NRDC Comments
on Proposed Energy Star New Homes Program Modifications

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Introduction

The Energy Star new homes program has been one of the success stories of market transformation in the United States. It has enjoyed increasing success in the marketplace, in most cases without the support of additional financial incentive-based programs. It has helped create an infrastructure to promote continued energy efficiency efforts. It has provided a platform upon which utilities and state energy offices interested in providing advanced incentives for energy efficiency can work in a mutually supportive way.

The Energy Star program staff and contractors have proposed modifications in the program to deal with several important changes in the marketplace, notably the introduction of the SEER 13 standard and the Energy Star program's own experience in promoting quality construction measures that have other benefits in addition to their energy savings. Despite their success in identifying the problems and the strategic directions for solving them, the proposals currently on the table have some significant flaws. Fortunately, the strengths of the proposals allow these flaws to be addressed in a relatively straightforward way.

These comments recommend the following changes in the proposed Energy Star revisions:

- Base the Energy Star qualification level on an enhanced HERS rating. The rating level should be above 84. While it is preferable that the number be the same across the United States, this goal could be achieved with regionally varying qualifying scores.

- Define the program on a performance basis, even if a prescriptive package is used to explain it to builders and homeowners.

- Set the qualification criterion at a more advanced level of energy efficiency than proposed. (The current proposal is equivalent to a score of 84.).

These recommendations are essential to obtaining the market transformation benefits of this program.

Market Transformation

The Environmental Protection Agency (EPA) was among the world's leaders in developing and implementing the concept of market transformation. While this concept has been defined theoretically in a number of ways, operationally it is best defined from the content and results of EPA's Energy Star programs and those that complement them, such as the incentive programs of the Consortium for Energy Efficiency (CEE).

The key criteria for a successful market transformation program are:

- Harmonize the specifications for defining energy efficiency performance and qualifying levels across the country. Competing efforts detract from each other, while harmonized efforts create synergy.

- Recognize that market transformation efforts succeed best when there are multiple partners. This means no one agency can claim credit for the entire amount of measured energy savings.

- Demand big advances in energy efficiency technology. Small savings do not allow sufficient distinction in the marketplace, and lead consumers to be disappointed if they can't see the savings in their energy bills.

The existing Energy Star new homes program has fit well within the market transformation paradigm. This is in part demonstrated by its success in the market. The program does this by relying on an existing infrastructure of technical standards for calculating energy performance (the RESNET HERS technical standards) and on quality assurance standards for making sure that homes achieve the energy performance that is being claimed.

The program <u>leverages efforts of others</u> to promote energy efficient new homes. It allows states or utilities that are interested to promote minimally Energy Star compliant new construction, while also allowing entities that want to demand higher levels of performance to do so. It supports builders who wish to claim higher levels of environmental or energy performance to do so based on a rating scale that is more complex than the simple "on/off" criterion of getting the Energy Star label.

***But the current proposal risks overturning these advantages*.**

Flaws in the Current EPA Proposal

The problems with the proposal come from a few seemingly minor decisions. These would be easy to correct while retaining the main thrust of the proposal.

The critical errors are:

1. Establishing a prescriptive reference home with arbitrarily defined characteristics to establish the minimum qualifying level. The rationale for the proposed prescriptive design is unclear. It seems particularly anomalous to establish many different envelope insulation requirements that depend in detail on climate but not set corresponding equipment or fenestration specifications.

2. Providing insufficient guidance on how to comply using a performance-based approach. This opens the door to abuse and degradation of the brand equity of Energy Star.

3. Establishing, in practice, a competing "EPA reference home" that is fighting the consistently defined reference home used by the IECC 2004 supplement and the RESNET reference home. Note that the IECC/RESNET reference home is based on a proposal developed after extensive energy and economic analysis and public input by U.S. DOE and adopted through a public consensus process by the International Code Council.

4. The emphasis on a prescriptive requirement undercuts competition between different energy efficiency providers by specifying relatively arbitrary levels of performance for different components of the building. Prescriptive approaches by their nature will be more expensive to meet and will promote innovation less than a performance-based emphasis.

5. The level of efficiency improvement is insufficient given the technologies available or potentially available in the near future. Cost effectiveness analysis performed using current price structures, where the minimum air conditioning requirement is SEER=10, will not be consistent with future price structures with minimum SEER=13.

These items are discussed in detail below.

1. Arbitrariness in establishing the prescriptive/reference house.

The prescriptive basis for the proposed Energy Star qualifying level takes an arbitrary and inconsistent approach to varying the technical requirements by climate on one hand and establishing national uniform criteria on the other. As a result, it may create doubts about the technical merit of the program. It also misses efficiency opportunities that would otherwise exist. (See item 5 below).

The proposed prescriptive reference home has insulation levels that vary widely and in small increments across climate. For example, ceiling R-values vary from R-30 to R-38 to R-49, walls from R-13 to R-15 to R-20 and then R-21, floors from R-13 to R-19 to R-30, and windows in five increments of U-value and two of solar heat gain coefficient.

The basis for these variations is obvious: cost effectiveness of insulation varies significantly as a function of climate. But the same no doubt holds true for HVAC equipment efficiencies and component characteristics as well as for fenestration. Utility programs are planning to encourage air conditioners at SEER 14 as well as SEER 15, and these programs must pass cost-effectiveness tests. Surely there are climates where a SEER 15 unit should be part of the Energy Star specification.

The fenestration characteristics are based on the Energy Star window program, which has been such a success that its products are now minimum-code, standard-issue in many parts of the country. Surely one could do better than a specification that is already standard practice. Surely some kind of solar heat gain reduction makes sense in the Washington, DC area, at least for West and East facing windows. Surely a U-value for windows better than plain vanilla double glazing with low-E coating makes sense in the coldest parts of the country.

By establishing prescriptive criteria that so closely mimic the IECC in terms of envelope and that are painted with such a broad brush on the national map as far as HVAC (and to a lesser extent fenestration) are concerned, EPA would be sending the wrong impression to builders and consumers nationwide by focusing on this particular prescriptive reference.

2. Insufficient guidance on how to use the performance-based approach.

While the principle of using a performance-based approach is clear, the road to achieving it is filled with potholes. This has been the repeated experience of state energy offices in enforcing performance-based codes for new homes and of utilities sponsoring performance-based incentive programs. Unless the reference home and the calculation procedure are specified to a high level of detail, builders and their consultants will discover ways to game the calculation. The presence of gaming strategies, or even inadvertent errors, means that the calculations are not repeatable: two different consultants will get different answers for the same home as to whether or not it complies. EPA must not go down that road.

The problems with allowing a "gamed" approach are bigger than one might expect: the California experience was that once one builder or consultant was able to get away with gaming, others had no choice but to do the same, due to competitive pressures for price reduction.

To avoid these problems, a performance-based approach cannot be developed from a standing start, but rather has to be based on the years of experience accumulated in programs that have evolved to being successful. The RESNET/IECC approach is one example of such an experience-based method. The amount of effort and expertise that has gone into that method alone would argue for its use in the Energy Star program.

But perhaps an even stronger argument is the danger of producing an inconsistent procedure between the code compliance or home rating path (which could continue to be used as an Energy Star compliance tool) and the Energy Star path. This will particularly be a problem when a given home complies with the criterion using one approach but fails to comply using another. EPA must not allow this to happen. Therefore, it should use the RESNET/IECC method for calculating compliance.

3. EPA must not create a competing reference home.

One of the strengths of Energy Star new homes in the past is that it was developed in a structure that allows builders to claim not only mere compliance with the Energy Star criterion but also compete on the extent to which they do better. The current system not only does not allow this to happen in a straightforward way, but it creates confusing and misleading "dueling criteria" for energy efficiency. If EPA establishes a prescriptive reference home and a performance method designed to achieve the same level, then something that beats this level of performance is likely to be advertised as "10% better than Energy Star" or "20% better than Energy Star."

But this is a different and incompatible rating system with the RESNET rating scale, which tracks the IECC rating scale. So now we run the risk that a house might be advertised as 40% better than IECC (or its equivalent, a HERS rating of 88) without the market understanding whether this is better than, equal to, or worse than Energy Star. Or worse, it will almost certainly turn out that in a given climate, an 88 complies with Energy Star for certain homes but other homes with an 88 fail it. This completely undercuts the market transformation goal.

Perhaps two or three years ago, EPA could have set the standard for the rest of the country by developing a prescriptive reference home (plus the very detailed description of how it is simulated to avoid intentional or accidental gaming) and urge this to be the basis for the other systems – the IECC system and the HERS system. But this isn't what happened. Instead, with help from DOE and others, the nation has harmonized on a reference home that jointly serves as the basis of the IECC 2004 and the new RESNET system. EPA should honor this consensus process – which has produced an excellent technical result – and not try to create a competing standard.

The alternative would be to allow and indeed encourage the use of two incompatible scales, in which a house could be advertised as "10% better than Energy Star" or "30% better than IECC." It would be bad enough if there were a fixed conversion factor between the two scales, but there couldn't be. Some houses would rank a comparable percent above Energy Star as they do beyond IECC, but a neighboring house, or even the same plan with a different orientation might rank very differently on the two scales. This would do nothing but create confusion in the marketplace.

The RESNET/IECC rating system is based on percentage savings relative to the RESNET/IECC reference house, using the RESNET/IECC calculation rules. It is tied clearly and directly to a prescriptive standard—namely the IECC 2004 Supplement's requirements.

No two "%-better-than" systems can be completely equivalent. So EPA has the choice of either maintaining consistency with an existing system—and one that will be the basis of federal tax credits if they are enacted in any of the forms currently under consideration—or creating destructive competition. The correct choice is obvious.

Many proponents of prescriptive standards have made assertions that the prescriptive standards are "simpler" than performance-based standards. But this argument cannot be made in any kind of rigorous fashion. How can one explain the concept that a list of a dozen or so insulation criteria (which cannot be understood unless you know what an R-value is and how it relates to a U-value in a real component (as opposed to the one-dimensional approximation R=1/U) and unless you understand other obscure technical criteria such as SHGC, AFUE, and SEER) is simpler to understand than a single energy score that is referenced to the national model code's standards?

Simplicity is not easy to define, so arguments that a certain system is "simpler" than another are standing on very squishy, subjective ground.

Prescriptive standards do not make sense as the primary method for enforcing (as opposed to communicating about) an energy specification, because the market has clearly rejected the prescriptive option whenever a workable performance option is made available. Most states do not have performance options that are workable for their energy codes. But the two states that do – California and Florida – see more than 90% of their energy code permit applications coming in using the performance method.

No one is forcing builders to use the performance approach. Either it is simpler, as perceived by the builder who's actually paying for the compliance documentation, or it is seen as so much more cost effective that it is clearly worth it.

Note further that even for the states that enforce a "prescriptive" version of the IECC, a large percentage of the applicants come in using the ResCHECK program. While this is not a true performance approach, as far as the user is concerned, it amounts to the same thing. This is because the ResCHECK approach allows flexible tradeoffs in at least some of the parameters

used to establish compliance. Thus, it would appear that flexibility based on local cost effectiveness is much more important to builders than simple prescriptive standards for "what do I have to do?"

Performance-based standards inherently are more innovation-friendly and pro-competition than prescriptive standards. A supplier or contractor that can come up with a cheaper way of improving energy efficiency than the standardized methods expressed in the prescriptive approach can sell this technology on the basis of lowering first costs. This creates a positive feedback in which cheaper and more effective technologies displace less effective ones in actual as-built homes, allowing the next generation of specification or code to include the prescriptive equivalent of the new measures while still including the old ones.

In theory, it is equally robust to establish a prescriptive definition of code compliance or efficiency program compliance and then define a performance equivalent or to do the reverse. But, as discussed, to create a whole new prescriptive/reference house would create a competing and much less poorly vetted performance calculation scheme compared to the existing consensus standard. Instead, it is just as defensible to set a performance criterion based on the HERS rating of a prototypical house that meets a given prescriptive package. Alternately, EPA could simply set a numerical score criterion and work backwards to what the prescriptive package is.

4. The advantages of performance-based criteria

All of EPA's goals in terms of explaining Energy Star simply and in a technically correct fashion are equally achievable whether the primary technical definition of the Energy Star level is a HERS score or a prescriptive package. Thus, to harmonize with other programs and achieve market transformation success, EPA must define Energy Star on the basis of HERS score.

Prescriptive packages can be constructed that agree with this score. They will, of course, vary from region to region, but this isn't a problem because EPA's proposed package already varies from region to region, either explicitly through its choice of equipment efficiencies or implicitly through its use of IECC U-values and SHGC criteria.

Based on the preliminary work by Philip Fairey, it appears that a single goal for an enhanced HERS score across the country makes sense when one looks at the prescriptive equivalents.

It would be straightforward for EPA to develop an idea for what the prescriptive package looks like, establish a trial level of HERS score that meets this, and then back-calculate whether the resulting prescriptive packages in all climate zones makes sense.

And EPA can communicate what Energy Star means in terms of this prescriptive package even if the technically more comprehensive definition is the enhanced HERS score. (The prescriptive package is still a technically correct definition of the criterion, because the package is *one* way of compliance.)

The RESNET system for enhanced HERS scores is a much better way of providing credit for non-traditional sources of energy savings than simply counting lighting fixtures or appliances. Not all EnergyStar products save the same amount. It is obvious that a 26-watt CFL fixture in a heavily used room saves a lot more energy than a 15 watt CFL fixture in a modestly used room. Similarly an Energy Star clothes washer saves a lot more energy than Energy Star refrigerator. Additionally, there are varying efficiencies of Energy Star appliances and if the criteria is "an appliance" rather than energy use, the least efficient qualifying appliance is likely to be chosen, as there is nothing to gained by choosing the model with the greater efficiency.

5. The proposed level is insufficiently stringent

The current EnergyStar program has not changed its specification in almost a decade. It is not unreasonable to assume that the current proposed specification will be similarly long-lived. Thus, it is important to establish the specification at a level that will not be embarrassingly low in the year 2009, even if this comes at the expense of initial market share. The energy and carbon savings over the long-term will be substantially higher with an ambitious goal, even if the initial year's market share is lower.

What is the basis of the current proposal, and why does NRDC think we can do better? The insulation levels in the current proposal are essentially the same as the IECC level. This applies to windows as well as walls. The solar heat gain coefficient for windows is the same as IECC, as is the geographic coverage of that requirement. These levels vary across about 9 climate zones in the United States.

To this, EPA has added some requirements for heating or cooling system efficiency (but never both). These do not vary by climate, despite the fact that a SEER 15 air conditioner makes a lot more economic sense in Phoenix or Miami than it does in North Carolina or Sacramento. Similarly, the furnace criterion – an Energy Star EF 90, does not vary between modestly cold climates and intensely cold climates. It is also not a very ambitious level, since in some states the market share of qualifying equipment is already well over 50%.

The proposed EnergyStar prescriptive package also includes duct sealing and leak sealing, which are valuable improvements in performance.

How will a more optimally designed package be constructed? For equipment efficiency, EPA should look at the full variation in EER and SEER levels from the minimum standard 13 SEER all the way up to the maximum level likely to be available, but at least the level supported by utility programs of SEER 15/EER 13. The analysis should be based on the expect cost premium for these products *after* SEER 13 is required, since the prices for air conditioners historically have declined significantly after a standard, and recent communications from ARI about how manufacturers are preparing for SEER 13 makes it clear that this will happen again.

For furnaces, criteria for efficiency that have been used by CEE and the DOE appliance efficiency standards analysis include 92% and 96%, as well as the 90% used in the current

analysis. NRDC's analysis of the DOE data used for that agency's ANOPR on furnace efficiency standards showed that a standard of EF 96, even if imposed on all furnaces including replacements (where the cost savings from using condensing technology do not occur), would provide the nation a net savings of over $100 billion in present value.

EPA is not proposing to give credit for more efficient furnace fans, which overlooks a major efficiency opportunity.

The state of Oregon sets furnace efficiency requirements for its tax incentives at 92% AFUE and specifies the use of an energy efficient motor. Clearly, given how mild Oregon's climate is, there must be some climates where 92 AFUE or even 95 or 96 would be a logical prescriptive requirement. Surely there are regions where EF 96 is cost effective and is a valid prescriptive basis for the Energy Star label.

For insulation, it is hard to imagine that the IECC went so far as to require all cost effective measures in all climates. EPA should look at higher levels of insulation, particularly recognizing that any particularly troublesome measure to an individual builder – such as 6-inch studs (although NRDC finds it hard to believe that we are still fighting this battle after 20 years) – can be traded off for other measures.

Perhaps the most significant area in which performance could be increased in a cost-effective way is through fenestration systems. The cost of low-E coatings and suspended films has declined dramatically since they were introduced, and further "learning curve" effects can be expected once EnergyStar gains mass market acceptance. Low-E coating that were expected to cost as much as an additional pane of glass – about $2.50 or $3/ft^2 – are now available for 50¢/ft^2 or less. EPA should investigate the cost effectiveness of U-values at least 50% lower than those currently in use for the northern climates. EPA should look at solar heat gain coefficients of .35 and .30 and .25 perhaps lower, again varying by climate.

Neither the IECC reference home nor the EPA proposal allows window SHGC to vary by orientation. This constraint does not make sense for a voluntary program. Surely a reduced SHGC makes sense on East and West windows far above 3500 HDD. And EPA should reconsider the boundary between requiring low-SHGC glass and not, noting that cooling savings are worth more in terms of dollars to the utility system and grams of carbon emitted to the atmosphere than average electricity savings.

As buildings move in the direction of controlled ventilation for purposes of air quality, we need to look at the market transformation process for introducing heat recovery ventilation. EPA should analyze the cost effectiveness of heat recovery of ventilators both in very hot climates and in very cold climates. Surely there are places in the country where these are reasonable and cost-effective technologies.

Conclusions and Recommendations for EPA

In summary, the EPA proposal amounts to only a 20% savings relative to the new 2004 IECC. This is a small amount of savings, and one that risks being lost in the noise. It is not that much more demanding than the current Energy Star level, which has been unchanged for years.

EPA should propose a higher level of efficiency that will really transform markets. And it must define the level in a way that complements other voluntary programs and also code compliance. This last goal cannot be accomplished by establishing a conflicting system to that used in the IECC and in the HERS systems.

EPA has taken an important first step in proposing changes to the Energy Star specification for new homes. NRDC will be pleased to work with EPA and other stakeholders to structure the additional analysis and specification that will achieve the goals of harmonization with other programs, protecting the integrity of the efficiency rating, and achieving the maximum practical level of energy savings and emissions reductions.