[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 430

[EERE–2019–BT–TP–0037]

RIN 1904-AE83

Energy Conservation Program: Test Procedure for Consumer Boilers

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy (DOE) is initiating a data collection process through this request for information (RFI) to consider whether to amend DOE's test procedure for consumer boilers. Specifically, DOE seeks data and information pertinent to whether amended test procedures would more accurately or fully comply with the requirement that the test procedure produces results that measure energy use during a representative average use cycle for the product, and not be unduly burdensome to conduct. DOE welcomes written comments from the public on any subject within the scope of this document (including topics not raised in this RFI), as well as the submission of data and other relevant information.

DATES: Written comments and information are requested and will be accepted on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *http://www.regulations.gov*. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2019–BT–TP–0037 and/or RIN 1904-AE83, by any of the following methods:

1. *Federal eRulemaking Portal*: *http://www.regulations.gov*. Follow the instructions for submitting comments.
2. *E-mail*: to *ConsumerBoilers2019TP0037@ee.doe.gov*. Include docket number EERE–2019–BT–TP–0037 and/or RIN 1904-AE83 in the subject line of the message.
3. *Postal Mail*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1445. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
4. *Hand Delivery/Courier*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., Suite 600, Washington, DC, 20024. Telephone: (202) 287-1445. If possible,

please submit all items on a CD, in which case it is not necessary to include printed copies.

No telefacsimilies (faxes) will be accepted. For detailed instructions on submitting comments and additional information on this process, see section III of this document.

*Docket***:** The docket for this activity, which includes *Federal Register* notices, comments, and other supporting documents/materials, is available for review at *http://www.regulations.gov*. All documents in the docket are listed in the *http://www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket webpage can be found at: *http://www.regulations.gov/docket?D=EERE-2019-BT-TP-0037*. The docket webpage contains instructions on how to access all documents, including public comments, in the docket. See section III for information on how to submit comments through *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Ms. Catherine Rivest, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-7335. E-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

Mr. Eric Stas, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-5827. E-mail: *Eric.Stas@hq.doe.gov*.

For further information on how to submit a comment or review other public comments and the docket, contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

SUPPLEMENTARY INFORMATION:

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I. Introduction

Consumer boilers are included in the list of "covered products" for which DOE is authorized to establish and amend energy conservation standards and test procedures.

(42 U.S.C. 6292(a)(5) [1] DOE's test procedures for consumer boilers are prescribed at Title 10 of the Code of Federal Regulations (CFR) part 430, subpart B, appendix N, *Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers* (Appendix N). The following sections discuss DOE's authority to establish and amend test procedures for consumer boilers, as well as relevant background information regarding DOE's consideration of test procedures for this product.

A. Authority and Background

The Energy Policy and Conservation Act, as amended (EPCA)[2], among other things, authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B[3] of EPCA, Public Law 94-163 (42 U.S.C. 6291-6309, as codified) established the Energy Conservation Program for Consumer Products Other Than Automobiles, which sets forth a variety of provisions designed to improve energy efficiency. These products include consumer boilers, which are the subject of this RFI. (42 U.S.C. 6292(a)(5))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42

[1] Pursuant to 42 U.S.C. 6292(a)(5), "furnaces" are covered products, and the term "furnace" is defined in 42 U.S.C. 6291(23) to include electric boilers and low pressure steam or hot water boilers.
[2] All references to EPCA in this document refer to the statute as amended through America's Water Infrastructure Act of 2018, Public Law 115–270 (Oct. 23, 2018).
[3] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption in limited circumstances for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6297(d))

The Federal testing requirements consist of test procedures that manufacturers of covered products must use as the basis for: (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6295(s)), and (2) making representations about the efficiency of those consumer products (42 U.S.C. 6293(c)). Similarly, DOE must use these test procedures to determine whether the products comply with relevant standards promulgated under EPCA. (42 U.S.C. 6295(s))

Under 42 U.S.C. 6293, the statute sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. EPCA requires that any test procedures prescribed or amended under this section must be reasonably designed to produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use and not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

If DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures in the *Federal Register* and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6293(b)(2))

EPCA also requires that DOE amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor, taking into consideration the most current versions of Standards 62301 and 62087 of the International Electrotechnical Commission (IEC), unless the current test procedure already incorporates the standby mode and off mode energy consumption, or if such integration is technically infeasible. (42 U.S.C. 6295(gg)(2)(A)) If an integrated test procedure is technically infeasible, DOE must prescribe separate standby mode and off mode energy use test procedures for the covered product, if a separate test is technically feasible. (*Id*.)

In addition, the Energy Independence and Security Act of 2007 (EISA 2007), Public Law 110-140, amended EPCA to require that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including the consumer boilers that are the subject of this RFI, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A)) If the Secretary determines, on his own behalf or in response to a petition by any interested

person, that a test procedure should be prescribed or amended, the Secretary shall promptly publish in the *Federal Register* proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such procedures. The comment period on a proposed rule to amend a test procedure shall be at least 60 days but may not exceed 270 days. In prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved. (42 U.S.C. 6293(b)(2)). If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. DOE is publishing this RFI to collect data and information to inform its decision in satisfaction of the 7-year-lookback review requirement specified in EPCA. (42 U.S.C. 6293(b)(1)(A))

B. Rulemaking History

As stated, the existing DOE test procedure for consumer boilers is located at 10 CFR part 430, subpart B, appendix N and is used to determine the annual fuel utilization efficiency (AFUE). For gas-fired and oil-fired boilers, AFUE accounts for fossil fuel consumption in active, standby, and off modes, but does not include electrical energy consumption. For electric boilers AFUE accounts for electrical energy consumption in active mode. Appendix N also includes provisions to determine the electrical energy

consumption in standby mode ($P_{W,SB}$) and off mode ($P_{W,OFF}$) for gas-fired, oil-fired, and electric boilers.

DOE first established test procedures for consumer boilers in a final rule published in the *Federal Register* on May 10, 1978. 43 FR 20147. In a final rule published in the *Federal Register* on March 28, 1984, DOE incorporated by reference in the DOE test procedure for furnaces and boilers, American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 103-82, "Methods of Testing for Heating Seasonal Efficiency of Central Furnaces and Boilers" (ASHRAE 103-82). 49 FR 12148, 12149. DOE subsequently amended the test procedure for consumer boilers on a number of occasions, including an amendment to update the ASHRAE 103 reference. 62 FR 26140, 26157 (May 12, 1997) (incorporating by reference the 1993 version of ASHARE 103, "Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers" ("ASHRAE 103-1993")).[4]

On October 20, 2010, DOE published a final rule in the *Federal Register* to amend its test procedure for consumer boilers to establish a method for measuring the electrical energy use in standby mode and off mode for gas-fired and oil-fired boilers in satisfaction of 42 U.S.C. 6295(gg)(2)(A). 75 FR 64621. The standby mode and off mode test procedure amendments incorporated by reference, and were based primarily on,

[4] On October 14, 1997, DOE published an interim final rule to revise a provision concerning the insulation of the flue collector box in order to ensure the updated test procedure would not affect the measured AFUE of existing furnaces and boilers. 62 FR 53508. This interim final rule was subsequently adopted without change. 63 FR 9390 (Feb. 24, 1998).

provisions of the International Electrotechnical Commission (IEC) Standard 62301 (First Edition), "Household electrical appliances—Measurement of standby power." *Id.* On December 31, 2012, DOE published a final rule in the *Federal Register* that updated the incorporation by reference of the standby mode and off mode test procedure provisions to refer to the second (latest) edition of IEC Standard 62301 (IEC 62301 (Second Edition)). 77 FR 76831. On July 10, 2013, DOE published a final rule in the *Federal Register* that amended its test procedure for consumer boilers by adopting equations that provide manufacturers the option to omit the heat-up and cool-down tests and still generate a valid AFUE measurement. 78 FR 41265.[5]

DOE most recently updated its test procedure for consumer boilers in a final rule published in the *Federal Register* on January 15, 2016 (January 2016 final rule). 81 FR 2628. The January 2016 final rule amended the existing DOE test procedure for consumer boilers to improve the consistency and accuracy of test results generated using the DOE test procedure and to reduce test burden. In particular, the modifications relevant to consumer boilers included: (1) clarifying the definition of the electrical power term, "PE"; (2) adopting a smoke stick test for determining whether minimum default draft factors can be applied; (3) allowing for optional measurement of condensate during establishment of steady-state conditions; (4) updating references to the applicable installation and operation (I&O) manual and providing clarifications for when the I&O manual does not specify test set-up; and (5) revising the AFUE reporting precision. DOE

[5] On August 30, 2013, DOE published a correction to the July 10, 2013 final rule in the *Federal Register* which rectified errors in the redesignations of affected subsections within section 10 of appendix N. 78 FR 53625.

also revised the definitions of several terms in the test procedure and added an enforcement provision to provide a method of test for DOE to determine compliance with the automatic means design requirement mandated by EISA 2007. 81 FR 2628, 2629-2630.

II. Request for Information

As an initial matter, DOE seeks comment on whether there have been changes in product testing methodology or new products on the market since the last test procedure update that may necessitate amendments to the test procedure for consumer boilers. Specifically, DOE seeks data and information that could enable the agency to propose that the current test procedure produces results that are representative of an average use cycle for the product and is not unduly burdensome to conduct, and, therefore, does not need amendment. DOE also seeks information on whether an existing private sector-developed test procedure would produce such results and should be adopted by DOE, either entirely or by adopting only certain provisions of one or more private sector-developed tests.

In the following sections, DOE has also identified a variety of issues on which it seeks input to aid in the development of technical and economic analyses regarding whether amended test procedures for consumer boilers would be warranted. More specifically, DOE seeks to determine whether amended test procedures for consumer boilers would more accurately or fully comply with the requirements in EPCA that test

procedures: (1) be reasonably designed to produce test results which reflect energy efficiency, energy use, or estimated annual operating cost during a representative average use cycle or period of use, and (2) not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

Further, the Department recently published an RFI regarding test procedures across the full range of consumer products and commercial equipment that fall under its regulatory authority pursuant to EPCA. In that RFI, DOE noted that over time, many of DOE's test procedures have been amended to account for products' and equipment's increased functionality and modes of operation. DOE's intent in issuing that RFI was to gather information to ensure that the inclusion of measurement provisions in its test procedures associated with such increased functionality has not inadvertently compromised the measurement of representative average use cycles or periods of use, and/or made some test procedures unnecessarily burdensome. 84 FR 9721 (March 18, 2019). DOE seeks comment on this issue as it specifically pertains to the test procedure for the consumer boilers that are the subject of this current RFI. DOE is also requesting comment on any opportunities to streamline and simplify testing requirements for consumer boilers.

Additionally, DOE welcomes comments on other issues relevant to the conduct of this process that may not be specifically identified elsewhere in this document. In particular, DOE notes that under section 1 of Executive Order 13771, "Reducing Regulation and Controlling Regulatory Costs," Executive Branch agencies such as DOE are directed to manage the costs associated with the imposition of expenditures required

to comply with Federal regulations. *See* 82 FR 9339 (Feb. 3, 2017). Consistent with that Executive Order, DOE encourages the public to provide input on measures DOE could take to lower the cost of its test procedure regulations applicable to consumer boilers consistent with the requirements of EPCA.

A. Scope and Definitions

In the context of "covered products," EPCA includes boilers in the definition of "furnace." (42 U.S.C. 6291(23)) EPCA defines the term "furnace" to mean a product which utilizes only single-phase electric current, or single-phase electric current or DC current in conjunction with natural gas, propane, or home heating oil, and which: (1) is designed to be the principal heating source for the living space of a residence; (2) is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 65,000 Btu per hour; (3) is an electric central furnace, electric boiler, forced-air central furnace, gravity central furnace, or low pressure steam or hot water boiler; and (4) has a heat input rate of less than 300,000 Btu per hour for electric boilers and low pressure steam or hot water boilers and less than 225,000 Btu per hour for forced-air central furnaces, gravity central furnaces, and electric central furnaces. (*Id.*) DOE has codified this definition in its regulations at 10 CFR 430.2.

The scope of the test procedure for consumer boilers is specified in section 1.0 of appendix N, which references section 2 of ASHRAE 103-1993. In relevant part, section 2 of ASHRAE 103-1993 states that the standard applies to boilers with inputs less than

300,000 Btu/h[6]; having gas, oil, or electric input; and intended for use in residential applications. Further, ASHRAE 103-1993 applies to equipment that utilizes single-phase electric current or low-voltage DC current.

Issue 1: DOE requests comment on whether any consumer boilers are available on the market that are covered by the scope provision of ASHRAE 103-1993 but that are not covered by the definition of "furnace" as codified by DOE at 10 CFR 430.2. Likewise, DOE requests comment on whether any consumer boilers on the market are covered by DOE's definition of "furnace" that are not covered by the scope provision of ASHRAE 103-1993.

DOE has defined several types of consumer boilers, including "electric boilers," "low pressure steam or hot water boilers," "outdoor boilers," and "weatherized warm air boilers." These terms are defined at 10 CFR 430.2 as follows:

1. *Electric boiler* means an electrically powered furnace designed to supply low pressure steam or hot water for space heating application. A low-pressure steam boiler operates at or below 15 pounds per square inch gauge (psig) steam pressure; a hot water boiler operates at or below 160 psig water pressure and 250 °F water temperature.
2. *Low pressure steam or hot water boiler* means an electric, gas, or oil-burning furnace designed to supply low pressure steam or hot water for space heating application. A low pressure steam boiler operates at or

[6] Btu/h refers to British thermal units per hour.

below 15 pounds psig steam pressure; a hot water boiler operates at or below 160 psig water pressure and 250 °F water temperature.

3. *Outdoor furnace or boiler* is a furnace or boiler normally intended for installation out-of-doors or in an unheated space (such as an attic or a crawl space).
4. *Weatherized warm air furnace or boiler* means a furnace or boiler designed for installation outdoors, approved for resistance to wind, rain, and snow, and supplied with its own venting system.

Issue 2: DOE requests comment on the definitions currently applicable to consumer boilers and whether any of these definitions need to be revised, and if so, how. Please provide justification for why any suggested change is necessary.

In addition to the definitions included in 10 CFR 430.2, section 2.0 of Appendix N incorporates by reference the definitions in section 3 of ASHRAE 103-1993, with modifications and additions as specified in that section of Appendix N. Sections 2.1 through 2.13 of Appendix N provide additional definitions relevant to the consumer boilers test procedure.

Issue 3: DOE seeks comment on whether the definitions for consumer boilers in section 2.0 through section 2.13 of Appendix N, including those from ASHRAE 103-1993 that are incorporated by reference, are still appropriate. If any of the definitions are no longer appropriate, DOE seeks input on how they should be amended and why.

B. Test Procedure

Appendix N includes provisions for scope (section 1.0, as discussed in section II.A of this document), definitions (section 2.0, as discussed in section II.A of this document), classifications (section 3.0), requirements (section 4.0), instrumentation (section 5.0), apparatus (section 6.0), testing conditions (section 7.0), test procedure (section 8.0), nomenclature (section 9.0), and calculations (section 10.0).

Each of the sections in Appendix N references a corresponding section in ASHRAE 103-1993. Many of the sections in Appendix N also include additions and/or modifications to the ASHRAE 103-1993 test method to provide additional specifications and make changes that DOE had previously determined to be otherwise necessary for the Federal test procedure, such as specifying procedures for measuring standby mode and off mode electrical consumption.

1. Updates to Industry Standards

As discussed, ASHRAE 103-1993 is referenced throughout Appendix N for various testing requirements pertaining to determination of the AFUE of consumer boilers. Appendix N also references certain sections of IEC 62301 (Second Edition), related to determining the electrical standby mode and off mode energy consumption, and American Society for Testing and Materials (ASTM) Standard D2156-09 (Reapproved 2013), "Standard Test Method for Smoke Density in Flue Gases from Burning Distillate Fuels" (ASTM D2156-09) for adjusting oil burners.

The following explains the developments to these industry test standards since their incorporation by reference in the DOE consumer boilers test procedure. IEC 62301 (Second Edition), which is currently incorporated by reference, is still the most recent version. ASTM D2156-09 was reapproved in 2018, and, therefore, the most up-to-date version of the standard is ASTM D2156-09 (Reapproved 2018). The 2018 reapproved version does not contain any changes from ASTM D2156-09. ASHRAE 103 has been updated twice since the version presently incorporated by reference (ASHRAE 103-1993) was adopted. Specifically, updated versions of the standard were published in 2007 (ASHRAE 103-2007) and 2017 (ASHRAE 103-2017) and included substantive changes. DOE's initial review of the differences between these versions of ASHRAE 103 are discussed in detail in the following paragraphs.

ASHRAE 103 provides procedures for determining the AFUE of consumer boilers (and furnaces). As mentioned previously, ASHRAE 103-1993 has been updated multiple times since 1993. In the rulemaking that culminated in the January 2016 final rule, DOE initially proposed to incorporate by reference the most recent version of ASHRAE 103 available at the time (*i.e.,* ASHRAE 103-2007), but ultimately declined to adopt the proposal in the final rule based on concerns about the impact that changing to ASHRAE 103-2007 would have on AFUE ratings of products distributed in commerce at that time. 81 FR 2628, 2632-2633 (Jan. 15, 2016). DOE stated that further evaluation was needed to determine the potential impacts of ASHRAE 103-2007 on the measured AFUE of boilers. *Id*. DOE theorized that ASHRAE 103-2007 might better account for

the operation of two-stage and modulating products, and stated that the Department may further investigate adopting it or a successor test procedure in the future. *Id*.

After the January 2016 final rule, ASHRAE 103 was once again updated to the current version (*i.e.,* ASHRAE 103-2017). DOE has identified the following substantive differences between ASHRAE 103-1993 and ASHRAE 103-2017 that pertain to consumer boilers:

1. ASHRAE 103-2017 includes calculations for determining the average on-time and off-time per cycle for two-stage and modulating boilers, rather than assigning fixed values as in ASHRAE 103-1993;
2. ASHRAE 103-2017 includes calculations for the part-load efficiency at maximum and reduced fuel input rates of condensing two-stage and modulating boilers when the heat up and cool down tests are omitted as per section 9.10, while ASHRAE 103-1993 does not include these calculations;[7]
3. ASHRAE 103-2017 increases post-purge time from less than 5 seconds in ASHRAE 103-1993 to less than or equal to 30 seconds for determining whether section 9.10, "Optional Test Procedures for Conducting Furnaces and Boilers that have no OFF-Period Flue Loss," is applicable for units with no measurable airflow through the combustion chamber during the burner off-period, and it also

[7] DOE published a final rule in the *Federal Register* on July 10, 2013 that added equations to Appendix N to calculate the part-load efficiencies at the maximum input rate and reduced input rates for two-stage and modulating condensing furnaces and boilers when the manufacturer chooses to omit the heat-up and cool-down tests under the test procedure. 78 FR 41265. The equations in ASHRAE 103-2017 are identical to those in Appendix N.

makes the application of the default draft factor values in section 9.10 a requirement rather than optional;

4. ASHRAE 103-2017 changes the method for determining national average burner operating hours (BOH), average annual fuel energy consumption (E_F), and average annual auxiliary electrical energy consumption (E_{AE}), especially for two-stage and modulating products, based on a 2002 study from NIST.

Issue 4: DOE requests comment on the differences between ASHRAE 103-1993 and ASHRAE 103-2017. In particular, DOE seeks information on whether any differences not identified by DOE above would impact the consumer boiler test procedure.

Issue 5: DOE requests information on whether the differences identified above would impact the measured AFUE, and if so, DOE requests test data demonstrating the degree of such impact.

Issue 6: DOE is also interested on receiving comment on whether the updates to ASHRAE 103 are appropriate for adoption in the Federal test procedure for consumer boilers, whether the changes allow for more representative energy efficiency ratings, and whether the changes would increase test burden.

2. Ambient Conditions

The consumer boilers test procedure specifies that the ambient air temperature during testing must be between 65 °F and 100 °F for non-condensing boilers, and 65 °F and 85 °F for condensing boilers. Section 7.0 of Appendix N and 8.5.2 of ASHRAE 103-1993. In addition, the relative humidity cannot exceed 80 percent during condensate measurement. Section 8.0 of Appendix N and 9.2 of ASHRAE 103-1993. In the January 2016 final rule, DOE addressed concerns regarding the ambient air temperature and humidity ranges allowed by the test method. 81 FR 2628, 2638 (Jan. 15, 2016). In particular, some commenters raised concerns that the wide range of allowable ambient conditions could impact test results, and that the ranges were initially developed based on laboratory conditions that are now outdated, such that more closely controlled conditions may now be achievable. *Id.* In the January 2016 final rule, DOE stated that the impact of ambient conditions on AFUE values warranted further study, but that DOE did not have adequate data to justify changing the test procedure to narrow the ambient temperature or humidity ranges. *Id.*

Issue 7: DOE is requesting comment and data on the effects of ambient temperature and relative humidity on AFUE results. DOE is particularly interested in whether the current ranges of allowable conditions adversely impact the representativeness of AFUE values or repeatability of AFUE testing, and whether a narrower range of allowable ambient conditions would increase testing burden, and if so, what that range should be.

3. Combustion Airflow Adjustment

In the course of the rulemaking for the January 2016 final rule, DOE proposed specifying that the excess air ratio, flue oxygen (O_2) percentage, or flue carbon dioxide (CO_2) percentage be within the middle 30th percentile of the acceptable range specified in the I&O manual. In absence of a specified range in the I&O manual, DOE proposed requiring the combustion airflow to be adjusted to provide between 6.9 percent and 7.1 percent dry flue gas O_2, or the lowest dry flue gas O_2 percentage that produces a stable flame, no carbon deposits, and an air-free flue gas CO ratio below 400 parts per million during the steady-state test described in section 9.1 of ASHRAE 103-2007, whichever is higher. 81 FR 2628, 2635-2636 (Jan. 15, 2016); *see also* 80 FR 12876, 12883, 12906 (March 11, 2015). DOE considered whether such a change could improve consistency in burner airflow settings during testing. However, after considering comments on this proposal, DOE determined that further study was needed to determine how such a change would impact AFUE ratings. 81 FR 2628, 2636 (Jan. 15, 2016).

Issue 8: DOE is requesting comment on whether more specific instructions for setting the excess air ratio, flue O_2 percentage, and/or flue CO_2 percentage should be provided in the consumer boilers test procedure, and if so, what those instructions should entail. DOE is particularly interested in understanding whether such a change would improve the representativeness of the test method, and whether it would impact test burden.

4. Calculation of Steady-state Heat Loss for Condensing, Modulating Units

A determination of AFUE for condensing, modulating boilers using ASHRAE 103-1993 relies on a series of intermediate values and equations. One intermediate value is the steady-state heat loss due to condensate ($L_{C,SS}$). For condensing, modulating units, section 11.5.7.2 of ASHRAE 103-1993 provides instruction for calculating $L_{C,SS}$ for both the maximum and reduced fuel input rates. To determine $L_{C,SS}$ at the maximum and reduced fuel input rates, a number of other values must first be calculated, including the steady-state efficiency at maximum fuel input rate ($Effy_{SS}$), and the steady-state efficiency at reduced fuel input rate ($Effy_{SS,R}$).[8] In following the progression of equations to calculate $L_{C,SS}$, ASHRAE 103-1993 directs $Effy_{SS}$ and $Effy_{SS,R}$ to be calculated according to section 11.4.7 of that document, which in turn references the equation at section 11.2.7 of that document. Section 11.2.7 of ASHRAE 103-1993 provides the calculation of $Effy_{SS}$ for *non-condensing*, *non-modulating* boilers. (Section 11.2, "Heating Seasonal Efficiency, Steady-State Efficiency, and AFUE for Noncondensing and Non-modulating Gas or Oil Furnaces and Boilers," of ASHRAE 103-1993 provides direction for non-condensing, non-modulating boilers.) As a result, AFUE for condensing, modulating boilers is based on calculations that rely on a $L_{C,SS}$ value that is based on steady-state efficiency values calculated for non-condensing, non-modulating boilers. ASHRAE 103-2017 presents a similar issue.

[8] Specifically, section 11.5.7.2 of ASHRAE 103-1993 provides instruction to calculate $L_{C,SS}$ as defined in section 11.3.7.2 of ASHRAE 103-1993, for both the maximum and reduced input rates, using the average outdoor air temperature at maximum and reduced input rates ("$T_{OA,H}$" and "$T_{OA,R}$," respectively). $T_{OA,H}$ and $T_{OA,R}$ are determined according to section 11.4.8.4 of ASHRAE 103-1993 and are based on the balance point temperature (T_C). T_C is determined using an equation in section 11.4.8.5 of ASHRAE 103-1993, and is in part based on the heating capacity at maximum fuel input rate (Q_{OUT}) and the heating capacity at reduced fuel input rate ($Q_{OUT,R}$). Q_{OUT} and $Q_{OUT,R}$ are determined according to sections 11.4.8.1.1 and 11.4.8.1.2 of ASHRAE 103-1993 and are based in part on the $Effy_{SS}$ and $Effy_{SS,R}$, respectively.

DOE notes that ASHRAE 103-1993 provides an equation for calculating the $Effy_{SS}$ of *condensing* boilers in section 11.3.7.3 of that document, which relies, in part, on the value of $L_{C,SS}$. As noted, calculating $L_{C,SS}$ at maximum and reduced input rates requires values for the $Effy_{SS}$ at maximum and reduced input rates, which if applying the equation in section 11.3.7.3 of ASHRAE 103-1993, ultimately depend upon the values of $L_{C,SS}$ at maximum and reduced input rates. As such, a circular reference would result from application of section 11.3.7.3 (calculation of $Effy_{SS}$ of condensing boilers) as opposed to application of section 11.2.7 (calculation of $Effy_{SS}$ of non-condensing boilers), as explicitly provided in ASHRAE 103-1993.[9]

Industry developed a computer program to calculate AFUE based on ASHRAE 103-1993 -- "AFUE v1.2" (last updated April 2004).[10] When calculating $L_{C,SS}$ for condensing boilers, the computer program uses an approach similar to one discussed in the prior paragraph, in which section 11.3.7.3 of ASHRAE 103-1993 is used for calculating $Effy_{SS}$. To address the circular reference that would result from applying section 11.3.7.3 of ASHRAE 103-1993, AFUE v1.2 appears to apply an iterative process that uses initial reference values to determine the values of $T_{OA,H}$ and $T_{OA,R}$ used in the

[9] Section 11.5.7.2 of ASHRAE 103-1993 provides instruction for calculating $L_{C,SS}$ at the maximum and reduced input rate ($L_{C,SS,H}$ and $L_{C,SS,R}$) using the average outdoor air temperature at maximum input ($T_{OA,H}$) and average outdoor air temperature at reduced input ($T_{OA,R}$), respectively. $T_{OA,H}$ and $T_{OA,R}$ are calculated using section 11.4.8.4 of ASHRAE 103-1993 and are dependent on T_C as calculated in section 11.4.8.5 of ASHRAE 103-1993. T_C is based in part on Q_{OUT} and $Q_{OUT,R}$ as determined in sections 11.4.8.1.1 and 11.4.8.1.2 of ASHRAE 103-1993. Q_{OUT} and $Q_{OUT,R}$ are based in part on the values for $Effy_{SS}$ and $Effy_{SS,R}$. To calculate $Effy_{SS}$ and $Effy_{SS,R}$ according to section 11.3.7.3 of ASHRAE 103-1993, which pertains to the steady-state efficiency for condensing boilers, values for $L_{C,SS,H}$ and $L_{C,SS,R}$ are required.

[10] The computer program was initially developed by the Gas Appliance Manufacturers Association (GAMA). In 2008, GAMA merged with the Air-conditioning and Refrigeration Institute (ARI) to form what is now the Air-conditioning, Heating, and Refrigeration Institute (AHRI).

calculation of $L_{C,SS}$.[11] Use of AFUE v1.2 may produce a different AFUE measurement than use of the test procedure as explicitly provided in ASHRAE 103-1993 (*i.e.*, relying on a $L_{C,SS}$ value that is based on steady-state efficiency values calculated for non-condensing, non-modulating boilers). However, a cursory comparison between the AFUE v1.2 methodology and the wording of ASHRAE 103-1993 as explicitly provided suggests that the variation in final AFUE measurements would be so small as to not affect the rounded AFUE value.

Issue 9: DOE requests comment on the direction in ASHRAE 103-1993 to rely on certain values calculated for non-condensing, non-modulating boilers to determine the AFUE of condensing, modulating boilers. DOE requests comment and information on whether the calculations should be modified to provide results that are more representative of the average use of condensing, modulating boilers, and if so, how the calculations should be modified.

5. Provisions for Testing Step Modulating Boilers

Appendix N includes a number of specific provisions for consumer boilers with step modulating controls. For example, the steady-state test is conducted at both the maximum and reduced inputs (referencing section 9.1 of ASRHAE 103-1993); the cool-down test is conducted after steady-state conditions have been reached at the reduced

[11]The iterative calculation process starts with reference values for the outdoor average air temperatures at $T_{OA,H}$ and $T_{OA,R}$. The program proceeds to calculate all of the other variables in the circular reference based on the reference values until arriving at new values for $T_{OA,H}$ and $T_{OA,R}$. The newly calculated values for $T_{OA,H}$ and $T_{OA,R}$ are compared to the initial reference values, and if they are not within 1 degree of the reference values, the calculations in the circular reference are repeated using the new values for $T_{OA,H}$ and $T_{OA,R}$ as the new reference values. The calculation cycle repeats until the reference values are within 1 degree of the calculated values, at which time the iterations stop and the values for $T_{OA,H}$ and $T_{OA,R}$ from the last round of calculations are used.

input rate (referencing section 9.5.2.4 of ASRHAE 103-1993), and the heat-up test is conducted at the reduced fuel input rate (referencing section 9.6.2.1 of ASRHAE 103-1993). In addition, both the optional tracer gas test and the measurement of condensate under cyclic conditions, when conducted, are performed at the reduced input (referencing sections 9.7.5 and 9.8 of ASHRAE 103-1993, respectively). Measurements taken during the testing at maximum and/or reduced inputs (as applicable) for each of the tests are used in the calculation of AFUE. ASHRAE 103-2017 contains similar provisions for modulating boilers as ASHRAE 103-1993, except that (as noted in section II.B.1 of this RFI) calculations are used to determine the average on-time and off-time per cycle, rather than assigning fixed values as is done in ASHRAE 103-1993.

Issue 10: DOE requests comment on whether the existing provisions for testing step modulating boilers appropriately reflect the performance of step modulating boilers. If not, DOE seeks specific recommendations on the changes that would be necessary to make the test procedure more representative for such products.

C. Other Test Procedure Topics

In addition to the issues identified earlier in this document, DOE welcomes comment on any other aspect of the existing test procedures for consumer boilers. As noted, DOE recently issued an RFI regarding covered products and equipment generally, to seek more information on whether its test procedures are reasonably designed, as required by EPCA, to produce results that measure the energy use or efficiency of a product during a representative average use cycle or period of use. 84 FR 9721 (March

18, 2019). DOE seeks comment on this issue as it specifically pertains to the test procedure for the consumer boilers that are the subject of this current RFI.

As noted previously, DOE also requests comments on whether potential amendments based on the issues discussed would result in a test procedure that is unduly burdensome to conduct, particularly in light of any new products on the market since the last test procedure update. If commenters believe that any such potential amendments, if adopted, would result in a procedure that is, in fact, unduly burdensome to conduct, DOE seeks information on whether an existing private sector-developed test procedure would be more appropriate or other avenues for reducing the identified burdens while advancing improvements to the consumer boilers test procedure. DOE also requests comment on the benefits and burdens of adopting any industry/voluntary consensus-based or other appropriate test procedure, without modification. As discussed in section II.B.1 of this RFI, ASHRAE 103-2017 includes procedures for determining the annual fuel utilization efficiency of residential central boilers; however, it does not include procedures for calculating the electrical standby mode and off mode energy consumption.

Additionally, DOE requests comment on whether the existing test procedures limit a manufacturer's ability to provide additional features to purchasers of consumer boilers. DOE particularly seeks information on how the test procedures could be amended to reduce the cost of new or additional features and make it more likely that such features are included on consumer boilers, while still meeting the requirements of EPCA.

DOE also requests comments on any potential amendments to the existing test procedures that would address impacts on manufacturers, including small businesses.

Finally, DOE recently published an RFI on the emerging smart technology appliance and equipment market. 83 FR 46886 (Sept. 17, 2018). In that RFI, DOE sought information to better understand market trends and issues in the emerging market for appliances and commercial equipment that incorporate smart technology. DOE's intent in issuing the RFI was to ensure that DOE did not inadvertently impede such innovation in fulfilling its statutory obligations in setting efficiency standards for covered products and equipment. DOE seeks comments, data, and information on the issues presented in the emerging smart technology RFI as they may be applicable to the consumer boilers that are the subject of this RFI.

III. Submission of Comments

DOE invites all interested parties to submit in writing by [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***], comments and information on matters addressed in this notice and on other matters relevant to DOE's consideration of amended test procedures for consumer boilers. These comments and information will aid in the development of a test procedure NOPR for consumer boilers, if DOE determines that amended test procedures may be appropriate for these products. After the close of the comment period, DOE will review the public comments received and may begin collecting data and conducting analyses as appropriate.

Submitting comments via *http://www.regulations.gov*. The *http://www.regulations.gov* webpage requires you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *http://www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through *http://www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through *http://www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *http://www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or postal mail. Comments and documents submitted via email, hand delivery/courier, or postal mail also will be posted to *http://www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via postal mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies. No telefacsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English, and free of any

defects or viruses. Documents should not contain special characters or any form of encryption, and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

DOE considers public participation to be a very important part of the process for developing test procedures and energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in each stage of

this process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this process should contact Appliance and Equipment Standards Program staff at (202) 287-1445 or via e-mail at *ApplianceStandardsQuestions@ee.doe.gov*.

Signed in Washington, D.C., on February 25, 2020.

Alexander N. Fitzsimmons
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy