

July 10, 2015

Mr. John Cymbalsky
Building Technologies Office, EE-5B
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585-0121

Via email: ResFurnaces2014STD0031@ee.doe.gov

RE: Notice of Proposed Rulemaking for Energy Conservation Standards for Residential Furnaces; docket number EERE-2014-BT-STD-0031

Dear Mr. Cymbalsky:

Thank you for the opportunity to offer our input concerning the Department of Energy's (DOE) proposed new standards for residential furnaces. As you know, the Appliance Standards Awareness Project is a coalition project led by a Steering Committee that includes representatives from efficiency, environmental and consumer advocacy organizations, state government and the utility sector. Our mission is to advance cost-effective energy and water efficiency standards that deliver significant consumer, environmental and energy system benefits.

We have been engaged with DOE's efforts to improve national furnace standards since the agency initiated its first rulemaking on this topic in 2001. We actively participated in DOE's public hearings for this rulemaking earlier this year and now offer these written comments to assist the Department in developing a final rule. We also work collaboratively with a range of organizations, many of which serve on the ASAP Steering Committee, which also are submitting comments in this docket. In particular, we recommend for your careful consideration the filings of the American Council for an Energy-Efficient Economy, Natural Resources Defense Council, the Alliance to Save Energy, the Joint Consumer Commenters (Consumer Federation of America, National Consumer Law Center, Texas Ratepayers Organization to Save Energy, Massachusetts Union of Public Housing Tenants), Earthjustice, California Energy Commission, Pacific Gas and Electric and Northeast Energy Efficiency Partnerships. These organizations are

recommending that DOE adopt standards at least as strong as the level contained in the notice of proposed rulemaking (NOPR) and that DOE seriously consider adopting higher standards.

The revised standard for residential furnaces is one of the largest energy savings opportunities currently before the DOE. This standard has the potential to save more natural gas than any other ever completed by the agency. Therefore, setting an appropriately strong level is an essential outcome for the DOE to fulfill its obligations under the appliance standards law and to meet the energy savings and climate emissions reductions commitment established by President Obama.

According to analysis underlying the proposed rule, on a national level, furnaces meeting the proposed new standards (92% AFUE) sold over 30 years would yield net savings of about 3.1 quadrillion Btus (quads) of energy, which is enough energy to meet the gas and propane heating needs of all of New England for 17 years, and \$4-19 billion in net savings for consumers. The higher potential standards (95% AFUE) would net 4.4 quads, or enough to heat New England for 24 years, and net consumers up to \$25 billion. As we describe in our comments below, we strongly believe these numbers *underestimate* the net benefits of these improved standards, by a large margin. By layering on one conservative assumption after another, DOE has developed an analysis that fails to provide a reasonable estimate of the impacts of the standards. Once DOE corrects the analytic errors and flawed assumption which we describe in these comments, we believe that it is very likely that DOE will find that the higher standards (95% AFUE) are necessary to meet the statutory requirements; i.e., improved standards which achieve the greatest technologically feasible and economically justified level of energy savings.

In these comments, we address the following points:

- Errors in DOE's analysis cause the agency to underestimate the net consumer benefits of improved standards;
- Low-income consumer benefits are underestimated;
- Manufacturer impacts are overstated;
- The gas industry recommendation for condensing and non-condensing product classes would eviscerate any final rule;
- DOE should consider investigating a separate product class for small furnaces; and
- Arguments by industry stakeholders that all cost-effective savings will happen even without new standards are unfounded.

I. DOE underestimates the consumer benefits of improved standards

Other commenters have identified a range of issues which cause DOE to underestimate the net consumer benefits of improved standards. These include the following serious concerns, identified here along with some of the commenters that elaborate on these concerns in their submittals:

1. DOE's main analysis does not account for the latest venting technologies (ACEEE and NRDC);
2. DOE improperly assumes zero learning in developing its venting costs (NRDC);
3. DOE's estimate of commonly vented appliances is outdated and does not account for water heater market trends (PG&E);

4. DOE improperly assigns a large additional cost (nearly \$1000) for water heating venting in 45% of new homes (PG&E);
5. Incremental mark ups are higher than justified (PG&E);
6. Incremental fan costs may not be properly characterized (PG&E)
7. DOE overestimates the rate of fuel switching (ACEEE);
8. DOE underestimates the learning rate for furnaces;
9. DOE underestimates per-unit gas savings (NEEP), and;
10. DOE underestimates the share of furnaces that will exceed any new standard level (ACEEE).

All of these points are important and we urge DOE to carefully review the arguments presented by other commenters. Below we further elaborate on items 7 through 10.

DOE overestimates the rate of fuel switching

DOE's NOPR predicts about 10% of consumers will switch to electric heat pumps or electric furnaces at a 92% AFUE standards and about 12% at a 95% AFUE standard (Technical Support Document, hereafter TSD, Table 8.4.1). These estimates are much too high. The DOE model is based on an assumption that consumers with gas furnace heat in the base case will switch to a lower first cost electric option if a gas furnace option's higher upfront cost has a payback of more than 3.5 years. In the NOPR, DOE explains that, using consumer survey data, "DOE deduced that consumers would expect a payback of 3.5 years or less for a more expensive but more efficient product" (80 Fed Reg 13153). But this consumer survey data does not directly address the consumer choice of whether to switch heating fuels. The decision to buy a more expensive but more efficient product is far different than the decision to switch from one heating fuel to another.

In the first situation, a consumer is deciding whether to pay more for a given product, for example, a refrigerator or light bulb. The more expensive product promises savings that pay back, but the more efficient product is a simple, perhaps a drop-in, replacement for the other. The decision to switch fuels is more complicated for three reasons. First, an electric heat pump or electric furnace is not a drop-in replacement for a gas furnace. Gas service to the furnace will need to be safely shut off and electric service upgraded to provide sufficient power for the new device. The consumer may face considerable uncertainty about the impacts of changing these utility services in a house. One or more utility companies may need to be contacted, service upgraded and rate plans changed. This set of changes is far more complex than buying a more efficient refrigerator or light bulb. Second, consumers who are satisfied with the service from their gas heating appliance are likely to be resistant to making changes. Heat is a fundamental need, and consumers are unlikely to want to change from a system type that has met their needs reliably. In other words, consumer decision making in the face of complexity and uncertainty is likely to demonstrate a high degree of inertia—consumers are more likely to stick with what they had before, especially for a product that provides a fundamental need. Third, in many parts of the country where gas heating is most common, electric heating options have a reputation for high operating costs, lower comfort and less than fully reliable service. Electric furnaces (electric resistance heat) is very expensive to operate. Heat pumps can be perceived to deliver lower comfort because warm air from a register fed by a heat pump is at a lower temperature than

provided by a furnace, and many consumers complain about it feeling cool.¹ For these reasons, many consumers perceive gas heat to be a better heating option than electric and will be far more resistant to change fuels than they would be to simply buying a more efficient refrigerator.

In sum, DOE has improperly equated the decision to buy a more efficient appliance with the decision to change fuels. We believe that a more realistic assumption would provide for no fuel switching. At a minimum, DOE should use the low switching scenario described in appendix 8J, which is based on a slightly more realistic payback threshold.

In addition, we have not been able to ascertain whether DOE has updated heat pump prices in its analysis to take into account new efficiency standards that took effect this year. DOE must use up-to-date heat pump prices in modeling any fuel switching choice. We further note that heat pump prices will also be affected by the next revision to the DOE heat pump standard, which could take effect as soon as 2021. Around the same time, refrigerant phase outs may also affect heat pump prices. Therefore, current prices are likely to be a conservative estimate of heat pump prices for the analysis period, causing DOE's switching estimate to be higher than is likely to actually occur.

DOE underestimates the learning rate for furnaces

The incorporation of learning rates in recent DOE rulemakings has allowed the analyses to reflect the observation that equipment prices tend to decrease over time. However, analyzing price trends of whole categories of equipment fails to capture the price trends of the actual technologies that are employed to improve efficiency. We would expect the prices of technologies used in high-efficiency equipment to decline much faster than the total price of the equipment. In the case of this rulemaking, we would expect that the price of condensing furnaces at the selected level would decline much faster than the price of all furnaces. The use of historic price trends of heating equipment to estimate learning rates for furnaces implicitly assumes that prices of non-condensing and condensing furnaces will change at the same rate, and will likely significantly underestimate future declines in the incremental cost of condensing furnaces.

Therefore, we recommend that DOE use the high decreasing price trend scenario shown in TSD appendix 10C for its main analysis in developing the final standard. This trend captures the whole market, but during the period when condensing products went from low to significant

¹ For example, Hannabery HVAC of Allentown, PA includes on their website the following in response to a FAQ: "A heat pump puts out much cooler air than a gas or oil furnace does, which most customers are used to. Furnaces tend to put out about 130 to 140 degree air. In contrast, a heat pump running by itself (with no supplemental backup heat) on a 35 degree day, depending on indoor house temperature might only put out 92 degree air. On a 20 degree day, it might drop to 85 degrees.

Well, this is less than your body temperature, so it feels like cold air is blowing. But, it is still warmer than the indoor house temperature, so it is still putting heat into the house. Unlike a furnace that puts out a lot of heat for short periods of time, a heat pump will put out less heat for longer periods of time."

market share. Therefore, this period is more representative of the trends we would expect once a condensing standard is established.

DOE underestimates per-unit gas savings

Comments filed by Northeast Energy Efficiency Partnerships (NEEP) cite a 2015 evaluation of furnace incentive programs by The Cadmus Group for the Electric and Gas Program Administrators of Massachusetts (hereafter, Cadmus). That evaluation, using measured and verified field data, shows that DOE has underestimated per-unit savings in the north. DOE shows per-unit annual savings for a 95% AFUE rated furnace compared to an 80% AFUE rated furnace at 8.3 MMBtu/year (TSD, Table 7.4.1), while Cadmus found measured savings of 10.9 MMBtu/year² (Cadmus, p 55). Thus, the measured and verified per-unit savings in the Cadmus field evaluation are 31% $((10.9 - 8.3)/8.3)$ higher than the average northern savings estimated by DOE.

We recognize that the Cadmus study covers just one state, but with a coastal climate, Massachusetts is perhaps representative of average conditions in the northern region. DOE should consider this study and investigate other utility evaluations to determine necessary adjustments to the estimates in the NOPR. (We are submitting the Cadmus evaluation report for the record under separate cover.)

DOE underestimates the share of furnaces which will exceed any new standard level

In the NOPR, DOE uses a “roll up” scenario to characterize future shipments of furnaces. The agency describes this scenario as “conservative.” (“DOE believes that the roll-up approach provides a conservative estimate of the potential energy savings in the standards cases.” 80 Fed Reg 13154.) We contend that this assumption is so conservative as to be inaccurate. In its place, DOE should model a version of a “shift” scenario, a common scenario used by DOE in many dockets. DOE does employ a shift scenario when modeling a 90% standard, but not for 92% or 95% AFUE (TSD chapter 10).

Under the rollup scenario, DOE assumes that every furnace sale in the baseline market share distribution which does not meet the new standard “rolls up” to exactly meet the new standard. The market share above the new standard remains unchanged. So, for example, since DOE projects that current market share of furnaces above 95% AFUE is under 1%, under the roll up scenario, the agency predicts that same extraordinarily low market share for the implementation year (TSD, Table 10.4.1). This assumption is clearly wrong. A host of market forces and public policies will foster market share growth for furnaces exceeding any new standard in the period leading up to the new standards’ compliance date. Manufacturers have powerful financial interests in being able to offer a range of products (i.e. good, better, best product offerings) to maximize margins and profits. Even if efficiency differences are reduced, manufacturers bundle other value added features (e.g. longer warranties, other non-energy features such as air filtration) with efficiency to distinguish better and best products. In addition, public policies like

² Cadmus report value is in therms which we convert to MMBTU. 1 therm = 100,000 BTUs.

the Energy Star program and utility incentive and education programs exist and will work to increase market share for products exceeding a new standard level. Energy Star typically seeks to revise its qualification criteria well in advance of new standards' compliance dates and utilities must do the same to continue to cost-justify their programs to their regulators. DOE rightly acknowledges these market features for the period after the compliance date. ("The growth in these shares reflects the likelihood that furnace manufacturers will promote premium products above the minimum standard, and that ENERGY STAR will target the products with highest efficiency" TSD, 10-9.) DOE's error is in denying that these features have an impact in the years leading up to the compliance date.

Using a shift scenario has important repercussions for DOE's analysis. National energy savings increase as the share of sales exceeding a new standard level grows and manufacturer impacts decline since they are able to sell higher margin, value-added products. We strongly urge DOE to modify its analysis to take into account the powerful market and policy drivers that will drive a future distribution of efficiency performance.

II. Low-income consumer benefits are underestimated

As elaborated in the Joint Consumer Comment, ACEEE and California Energy Commission comments, DOE has underestimated the benefits of the standards for low-income consumers. DOE should re-analyze the low-income subgroup taking into account those who live in public housing and those who live in rental housing.

III. Manufacturer impacts are overestimated

We join in the comments of Earthjustice, NRDC and ACEEE with respect to manufacturer impacts. DOE has improperly excluded sales of heat pumps and electric furnaces from the analysis of manufacturer impacts while including impacts from sales of these products induced by increased furnace standards in the lifecycle cost analysis and the national impact analysis. Furthermore, the public benefits of improved standards dwarf projected impacts on manufacturers and any reasonable balancing of these interests would lead to choosing improved standards. Using the estimates from the NOPR, public benefits exceed the worst case manufacturer impacts by 200/1 at a 92% standard and by 68/1 at a 95% standard, based on the worst case manufacturer impact scenario and 3% discount rate. Accounting for the value of emissions reductions yields higher ratios. Once consumer benefit and manufacturer impact estimates are corrected, these ratios will be higher still.

Finally, DOE must recognize and take into account that these estimates are worst case scenarios for manufacturers. DOE's other scenario shows manufacturer value *increasing* slightly with improved standards (a gain of \$4 million in industry value at 92% AFUE and a gain of \$44

million at 95% AFUE). This improved scenario depends upon manufacturers being able to pass on costs to consumers and is not an unreasonable assumption.

Notably, DOE uses this assumption about passing through costs to consumers in the life-cycle cost analysis, so if the worst case manufacturer analysis assumption proves correct, then consumer benefits are even larger than projected. In other words, losses for manufacturers estimated in the manufacturer impact analysis are gains for consumers in the form of lower prices and these gains are reflected nowhere in the DOE's lifecycle cost or national net present value analysis. If DOE is to rely on the worst case scenario for manufacturers in its decision making, it needs to use a consistent approach in the consumer economic impact analyses.

DOE must also recognize that 95% furnaces are more common in the market today than 92% products. Two-thirds of condensing products available today are at 95% AFUE, and only one-fourth at 92% (the rest are below 92% or above 95%) (TSD Table 8I.3.2). This basic observation raises the question of whether investing to comply with a 95% standard is any more onerous than investing to comply with a 92% AFUE standard. Manufacturers and furnace buyers benefitted from very generous tax credits for furnaces at 95% AFUE during this first part of this decade. As a result, all manufacturers developed and aggressively marketed product lines at 95% AFUE. Many utility programs now promote this level. Taxpayers and ratepayers have already helped manufacturers bear the cost of developing 95% AFUE furnaces.

IV. The gas industry recommendation for condensing and non-condensing product classes would eviscerate any final rule

The gas industry has recommended that DOE create separate product classes for condensing and non-condensing furnaces. We strongly oppose this recommendation and agree with the reasons outlined by DOE in the NOPR for the product classes selected. (80 Fed Reg 13137) Earthjustice and NRDC comments to this docket explain why the gas industry recommendation would be contrary to law; we join in those comments. From a practical perspective, separate classes would render a final rule meaningless, eviscerating the purpose of the statute. Since non-condensing furnaces have significantly lower upfront costs than condensing products, yet provide the exact same service and utility (warmth), the gas industry's recommended product class structure would simply preserve the status quo, saving no energy. While the condensing and non-condensing products have different venting requirements, these do not affect the service provided. The issue of venting condensing furnaces has been thoroughly vetted over the course of multiple furnace dockets. While many commenters have pointed to the costs to vent condensing furnaces, doing so is never impossible. Therefore, DOE has properly treated venting as an issue to be treated by accounting for costs rather than creating separate classes.

V. We support investigating a separate product class for small furnaces

Some commenters have recommended that DOE evaluate if creating a class of small furnaces subject to an 80% AFUE standard combined with a 95% AFUE standard for the vast majority of sizes would maintain or increase benefits relative to the proposed standards. We think this idea merits investigation by the Department, but DOE should only adopt such an approach if it maintains or increases national benefits compared to single product class standards which meet the statutory criteria.

VI. Arguments by industry stakeholders that all cost-effective savings will happen even without new standards are unfounded.

DOE projects growth in the sale of efficient furnaces even absent new standards and those projections are reflected in DOE's impact estimates. But, large cost effective savings potential remains. Some stakeholders have questioned how it can be possible that consumers do not already acquire efficiency that make them better off. The proposed rule provides a short description of some of the market failures addressed by efficiency standards. 80 Fed Reg 13191. The letter filed by the Joint Consumer Commenters summarizes the consumer interest in improved energy efficiency standards and the series of market imperfections or failures which explain why consumers often select furnaces which are not their least life-cycle cost option (or why such furnaces are selected for them, since oftentimes a contractor, a builder or a landlord makes the choice rather than the ultimate user of the furnace). There is a rich literature which documents why markets fail to deliver an optimal level of efficiency for society and for individual consumers. Under separate cover, we are submitting papers by Cooper³ and Levine⁴, et al, which discuss market failures related to cost-effective efficiency decision making.

The market failures identified by DOE and in the literature can lead to some seemingly strange results in consumer decision making. Moreover, DOE's models rightly account for the wide variability and uncertainty in consumer decision making to develop impact estimates.

Summary

DOE's proposed rule provides a strong basis for adopting significantly improved standards for furnaces. Updating and correcting flaws in the analysis will show that improved standards are

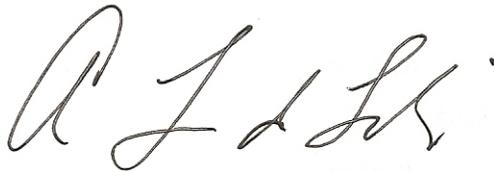
³ http://www.consumerfed.org/pdfs/Energy_Efficiency_Performance_Standards_Report.pdf

⁴ <http://emp.lbl.gov/publications/energy-efficiency-market-failures-and-government-policy>

even more beneficial than originally estimated. We urge DOE to expeditiously update the analysis and complete a new standard as soon as possible.

If you have any questions regarding these comments, please do not hesitate to contact me at adelaski@standardsASAP.org or 617-363-9470.

Sincerely,

A handwritten signature in black ink, appearing to read 'A. deLaski', is centered on the page. The signature is fluid and cursive.

Andrew deLaski
Executive Director