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April 12th, 2016

Abigail Daken
Environmental Protection Agency
1200 Pennsylvania Ave. NW
Washington, DC 20460

Re: Energy Star Commercial Boiler Specification Version 1.0 Draft 1 and March 23, 2016 Modifications

Cleaver-Brooks is a complete boiler room solutions provider that helps businesses run better every day. It develops hot water and steam generation products aimed at integrating and optimizing the total boiler/burner/control/stack exhaust system to maximize energy efficiency and reliability while minimizing emissions.

On behalf of Cleaver-Brooks I would like to submit the following comments on the referenced draft specification. Cleaver-Brooks does not support the Energy Star Specification for Commercial Boilers for the following reasons.

1. We strongly feel that a specification based on steady state full load efficiency will not result in the desired efficiency gains, and may be confusing and misleading to consumers. Actual efficiency achieved in operation is highly dependent on the system parameters. Efficiencies determined in accordance with 10 CFR Part 431.86 are based on return temperatures that are not representative of what is actually seen in operation. The current test standards are based on 80 °F inlet water temperature which is very conductive to high efficiencies in natural gas fired boilers. However, the vast majority of hydronic systems in the United States operate at temperatures much higher than 80 °F – most are designed and operated at water temperatures between 140 °F and 180 °F. Hydronic boiler operational efficiency is primarily dependent on the operating water temperatures of that system. That along with other boiler and system parameters, such as how the boiler is controlled, piped, and operated will result in actual efficiencies much lower than the proposed Energy Star rated efficiency.

2. While we are in support of using combustion efficiency vs. thermal efficiency, we do not feel that the logic for setting the specification at 95% combustion efficiency is sound. Basing the combustion efficiency on a value 1.0% higher than the originally proposed 94% thermal efficiency is not a reasonable method for setting the value. Thermal efficiencies are notably inaccurate due to significant errors in measurement upon which the thermal efficiency is based. This is evidenced by the fact that in several instances, the thermal efficiencies in AHRI's database are higher than the combustion efficiencies. Technically speaking, this is impossible. Combustion efficiency ratings are less sensitive to measurement error and provide a more

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reliable baseline for setting an efficiency standard. Also, boiler insulation practices vary across manufacturers. Using a fixed percentage for radiation and convection losses to assume combustion efficiency gives an unfair advantage to manufacturers that use little to no boiler jacket insulation and hurt manufacturers that use plenty of boiler jacket insulation.

3. EPA noted in the letter that there was a "clear distinction" between condensing and non-condensing that was perceived to be at 92.0% TE. The EPA analysis based on empirical findings (AHRI directory, on-line research, and discussions with stakeholders) is not as scientific as thermodynamically based combustion efficiency calculations. In fact, the transition to condensing when firing natural gas typically occurs in boilers at approximately 89% combustion efficiency. The combustion efficiency calculation for natural gas firing shows that the theoretical maximum efficiency of an ideal heat exchanger *without* condensing is approximately 90% efficiency. Therefore, either 89% or 90% combustion efficiency is the logical level to distinguish between non-condensing and condensing boilers. Thermal efficiency is dependent on measurements – which are always susceptible to error -- and does not clearly delineate when condensing begins to occur in a boiler. This further bolsters the argument for using combustion efficiency as the exclusive determinant of the baseline rather than basing it from thermal efficiencies gleaned from web site databases. A more realistic delineation of a premium efficiency commercial boiler baseline would be in the range of 92-94% combustion efficiency.

4. We do not feel that the proposed specification is in adherence to the first three guiding principles of the EPA Energy Star Program Guiding Principles.

    - "Significant energy savings can be realized on a national basis". Because of the variability and dependence of boiler efficiency on system characteristics, it has not been demonstrated that this specification will actually achieve the purported energy savings.

    - "Product performance can be maintained or enhanced with increased energy efficiency". Again, because of system variability it has not been demonstrated that this program will result in enhanced product performance.

    - "Purchasers will recover their investment in increased energy efficiency within a reasonable period of time". EPA has not demonstrated that purchases will recover their investments in Energy Star boilers within a reasonable period of time.

5. The commercial boiler market already has a well-established, widely accepted appliance efficiency rating certification program, that being the Air-Conditioning, Heating and Refrigeration Institute (AHRI). Adding Energy Star as another efficiency certification program

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will bring more confusion to the commercial boiler market with the potential to mislead consumers into the misguided belief that merely installing an Energy Star labeled boiler will result in automatic energy savings. The Energy star "brand" should ensure consumers that the labeled equipment is indeed going to operate at the efficiency rating the Energy Star label implies with the resultant reduction in energy consumption. Applying this label to hydronic commercial boilers in systems that cannot achieve these efficiencies detracts from the Energy Star brand.

For these reasons, Cleaver-Brooks opposes the adoption of the Energy Star Commercial Boiler Specification. Cleaver-Brooks is more than willing to meet with EPA to discuss hydronic system operational efficiency and the role boilers play in these systems. Or if EPA prefers, we would be willing to participate in a round table discussion on commercial boiler efficiency with other stakeholders participating in the commercial hydronic market.

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Respectfully submitted,

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