

This document, concerning furnace fans is an action issued by the Department of Energy. Though it is not intended or expected, should any discrepancy occur between the document posted here and the document published in the Federal Register, the Federal Register publication controls. This document is being made available through the Internet solely as a means to facilitate the public's access to this document.

[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 430

[EERE-2020-BT-TP-0041]

RIN 1904- AE15

**Energy Conservation Program: Test Procedures for Consumer Products; Early
Assessment Review: Consumer Furnace Fans**

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

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy (“DOE”) is undertaking an early assessment review to determine whether amendments are warranted for the test procedure for consumer furnace fans. DOE has identified certain issues associated with the currently applicable test procedure on which DOE is interested in receiving comment. The issues outlined in this document mainly concern: test settings (selection of airflow control settings and external static pressure (“ESP”) requirement for airflow settings other than the maximum setting); incorporation by reference of the most recent industry test method; clarifications for testing of certain products, including furnace fans with modulating controls, furnace fans and modular blowers tested with electric heat kits, certain two-stage furnaces that operate at reduced input only for a preset period of time,

dual-fuel furnaces, and certain oil-fired furnaces; and issues related to test procedure repeatability and reproducibility. DOE welcomes written comments from the public on any subject within the scope of this document, including topics not raised in this request for information (“RFI”).

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 <https://www.regulations.gov>. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE-2020-BT-TP-0041, by any of the following methods:

1. *Federal eRulemaking Portal:* <https://www.regulations.gov>. Follow the instructions for submitting comments.
2. *E-mail:* to FurnFans2020TP0041@ee.doe.gov. Include docket number 2020-BT-TP-0041 and/or RIN 1904-AE15 in the subject line of the message.

No telefacsimiles (“faxes”) will be accepted. For detailed instructions on submitting comments and additional information on this process, see section **Error!**

Reference source not found. of this document.

Although DOE has routinely accepted public comment submissions through a variety of mechanisms, including email, postal mail, or hand delivery/courier, the Department has found it necessary to make temporary modifications to the comment submission process in light of the ongoing pandemic. DOE is currently suspending receipt of public comments via postal mail and hand delivery/courier. If a commenter finds that this change poses an undue hardship, please contact Appliance Standards Program staff at (202) 586-1445 to discuss the need for alternative arrangements. Once the COVID-19 pandemic health emergency is resolved, DOE anticipates resuming its regular options for public comment submission, including postal mail and hand delivery/courier.

Docket: The docket for this activity, which includes *Federal Register* notices, comments, and other supporting documents/materials, is available for review at <https://www.regulations.gov>. All documents in the docket are listed in the <https://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: <https://beta.regulations.gov/docket/EERE-2020-BT-TP-0041>. The docket webpage contains instructions on how to access all documents, including public comments, in the docket. See section III of this document for information on how to submit comments through <https://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. Pete Cochran, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-9496. E-mail: *Peter.Cochran@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:

Table of Contents

- I. Introduction
 - A. Authority
 - B. Rulemaking History
- II. Request for Information
 - A. Scope and Definitions
 - B. Test Procedure
 - 1. Default Airflow-Control Settings
 - 2. Modulating Controls and Thermostat Pairings
 - 3. ESP Requirements for Airflow-Control Settings Other than the Maximum
 - 4. ESP Limits for Electric Resistance Heat Kits
 - 5. Updates to Industry Standards and Consensus-Based Test Procedures
 - 6. Tolerance on Temperature Measuring Instruments
 - 7. Dual-Fuel Heating Products
 - 8. Two-Stage Furnaces with Limited-Duration Reduced Stages
 - 9. Furnaces Shipped without Burners

10. Test Procedure Repeatability
C. Test Procedure Waivers
III. Submission of Comments

I. Introduction

DOE established an early assessment review process to conduct a more focused analysis that would allow DOE to determine, based on statutory criteria, whether an amended test procedure is warranted. 10 CFR part 430, subpart C, appendix A, section 8(a). This RFI requests information and data regarding whether an amended test procedure would more accurately and fully comply with the requirement that the test procedure produce results that measure energy use during a representative average use cycle for the product, and not be unduly burdensome to conduct. To inform interested parties and to facilitate this process, DOE has identified several issues associated with the currently applicable test procedures on which DOE is interested in receiving comment. Based on the information received in response to the RFI and DOE's own analysis, DOE will determine whether to proceed with a rulemaking for an amended test procedure.

If DOE makes an initial determination that an amended test procedure would more accurately or fully comply with statutory requirements, or DOE's analysis is inconclusive, DOE will undertake a rulemaking to issue an amended test procedure. If DOE makes an initial determination based upon available evidence that an amended test procedure would not meet the applicable statutory criteria, DOE will engage in notice and comment rulemaking before issuing a final determination that an amended test procedure is not warranted.

A. Authority

EPCA, 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 B¹ of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles. These products include consumer furnace fans, the subject of this document. (42 U.S.C. 6295(f)(4)(D))

Under EPCA, DOE's energy conservation program consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 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 instances for particular State laws or regulations, in accordance with the procedures and other provisions set forth under 42 U.S.C. 6297(d).

¹ For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

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)) EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including consumer furnace fans, 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. (42 U.S.C. 6293(b)(1)(A)) DOE is publishing this RFI to collect data and information to inform its decision to satisfy the 7-year-lookback review requirement.

B. Rulemaking History

DOE published a final rule on January 3, 2014, establishing the test procedure for consumer furnace fans at title 10 of the Code of Federal Regulations (“CFR”) part 430, subpart B, Appendix AA, *Uniform Test Method for Measuring the Energy Consumption of Furnace Fans* (“Appendix AA”). 79 FR 499 (“January 2014 Final Rule”). The test

procedure is applicable to air circulation fans used by weatherized and non-weatherized gas furnaces, oil furnaces, electric furnaces, and modular blowers.² Section 1, Appendix AA. For each of these categories, the test procedure covers both mobile home and non-mobile home models. The test procedure is not applicable to non-ducted products, such as whole-house ventilation systems without ductwork, central air-conditioning condensing unit fans, room fans, and furnace draft inducer fans.

As established in the January 2014 Final Rule, Appendix AA incorporates by reference the definitions, test setup and equipment, and procedures for measuring steady-state combustion efficiency from the 2007 version of American National Standards Institute (“ANSI”) / American Society of Heating, Refrigerating and Air Conditioning Engineers (“ASHRAE”) Standard 103, *Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers* (“ANSI/ASHRAE 103-2007”). In addition to these provisions, Appendix AA includes provisions for apparatuses and procedures for measuring temperature rise, external static pressure, and furnace fan electrical input power. Appendix AA also incorporates by reference provisions for measuring temperature and external static pressure from ANSI/ASHRAE 37-

² DOE defines the term “modular blower” in section 2.9 of Appendix AA as a product which only uses single-phase electric current, and which: (a) Is designed to be the principal air circulation source for the living space of a residence; (b) Is not contained within the same cabinet as a furnace or central air conditioner; and (c) Is designed to be paired with HVAC products that have a heat input rate of less than 225,000 Btu per hour and cooling capacity less than 65,000 Btu per hour.

2009, *Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment* (“ASHRAE 37-2009”).

In the January 2014 Final Rule, DOE determined that there is no need to address standby and off mode energy use in the test procedure for furnace fans, as the standby mode and off mode energy use associated with furnace fans is measured by test procedures for the products in which furnace fans are used (*i.e.*, residential furnaces and residential central air conditioners and heat pumps). 79 FR 499, 504-505.

On October 12, 2018, DOE received a petition (“AHRI Petition”) from the Air-Conditioning, Heating, and Refrigeration Institute (“AHRI”) requesting that DOE consider adopting a new test procedure and associated performance metric, “AFUE2,” that would combine and replace the DOE test methods and associated performance metrics currently required for furnace fans (*i.e.*, Fan Energy Rating (“FER”)) and consumer furnaces (*i.e.*, annual fuel utilization efficiency (“AFUE”), standby mode energy consumption ($P_{W,SB}$), and off mode energy consumption ($P_{W,OFF}$)). On November 14, 2018, DOE published a notice of petition for rulemaking and requested comments to assist DOE in its determination of whether to proceed with the petition. 83 FR 56746. DOE received numerous comments on the petition, which are available for review in the docket at <https://www.regulations.gov/document/EERE-2018-BT-PET-0017-0004>. Accordingly, and consistent with the separate docket maintained for this matter, DOE will publish its final decision in the *Federal Register* on whether to grant or deny this petition in a separate notice. As DOE has already requested comments on the AFUE2

performance metric through the petition for rulemaking process, DOE is not requesting additional comment on this topic in this RFI.

II. Request for Information

DOE is publishing this RFI to collect data and information during the early assessment review to inform its decision, consistent with its obligations under EPCA, as to whether the Department should proceed with an amended test procedure rulemaking, and if so, to assist in the development of proposed amendments. Accordingly, in the following sections, DOE has identified specific issues on which it seeks input to aid in its analysis of whether an amended test procedure for consumer furnace fans 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 also welcomes comments on other issues relevant to its early assessment that may not specifically be identified in this document.

A. Scope and Definitions

A “furnace fan” is “an electrically-powered device used in a consumer product for the purpose of circulating air through ductwork.” 10 CFR 430.2. As stated, DOE’s furnace fan test procedure is applicable to circulation fans used in weatherized and non-weatherized gas furnaces, oil furnaces, electric furnaces, and modular blowers. Section 1, Appendix AA. The test procedure is not applicable to non-ducted products, such as whole-house ventilation systems without ductwork, central air-conditioning condensing unit fans, room fans, and furnace draft inducer fans.

Section 2 of Appendix AA provides additional definitions relevant to furnace fans through incorporating by reference the definitions of section 3 of ASHRAE 103-2007 and defining additional terms both in addition to and in place of those from section 3 of ASHRAE 103-2007. Of particular relevance for this RFI (see further discussion in section II.B.1 of this document), section 2.2 of Appendix AA defines “Airflow-control settings” as “programmed or wired control system configurations that control a fan to achieve discrete, differing ranges of airflow—often designated for performing a specific function (e.g., cooling, heating, or constant circulation)—without manual adjustment other than interaction with a user-operable control such as a thermostat that meets the manufacturer specifications for installed-use. For the purposes of [the furnace fan test procedure], manufacturer specifications for installed-use shall be found in the product literature shipped with the unit.” Section 2.6 of Appendix AA defines “Default airflow-control settings” as “the airflow-control settings specified for installed-use by the manufacturer. For the purposes of [the furnace fan test procedure], manufacturer specifications for installed-use are those specifications provided for typical consumer installations in the product literature shipped with the product in which the furnace fan is installed. In instances where a manufacturer specifies multiple airflow-control settings for a given function to account for varying installation scenarios, the highest airflow-control setting specified for the given function shall be used for the procedures specified in this appendix.”

Issue 1: DOE seeks comment on whether any changes are warranted to the scope of applicable products currently covered by the test procedure in Appendix AA, and if so, how the scope should be revised.

Issue 2: DOE seeks comment on whether any definitions in the test procedure at Appendix AA require any revision, and if so, how the definitions should be revised.

B. Test Procedure

Furnace fans are currently tested according to Appendix AA, which is used to calculate the Fan Energy Rating (“FER”). FER is expressed as watts per 1,000 cubic feet per minute of airflow (“W/1000 cfm”) and is calculated as the estimated annual electrical energy consumption of the furnace fan (in watt-hours) normalized by: (a) the estimated total number of annual fan operating hours (1,870); and (b) the airflow in the maximum airflow-control setting. For the purposes of the DOE furnace fan test procedure, the estimated annual electrical energy consumption is the sum of the furnace fan electrical input power (in watts), measured separately for multiple airflow-control settings at different ESPs representing a typical installation, multiplied by national average operating hours associated with each setting. Section 10, Appendix AA.

1. Default Airflow-Control Settings

For furnace fans used in furnaces or modular blowers with single-stage heating, the three airflow-control settings required to be tested are: the maximum setting, the default constant-circulation setting, and the default setting when operated using the

maximum heat input rate.³ For furnace fans used in furnaces or modular blowers with multi-stage heating or modulating heating, the airflow-control settings to be tested are: the maximum setting; the default constant-circulation setting; and the default setting when operated using the reduced heat input rate. See sections 8.6.1, 8.6.2 and 8.6.3 of Appendix AA. For both single-stage and two-stage or modulating units, if a default constant-circulation setting is not specified, the lowest airflow-control setting is used to represent constant circulation. See section 8.6.2, Appendix AA. In addition, if the manufacturer specifies multiple heating airflow-control settings, the highest airflow-control setting specified for the given function (*i.e.*, at the maximum or reduced input, as applicable) is used. See section 8.6.3, Appendix AA.

Inquiries sent to DOE since the publication of the January 2014 Final Rule indicate that there are differing interpretations regarding the appropriate airflow-control settings for testing, with some manufacturers possibly interpreting the DOE test procedure as requiring testing only the “as-shipped” airflow-control settings. However, as stated in section II.A, the definition for “Default airflow-control setting” specifically states that “[i]n instances where a manufacturer specifies multiple airflow-control settings for a given function to account for varying installation scenarios, the highest airflow-control setting specified for the given function shall be used for the procedures specified in this appendix.” Section 2.6 Appendix AA. Further, the definition defines the default

³ For furnaces where the maximum airflow control setting is a heating setting, the maximum airflow control setting test and the default heating airflow control setting test would be identical, so only two tests are required: (1) maximum airflow (which is the same as the default heating setting) and (2) constant circulation.

airflow-control settings as airflow-control settings specified for installed-use by the manufacturer, which are those specifications provided for typical consumer installations in the product literature shipped with the product in which the furnace fan is installed. *Id.* These provisions account for manufacturer installation instructions that specify installation of a furnace fans with a setting other than the “as shipped” airflow-control settings and that specify multiple potential settings based on varying installation scenarios. For example, a furnace may be shipped with the low speed airflow-control setting configured for the heating function, but the installation manual shipped with the furnace fan specifies the medium speed airflow-control setting for the heating function for certain installations, which is the highest airflow-control setting specified for the heating function. In this scenario, the DOE definition for “Default airflow-control setting” instructs to test the medium airflow-control setting for heating, rather than the “as shipped” setting (*i.e.*, the low setting), since there are multiple airflow-control settings for the heating function and the medium setting is the highest setting specified. *See id.*

The inquiries DOE has received from manufacturers also indicate that some manufacturers may be interpreting the test procedure to require testing according to installation instructions printed on the control board. DOE notes that the same control board can be used across multiple products to reduce manufacturing complexity and cost, so instructions provided on a control board may not be applicable to every unit in which a control board is used, which could lead to contradictory specifications regarding the installed use of consumer furnace fans. For this reason, DOE specifies in the definition of default airflow-control setting that the manufacturer specifications for installed-use are

those specifications provided for typical consumer installations in the product literature shipped with the product in which the furnace fan is installed.

Issue 3: DOE requests comment on whether further instruction is needed for determining the appropriate airflow control settings for testing.

Issue 4: In the event of conflicting airflow-control setting information across multiple sources, DOE seeks comment on what the hierarchy should be for following manufacturers' instructions.

In inquiries received after the January 2014 Final Rule, manufacturers have stated that requiring testing of the highest airflow-control setting for a given function when presented with multiple airflow-control setting options may result in a control configuration that is not representative of field installation.

Issue 5: DOE requests information about configuration of control settings for field installations of furnace fans. Specifically, for instances in which a manufacturer specifies multiple airflow-control settings for a given function, DOE requests information and data that could help inform which airflow-control setting would be most representative of consumer use, such as data indicating the frequency with which a furnace fan is installed using each of the specified airflow-control settings.

In addition to specifying the airflow-control settings for testing, the DOE test procedure also specifies operating conditions (*e.g.*, temperature rise ranges and ESP ranges). See section 8 of Appendix AA. In some instances, manufacturers specify that an airflow-control setting is to be used only under certain specified conditions, which are typically expressed as a maximum recommended ESP or temperature rise range associated with each airflow-control setting. In such instances, the manufacturer-specified operating conditions may not be consistent with the operating conditions required by the DOE test procedure. As a result, the furnace fan would be tested at conditions outside of those specified by the manufacturer for the applicable setting, if the airflow-control setting is one that is required to be tested. Section 8 of Appendix AA requires measurements of the heating setting operating within the ESP range and the temperature rise range defined by the test procedure, regardless of the range specified by the manufacturer. The operating conditions required by DOE are intended to produce results that measure energy efficiency during a representative average use cycle for furnace fans. See 79 FR 500, 504 (Jan. 3, 2014).

Moreover, testing outside the conditions specified by the manufacturer may not be possible. Because furnaces are designed with safety controls that will automatically shut off the furnace when the outlet temperature reaches a certain temperature threshold, if the unit is operated at conditions other than those it is designed for, it may shut down before testing can be completed. For example, a thermal cutout switch might “trip” during testing causing the unit to shut down if the outlet temperature exceeds the temperature threshold of the safety control.

Issue 6: DOE requests data on the operating conditions typically encountered in the field for furnace fans across the various design options and input capacities currently available on the market.

Issue 7: DOE requests information on whether and to what extent safety shut-downs have occurred during testing.

In other cases, furnace fans have airflow-control settings that are designated by the manufacturer as being suitable for multiple functions (*i.e.*, heating, cooling, circulation); however, in the field each setting would be used only for a single function. The function that the setting would be used for when installed varies depending on installation needs (*e.g.*, assignment of a given airflow-control speed that can be used either for heating or cooling may be based on design considerations such as the size of the cooling coil paired with the furnace). In some field installations, the furnace fan must be physically reconfigured or re-wired to assign a particular function to the desired airflow-control setting. As discussed in section II.A, Appendix AA defines airflow-control settings as being configured so that they perform a certain function without manual adjustment other than interaction with a user-operable control such as a thermostat that meets the manufacturer specifications for installed use.

However, in cases where multiple functions are assigned to the same airflow-control setting, the current test procedure could be understood to require that the unit be tested in multiple functions, meaning that the unit would need to be manually reconfigured or rewired during testing. For example, for a single-stage furnace fan, if the

same airflow-control setting was designated as both the highest default heat function and the highest default constant-circulation function, then laboratory personnel would be required to first wire the fan motor to conduct the heating test at that airflow control setting, and later rewire the fan motor to conduct the constant circulation test at the same airflow control setting. Similarly, rewiring could be required for multi-stage or modulating furnace fans for which the same airflow control setting was the highest airflow control setting for constant circulation function and the highest airflow control setting for reduced heat function, and the setting was not able to be configured for both functions without reconfiguring or re-wiring the setting. (DOE notes that there is no requirement to test at a specific manufacturer specified airflow-control setting for cooling function for the DOE test.) See sections 8.6.1.1, 8.6.1.2, and 8.6, Appendix AA. Reconfiguring or re-wiring an airflow-control setting in such a manner would not be representative of how that unit is installed and operated in the field and conflicts with the requirement that an airflow-control setting perform a certain function without manual adjustment.

Issue 8: DOE seeks comment on whether there are furnace fans on the market for which the combination of control settings required by the DOE test procedure would require reconfiguration or re-wiring of the unit during testing under the current DOE test procedure. DOE also requests information on whether manufacturers have plans to introduce such furnace fans into the market. If so, DOE requests comment on whether a hierarchy should be established to give precedence to a given function.

2. Modulating Controls and Thermostat Pairings

DOE is aware that an increasing proportion of furnace fans employ modulating controls for heating, and constant circulation modes that allow fan speed to continuously vary as opposed to operating at a discrete speed for each function. These fans are characterized by having electrically commutated brushless permanent magnet (“BPM”) motors, which can be paired with thermostats that have the capability to provide modulating control in order to make use of the BPM’s ability to vary its speed to maintain a constant airflow at various ESPs. Because input from the thermostat is essential to the functioning of these types of systems, furnace fan performance may be dependent on the specific type of thermostat with which the system is paired as it could vary depending on the types of control signals provided by the thermostat. In field operation, modulating controls enable the furnace fan to reduce its speed to match heating demand during periods of low heating demand.

Section 8.3 of Appendix AA requires that the system operate continuously for at least 30 minutes at each discrete airflow setting, which would preclude dynamic response to thermostat signals that vary more frequently than 30 minutes. In addition, there are no specific provisions for testing the performance of the furnace fan under modulating control conditions. Further, the furnace fan test procedure relies on an assumed number of hours each year that the furnace fan is in heating mode operating at a constant fan speed. See Table IV.2, Appendix AA. A modulating furnace fan could potentially spend a portion of these hours operating at a fan speed other than the speed required by the test

method, impacting the energy use during periods of lower heating demand and, consequently, reduced fan speed.

Issue 9: DOE requests information about available control features that impact fan performance. Specifically, DOE requests information and data regarding modulating control approaches currently in use or planned for future use, whether the performance differences of such modulating furnace fans are currently adequately captured by the furnace fan test procedure, and, if necessary, what new provisions could be necessary to reflect the impact of these control features in FER ratings. If new provisions are suggested, DOE also seeks comment on any burdens associated with those provisions.

Issue 10: DOE requests comment on the most common type of thermostats used by consumers, particularly with regards to furnace fans with modulating control strategies.

DOE has also observed that some furnace fans have a “ramping profile” setting that is selectable through dual in-line package (“DIP”) switch adjustments during installation. Ramping profiles allow a modulating furnace fan to gradually ramp up or down over time to meet the target fan speed instead of immediately controlling to the target fan speed. Ramping profiles are often marketed as providing additional benefits to users by increasing dehumidification in cooling mode, providing faster outlet temperature change in heating mode, and reducing fan noise. As noted, section 8.3 of Appendix AA requires that the system operate continuously for at least 30 minutes at each test point

before steady state conditions are achieved and test parameters start to be recorded, and testing is conducted at steady-state and would not account for any ramping period.

Issue 11: DOE requests information on the prevalence of field installations for modulating furnace fans where dip switches are selected to allow for ramping behavior.

Issue 12: DOE requests information on whether ramping profiles may result in any difference in tested performance vs field performance, and whether this difference should be captured by the furnace fans test procedure.

3. ESP Requirements for Airflow-Control Settings Other than the Maximum

Sections 8.6.2 and 8.6.3 of Appendix AA provide the test requirements for taking measurements in airflow-control settings other than the maximum airflow-control setting. Both sections state that their respective required operating settings be maintained “until steady-state conditions are attained as specified in section 8.3, 8.4, and 8.5” of Appendix AA. Regarding ESP, sections 8.3, 8.4, and 8.5 state that stabilization is “indicated by an external static pressure within the range shown in Table 1.” The ESP values in Table 1, as indicated by the table’s title, apply only to the maximum airflow-control setting (section 8.6.1), and therefore are not applicable to sections 8.6.2 and 8.6.3. In an accompanying statement immediately below Table 1, Appendix AA directs that “once the specified ESP has been achieved, the same outlet duct restrictions shall be used for the remainder of the furnace fan test.” As such, the test procedure specifies the ESP

conditions in terms of the ductwork geometry when testing at airflow-control settings other than the maximum airflow-control setting.

Given that the ESP will vary as the airflow-control setting is changed if the outlet duct restriction remains unchanged, the ESP targets in Table 1 are not required to be met at the airflow-control settings other than the maximum setting. DOE is considering whether it would be helpful to instruct more directly that the Table 1 ESP requirements are only applicable to the maximum airflow control setting; for all other airflow-control settings, the required ESP is that which results from using the same test duct restrictions as used for the maximum airflow-control setting. Further, DOE is seeking feedback on whether additional criteria is necessary to limit variability in ESP readings for steady-state operation during the tests for airflow-control settings other than the maximum airflow setting.

Issue 13: DOE requests comment on how manufacturers are currently implementing sections 8.6.2 and 8.6.3 with respect to ESP.

Issue 14: DOE requests comments on whether it is necessary to further clarify that the specific ESP values in Table 1 are not required to be maintained for testing to sections 8.6.2 and 8.6.3.

Issue 15: DOE requests comments on whether additional direction is needed as to the ESP requirement provided in the statement accompanying Table 1, including whether additional criteria is necessary to limit variability in ESP readings for steady-state operation during the tests for airflow-control settings

other than the maximum airflow setting, and if so, what that direction should be.

4. ESP Limits for Electric Resistance Heat Kits

Modular blowers are not contained in the same cabinet as a furnace or central air conditioner and are sold as stand-alone products that can come with a variety of sizes of heating elements. During testing, they must be paired with the electric resistance “heat kit” that is likely to have the largest volume of retail sales with that basic model of modular blower. Section 6.3, Appendix AA. An electric resistance heat kit is a group of usually three to seven electric resistance coils, called elements, each of which typically is rated at five kilowatts. These heating elements can activate in stages to provide the appropriate amount of heat to the conditioned space.

Section 6.3 of Appendix AA requires modular blowers to be tested with the electric resistance heat kit with the largest volume of retail sales with that basic model of modular blower. Section 6.6 of Appendix AA also includes provisions for electric furnaces that use electric resistance heat elements. With an electric resistance heat kit, some modular blowers and electric furnaces shut off the electric resistance heat elements beyond certain ESP limits. These ESP limits may be lower than the ESP levels required by Appendix AA. As a result, the resistance heat elements would not be energized during testing, making it impossible to complete a test that reflects the electrical energy consumption of the electric heating elements as required in section 8.6.3 of Appendix AA. Since these elements would be energized during typical field use, the test procedure

may not produce results that measure energy efficiency during a representative average use cycle.

Issue 16: DOE requests comment on the prevalence of electric resistance heating kits installed in modular blowers and electric furnaces that have cutoff limits based on ESP.

Issue 17: DOE requests comment on the typical range of ESP values at which electric resistance heat kits will automatically shut off.

Issue 18: DOE requests data on the ESP ranges that this equipment experiences in the field and the frequency with which electric resistance heat kits are turned off during actual operation of modular blowers and electric furnaces.

5. Updates to Industry Standards and Consensus-Based Test Procedures

In general, DOE will adopt industry test standards as DOE test procedures for covered equipment, unless such methodology would be unduly burdensome to conduct or would not produce test results that reflect the energy efficiency, energy use, water use (as specified in EPCA) or estimated operating costs of that equipment during a representative average use cycle. Section 8(c) of appendix A to subpart C of 10 CFR part 430.

The current DOE test procedure for furnace fans incorporates by reference ANSI/ASHRAE 103-2007. ANSI/ASHRAE 103-2007 is a test procedure for residential furnaces and boilers, rather than a specific test procedure for furnace fans, and calculates

AFUE, rather than FER. Therefore, DOE's test procedure for furnace fans in Appendix AA includes references to only certain sections of ANSI/ASHRAE 103-2007, including requirements for instrumentation and test apparatus setup as well as test methodology. Appendix AA also includes additional instructions for conducting the FER test, including instructions for calculating FER.

In July 2017, ASHRAE published an update to ASHRAE 103, *i.e.*, ANSI/ASHRAE 103-2017. The 2017 version made several editorial changes to the 2007 version, including use of mandatory language and use of the International System of units. In addition to these editorial changes, the 2017 revision made updates to the test duct and plenum figure (Figure 2 of ANSI/ASHRAE 103-2017) and the system number table (Table 6 of ANSI/ASHRAE 103-2017), and removed figures for surface heat transfer and coefficient of radiation (Figures 12 and 13 of ANSI/ASHRAE 103-2007). It also adopted an amendment made by DOE in a July 10, 2013 final rule that modified the residential furnace and boiler test procedure to provide a means to accurately calculate AFUE for two-stage and modulating condensing furnace and boiler models meeting the criteria in section 9.10 of ANSI/ASHRAE 103-1993 (the version incorporated by reference at the time of the 2013 final rule). 78 FR 41265, 41268.

Figure 2 of ANSI/ASHRAE 103-2017 was changed to reflect an extension of the minimum length of the inlet duct from 12 inches to 18 inches. The current DOE test procedure requires that ESP taps be placed a minimum of 12 inches from the product inlet, indicating that models installed with a return (inlet) air duct must have a duct length

greater than 12 inches. Section 6.4.1, Appendix AA. In practice, DOE does not expect this change to interfere with nor impact the performance rating of consumer furnace fans, because the external static pressure and airflow will not change with this alteration. Additional notes were also added to Figure 2 to clarify inlet duct construction and pressure measurement.

Issue 19: DOE seeks comment on any additional changes (not discussed above) made in the 2017 version of ANSI/ASHRAE 103 as compared to 2007 version currently incorporated by reference in the DOE test procedure for furnace fans.

Issue 20: DOE requests comment on whether to update the referenced version of ANSI/ASHRAE 103 to the 2017 version and if so, what impacts would that have on the test procedure and test procedure results.

Issue 21: DOE seeks comment on whether its assumption that increasing the minimum inlet duct length from 12 inches to 18 inches will not impact the performance rating is correct and, if not, how this duct length change would change the rating.

Issue 22: DOE seeks comment on the availability of consensus-based test procedures for measuring the energy use of furnace fans that could be adopted without modification and 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.

6. Tolerance on Temperature Measuring Instruments

Section 5.1 of Appendix AA, which references Section 5.1 of ASHRAE 37-2009, requires that temperature measuring instruments must be accurate to within 0.75 °F. Section 6 of Appendix AA references section 7 of ASHRAE 103-2007 for the test apparatus setup. Section 7.6 of ASHRAE 103-2007 includes instructions to take temperature measurements with thermocouple grids constructed of either 5, 9, or 17 thermocouples, depending on the stack diameter. The measurement accuracy of a thermocouple grid depends on the type and number of thermocouples used, as well as the magnitude of the air temperature being measured. Using the types of thermocouples commonly used in test facilities (including “T-type” and “K-type”), the measurement accuracy required in Appendix AA is achievable with a minimum of 5 thermocouples at temperatures up to approximately 450 °F.⁴ Stack temperatures in gas-fired furnaces are unlikely to exceed this temperature. However, DOE has observed some oil-fired furnaces with stack temperatures exceeding 500 °F. DOE is considering whether additional specifications are required to accommodate the measurement of stack temperatures of oil-fired furnaces to ensure the repeatability and reproducibility of FER calculations.

⁴ Achievement of the measurement accuracy requirement was calculated using the thermocouple characteristics found in Table 1 of ANSI/ASTM E230/E230M-17 and assuming that the overall measurement accuracy is equal to the measurement tolerance of individual thermocouples of that type divided by the square root of ‘n’, where n is the number of thermocouples.

Issue 23: DOE seeks comment on the number and types of thermocouples, or other temperature measurement devices, that laboratories use to measure the stack temperatures of oil-fired furnaces.

Issue 24: DOE requests comment on whether stack temperatures of gas-fired furnaces are likely to exceed 450 °F. If so, DOE also seeks comment on the number and types of thermocouples or other temperature measurement devices, that laboratories use to measure the stack temperatures of such gas-fired furnaces.

Issue 25: DOE requests comment on the accuracy of measurement devices currently used to test oil-fired furnaces or gas-fired furnaces with stack temperatures exceeding 450 °F.

Issue 26: DOE requests comment on any burdens that would be associated with adding specifications to address the measurement of outlet air temperatures greater than 450 °F.

7. Dual-Fuel Heating Products

Some residential heating products include an electric heat pump and gas burner, often referred to as dual-fuel or hybrid heating units. These products are designed to provide heating with the heat pump and/or gas burner, depending on the operating conditions (*e.g.*, outdoor air temperature and heating demand). The annual operating characteristics of a dual-fuel product may differ significantly from a typical furnace. This is because the inclusion of a heat pump may change the amount of operating time necessary to meet the heating load demand when compared with a gas burner alone,

resulting in changes to the operating hours of the fan. Therefore, the estimated national annual operating values provided in Table IV.2 of Appendix AA may not be representative of an average use cycle for furnaces installed in dual-fuel applications. In addition, under the current DOE test procedure, there are no provisions to set up or operate furnace fans as dual-fuel heating units.

Issue 27: DOE requests comment on the typical operating characteristics of dual-fuel systems. Specifically, DOE requests comment on what conditions dictate when the heat pump or gas burner are providing heat, and during what conditions the heat pump and gas burner operate simultaneously.

Issue 28: DOE requests comment on whether and how the user has control over which heating source is used in a dual-fuel system.

8. Two-Stage Furnaces with Limited-Duration Reduced Stages

The DOE test procedure requires testing two-stage furnaces in “reduced” heating mode, which corresponds to burner operation at the nameplate minimum input rating. Section 8.6.3, Appendix AA. Typically, two-stage furnaces determine whether to operate at the reduced or maximum input based on heating demand and are capable of operating in reduced heating mode for extended periods of time if demand remains low. However, DOE has identified two-stage furnace models that use the reduced heating stage only temporarily and that ramp-up to the high heating stage after a pre-set period of time if the call for heat from the thermostat is not satisfied. DOE has observed that the ramp-up period for these models may be configurable by the user, but is temporary and shorter in

duration than the time required to achieve the steady-state conditions during a test.⁵ A ramp period that is shorter than the DOE-required period to achieve steady-state precludes these furnaces from completing a valid test as a two-stage furnace because the steady-state conditions cannot be met at the reduced input rate before the unit automatically ramps up to the maximum input rate.

Issue 29: DOE requests comment on how the industry currently tests and certifies two-stage furnaces that automatically ramp up from the reduced input to the maximum input after a set period.

Issue 30: DOE requests comment on the prevalence of two-stage furnaces that are controlled such that they are unable to achieve steady-state operation under the DOE test procedure in reduced heating mode.

9. Furnaces Shipped without Burners

DOE is aware that some furnaces are shipped without a burner and the furnace manufacturer specifies one or multiple options for compatible burners in product literature (*e.g.*, brochures and installation manuals). This is particularly common for oil-fired furnaces. In cases where multiple burner options from multiple manufacturers are specified, the different burners may have performance differences that impact FER even

⁵ For gas and oil furnaces, Section 8.3 of Appendix AA specifies that steady-state operation is indicated by specific defined ranges of ESP and temperature for 3 measurements taken 15 minutes apart, for a total steady-state operation period of 30 minutes. For electric furnaces and modular blowers, Section 8.4 of Appendix AA specifies that steady-state operation is indicated by specific defined ranges of ESP and temperature for 4 measurements taken 15 minutes apart, for a total steady-state operation period of 45 minutes.

though the various options may each provide the same heating capacity. These burners may be constructed differently between manufacturers, potentially resulting in different steady-state heating efficiency and/or different airflow resistance characteristics, both of which would impact FER. DOE's furnace fan test procedure and certification requirements do not specify whether to test and certify a furnace that is compatible with multiple burners with each specified burner, or a single manufacturer-specified burner. If different burner options are used in tests for a given oil furnace and burner selection impacts FER, this could result in test repeatability issues.

Issue 31: DOE requests comments on whether and by how much burner selection can impact furnace fan performance, particularly as measured by FER. If burner selection does impact furnace fan performance, DOE requests comment on potential approaches for specifying burner(s) for testing.

10. Test Procedure Repeatability

DOE understands that variations in ESP⁶ or ambient conditions (such as dry bulb temperature or relative humidity) can affect test results. In particular, the relative humidity and dry bulb temperature of the test room must be measured at the beginning of the test, but there is no specified value or tolerance that must be met. DOE seeks

⁶ Table 1 in Section 8.6.1.2 specifies the required minimum external static pressure in the maximum airflow-control setting by installation type. For each installation type, the furnace fan must be tested within a 0.05 in. w.c. range of the required ESP test condition. ESP adjustment is accomplished by symmetrically restricting the outlet of the test duct until the target ESP condition is attained within tolerance.

comment and information on whether these factors could pose a challenge to obtaining repeatable test results and reproducible results across laboratories.

Issue 32: DOE requests comment on whether stakeholders have encountered difficulty obtaining repeatable and reproducible FER results using Appendix AA. Specifically, DOE seeks information and data on how significantly fluctuations in ESP and ambient conditions (within the boundaries allowed by Appendix AA) can impact FER ratings.

C. Test Procedure Waivers

A person may seek a waiver from the test procedure requirements for a particular basic model of a type of covered product when the basic model for which the petition for waiver is submitted contains one or more design characteristics that: (1) Prevent testing according to the prescribed test procedure, or (2) cause the prescribed test procedures to evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data. 10 CFR 430.27(a)(1). On February 20, 2019, DOE received a petition for waiver and an application for interim waiver from ECR International, Inc. (“ECR”) for several models of belt-driven, single-speed furnace fans designed for heating-only applications in oil-fired warm air furnaces.⁷

⁷ See: <https://www.regulations.gov/document?D=EERE-2019-BT-WAV-0004-0001>.

The current DOE test procedure for furnace fans does not contain any provisions specific to “heating-only” units. In a notice of proposed rulemaking published on May 15, 2012, DOE initially determined that for heating-only furnaces, a reference system ESP of 0.50 in. w.c. would provide test results representative of an average use cycle. 77 FR 28674, 28686. However, DOE withdrew the proposal for separate conditions for heating-only furnace fans in a subsequent supplemental notice of proposed rulemaking, because DOE was unable to identify heating-only models on the market at that time that were within the scope of the rulemaking. 78 FR 19606, 19619 (April 2, 2013). Therefore, in the January 2014 Final Rule, DOE did not adopt separate ESP requirements for heating-only furnace fans. See 79 FR 500, 505-506.

In its petition for waiver, ECR asserted that the furnace fan basic models specified in its petition have design characteristics that prevent testing of the basic model according to the test procedure prescribed in Appendix AA. Specifically, ECR claimed that testing such furnace fans at the ESP requirements in Appendix AA reduces airflow and increases temperature rise to the point where the units shut off during testing due to high temperature limits, making it impossible to reach steady state for testing at the required conditions. On March 9, 2021, DOE published a Decision and Order granting ECR a waiver from the applicable test procedure at 10 CFR part 430, subpart B, appendix AA for specified basic models of furnace fans, which specifies an alternate test procedure (specifically it specifies alternate ESP test conditions). 86 FR 13530. The Decision and

Order provides that ECR must test and rate such products using the alternate test procedure set forth in the Decision and Order.⁸ *Id.* at 86 FR 13534-13535.

The test procedure waiver for these furnace fans basic models provides alternate test provisions to measure energy that are representative of real-world use conditions for the basic models specified in the Order.

Issue 33: DOE requests feedback on whether the test procedure waiver approach is generally appropriate for testing all basic models of furnace fans designed for heating-only applications.

III. Submission of Comments

DOE invites all interested parties to submit in writing by the date specified in the **DATES** heading, comments and information on matters addressed in this RFI and on other matters relevant to DOE's early assessment of whether an amended test procedure for furnace fans is warranted and if so, what such amendments should be.

Submitting comments via <https://www.regulations.gov>. The <https://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

⁸ See: <https://www.regulations.gov/document/EERE-2019-BT-WAV-0004-0015>.

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 <https://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 <https://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 <https://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 <https://www.regulations.gov> provides after you have successfully uploaded your comment.

Submitting comments via email. Comments and documents submitted via email also will be posted to <https://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. 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 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. 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.

Signing Authority

This document of the Department of Energy was signed on June 29, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, D.C., on June 29, 2021.

X Kelly Speakes-Backman Digitally signed by Kelly Speakes-Backman
Date: 2021.06.29 22:02:31 -04'00'

Kelly Speakes-Backman
Principal Deputy Assistant Secretary and
Acting Assistant Secretary
Energy Efficiency and Renewable Energy