DEPARTMENT OF ENERGY
Energy Efficiency and Renewable Energy

National Energy Rating Program for Homes

Request for Information (RFI)

RFI Submissions: You may submit comments, identified by "RFI: National Energy Rating Program for Homes," by any of the following methods by **July 10, 2010**:

1) Federal eRulemaking Portal:

http://www.regulations.gov. Follow the instructions for submitting comments.

2) E-mail:buildingratingRFI@EE.DOE.GOV. Include "RFI: National Energy Rating Program for Homes" in the subject line of the message.

3) By Mail: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy (EE-1), 1000 Independence Avenue, SW , Washington, DC 20585 Attn: National Energy Rating Program for Homes, Jessica Balsam

Comments must be received by no later than **July 10, 2010**.

BACKGROUND:

The Department of Energy (Department/DOE) seeks to develop a voluntary National Energy Rating Program for Homes (National Program). With the focus on existing homes, this program would help implement key recommendations of the Vice President's Middle Class Task Force, as outlined in the Report, *Recovery Though Retrofit*.[1] The overall objective is to facilitate a new level of investment in home energy efficiency by overcoming a range of informational and market barriers frequently identified as hindering these investments. Greater investment in home energy retrofits will grow jobs, save homeowners money on their energy bills, help avoid emissions of greenhouse gases and other air pollutants, and improve energy security. This strategy is intended to support and compliment existing residential retrofit programs happening across the country.

The Department has been involved in a number of efforts related to home energy performance over the past two decades. To date, the Department has focused largely on new homes, through its work with the Home Energy Rating Score (HERS), the E-scale, and ENERGY STAR for New Homes. Now, the Department is working to establish a rating program that could be broadly applied to existing homes and provide reliable information at a low cost to consumers. The Department recognizes that the National Program must be complementary to these efforts as well as to other residential energy efficiency and rating programs across the country.

This Request for Information (RFI) calls on stakeholders to review the proposed approaches and provide information that can inform the Department in the development and implementation of this strategy.

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[1] Middle Class Task Force. 2009, October. Recovery Through Retrofit. Council on Environmental Quality. 12 pp. http://www.whitehouse.gov/assets/documents/Recovery_Through_Retrofit_Final_Report.pdf

The National Program would consist of standardized approaches for evaluating home energy performance and options for conveying this information to the consumer. This RFI builds upon the rationale as outlined in the *Recovery Through Retrofit* Report. It presents the following aspects of the National Program:

- Guiding principles for the program
- Options and approaches for key elements of the program
- Pros and cons of various approaches
- Initial proposed approach where the Department has developed one
- Additional work that the Department is considering

It is structured by presenting information, issues and options in the following areas:

1) Basic Metric
2) Rating
3) Scales and Reference Points
4) Recommendations for Improvements
5) Presenting Information to the Consumer
6) National Home Energy Registry
7) Quality Assurance
8) Potential for Additional Supported Options
9) Other Issues
10) Glossary of terms (for words in bold in the document)

The Department will consider all input it receives. The Department plans to have an initial program design available by end of September 2010 with additional opportunities for stakeholder input between the RFI dissemination (June 2010) and September 2010. Based on the program design provided in September, the Department expects to partner with interested parties and ongoing residential energy efficiency retrofit programs to implement this effort.

Introduction

Lack of access to credible, reliable information on home energy performance and cost effective improvement opportunities limit consumers from undertaking home energy retrofits. The Department seeks to address this lack of information by establishing standardized approaches for assessing the energy performance of homes, identifying opportunities for improvement, and providing consumers with this information. At the same time, the Department recognizes that consumers in different parts of the country may find value in different types of information and expects to design a program that allows some flexibility and customization by the organizations that may partner with the Department to implement this program. The structure of these partnerships will be explored in another document.

Guiding Principles

The primary goal of this program is to spur home energy improvements or retrofits. Given that consumers must ultimately make the choice to invest in retrofits, the program must work first and foremost for the consumer. Based on experience from other consumer-oriented programs, such as ENERGY STAR, the following principles would guide the program:

- Information must be credible, reliable, and replicable.

- Information must be transparent and easy to understand.
- Implementation costs must be affordable.
- Program must include effective quality assurance.

The Department welcomes stakeholder comment on these guiding principles as the framework for the development of the program.

The options presented for each of the key program elements are discussed relative to these guiding principles. Attachment A depicts a chart delineating how options relate to the guiding principles. This discussion has also been informed by the Department's review of existing studies, home performance rating and labeling programs across the U.S. and worldwide, as well as audit software tools.

1) Basic Metric

A home's energy performance can be described in a variety of different ways, including (1) how much energy the home is likely to consume; (2) how much utility bills are likely to be; or (3) the amount of greenhouse gas emissions associated with the home's energy use. Regardless of what metrics are selected, the label must present these metrics so that consumers can easily understand them. The Department is considering a variety of options as described below.

Energy Metric – Source or Site Energy Use; Regional or National Energy Data

An energy metric is likely the most straightforward metric to use in a program about home energy performance. Given the goals of helping the consumer understand home energy

performance and encouraging home retrofits, this metric would need to provide consumers with information as to the total energy use of the home and the potential for improvement. DOE believes that a **source energy** metric would allow consumers to more equitably consider all fuel types. Furthermore, depending on the conversion factors used, as well as how renewable energy is counted, source energy can more effectively reflect the environmental consequences of energy generation, transmission, and use.

For these reasons, the Department plans to use source energy as the basic metric for the program. This would ensure that the information provided for homes that use both gas and electric energy will reflect the energy consumption of these fuels using an apples-to-apples approach and reflect a more complete picture of the energy use of the home. While the use of source energy, relative to **site energy**, requires the use of a conversion factor to convert site electricity use to a source equivalent, the Department believes this can be accomplished in a manner that is credible and transparent for the consumer as well as easy to implement and oversee.

The source energy associated with the use of electricity can either be determined on a regional or national basis. The benefit of using a national conversion factor for source energy is that it is easier to implement and allows the easy comparison of energy performance for homes across the nation. Regional source conversion factors, however, more accurately depict the actual energy use of the home and are also readily available.

Cost Information

Showing a home's energy performance in terms of dollars would be beneficial because consumers are not generally familiar with energy units such as British Thermal Units (BTUs). However, energy costs vary considerably in different parts of the country and change over time. If cost information is provided, steps would be necessary to help consumers understand that their costs could vary considerably or to provide them with access to more specific information on how their specific rate structure could affect the potential for energy savings in their home (e.g., through web-based information). Furthermore, in order to have home energy performance information that is replicable and transparent it may be important to have a metric that changes only when the efficiency of the home changes, not when the prices for the energy of the home change. This direction is supported by the complexity associated with the many different local energy rate structures that residential customers currently face as well as the movement to time of use pricing. For these reasons, the Department does not intend to choose cost information as the primary metric for the program. However, the Department is exploring how to support this information as an optional element of the program based on a partner's interest.

Greenhouse Gas Information

Reducing energy use also reduces emissions of greenhouse gases. This program would provide an opportunity to educate consumers about the greenhouse gas emissions associated with home energy use and the opportunities to reduce those emissions. Since greenhouse gas emissions directly relate to the local sources of energy, emission levels would be more accurate if calculated using local or regional source information. For these reasons, the Department does not intend to choose greenhouse gas information as the primary metric for the program.

However, the Department is exploring how to support this information as an optional element of the program based on a partner's interest (see #8 below).

Initial Approach: The Department intends to use annual source energy consumption as the primary **performance metric** (potentially adjusted for square footage and climate zone, see below) and to use a national conversion factor to convert site electricity use to source energy consumed.

2) Ratings

The specification of the rating method is a cornerstone of a standardized home energy performance and rating program. Based on a review of programs across the U.S. and world wide, there are a number of issues that need to be considered. These include:

"Asset" Rating or "Operational" Rating

An **asset rating** provides an assessment of a home's energy performance based on the physical characteristics built into the home given a standardized set of operating characteristics. It allows consumers to differentiate between the physical assets of the house and the behavior of its occupants and facilitates comparisons across different homes. Asset ratings are typically determined by entering measured building information into a software tool and using stipulated operational assumptions. The software then calculates the "score" based on the calculated energy use.

All modeling tools have some degree of uncertainty; and measurement inputs are dependent both on the auditor as well as on the degree to which certain building characteristics can actually be measured (e.g. tightness of thermal envelope).

Operational ratings reflect how a home performs given a homeowner's actual usage patterns and can be generated by looking at energy data from utility bills. An operational rating is based on the actual energy use of a home and reflects the specific ways in which occupants use the home.

Occupant behavior can have a significant impact on the energy use in a home, so relying on energy bills alone may not provide the type of replicable, transparent, and verifiable system desired.[2] However, combining energy usage data with some data on key characteristics of the home may be a viable approach, though additional work is needed to assess such an approach relative to the program guidelines outlined above and relative to other methods.

Controlling for Size of Home and/or Climate Zone

The primary purpose of the program is to motivate consumers to reduce their home energy use. Because energy use correlates fairly closely with the size of a house, it is important to determine how best to provide information that is helpful to consumers in making home retrofit decisions. An **efficiency rating** (e.g., energy use per square foot; energy use per home with X number of bedrooms) may motivate a homeowner to make changes regardless of the home's overall energy

[2] As an example, occupant behavior was estimated to impact home energy use by as much as a factor of 5 in a recent NREL study on 115 new houses in Las Vegas (Bianchi, M. 2010, April. Putting Energy Savings Software through the (BEST) Test. ACI National conference presentation. NREL. Austin, TX.)

use. For example, a homeowner in an inefficient small home may still be able to benefit from energy improvements even though the home uses less energy than an average home. A **consumption rating**, conversely, allows a consumer to understand how much energy the home actually uses. Therefore, a small home would generally rate more favorably than a large home and potentially mask the energy savings opportunities of the smaller home.

If an efficiency metric is pursued, the energy use for a home could be normalized based on square footage, number of bedrooms (which would serve as a proxy for the number of occupants) or some other measure to reflect the size of home. This may require additional definitions, standardization, and training to ensure consistency in how square footage is measured, how bedrooms are counted, etc.

Either type of rating -- efficiency or consumption -- can provide useful, credible information. Regardless of whether a consumption or efficiency metric is used, consumers are likely to be motivated in part by how they compare to various reference points as well as how a home can perform with or without improvements. Therefore, the Department is carefully considering what points of comparison to include in the program (see discussion under #3 below).

As with size, climate can be factored into a home energy rating. Homes in mild climates typically use less energy than homes where heating and/or cooling needs are greater. A rating that is adjusted for climate would help educate homeowners on home energy efficiency versus the magnitude of energy required to deliver services in the home. It would help place the energy bill in context relative to other homes throughout the country. That is, a house in San Diego

could be compared to one in Minneapolis or Miami. While improving the ability to compare different homes' levels of efficiency, this adjustment for climate may reduce transparency.

Finally, if utility bills are used as part of the rating method, climate normalization -- that is, readjusting the bills to take into account the actual weather for that period -- would increase replicability from one time period to another.

Initial Approach: Based on the primary objectives of educating consumers about home energy performance and motivating home retrofits, the Department intends to use an asset rating that would result from the use of a prescribed set of data, data collection methods, and calculations. The Department is undertaking additional work to explore the specific data, collection methods, and calculations. The Department is considering adjustments for home size and climate.

3) Scales and Reference Points

Information can be provided in a number of ways to help the consumer understand home energy performance, how one's home compares to other homes, and the opportunities for improvement. Understanding how a home compares to others – particularly homes in the vicinity -- has been identified as information that can help motivate consumers to make changes.[3] The Department is considering a variety of options as described below.

Numeric Scale Reflecting Physical Units

Some scales simply represent a certain type of physical unit. For example, the EnergyGuide label found on household appliances uses a cost scale. While not shown on a scale, the miles per gallon rating displayed on new cars is another example of using non-converted physical units to convey information.

[3] Sellers, D. Using Utility Bills and Average Daily Energy Consumption to Target Commissioning Efforts and Track Building Performance. Portland Energy Conservation Inc., Portland OR.

A benefit of physical unit scales is that they are fairly transparent – that is, the consumer sees a number that hasn't been converted into another number or rating. A disadvantage of this type of scale is that the specific unit – for example, BTUs – may not be commonly understood.

Numeric Scale Converting Physical Units into Score System

Some rating programs convert a metric from physical units into a score or index. EPA's portfolio manager, for example, converts energy use in commercial buildings into a score on a 100 point scale. The HERS scale used primarily for new homes also converts energy units into an index, where 100 represents a home built to 2004 International Energy Conservation Code standards.

Consumers may more easily understand score systems and therefore appreciate having BTUs converted into a point scale. However, these types of scales can still generate confusion given that various programs use scales that go in different directions – that is, a high score is good on some scales while a low score is good for others. This type of scale also creates the additional problem of how to best convert physical units into specific points on a scale and reduces overall transparency.

Non-numeric Systems Using Bins and/or Reinforcing Symbols

As an alternative to a numeric scale, energy performance information can be presented in a set of bins (e.g., grades, stars, points). One benefit of a binned system is that a consumer can more easily gauge how the house performs relative to other homes. That is, if a house is rated an "A"

or “5 out of 5 stars” or “9 out of 10”, a consumer would interpret that as a highly performing home. Likewise, if a house was rated as a C or 3 stars or a “6 out of 10”, a consumer would likely presume that the house’s energy performance is average.

While stars and grades can be attractive from the perspective of simplified communication to consumers, a binned system also has drawbacks. In particular, if a binned system is used, the method for calculating the rating value needs to be sufficiently precise to reliably place homes in the appropriate bin. Imprecise models could result in a home being rated a “B” rather than an “A” or vice versa.

Points of Comparisons and Benchmarks

Consumers are often motivated by how they compare to others, as mentioned above. For example, a homeowner with a small home that uses less energy than an average home may still choose to improve the efficiency of their home if it compares poorly relative to other homes in the area. Conversely, the owner of a large home may be motivated to change their behavior or improve the building further if they understand that the home, while relatively efficient, uses a lot more energy than other homes in the area – even if these homes are smaller. Types of reference points or **benchmarks** include but are not limited to the following: an average home of comparable size; a new home; an average home in the same climate zone; a home that meets current local codes. Once the types of reference points are agreed upon, a program needs to define how those reference points will be generated.

A home's potential energy performance, given investments in energy efficiency, is perhaps the most important point of reference. This point allows a consumer to understand how much energy or money they can save if certain improvements are made (see # 4 below).

Initial Approach: The Department intends to use an absolute numeric scale without converting to a point scale or converting into bins (e.g., grades), complemented with key comparisons/benchmarks, and to explore supporting the following types of benchmarks and reference points:

- The home's energy performance with improvements (see #4 below)
- A national average home of similar size
- A new home in the state or locality

4) Recommendations for Energy Efficiency Improvements

Energy audits and assessments can provide useful information on the extent of energy savings possible from home improvements and recommendations for the types of improvements to make that are cost-effective. This type of information will motivate some consumers to implement retrofits that will save energy and money, and in some cases increase comfort and/or health.

While recommendations for improvements are useful, there is not currently a standardized approach to providing and prioritizing these recommendations. They may vary to some degree depending upon the audit or analysis tool used, or the professional who conducts the assessment or audit. Recommendations could be prioritized based on simple payback, potential energy savings, or other factors, including local utility rebates.

Given the limited opportunities to educate consumers about how to save energy in their homes, information regarding potential improvements, while imperfect, is important. At the same time, these recommendations need to be complemented and fleshed out further through the work of qualified home improvement contractors for the consumer to make final determinations regarding improvements.

Key design decisions in developing a standardized approach to home improvement recommendations include whether to use national or regional data on energy prices and costs of measures and what tools to use to generate the list of potential energy improvement measures. Using national data would provide consistency across the nation and reduce the potential for data errors. On the other hand, average national energy prices and costs of improvements could vary greatly from the costs that an individual consumer will face in their locality. Integrating local energy prices and estimates for the cost of improvements would be challenging and resource-intensive.

Initial Approach: The Department intends to develop a standardized, consistent system to estimate potential energy savings from home improvements and a list of recommendations. The Department is considering using national cost averages to prioritize improvements, but not disclosing return on investment given that costs are likely to vary considerably. The Department will also explore providing savings estimates based on local energy tariffs, and will communicate that the list of recommendations is based on preliminary estimates of savings based on national price of energy and costs of measures and that a detailed audit is necessary to develop the work scope to pursue particular measures.

5) Presenting Information to the Consumer

A homeowner would benefit from information on home energy performance and potential retrofit opportunities. This information must be presented in a simple enough form for consumers to readily understand. Complementing this information with more extensive information electronically would allow interested consumers to find out more detailed information that cannot be presented quickly and simply.

Initial Approach: The Department is exploring options for presenting information on a home's energy performance and opportunities for energy savings, as well as providing more extensive information through electronic links (two examples are provided in Attachment B). The Department will test different ways of presenting information in a simple, straightforward manner to consumers as part of developing the National Program.

6) National Home Energy Registry

The Department intends to establish a voluntary national home energy registry that would likely have a public dimension accessible to anyone and a private dimension accessible only to the homeowner or program that provided the information. Certain general information would be required for those homes that participate in the program. The Department is cognizant of the privacy issues related to maintaining information on homes and plans to address such issues in the development of the registry.

The registry would serve as a repository for energy information on a large number of homes and therefore allow the Department and others to establish more reliable benchmarks and perform

other types of analysis. Information used for benchmarking and analysis would only be provided in aggregate form to minimize use of personal information.

7) Quality Assurance

The National Program will only be effective if consumers and others have confidence that the information provided is accurate and consistently generated. Various types of quality assurance can help ensure that the program offers reliable information. The Department would include quality assurance requirements for the following:

Requirements for Home Professionals

Only certified professionals would be allowed to generate home ratings. These professionals may include contractors, inspectors, auditors or others who are certified to perform audits and assessments. The Department is currently developing skill standards that professionals will need to have in order to generate a rating as well as standard protocols that direct professionals on the minimum actions required for the rating.

Audit Tool Requirements

Some type of modeling **tool** is required to calculate an asset rating. In order to be credible, ratings must be generated in a consistent manner. One option is to have the rating generated through a standardized approach consisting of a prescribed set of data inputs, data collection procedures, and calculations. Another option is to set parameters that various software tools must meet and then certify those tools that both adhere to these parameters and meet other requirements in terms of their ability to generate reliable information. Underlying assumptions

about use patterns and other factors would need to be consistent across all software models for the purposes of generating an asset rating.

The Department of Energy is developing a software tool that will be publicly available and able to generate ratings. The Department is considering how to specify standard approaches for generating ratings, allowing for their use by various organizations, and overseeing that the ratings are developed consistently. The Department will consider ways for generating the rating and the list of recommendations and whether to generate these concurrently or separately.

Third Party Verification

Third party verification can be an effective means for ensuring quality of programs. The Department is considering whether to require that contractors or programs participating in the National Program agree to abide by a set of third party verification requirements. This would likely entail third party review of a certain percentage of the ratings generated by one contractor or one program. The Department is evaluating options for implementing this type of requirement, including providing or approving an official firm or set of qualifying firms that can perform the verifications.

Initial Approach: The Department is considering how to best develop a quality assurance component for the National Program. It will likely include professional certification standards, rating procedures, data submittal review processes, and reporting protocols. The program will also likely provide standardized methods for organizations to implement their own quality assurance procedures.

8) Additional Information to Consumers

Many states, local governments, and private organizations have already developed home energy assessment programs to inform homeowners and homebuyers about a home's energy performance as well as the potential for improvements. While a national performance metric and rating system would help ensure consistency across the country, the Department recognizes that states and other program implementers may be interested in providing information that goes beyond the national metric and rating.

To that end, the Department intends to work in partnership with states and others to support the sharing of certain additional information as part of this effort. For example, while greenhouse gas information is not likely to be a standard metric for the National Program, the Department could provide conversion factors to states and other partners that are interested in providing such information.

At this point, the Department plans to support program implementers in the provision of greenhouse gas emission and cost information. The Department may be willing to support other types of information as well, particularly if national involvement is needed to ensure accuracy and consistency.

9) **Public Comment Requested**

This document describes the major design questions that the Department is considering in developing a voluntary national label, performance metric, and broader program. We seek comments on the specific issues discussed above. However, stakeholders are welcome to raise other relevant issues that the Department may have overlooked in this design process.

10) Glossary of Key Terms

Asset Rating

A value reflecting a home's energy performance based on the home's physical characteristics as well as a standard set of operating assumptions.

Benchmark

A value that serves as a standard against which others may be compared. Examples of benchmarks are the average energy performance of a home in the same area.

Consumption rating

Measure of how much energy the home and its systems consume. Consumption is usually represented in BTUs.

Efficiency rating

Measure of how well the home and its systems use the energy they consume. This is an energy intensity measure, for example BTUs/square foot or BTUs/heating degree day.

Operational Rating

A value reflecting a home's energy performance based on the home's physical characteristics as well as the behavior of specific occupants (usually the current homeowner).

Performance metric

A unit of measure chosen to reflect a building's energy performance (e.g., BTUs per year, dollars per year).

Rating

A calculated energy use value for a home based on measured characteristics and/or utility bills of the house. The value may be an absolute measure of energy use or a converted value as compared to a standard.

Site Energy

The total amount of energy consumed at a building location or other end use site.

Source Energy

All the energy used in delivering energy to a site, including power generation, transmission and distribution losses, to perform a specific function, such as space conditioning, lighting or water heating. The sum of direct fossil fuel consumption and electricity, with electricity converted from kWh to Btu using the national average power plant conversion (10,236 Btu/kWh). Approximately 3 watts of energy is consumed to deliver 1 watt of usable electricity at the end use site.

Tool

Software used to model a home's energy use, calculate a rating and produce a label.

Attachment A: Relationship between Options and Guiding Principles

Approach Under Consideration	Program Principle			
	Credible, Reliable, Replicable	**Transparent, Easy to Understand**	**Low Cost**	**Ability to Implement Quality Assurance (QA)**
Asset or Operational Rating				
Asset Rating	• Level of replicability depends on the consistency of those making measurements in the home.	• Concept is similar to MPG and easy to explain. • Models are complex and hard to explain.	• Higher cost due to need to collect information on building characteristics • Additional analysis is required to assess accuracy achievable at different costs.	• Need to verify accurate measurement and input of many building characteristics.
Operational Rating Based on Utility Bills (adjusted for behavior)	• Bills reflect behavior and not efficiency of the home. • Replicable for given time period; differences likely for different time periods. • Additional analysis needed to assess accuracy.	• Using energy bills as the basis for a rating is transparent and easy to understand. • Utility bills are not always readily available.	• Lower cost due to need for less data collection • Use energy bills to "calibrate" calculations • Some building data need to be collected.	• Need system to verify use of actual bills. • Need to verify accurate some building characteristics measurements and input.
Consumption or Efficiency Metric				
Consumption Rating	• Credible, replicable (if adjusted for climate)	• Reflects energy use for a home, regardless of its size.	NA	NA
Efficiency Rating	• Credible, replicable (if adjusted for climate)	• Allows a consumer to understand overall efficiency of a home, like MPG.	NA	• Additional QA required to verify accurate measurement of home size.

Physical Unit Scale or Converted Scale				
Physical Unit Scale	NA	• Transparent, easy to understand • May require some education	NA	NA
Converted Scale	• Scales with grades / bins may encourage gaming to achieve favorable bin.	• Not as transparent given use of conversion	NA	• Potentially require additional QA to ensure accurate conversion into scale, and deter gaming.
Source or Site Energy				
Source Energy	• Provides more accurate measure of the energy needed to fuel the home.	• Not a unit that consumers understand.	NA	NA
Site Energy	• Does not accurately portray the full energy impact of the home.	• Depending upon how it is presented, may correspond more closely to information on utility bills.	NA	NA
Other				
Energy Savings Recommendations	• Recommendations generated with a low cost tool may vary from those provided with extensive audit including diagnostics.	• Inclusion of recommendations can help translate a score or rating into actionable, practical steps.	• Energy recommendations as part of a low cost energy rating process may spur consumer action at relatively low cost.	• If recommendations for improvements are provided, an additional level of QA will be necessary to verify accuracy.
Prescribed, Standardized Algorithms	• Provides consistent approach for calculating the performance metric.	• Easier to understand, consistent approach.	• Would be low cost for market to implement.	• Need quality assurance mechanisms.

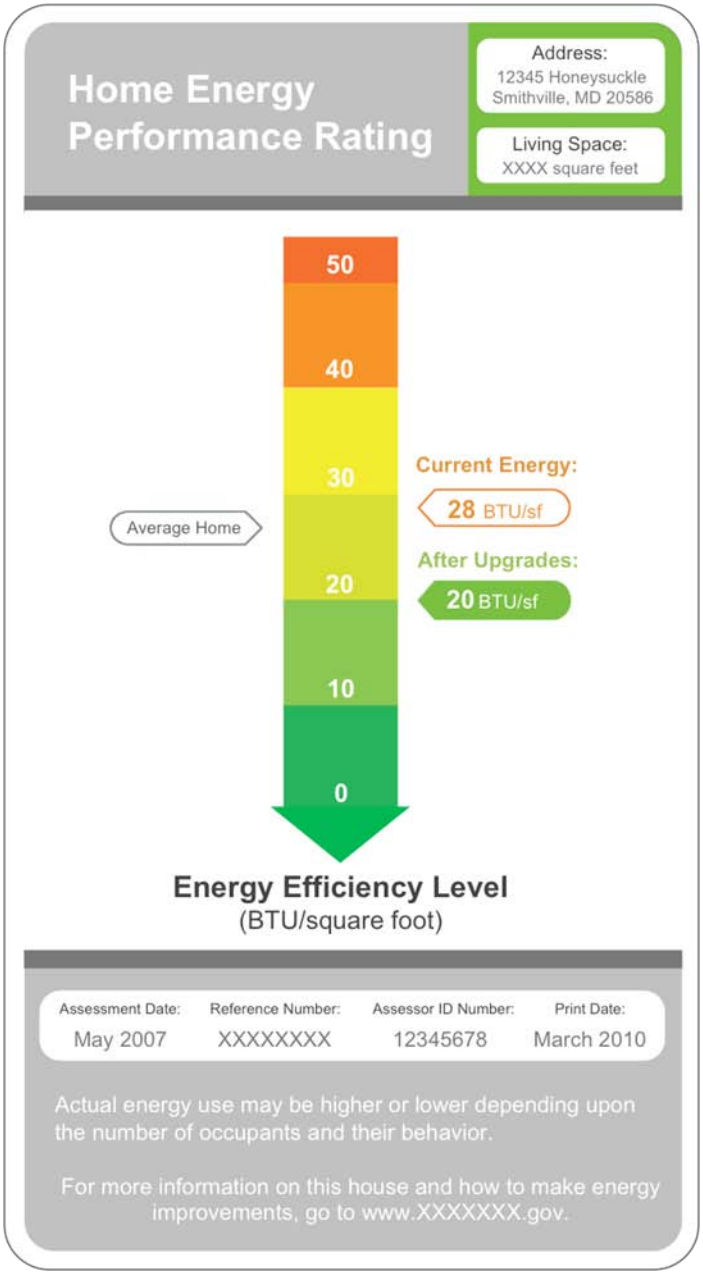
Points in green support the program principle.

Points in blue do not support the program principle.

Points in black are neutral to the program principle.

Attachment B: Examples of How to Present Information to Consumers

Example #1: Efficiency Rating



Example #2:
Consumption in BTU/yr with Recommendations