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

May 31, 2016

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
Mailstop EE-5B
1000 Independence Avenue, SW
Washington, DC 20585

RE: Docket Number EERE–2014–BT–TP–0006/RIN 1904–AD16: **Notice of Proposed Rulemaking for Test Procedures for Commercial Packaged Boilers**

Dear Ms. Edwards:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), Alliance to Save Energy, American Council for an Energy-Efficient Economy (ACEEE), and Natural Resources Defense Council (NRDC) on the notice of proposed rulemaking (NOPR) for test procedures for commercial packaged boilers. 81 Fed. Reg. 14642 (March 17, 2016). We appreciate the opportunity to provide input to the Department.

We support DOE's proposal to modify the inlet and outlet water temperatures for tests of hot water commercial packaged boilers. The current test procedure specifies that the inlet water temperature be between 35°F and 80°F for non-condensing boilers and 80°F for condensing boilers.[1] However, the location of the inlet water temperature measurement is upstream of the point where the recirculating loop enters (in cases where recirculating loops are used in the testing), which obscures the actual temperature of the water entering the boiler. The currently-specified outlet temperature is 180°F for both non-condensing and condensing boilers. The NOPR notes that based on the permissible inlet and outlet temperatures, the tolerances on those temperatures, and the use of recirculating loops, the temperature rise across the boiler can range from 20-147°F for non-condensing boilers and 20-107°F for condensing boilers.[2] At the public meeting on April 4, DOE further explained that the current test procedure is not specific and that the Department understands that different manufacturers are testing in different ways.[3]

Specifically, we support DOE's proposal to modify the inlet and outlet water temperatures for non-condensing boilers to be 140°F and 180°F, respectively, and for condensing boilers to be 80°F and 120°F, respectively, with the inlet water temperatures measured downstream from the point where a recirculating loop would enter.[4] We agree with DOE's conclusion that the

[1] 81 Fed. Reg. 14649-50.
[2] 81 Fed. Reg. 14652.
[3] Public Meeting Transcript. p. 40.
[4] 81 Fed. Reg. 14652.

proposed inlet and outlet water temperatures will more accurately represent the efficiency of commercial packaged boilers and are more consistent with the conditions typically observed in field installations.[5] In particular, the range of inlet water temperatures in the current test procedure for non-condensing boilers (35-80°F) is entirely unrepresentative of field performance since the return water temperatures in systems utilizing non-condensing boilers must be maintained above about 140°F in order to minimize condensation and consequent corrosion of the heat exchanger. We also agree with DOE's conclusion that the proposed modifications to the inlet and outlet water temperatures would remove ambiguity and improve the consistency and repeatability of the test procedure.[6] In particular, the proposed modifications would ensure that the inlet water temperature is consistent across all non-condensing and condensing boilers, respectively.

At the public meeting on the standards NOPR for commercial packaged boilers on April 21, one stakeholder suggested that the test conditions proposed in the test procedures NOPR would reduce the efficiency ratings of condensing boilers by 10 points (i.e. that condensing boiler efficiency ratings would drop below 90%).[7] However, published efficiency curves from multiple manufacturers show very high efficiencies (>96%) at the proposed inlet water temperature with similar temperature rises as that proposed in the NOPR.[8] Further, the inlet and outlet water temperatures for condensing boilers proposed in the NOPR (80°F and 120°F, respectively) are representative of conditions in the field for condensing boilers installed in well-designed systems, where the boilers operate in condensing mode with efficiencies above 90%.

We believe that any boiler tested at the proposed inlet and outlet temperatures for condensing boilers (80°F and 120°F, respectively) that does not achieve an efficiency rating of at least 90% cannot be a condensing boiler.

We encourage DOE to ensure that the distinction between condensing and non-condensing boilers for the purposes of testing is clear and unambiguous. As noted above, DOE is proposing to specify different inlet and outlet water temperatures depending on whether a boiler is condensing or non-condensing, which we believe is appropriate. However, it is important that there be a clear distinction between condensing and non-condensing boilers so that each boiler model is tested using the appropriate water temperatures. The NOPR states that condensing and non-condensing boilers would be defined based on ANSI/AHRI 1500-2015.[9] We encourage

[5] 81 Fed. Reg. 14652.
[6] 81 Fed. Reg. 14652.
[7] Commercial Packaged Boilers Energy Conservation Standards NOPR Public Meeting Transcript. p. 30. We note that the testing referenced by the stakeholder (see Comment ID: EERE-2013-BT-STD-0030-0038) was published in 2012—four years before DOE published the test procedures NOPR. In addition, the testing referenced by the stakeholder did not include any testing using the current test procedure. Further, there appear to be anomalies with the specific condensing boiler model successfully tested at full load ("Unit 2": Hydrotherm KN-6). In particular, the rated thermal efficiency (92.7%) of this unit in the AHRI directory is significantly higher than the rated combustion efficiency (87%). As DOE notes in the test procedures NOPR, thermal efficiency includes losses not captured by combustion efficiency (81 Fed. Reg. 14648), which means that thermal efficiency should be lower than combustion efficiency.
[8] See, for example: http://aerco.com/sites/default/files/document/document/BMK-750-Efficiency-Charts.pdf; http://www.lochinvar.com/_linefiles/Knight%20XL%20Efficiency%20Curve-2013.pdf; http://www.weil-mclain.com/sites/default/files/field-file/slimfit-1000-2000-efficiency-curve_1.pdf.
[9] 81 Fed. Reg. 14673.

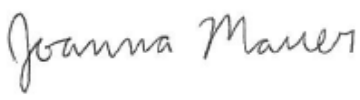
DOE to ensure that the distinction between condensing and non-condensing boilers for the purposes of testing is clear and unambiguous such that a non-condensing boiler could not be tested using the water temperatures for condensing boilers in order to obtain a higher efficiency rating.

We agree with DOE's clarification that boilers capable of producing both steam and hot water must be certified as two basic models. The NOPR notes that some commercial packaged boilers are capable of supplying both steam and hot water.[10] We agree with DOE's clarification that such boiler models span two equipment classes and therefore are subject to the energy conservation standards and testing requirements for both equipment classes.[11] We also support DOE's proposal that the Department could choose to test a given model that is capable of producing both steam and hot water in either mode for the purposes of assessing compliance with the applicable standard.[12]

We encourage DOE to initiate work on developing a test procedure that incorporates part-load performance which could be adopted in a future test procedure rulemaking. DOE's analysis for the standards rulemaking for commercial packaged boilers shows that the efficiency of condensing boilers increases significantly at lower burner input rates, and that the real-world part-load efficiency of non-condensing single-stage boilers is significantly lower than rated efficiency due to cycling losses.[13] However, neither of these impacts are captured in the current test procedure. At the public meeting on April 4, DOE noted that the Department is supportive of eventually moving to a part-load test for commercial packaged boilers.[14] We appreciate DOE's willingness to incorporate part-load performance in a future test procedure revision. However, we encourage DOE to work on developing a test procedure that incorporates part-load performance in parallel with the work of the ASHRAE Standard 155 committee. As ACEEE noted at the public meeting on April 4, ASHRAE Standard 155 has been in development for more than two decades.[15] DOE work in parallel on developing a revised test procedure could help accelerate the ASHRAE 155 process and ensure that the necessary pieces are in place to adopt a part-load test in the next DOE test procedure rulemaking.

Thank you for considering these comments.

Sincerely,



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[10] 81 Fed. Reg. 14658.
[11] 81 Fed. Reg. 14658.
[12] 81 Fed. Reg. 14659.
[13] Commercial Packaged Boilers Notice of Proposed Rulemaking. Technical Support Document. pp. 7B-10, 7B-11.
[14] Public Meeting Transcript. p. 25.
[15] Public Meeting Transcript. p. 27.

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