



# American Council for an Energy-Efficient Economy

WASHINGTON, DC

August 29, 2006

Ms. Rachel Schmeltz  
Energy Star Program Development  
United States Environmental Protection Agency  
sarrel.rachel@epa.gov

Dear Rachel –

The American Council for an Energy-Efficient Economy (ACEEE) appreciates the opportunity to comment on the proposed revisions to the ENERGY STAR furnace specification (Version 2.0 – Draft 1).

ACEEE is a nonprofit, non-partisan, organization dedicated to advancing energy efficiency as a means of promoting both economic prosperity and environmental protection. ACEEE fulfills its mission by conducting in-depth technical and policy assessments; advising policymakers and program managers; working collaboratively with businesses, public interest groups, and other organizations; publishing books, conference proceedings, and reports; organizing conferences and workshops; and educating consumers and businesses.

Although we support the idea of specification change now, we suggest that several aspects of the proposal of July 28 require revision. We rank these from highest to lowest importance, from our perspective:

## **Electricity Use of Gas Furnaces.**

ACEEE is very pleased that ENERGY STAR proposes to include electricity use in its definition of an efficient furnace. In theory, many design choices affect electricity use of furnaces. These include internal aerodynamics, fan clearances, motor and fan technologies, and equipment capacity. In practice, three variables seem to largely account for variation in Eae:

1. *Motor Technology.* DC permanent magnet motors generally use much less electricity than PSC (permanent split capacitor induction motors). We estimate market share as about 20% and 80%, respectively.
2. *Furnace capacity.* Larger furnaces include larger fans that use more electricity.
3. *Climate.* Furnaces sold in hotter regions typically have larger fans than the same units sold for northern application. Where the ratio of cooling to heating load is high, the fan size adequate for the mild winter loads will not suffice for the air-conditioning season.

Thus, a single criterion applied to all furnaces, such as  $Eae \leq 800$  kWh, will be far too generous for small furnaces. Given that your analysis suggests that 50% of condensing furnaces meet this criterion, it is probably generous for larger furnaces, as well. ACEEE's listing of the Most Efficient Gas Furnaces in the 111,000 – 127,000 Btuh category, the largest listed, showed an Eae range of 258 – 740 kWh/yr. Indeed, all but one of the listed units with capacities <110,000 Btuh had Eae values <400 kWh/yr.

Your announcement also states that 50% of existing condensing models meet the 800 kWh performance floor. It has been our understanding that ENERGY STAR performance levels would initially reflect no more than a 25% market share. Why is there this apparent inconsistency? ACEEE would offer two other observations:

1. We believe that analysis of the GAMA database will show that advanced air handling systems (epitomized by “ECM” fan motors) are rare at 90% AFUE, very common at 92%, and ubiquitous above. Thus, AFUE and Eae are highly correlated variables. This means that analyses that treat them as independent are very likely to underestimate the number of models available that satisfy both AFUE and Eae parameters.
2. Thus, ACEEE recommends setting a level at which only 15% - 20% of available models now qualify. Once the Energy Star specification is set, the number of complying models will quickly grow as manufacturers respond to the market. If you start with 25%, the number of qualifying models will likely grow further, requiring earlier specification revision.

We are even more puzzled why EPA would propose such an inadequate criterion when an adequate metric for the electric efficiency of gas furnaces is in widespread use. We refer to the GAMA/CEE criterion, which defines an electrically efficient condensing furnace as one in which the electricity used is less than 2% of the total site energy use. This is inherently capacity-normalized. ACEEE strongly recommends this as the best available measure of electric efficiency.

### **Oil Furnaces**

We agree with EPA that requiring 90% efficiency for oil furnaces is unrealistic. To our knowledge, only one manufacturer makes these products. However, we are less convinced by your analysis that AFUE 83 represents the right level. First, information in the DOE Technical Support Document<sup>1</sup> suggests that the de facto market baseline is 80%, not the statutory legal minimum of 78%. This savings step is about 4% (83/80), which is low compared to other ENERGY STAR products, and fails the 5% minimum improvement threshold that we thought underlay your screening process. We request that EPA redo its analysis, using 80% as the baseline, and selecting a performance level that gives a substantially larger energy use reduction and preserves a sufficient number of manufacturers and models for a robust program. Alternatively, if you can't obtain 5% savings relative to the appropriate baseline, you may need to drop this equipment category from the ENERGY STAR program. If oil-fired ENERGY STAR furnaces do not produce at least 5% savings, we believe that this category will undermine the value of the brand, and expose ENERGY STAR to further press or industry criticism.

### **Climate Effects**

The market share of (gas-fired) condensing furnaces varies widely by state. Appendix A shows new furnace shipments for 2000.<sup>2</sup> Market share of condensing furnaces (AFUE > 0.88) ranges from >80% in some cold states to less than 20% in the southern tier of states. Beyond that, at today's prices, ACEEE analyses show that basic condensing furnaces (90%) are now cost-effective in parts (or all) of all 48 contiguous states. The wide range of market shares suggests

---

<sup>1</sup> [TSD] Technical Support Document: Energy Efficiency Program for Consumer Products: Energy Conservation Standards for Residential Furnaces and Boilers.

[http://www.eere.energy.gov/buildings/appliance\\_standards/residential/furnaces\\_boilers\\_1113\\_r.html](http://www.eere.energy.gov/buildings/appliance_standards/residential/furnaces_boilers_1113_r.html)

<sup>2</sup> From letter by Mark Kendall (GAMA) to Cyrus Nasserri (USDOE), April 10, 2002.

that no single AFUE value will meet ENERGY STAR criteria, so separate northern and southern values are appropriate. The warm climate level could be 90%. The cold level should be in the range of 92% - 95%, depending on share of the market at each AFUE level. This is consistent with the climate sensitive qualification criteria for fenestration that seem to be working well for the program.

In addition, we believe that very few 90% furnaces are electrically-efficient, while a substantial fraction of 92% AFUE furnaces are electrically-efficient. This would suggest that a minimum AFUE of 92% might become the *de facto* lower limit for ENERGY STAR in the South, as well, if ENERGY STAR includes an effective electricity efficiency criterion, as discussed above.

### **Furnace Capacity**

EPA proposes allowing furnaces up to 340,000 Btuh. ACEEE requests that this figure be adjusted downward. The DOE standard does not recognize furnaces >225,000 Btuh as residential equipment, so that should be the largest size considered. Indeed, according to DOE data, the market share of furnaces 165,000 Btuh and above is extremely small. Considering the bills associated with oversized furnaces, and the propensity of contractors to install oversized units, which reduces efficiency, we suggest that consideration be given to an eligibility cap in this range.

### **Summary**

Again, ACEEE appreciates the opportunity to comment on this proposal. We believe that an effective program will require moving from your proposal to the industry practice for measuring electrical efficiency, and that the AFUE level for oil furnaces should be reviewed. We also suggest restricting the capacity range to no greater than 225,000 Btuh, and considering a higher than 90% level in the northern tier, where condensing furnaces have a very high market share already. This is the only way that utilities and other partners could justify linking their efforts to ENERGY STAR in colder climates.

Sincerely,

Harvey M. Sachs, Ph.D.  
Buildings Program Director

Cc: Ms. Rebecca Duff, [rduff@icfi.com](mailto:rduff@icfi.com)  
Ms. Stephanie Jones, [sjones@cee1.org](mailto:sjones@cee1.org)