not undergo upgrades. These methods typically rely on conventional monthly billing data for the pre- and post-upgrade comparisons. This approach to quantification can yield accurate results. However these studies have in the past proved expensive to conduct and the results are limited by reliance on monthly data only. The more granular data that smart meters and home energy monitoring devices make available have the potential to address these issues, and may prove to be a game changer in EM&V.

### **Enhanced Evaluation, Measurement and Verification**

By 2015, approximately 65 million smart meters will have been installed, with the result that about 50% of US households will contain a smart meter.<sup>6</sup> This enormous amount of data about home energy use has yet to be tapped for evaluation, measurement and verification (EM&V) purposes. Data from smart meters can enhance "traditional" EM&V, as described in the previous section, by reducing the costs of obtaining pre- and post-retrofit data for a reasonably sized sample of homes. Smart meters can also provide detailed information about energy consumption in extremely short time intervals throughout the day; this data can help to explain observed reductions in energy consumption through techniques that disaggregate "baseload" energy consumption from energy used for heating and cooling.

### **Building Performance Data Evolution: The Difference Between Today and 5 Years Ago**

During the past five years, the home performance industry has developed national standards for the collection and transfer of data that will allow much more precise quantification of the energy saved through the installation of energy efficiency measures than has been possible. The two Building Performance Institute standards, BPI-2200 (*Standard for Home Performance-Related Data Collection*) and BPI-2100 (*Standard for Home Performance-Related Data Transfer*), provide a data dictionary for the residential energy efficiency field and a standard protocol for

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<sup>6</sup> : Institute for Electric Efficiency, *Utility-scale smart meter deployments, plans & proposals*, May 2012

transferring this data between different software systems. An addendum to BPI-2200 defines a standard data set to be collected at the completion of an energy efficiency upgrade. (Note that BPI-2200 is aligned with the evolving DOE BEDES standard.)

These standards are reducing the costs of collecting data and allowing much more high-quality data to be collected by making click-of-a-button reporting possible. The data collection challenge for residential energy efficiency programs involves finding a way for contractors to report the work that is done in a home to the program administrator. This is typically achieved through transfer of a file from the contractor's software (which can range from an excel spreadsheet or a fillable PDF to sophisticated modeling software) to a program administrator's database. Until now, the standard practice has been for each program to develop its own unique data reporting requirements, requiring software developers to create new reporting formats for each program. The expense of this work typically results in clumsy, hard-to-use solutions. Adoption of the standards, by contrast, allows programs to use off-the-shelf software tools to report a standard, high-quality data set with only minimal IT costs for customization.

In summary, adoption of the new data standards allow contractors to easily submit large quantities of data to programs, and ensure that the data that each program receives is consistent with and comparable to the data received by other programs.

The large quantities of high-quality data that can be generated by programs using the new data standards can make a significant contribution to efforts to quantify the reduction in energy consumption realized by residential upgrades. Smart meter data can indicate with a high degree of precision how much energy is being consumed in a home at a given time, and even provide strong indications as to which systems are responsible for the energy consumption. However, its ability to explain what is *causing* a change in energy consumption is limited. The rich data sets about energy efficiency upgrades made possible by the BPI data standards make possible a new level of analysis, in which on overall reduction in energy consumption can be associated with the overall size of an upgrade, and even with specific energy efficiency measures undertaken.

Analysis of smart meter data and data on implemented energy efficiency measures in combination can be used both as a check to provide additional certainty that observed reductions in energy consumption are the result of the energy efficiency program (rather than behavioral or other factors). Such analyses, if based on sufficiently large samples, can also be used to predict the impact of specific energy efficiency measures (or combinations of measures) on energy consumption.

### **Better Modeling**

The residential energy efficiency field has developed sophisticated modeling techniques to estimate the energy savings that will result from any given package of energy efficiency measures. These models have often performed relatively poorly in their ability to predict actual

post-retrofit energy consumption, as indicated by actual billing data. However, a new national standard, BPI-2400 (*Standardized Qualification of Whole House Energy Savings Estimates*), has demonstrated a way to improve modeling accuracy. BPI-2400 provides a methodology for “calibrating” a model to actual, pre-retrofit billing data. Preliminary research indicates that this calibration significantly increases the accuracy of predicted energy savings.<sup>7</sup> Modeling tools that calibrate according to BPI-2400 or a similar protocol might be used as a way to estimate the savings from energy efficiency measures with a relatively high degree of accuracy.

## Conclusion

Thank you for this opportunity to provide comment on the role of home energy performance improvement in meeting state requirements in the forthcoming CO2 emissions requirements for existing power plants. We look forward to reviewing the compliance options released in June and providing more detailed insights on the role the home performance industry can play in meeting the requirements on the states. Please do not hesitate to contact our government affairs representative, Kara Saul Rinaldi at 202.276.1773 or [kara@anndyl.com](mailto:kara@anndyl.com) with any questions.

Sincerely

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Brian Bovio, Chair  
Efficiency First

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<sup>7</sup> See New York State Energy Research and Development Authority. “Home Performance with ENERGY STAR Realization Rate Attribution Study.” February 2014.