American Council for an Energy-Efficient Economy
Appliance Standards Awareness Project
Alliance to Save Energy
Natural Resources Defense Council
Northeast Energy Efficiency Partnerships

March 13, 2014

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
1000 Independence Avenue, SW
Mailstop EE-2J
Washington, DC 20585

RE: Docket Number EERE–2012–BT–STD–0047/ RIN 1904–AC88: Notice of Data Availability for Residential Boilers

Dear Ms. Edwards:

This letter constitutes the comments of the American Council for an Energy-Efficient Economy (ACEEE), Appliance Standards Awareness Project (ASAP), Alliance to Save Energy (ASE), Natural Resources Defense Council (NRDC), and Northeast Energy Efficiency Partnerships (NEEP) on the notice of data availability (NODA) for residential boilers. 79 Fed. Reg. 8122 (February 11, 2014). We appreciate the opportunity to provide input to the Department.

We urge DOE to strongly consider condensing-level standards for both gas- and oil-fired hot water boilers. In the analysis for the NODA, DOE found that condensing-level standards for gas-fired (90% AFUE) and oil-fired (91% AFUE) hot water boilers would yield positive average life-cycle cost savings for consumers.[1] Furthermore, there are reasons that the life-cycle cost savings for consumers at condensing levels may be higher than indicated in the analysis for the NODA, as discussed below, including lower installation costs due to the introduction of advanced venting systems, and declining equipment costs. DOE estimates that standards at these efficiency levels would result in national energy savings for gas- and oil-fired hot water boilers of 0.35 quads and 0.32 quads, respectively.[2]

Condensing-level standards for hot water boilers would follow the adoption of condensing standards in the EU. The UK has required that gas- and oil-fired hot water boilers be condensing as of 2005 and 2007, respectively.[3] In the EU, new regulations requiring condensing boilers will take effect in September 2015.[4] We note that in the U.S., residential boilers are predominantly used in the Northeast and northern Midwest. Thus, it is relevant to compare heating climate intensity in this region with that of England. The table below is a quick snapshot,

[1] NODA Technical Support Document. pp. 8-38, 8-44.
[2] *Ibid*. p. 10-18.
[3] https://www.planningportal.gov.uk/uploads/br/BR_PDF_PTL_GASHEATADVICE.pdf.
[4] http://www.eup-network.de/fileadmin/user_upload/Heaters_Ecodesign_Reg_813_2013.pdf.

but suggests that U.S. climate in the regions where residential boilers are used is comparable to or colder than in England. In choosing sites for these quick ballpark estimates, we avoided colder areas with high penetrations of residential boilers in New England and the upper Midwest to try to make a fair comparison, and attempted to use representative English stations.

Weather Intensity, DD in Celsius[5]			
Weather Station	Reference Temp, C		Station Code
	15.5	**18**	
England			
Heathrow Airport	1939	2682.5	EGLL
Manchester Airport	2342	3150.5	EGCC
24-Month Average	**2140**	**2917**	
Northeast U.S.			
Newark Airport	2040.5	2577	KEWR
Columbus Int. Airport	2347	2882	KCMH
Pittsburgh PA	2526	3096	KPIT
24-Month Average	**2304**	**2852**	

We agree with DOE that it is appropriate to also consider condensing-level standards for oil-fired boilers as the widespread use of ultra-low-sulfur fuel has reduced the historical challenges associated with condensing oil-fired boilers. Historically, U.S. regulation has treated oil separately from natural gas/propane, presumably because of the traditional design and maintenance challenges associated with soot formed on the heat exchangers of oil-fired boilers. In addition, oil inherently has a slightly lower potential for recovery of latent heat, since oil's Hydrogen:Carbon ratio is lower. As we read the EU and UK regulations, they draw no such distinction. In the NODA, DOE notes that tests conducted by Brookhaven National Laboratory and the New York State Energy Research and Development Authority (NYSERDA) show that 500 ppm low-sulfur fuel leads to very clean heat exchangers, while 15 ppm ultra-low-sulfur (ULS) fuel leads to completely clean heat exchangers.[6] DOE estimates that by 2020, 65% of residential oil boiler shipments will be to areas requiring ULS fuel.[7] DOE also notes that the ban on high-sulfur diesel fuel has also had an impact on the sulfur content of heating oil since refineries are manufacturing highway diesel and heating fuel through the same process.[8]

We expect to see declines in the installed cost of condensing boilers between now and the compliance date of amended standards. In the NODA, DOE notes that the assumed compliance date for amended standards is 2020.[9] The new ENERGY STAR specification for residential boilers, which will take effect October 1, 2014, requires condensing levels (90% AFUE) for gas-fired boilers.[10] We expect that the ENERGY STAR specification will increase

[5] All data computed by BizEE from Weather Underground. http://www.degreedays.net/#
[6] NODA Technical Support Document. p. 8-E-4.
[7] *Ibid*. p. 8-E-7.
[8] *Ibid*. p. 8-E-4.
[9] *Ibid*. p. 10-1.
[10] http://www.energystar.gov/certified-products/sites/products/uploads/files/Boilers%20Program%20Requirements%20Version%203_0.pdf?47cb-526c.

the market share of condensing gas boilers, resulting in a decline in equipment costs. We also expect that installation costs associated with condensing boilers will decline as contractors gain more experience installing condensing boilers, competition increases, and new venting systems for retrofits, including flexible polypropylene, are introduced to the market.

We encourage DOE to explore ways to estimate learning rates for condensing technology. In the analysis for the NODA, DOE examined historic price trends for heating equipment and found that from 1998-2006, the deflated price index for heating equipment was relatively constant. DOE concluded that using constant prices over time as the default price assumption is appropriate.[11] 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 boilers would decline much faster than the price of all boilers. The use of historic price trends of heating equipment to estimate learning rates for boilers implicitly assumes that prices of non-condensing and condensing boilers will change at the same rate, and will likely significantly underestimate future declines in the incremental cost of condensing boilers.

DOE should evaluate polypropylene venting systems for condensing boilers and must base the analysis of installation costs on the lowest-cost venting option. It appears that in the analysis for the NODA, DOE has thoroughly evaluated installation costs for both condensing and non-condensing boilers in replacement and new construction installations, including situations where chimney re-lining or venting of “orphaned” water heaters is necessary. However, it does not appear that DOE has evaluated well-established polypropylene venting systems that are designed for easy retrofit installations.[12] We encourage DOE to evaluate whether these polypropylene venting systems would represent the lowest-cost venting option for some portion of installations. If in some cases polypropylene venting systems represent the lowest-cost option, the analysis must assume the use of polypropylene venting systems for these installations.

DOE must consider NPV at both 3% and 7% discount rates and should weigh the NPV at 3% more heavily. In recent rulemakings for other products, it appears that DOE has placed significant emphasis on NPV at a 7% discount rate. For example, in the recent final rule for commercial refrigeration equipment, TSL 3 represented the maximum NPV at 7%, and TSL 4 represented the maximum energy savings combined with a positive NPV at 7%.[13] DOE must consider NPV at both 3% and 7% as directed in Office of Management and Budget (OMB) guidance to Federal agencies,[14] and should weigh the NPV at 3% more heavily. In comments on previous rulemakings, NRDC has explained why a 3% discount rate is more appropriate to use when considering national economic benefits and NPV at 3% should be more heavily weighed.

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[11] NODA Technical Support Document. p. 8-12.
[12] See, for example, http://www.centrotherm.us.com/products/flex/ and http://www.duravent.com/ProductCategory.aspx?c=49.
[13] http://energy.gov/sites/prod/files/2014/02/f8/cre_ecs_final_rule.pdf. pp. 228-229.
[14] U.S. Office of Management and Budget, Circular A-4: Regulatory Analysis, 2003. http://www.whitehouse.gov/omb/Circulars_a004_a-4.

(See comments submitted by NRDC to docket EE-RM/STD-01-350 on January 15, 2007, COMMENT 131, pp 16-17.)

We believe that DOE's assumption for rebound effect is too high. In the analysis for the NODA, DOE included a 20% rebound effect based on a 2009 paper by Sorrell and Sommerville.[15] A 2012 ACEEE paper examined a prior 2007 paper by Sorrell, which was largely based on the same studies used for the 2009 Sorrell and Sommerville paper. The ACEEE paper found that the high end of the 10-30% range of rebound for space heating reported in these studies applies to atypical situations such as multiple studies from a single town in Oregon where weatherization allowed residents to decrease their use of wood heat while moderately increasing their electric use.[16] The ACEEE paper concluded that the most widely applicable estimates of rebound in the studies reviewed by Sorrell range from 1-12%.[17] A similar range is provided in a 2013 paper by Thomas and Azevado which lists five space-heating studies with rebound ranging from 1-15%.[18]

In summary, we urge DOE to strongly consider condensing-level standards for both gas- and oil-fired hot water boilers. Condensing-level standards are feasible, as demonstrated by adoption in the EU and the shift from high-sulfur to ULS fuel, and DOE's preliminary analysis indicates that condensing-level standards would be cost-effective for consumers.

Thank you for considering these comments.

Sincerely,

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[15] 79 Fed. Reg. 8125.
[16] Nadel, S. 2012. "The Rebound Effect: Large or Small?" http://www.aceee.org/white-paper/rebound-effect-large-or-small. Washington, DC: American Council for an Energy-Efficient Economy.
[17] A detailed critique of both the Sorrell work and an earlier similar estimate of rebound by Greening can be found in footnote 3 of the 2012 ACEEE paper.
[18] See Table 1. Thomas, Brinda and Ines Azevedo. "Estimating Direct and Indirect Rebound Effects for U.S. Households with Input-Output Analysis Part 1: Theoretical Framework." *Ecological Economics* 86(2013) 199-210.

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