[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 430

[Docket No. EERE-2012-BT-TP-0013]

RIN 1904-AC71

Energy Conservation Program: Test Procedures for Conventional Ovens

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

ACTION: Final rule.

SUMMARY: On December 3, 2014, the U.S. Department of Energy (DOE) issued a supplemental notice of proposed rulemaking (SNOPR) to amend the test procedures for conventional cooking products. The oven-related procedures proposed in that rulemaking serve as the basis for this final rule. As part of the SNOPR, DOE proposed to incorporate methods for measuring conventional oven volume, clarified that the existing oven test block must be used to test all ovens regardless of input rate, and proposed a method to measure the energy consumption of conventional ovens equipped with an oven separator. Additionally, DOE proposed technical corrections to the units of measurement in certain calculations. This final rule amends the current procedure to include the proposed changes listed above, as well as clarifications to certain definitions, that will take effect 30 days after the final rule publication date. These changes will be mandatory for product testing to demonstrate compliance with any new or amended energy conservation standards when they take effect and for representations of the energy consumption of conventional ovens starting 180 days after publication.

DATES: The effective date of this rule is **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].** The final rule changes will be mandatory for product testing starting **[INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].** The incorporation by reference of certain publications listed in this rule was approved by the Director of the Federal Register as of [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**].

ADDRESSES: The docket, which includes Federal Register notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials, is available for review at regulations.gov. All documents in the docket are listed in the 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.

A link to the docket web page can be found at: http://www.regulations.gov/#!docketDetail;D=EERE-2012-BT-TP-0013. This web page will contain a link to the docket for this notice on the regulations.gov site. The regulations.gov web page will contain simple instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket, contact Ms. Brenda Edwards at (202) 586-2945 or by email: Brenda.Edwards@ee.doe.gov.

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SUPPLEMENTARY INFORMATION:

This final rule incorporates by reference into part 430 the following industry standard:

AHAM OV-1-2011, ("AHAM OV-1"), Procedures for the Determination and Expression of the Volume of Household Microwave and Conventional Ovens, (2011).

Copies of AHAM standard can be purchased from the Association of Home Appliance Manufacturers, 1111 19th Street NW, Suite 402, Washington DC 20036, 202-872-5955, or www.aham.org.

This AHAM standard is discussed further in section III.D.

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I. Authority and Background

Title III of the Energy Policy and Conservation Act of 1975 (42 U.S.C. 6291, et seq.; "EPCA" or, "the Act") sets forth a variety of provisions designed to improve energy efficiency. (All references to EPCA refer to the statute as amended through the Energy Efficiency Improvement Act of 2015, Pub. L. 114-11 (Apr. 30, 2015). Part B of Title III, which for editorial reasons was redesignated as Part A upon incorporation into the U.S. Code (42 U.S.C. 6291–6309, as codified), establishes the "Energy Conservation Program for Consumer Products Other

Than Automobiles." These include cooking products[1], and specifically consumer conventional ovens, the subject of this document. (42 U.S.C. 6292(a)(10))

Under EPCA, the energy conservation program consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. The 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 under EPCA, and (2) making representations about the efficiency of those products. Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA.

A. General Test Procedure Rulemaking Process

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. EPCA provides that any test procedures prescribed or amended under this section shall 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 shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

In addition, if DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures and offer the public an opportunity to present oral and written

[1] DOE's regulations define kitchen ranges and ovens, or "cooking products", as one of the following classes: conventional ranges, conventional cooking tops, conventional ovens, microwave ovens, microwave/conventional ranges and other cooking products. (10 CFR 430.2) Based on this definition, DOE interprets kitchen ranges and ovens to refer more generally to all types of cooking products including, for example, microwave ovens.

comments on them. (42 U.S.C. 6293(b)(2)) Finally, in any rulemaking to amend a test procedure, DOE must determine to what extent, if any, the proposed test procedure would alter the measured energy efficiency of any covered product as determined under the existing test procedure. (42 U.S.C. 6293(e)(1))

This final rule fulfills, in part, DOE's obligation to periodically review its test procedures under 42 U.S.C. 6293(b)(1)(A). DOE anticipates that its next evaluation of this test procedure for conventional ovens will occur in a manner consistent with the timeline set out in this provision.

B. Test Procedures for Cooking Products

DOE's test procedures for conventional ranges, conventional cooking tops, conventional ovens, and microwave ovens are codified at appendix I to subpart B of Title 10 of the Code of Federal Regulations (CFR) part 430 (Appendix I).

DOE established the test procedures in a final rule published in the Federal Register on May 10, 1978. 43 FR 20108, 20120–20128. DOE revised its test procedures for cooking products to more accurately measure their efficiency and energy use, and published the revisions as a final rule in 1997. 62 FR 51976 (Oct. 3, 1997). These test procedure amendments included: (1) a reduction in the annual useful cooking energy; (2) a reduction in the number of self-cleaning oven cycles per year; and (3) incorporation of portions of International Electrotechnical Commission (IEC) Standard 705-1988, "Methods for measuring the performance of microwave ovens for household and similar purposes," and Amendment 2-1993 for the testing of microwave ovens. Id. The test procedures for conventional cooking products establish provisions for determining estimated annual operating cost, cooking efficiency (defined as the ratio of cooking

energy output to cooking energy input), and energy factor (defined as the ratio of annual useful cooking energy output to total annual energy input). 10 CFR 430.23(i); Appendix I. These provisions for conventional cooking products are not currently used for compliance with any energy conservation standards because the present standards are design requirements, and there is not an EnergyGuide[2] labeling program for cooking products.

DOE subsequently conducted a rulemaking to address standby and off mode energy consumption, as well as certain active mode testing provisions, for dishwashers, dehumidifiers, and conventional cooking products. DOE published a final rule on October 31, 2012 (77 FR 65942, hereinafter referred to as the October 2012 Final Rule), adopting standby and off mode provisions that satisfy the EPCA requirement that DOE include measures of standby mode and off mode energy consumption in its test procedures for residential products, if technically feasible. (42 U.S.C.6295(gg)(2)(A))

C. The January 2013 NOPR

On January 30, 2013, DOE published a NOPR (78 FR 6232, hereinafter referred to as the January 2013 NOPR) proposing amendments to Appendix I that would allow for measuring the active mode energy consumption of induction cooking products; i.e., conventional cooking tops and ranges equipped with induction heating technology for one or more surface units[3] on the cooking top. DOE proposed to incorporate induction cooking tops by amending the definition of "conventional cooking top" to include induction heating technology. Furthermore, DOE proposed to require for all cooking tops the use of test equipment compatible with induction

[2] For more information on the EnergyGuide labeling program, see: www.access.gpo.gov/nara/cfr/waisidx_00/16cfr305_00.html.

[3] The term surface unit refers to burners for gas cooking tops, electric resistance heating elements for electric cooking tops, and inductive heating elements for induction cooking tops.

technology. Specifically, DOE proposed to replace the solid aluminum test blocks currently specified in the test procedure for cooking tops with hybrid test blocks comprising two separate pieces: an aluminum body and a stainless steel base. In the January 2013 NOPR, DOE also proposed amendments to include a clarification that the test block size be determined using the smallest dimension of the electric surface unit. 78 FR 6232 (Jan. 30, 2013).

D. The December 2014 SNOPR

On December 3, 2014, DOE published a supplemental NOPR (SNOPR) (79 FR 71894, hereinafter referred to as the December 2014 SNOPR), modifying its proposal from the January 2013 NOPR to more accurately measure the energy efficiency of induction cooking tops. DOE proposed to add a layer of thermal grease between the stainless steel base and aluminum body of the hybrid test block to facilitate heat transfer between the two pieces. DOE also proposed additional test equipment for electric surface units with large diameters (both induction and electric resistance) and gas cooking top burners with high input rates. 79 FR 71894 (Dec. 3, 2014). In addition, DOE proposed methods to test non-circular electric surface units, electric surface units with flexible concentric cooking zones, and full-surface induction cooking tops. Id. Furthermore, DOE proposed to incorporate methods for measuring conventional oven volume, clarify that the existing oven test block must be used to test all ovens regardless of input rate, and provide a method to measure the energy consumption and efficiency of conventional ovens equipped with an oven separator. Id.

E. Conventional Cooking Top Active Mode Test Procedures

DOE received a number of comments from interested parties on the cooking top active mode test procedure proposed in the December 2014 SNOPR. The majority of comments stated

that additional analysis was necessary before establishing a test procedure for conventional cooking tops. AHAM requested an extension of the comment period for the December 2014 SNOPR, citing the difficulty its members had procuring the specified test equipment materials. Therefore, AHAM stated, many manufacturers were not able to properly assess the new specifications, testing variation, repeatability, and reproducibility of the proposed test procedure before the comment period closed. (AHAM, No. 14 at p. 1)[4] AHAM also expressed concern with DOE's choice to pursue an accelerated rulemaking schedule for cooking products, stating that the rulemaking schedule did not allow for a thorough technical examination. AHAM asked DOE to seek additional input from interested parties on the December 2014 SNOPR and commented that the proposed cooking top test procedure may result in technical problems. (AHAM, No. 18 at pp. 1–2)

BSH Home Appliances Corporation (BSH) and General Electric Appliances (GE) stated that delays associated with acquiring the hybrid test block materials necessitated additional time for them to evaluate DOE's proposal. (BSH, No. 16 at p. 2; GE, No. 17 at p. 1) BSH commented that the proposed hybrid test block method did not include certain specifications necessary for test procedure reproducibility, such as test load sizing and positioning, and recommended that DOE consider the specifications in International Electrotechnical Commission (IEC) Standard 60350-2 Edition 2, "Household electric appliances – Part 2: Hobs – Method for measuring performance" (IEC Standard 60350-2). (BSH, No. 16 at p. 1) Further, AHAM, BSH, and GE suggested that DOE specify additional test block diameters because these commenters asserted

[4] A notation in the form "AHAM, No. 14 at p. 1" identifies a written comment (1) made by AHAM; (2) recorded in document number 14 that is filed in the docket of this cooking products test procedures rulemaking (Docket No. EERE-2012-BT-TP-0013) and maintained in the Resource Room of the Building Technologies Program; and (3) which appears on page 1 of document number 14.

that the proposed test block sizes do not adequately reflect surface unit sizes currently available on the market. (BSH, No. 16 at p. 5; GE, No. 17 at p 2; AHAM, No. 18 at p. 2)

Interested parties also expressed a significant number of concerns with the use of thermal grease. GE noted that since receiving DOE's proposal, it has not been able to replicate the DOE test results using the methods described. (GE, No. 17 at p. 2) Specifically, GE observed during its testing that the aluminum body slid off the stainless steel base, the thermal grease dried out, and the amount of grease between the blocks changed from one test to another. (GE, No. 17 at p. 2) AHAM, BSH, and GE requested that DOE specify an operating temperature range for the thermal grease as well as an application thickness, but also noted that the thermal conductivity and viscosity of the grease may change over time or after repeated use at high temperatures. (BSH, No. 16 at p. 11; GE, No. 17 at p. 2; AHAM, No. 18 at p. 3) GE further commented that the variation introduced by the hybrid test block due to the inability to reliably maintain the specified flatness, thermal grease, and inadequate sizing, may be small individually, but collectively result in a test procedure that cannot reliably discern efficiency differences between similar products, alternate technology options, and product classes. Thus, GE believes the proposal for conventional cooking tops in the December 2014 SNOPR results in too much variability to serve as the basis for establishing a standard. (GE, No. 17 at p. 3)

The California IOUs also stated that they prefer an alternative to the hybrid test block and recommended that DOE require water-heating test methods to measure the cooking efficiency of conventional cooking tops. Specifically, the California IOUs requested that DOE align the residential cooking product test methods with existing industry test procedures, such as

American Society for Testing and Materials (ASTM) standard F1521-12, Standard Test Methods for Performance of Range Tops, and IEC Standard 60350-2, Household electric cooking appliances - Part 2: Hobs - Methods for measuring performance. (California IOUs, No. 19 at p. 1) The California IOUs commented that they plan to conduct additional testing to better characterize the differences between the water-heating and hybrid test block test procedures, and will provide these results to DOE. According to the California IOUs, the differences in test procedure standard deviation between the hybrid test block and water-heating test method as presented in the December 2014 SNOPR did not sufficiently show that the hybrid test block method is more repeatable than a water-heating method. (California IOUs, No. 19 at p. 2) Additionally, the California IOUs believe cooking efficiencies derived using a water-heating test method are more representative of the actual cooking performance of cooking tops as opposed to a test procedure using hybrid test blocks, since many foods prepared on cooktops have relatively high liquid content. (California IOUs, No. 19 at p. 1)

In February and March of 2015, DOE conducted a series of interviews with manufacturers of conventional cooking products representing the majority of the U.S. market to discuss key issues with the proposed cooking top test procedure. Manufacturers agreed that the hybrid test block method, as proposed, presented many issues which had not yet been addressed, and which left the repeatability and reproducibility of the test procedure in question. These concerns were similar to those expressed in written comments but were received from a larger group of manufacturers and included:

- Difficulty obtaining the hybrid test block materials;

- Difficulty obtaining and applying the thermal grease without more detailed specifications (i.e., thermal conductivity alone was not sufficient to identify a grease that performed according to DOE's descriptions in the December 2014 SNOPR);
- Difficulty testing induction cooking tops that use different programming techniques to prevent overheating (some manufacturers observed that power to the heating elements cut off prematurely during testing with the hybrid test block even after adding thermal grease); and
- The need for larger test block sizes to test electric surface units having 12-inch and 13-inch diameters and gas surface units with high input rates.

Interviewed manufacturers that produce and sell products in Europe uniformly supported the use of a water-heating test method and harmonization with IEC Standard 60350-2 for measuring the energy consumption of electric cooking tops. These manufacturers cited the benefits of adopting a test method similar to the IEC water-heating method as including: (1) compatibility with all electric cooking top types, (2) additional test vessel diameters to account for the variety of surface unit sizes on the market, and (3) the test load's ability to represent a real-world cooking top load.

After reviewing public comments and information received during manufacturer interviews, as well as performing additional analyses, DOE concluded that further study is required before a cooking top test procedure can be established that produces test results which measure energy use during a representative average use cycle, is repeatable and reproducible,

and is not unduly burdensome to conduct. For these reasons, this final rule addresses test methods for conventional ovens only, including conventional ovens that are a part of conventional ranges. This final rule also addresses minor technical corrections to existing calculations and definitions in Appendix I for both conventional cooking tops and ovens.

DOE plans to address test procedures for cooking tops in a separate rulemaking in order to consider any additional data and information that will allow it to further conduct the analysis of cooking tops, particularly when using a water-heating method to evaluate energy consumption. As part of that rulemaking, DOE will carefully consider and address remaining cooking top-related comments on the December 2014 SNOPR.

II.Summary of the Final Rule

This final rule amends the current DOE test procedure for conventional ovens. These changes will primarily clarify the manner in which to test for compliance with potential energy conservation standards for conventional ovens. The final rule establishes that the existing oven test block should be used to test all ovens, including ovens having input rates greater than 22,500 British thermal units per hour (Btu/h). The final rule additionally amends the current DOE test procedure to include test methods for conventional ovens equipped with an oven separator. Conventional ovens equipped with an oven separator shall be tested in each possible oven configuration (i.e., full oven cavity, upper cavity, and lower cavity), with the results averaged.

Because Appendix I does not currently contain a measure of conventional oven volume, the final rule incorporates by reference in the DOE test procedure the relevant sections of AHAM Standard OV-1-2011 “Procedures for the Determination and Expression of the Volume of Household Microwave and Conventional Ovens” (AHAM-OV-1-2011) for determining

conventional oven cavity volume. As part of its rulemaking that is considering amended standards for conventional ovens, DOE proposed standards as a function of oven cavity volume.

Additionally, this final rule is clarifying the current definitions for "freestanding" and "built-in" installation configurations. Because the manufacturer instructions of some conventional ovens state the oven can be used in either a freestanding or built-in configuration, this final rule is clarifying that ovens with this option be tested in the built-in configuration, as ovens designed to be used in a built-in configuration incorporate fan-only mode for thermal management, and the energy consumption of these products is likely higher than for comparable ovens designed for use only in a freestanding configuration. Furthermore, the final rule is clarifying the term "self-cleaning operation" when referring to an oven's self-cleaning process. The existing test procedure in Appendix I does not include an explicit definition, although section 3 of Appendix I, Test Methods and Measurements, requires measurement of self-cleaning operation.

Finally, the final rule includes technical corrections to the calculation of derived results from test measurements in section 4 of Appendix I. Section 4 contains a number of references to incorrect units of measurement and an incorrect value for the annual useful cooking energy output for gas cooking tops. The final rule also restores headings for sections 4.2 and 4.2.1 in Appendix I regarding the calculations for conventional cooking tops, which were inadvertently removed in the October 2012 Final Rule.

III. Discussion

A. Products Covered by this Test Procedure Rulemaking

As discussed in section I of this final rule, section 6292(a)(10) of EPCA covers kitchen ranges and ovens, or "cooking products." DOE's regulations define "cooking products" as consumer products that are used as the major household cooking appliances. They are designed to cook or heat different types of food by one or more of the following sources of heat: gas, electricity, or microwave energy. Each model may consist of a horizontal cooking top containing one or more surface units[5] and/or one or more heating compartments. Cooking products include the following classes: conventional ranges, conventional cooking tops, conventional ovens, microwave ovens, microwave/conventional ranges and other cooking products. (10 CFR 430.2) In this final rule, DOE is addressing test procedures for conventional ovens.

DOE notes that conventional ranges are defined in 10 CFR 430.2 as a class of kitchen ranges and ovens which is a household cooking appliance, consisting of a conventional cooking top and one or more conventional ovens. Because ranges consist of both a cooking top and at least one oven, any potential cooking top energy conservation standard or oven energy conservation standard would apply to each of these cooking systems individually. Thus, the test procedures presented in this final rule also apply to the oven portion of a conventional range.

As part of the previous energy conservation standards rulemaking for conventional cooking products, DOE decided not to analyze conventional gas cooking products with higher burner input rates, including products marketed as "commercial-style" or "professional-style," in its consideration of energy conservation standards due to a lack of available data for determining

[5] The term surface unit refers to burners for gas cooking tops, electric resistance heating elements for electric cooking tops, and inductive heating elements for induction cooking tops.

the efficiency characteristics of those products. At the time, DOE considered commercial-style ovens to be gas ovens with burner input rates greater than 22,500 Btu/h. 74 FR 16040, 16054 (Apr. 8, 2009); 72 FR 64432, 64444–64445 (Nov. 15, 2007). In the December 2014 SNOPR, DOE noted that the current definitions for "conventional oven" and "conventional range" in 10 CFR 430.2 already cover conventional gas ovens with higher input rates (including commercial-style gas ovens), as these products are household cooking appliances with compartments intended for the cooking or heating of food by means of a gas flame.

Sub-Zero Group, Inc. (Sub-Zero) commented that DOE's findings based on manufacturer feedback in the previous energy conservation standards rulemaking are still relevant. Specifically, the small market size, the limited energy savings potential, and the lack of energy consumption data for ovens with high input rates are reasons to exclude these products from coverage. (Sub-Zero, No. 20 at pp. 2, 3) Sub-Zero further commented that "high performance" is a better descriptor of cooking products with high input rates rather than "commercial-style," noting that the "high performance" segment appeals to consumers demanding restaurant-style cooking performance in their homes. (Sub-Zero, No. 20 at p. 2) Sub-Zero suggested that high performance (i.e., "commercial-style") products be defined as cooking products that offer residential consumers restaurant-quality performance at a safety and convenience level that is acceptable for residential use. (Sub-Zero, No. 20 at p. 2)

DOE excluded "commercial-style" conventional gas ovens from its analysis in the previous energy conservation standards rulemaking due to a lack of available data for determining efficiency characteristics of those products. 74 FR 16040, 16054 (Apr. 8, 2009); 72 FR 64432, 64444–64445 (Nov. 15, 2007). As discussed in section III.C of this final rule, DOE

conducted testing in support of the December 2014 SNOPR that demonstrated that the existing conventional oven test procedure is appropriate for ovens with high input rates. Additionally, DOE is not aware of any data or test procedures that establish whether a conventional oven with burner input rates greater than 22,500 Btu/h delivers "restaurant-quality performance" as compared to an oven with burner input rates lower than 22,500 Btu/h. Furthermore, through testing, reverse engineering analyses, and discussions with manufacturers conducted in support of the concurrent energy conservation standards rulemaking for cooking products, DOE determined that the primary differentiation between conventional gas ovens with lower burner input rates and those with higher input rates, including those marketed as commercial-style, was design and construction related to aesthetics rather than improved cooking performance. Some examples of design and construction related features include heavier gauge cavity walls, extra interior support structure for heavier gauge racks, and ball-bearing extension racks. These features add to the overall thermal mass that must be heated during the baking process but do not necessarily improve cooking performance.

For these reasons, DOE notes in this final rule that the current definitions for "conventional oven" and "conventional range" in 10 CFR 430.2 already cover conventional gas ovens with higher input rates (including commercial-style gas ovens), as these products are household cooking appliances with compartments intended for the cooking or heating of food by means of a gas flame.

B.Effective Date

The amended test procedure becomes effective 30 days after this test procedure final rule is published in the Federal Register. Pursuant to EPCA, manufacturers of covered products must

use the applicable test procedure as the basis for determining that their products comply with the applicable energy conservation standards adopted pursuant to EPCA and for making representations about the efficiency of those products. (42 U.S.C. 6293(c); 42 U.S.C. 6295(s)) Beginning 180 days after publication of this test procedure final rule, representations related to the energy consumption of conventional ovens must be based upon results generated under the applicable provisions of the amended test procedure in Appendix I. (42 U.S.C. 6293(c)(2))

C. Gas Ovens with Input Rates Greater than 22,500 Btu/h

Because DOE is considering in a separate rulemaking energy conservation standards for conventional ovens, including gas ovens with high input rates, DOE evaluated the appropriateness of the existing test methods in Appendix I for use with conventional gas ovens that have burner input rates greater than 22,500 Btu/h. In the December 2014 SNOPR, DOE proposed that the existing test methods in Appendix I should be used to test ovens with high input rates, including gas ovens marketed as commercial-style. 79 FR 71916 (December 3, 2014).

The current active mode test procedure for conventional ovens involves setting the temperature control for the normal baking cooking cycle such that the temperature inside the oven is 325 ± 5 degrees Fahrenheit (°F) higher than the room ambient air temperature (77 ± 9 °F). An 8.5-pound (6.25-inch diameter) cylindrical anodized aluminum test block is then heated in the oven from ambient room air temperature ± 4 °F until the test block temperature has increased 234 °F above its initial temperature. If an oven permits baking by either forced convection by using a fan, or without forced convection, the oven is tested using the procedure described above in each of those two cooking modes. After the baking test(s), if the oven is

equipped with a self-cleaning function, the self-cleaning process is initiated in accordance with the manufacturer's instruction and allowed to run until completion. The measured energy consumption during these test cycles is used to calculate the oven's cooking efficiency and integrated annual energy consumption (IAEC).[6]

DOE's review of the gas oven cavity volumes currently available on the U.S. market indicated that there is significant overlap in oven cavity volume between products marketed as standard, residential-style ovens and those marketed as commercial-style ovens. The primary differentiating factor between the two oven types was burner input rate, which is greater than 22,500 Btu/h for most commercial-style gas ovens. In the December 2014 SNOPR, DOE investigated the effect of increasing oven test block size on oven cooking efficiency. DOE sought to determine whether a larger test block would provide a more representative measure of cooking efficiency at higher input rates. DOE also sought to determine whether the smaller block was inadequate to properly measure the efficiency of commercial-style ovens. In its testing, DOE found that while cooking efficiency increased with the larger test block, it scaled by approximately the same factor for all ovens tested regardless of a particular oven's input rate or cavity volume, or whether the oven was marketed as residential-style or commercial-style. The relative ranking of cooking efficiency for ovens with high input rates as compared to ovens with input rates lower than 22,500 Btu/h did not change with increased test block size. This suggested that thermal losses are large enough in comparison to the heat absorbed by either sized test block that they account for much of the additional oven energy input for ovens with high input rates.

[6] For ovens that can be operated with or without forced convection, the average of the energy consumption for these two modes is used. For self-clean mode, the test procedure in Appendix I assumes an average of 4 self-cleaning operations per year.

Thus, the thermal losses from the cavity are driven largely by input rate alone and do not change greatly with increased test block size. 79 FR 71915–71916 (December 3, 2014).

Sub-Zero stated that the proposed test procedure does not accurately measure the performance and efficiency of the larger, higher-output components. (Sub Zero, No. 20 at p. 2) Additionally, Sub-Zero commented that an analysis based largely on 30-inch wide gas or electric ranges cannot adequately evaluate the very different performance attributes offered by high-performance products which are essential to consumer utility. (Sub-Zero, No. 20 at p. 2) Thus, Sub-Zero believes that DOE's conclusion that the existing test procedure in Appendix I is appropriate for ovens with high input rates is incorrect. (Sub-Zero, No. 20 at p. 3) Sub-Zero requested that high performance products be exempted until adequate further analysis is conducted such that these products can be accurately and fairly evaluated. (Sub Zero, No. 20 at p. 3)

In support of the December 2014 SNOPR and in support of the parallel energy conservation standards rulemaking for conventional ovens, DOE tested eight conventional gas ovens that were selected to capture a range of design features that might impact performance, including infrared broilers, convection fans, and hidden bake elements. The basic design features and measured IAEC are shown in Table III-1. The test sample included 30-inch wide models as well as models with widths greater than 30 inches. DOE observed that many of the same features found in gas ovens marketed as commercial-style were also available in ovens marketed as residential-style. By comparing the design features and the measured energy consumption of the ovens in its test sample, DOE determined that the major differentiation between conventional gas ovens with lower burner input rates and those with higher input rates, including those marketed

as commercial-style, was design and construction related to aesthetics rather than improved cooking performance. Available information also indicates that the high thermal mass of products marketed as commercial-style likely lead to a low oven cooking efficiency and require higher oven input rates to compensate for the heat lost to the cavity.

Table III-1 Gas Oven Features in DOE Test Sample

Test Unit #	Type	Installation Configuration	Burner Input Rate (Btu/h)	Unit Width (in.)	Cavity Volume (ft^3)	Ignition Type	Hidden Bake Element (Y/N)	Convection (Y/N)	Normalized IAEC† (kBtu/yr)
1	Standard	Freestanding	18,000	30	4.8	Spark	Y	N	1234.2
2	Standard	Freestanding	18,000	30	4.8	Glo-bar	Y	N	1396.5
3	Self-Clean	Freestanding	18,000	30	5.0	Glo-bar	Y	Y	1269.0
4	Standard	Freestanding	16,500	30	4.4	Glo-bar	Y	N	1495.2
5	Self-Clean	Built-in	13,000	24	2.8	Glo-bar	Y	N	1492.9
6*	Standard	Freestanding	28,000	36	5.3	Glo-bar	Y	Y	1864.5
7*	Standard	Slide-in	27,000	30	4.4	Glo-bar	Y	Y	1916.5
8*	Standard	Freestanding	30,000	36	5.4	Glo-bar	Y	Y	2079.3

* Models are marketed as commercial style.
† Measured IAEC normalized to a fixed cavity volume of 4.3 ft^3.

DOE also investigated the time it took each oven in its sample to heat the test block to the required final temperature of 234 °F above its initial temperature. As shown in Table III-2, gas ovens with burner input rates greater than 22,500 Btu/h do not heat the test block significantly faster than the ovens with lower burner input rates, and two out of the three units with the higher burner input rates took longer than the average time to heat the test block.

Table III-2. Gas Oven Test Times

Unit	Product Class	Burner Input Rate (Btu/h)	Bake Time for the Test Block to Reach 234 °F Above Initial Temp (minutes (min))	Difference in Time from Avg. (min)

1	Standard	18,000	43.6	-3.8
2	Standard	18,000	43.6	-3.8
3	Self-Clean	18,000	47.2	-0.2
4	Standard	16,500	44.9	-2.5
5	Self-Clean	13,000	48.9	1.5
6	Standard *	28,000	48.9	1.5
7	Standard *	27,000	45.4	-2.0
8	Standard *	30,000	57.2	9.8
		Average	47.4	-

* Test units 6, 7, and 8 are marketed as commercial-style ovens.

Considering the testing results and analysis described above, and because interested parties did not provide data or information to support the assertion that the performance of conventional ovens with input rates greater than 22,500 Btu/h as compared to ovens with lower input rates cannot be accurately measured using the existing test procedure, DOE maintains in this final rule that the existing test block and existing conventional oven test method are appropriate to test conventional ovens with input rates greater than 22,500 Btu/h.

D. Incorporating by Reference AHAM-OV-1-2011 for Determination of the Volume of Conventional Ovens

As discussed in section I of this final rule, DOE has initiated a rulemaking to determine whether to amend the current energy conservation standards for conventional ovens. As part of that rulemaking, DOE has proposed standards as a function of oven cavity volume.

In the December 2014 SNOPR, DOE proposed to amend section 3.1.1 of Appendix I to incorporate by reference the industry test standard AHAM-OV-1-2011, which includes a method for determining oven cavity volume. DOE proposed to incorporate section 3, “Definition,”

section 5.1, “General Principles,” and section 5.2 “Overall Volume” of AHAM-OV-1-2011, as these sections provide a repeatable and reproducible method to measure cavity dimensions and calculate overall volume by including clear definitions of oven characteristics and tolerances for dimensional measurements. 79 FR 71916 (December 3, 2014). Section 5.1 of AHAM-OV-1-2011 specifies that if depressions or cutouts exist in the cavity wall, dimensions are taken from the plane representing the largest area of the surface. Section 5.1 of AHAM-OV-1-2011 also specifies that oven lights, racks, and other removable features shall be ignored in the overall volume calculation, and the volume of non-rectangular cavities is calculated by measuring the rectangular portion of the cavity and non-rectangular cavity separately and adding their volumes together.

AHAM-OV-1-2011 also includes a measurement of the oven’s usable space, which is the volume inside the oven cavity available for the placement of food, but DOE did not propose to incorporate this measurement in Appendix I. The usable space is oven-specific and determined by measuring either the size of the cavity door aperture or the distance between barriers, racks, and rack supports inside the cavity or on the cavity walls. The lesser of these dimensions is used to calculate the volume of the usable space.

Although DOE did not receive any public comments on its proposal to incorporate the overall cavity volume measurement described in section 5.1 and 5.2 of AHAM-OV-1-2011, one manufacturer commented during interviews conducted in February and March of 2015 that DOE should instead consider incorporating the usable space measurement described in section 5.3 of AHAM-OV-1-2011. The manufacturer cited difficulty in determining the plane representing the largest area of the cavity wall surface, and also stated that the oven test procedure used by

National Resources Canada (NRCan) bases its energy efficiency regulations on the volume of usable oven space and not overall cavity volume.

DOE notes that during February and March 2105 manufacturer interviews conducted to discuss the December 2014 SNOPR, the majority of manufacturers confirmed that the cavity volume currently published in marketing materials and product literature typically represents overall cavity volume. DOE does not believe that requiring this measurement will place additional burden on manufacturers. Manufacturers already provide exterior dimensions in the installation instructions and may also be able to use the configuration and dimensions of indentions in the oven cavity walls provided in engineering drawings to determine the plane representing the largest area of the cavity wall surface. Incorporating a cavity measurement into Appendix I would, in most circumstances, add only the three additional measurements of cavity height, width, and depth. Furthermore, DOE believes the overall cavity volume measurement provides a more accurate representation of the relationship between cavity volume and cooking efficiency as measured by the DOE test procedure in Appendix I. Any mass in the overall cavity volume outside of the usable space is heated during the bake cycle, contributes to the thermal mass, and thus impacts the cooking efficiency of the oven.

For the reasons discussed above, DOE amends in this final rule section 3.1.1 of Appendix I to incorporate by reference Sections 3, 5.1, and 5.2 of AHAM-OV-1-2011 for measuring the overall oven cavity volume.

E. Conventional Oven Separator

In the December 2014 SNOPR, DOE observed one conventional electric oven equipped with an oven separator on the U.S. market that allows for cooking using the entire oven cavity in the absence of the separator or, if the separator is installed, splitting the oven into two smaller cavities that may be operated individually with independent temperature controls. DOE proposed to test conventional ovens equipped with an oven separator in each possible oven configuration (i.e., full oven cavity, upper cavity, and lower cavity) with the cooking efficiency and total annual energy consumption averaged. DOE noted that while the current test procedure in Appendix I includes provisions for measuring the energy consumption and cooking efficiency of single ovens and multiple (separate) ovens[7], it does not include provisions for how to test a single oven that can be configured as a full oven or as two separate smaller cavities. 79 FR 71916-71917 (December 3, 2014).

During the subsequent manufacturer interviews, several manufacturers commented that without an easy or convenient way to store the separator, consumers would rarely use the feature. One manufacturer suggested that DOE consider applying a consumer usage factor to the oven separator when calculating annual energy consumption instead of using an equally-weighted average.

DOE is not aware of any consumer usage data indicating how often consumers might use an oven separator in each configuration. Additionally, DOE notes that the annual energy consumption of conventional ovens having multiple, permanent cavities of different volumes are

[7] For multiple ovens, Appendix I specifies that the energy consumption and cooking efficiency be calculated as the average of each individual oven.

currently averaged with an equal weighting in the existing oven test procedure in Appendix I. Therefore, DOE has no basis to adopt a weighted average of cooking efficiency and annual energy consumption as part of the test procedure for ovens equipped with an oven separator. In this final rule, DOE amends the oven test procedure in Appendix I to require the test of conventional ovens equipped with an oven separator in each possible oven configuration and to calculate cooking efficiency and annual energy consumption as an equal average of the results measured in each configuration.

F. Standby and Off Mode Test Procedure

EPCA requires that DOE amend its test procedures for all covered consumer products, including conventional ovens, to include measures of standby mode and off mode energy consumption, if technically feasible. (42 U.S.C. 6295(gg)(2)(A)) Accordingly, DOE conducted a rulemaking for conventional cooking products, dishwashers, and dehumidifiers to address standby and off mode energy consumption.[8] In the October 2012 Final Rule, DOE addressed standby mode and off mode energy consumption, as well as active mode fan-only operation, for conventional cooking products. 77 FR 65942 (Oct. 31, 2012).

DOE noted in the December 2014 SNOPR that because conventional gas ovens with higher input rates are covered under the definition of "cooking products" in 10 CFR 430.2, these products are covered by the standby and off mode test procedures discussed above. During testing of conventional ovens with both standard and higher input rates in its test sample, DOE did not observe any standby mode or off mode operation or features unique to these products that

[8] DOE pursued amendments to Appendix I addressing standby and off mode energy for microwave ovens as part of a separate rulemaking. The final rule for this microwave oven rulemaking published on January 18, 2013. 78 FR 4015.

would warrant any changes to the standby mode and off mode test methods. 79 FR 71917 (December 3, 2014). Because DOE received no comments objecting to these findings, this final rule does not amend the standby mode and off mode test methods currently specified in Appendix I section 3.1.

G. Technical Corrections to the Calculation of Derived Results from Test Measurements

DOE did not receive comments on its proposal to correct the units of measurement in section 4 of Appendix I nor did DOE receive comments on its correction of the integrated energy factor for conventional electric cooking tops, IR_{CT}. In this final rule, DOE corrects the following sections of Appendix I to reference the appropriate units: 4.1.2.1.1, 4.1.2.2.1, 4.1.2.4.3, 4.1.2.5.3, 4.1.4.1, 4.1.4.2, 4.2.1.2, 4.2.2.2.1, and 4.2.2.2.2. DOE also corrects the value of the annual useful cooking energy output, O_{CT}, used to calculate IR_{CT}, to 173.1 kWh per year.

H. Headings for Conventional Cooking Top Calculations

DOE did not receive comments on its proposal in the December 2014 SNOPR to restore headings to section 4.2 "Conventional cooking top," and section 4.2.1, "Surface unit cooking efficiency" in Appendix I to appropriately describe these sections. Therefore DOE has included these modifications in this final rule.

I. Clarifying Definitions for Freestanding and Built-in Ovens

Appendix I contains definitions for various cooking product installation conditions and specifies that the unit under test must be installed in an enclosure in accordance with the manufacturer's instructions. The test procedure in Appendix I currently defines "freestanding" as an installation configuration where the product is not supported by surrounding cabinetry, walls,

or other similar structures. A "built-in" installation condition means the product is supported by surrounding cabinetry, walls, or other similar structures. "Drop-in" means the product is supported by horizontal surface cabinetry. During interviews after publication of the December 2014 SNOPR, manufacturers commented that the current definitions for "freestanding," "built-in," and "drop-in" should be amended. Specifically, manufacturers noted that some conventional ovens and conventional ranges are designed to be used in both a freestanding or built-in configuration, and that it is currently unclear in which configuration the oven should be tested.

During its testing, DOE observed that built-in ovens consume energy in fan-only mode, whereas freestanding ovens do not. The additional energy required to exhaust air from the oven cavity is necessary to meet safety-related temperature requirements for built-in installation configurations, in which the oven is enclosed in cabinetry. Because built-in ovens consume additional energy in fan-only mode, as part of DOE's ongoing energy conservation standards rulemaking for conventional ovens, DOE has proposed to establish separate product classes for built-in and freestanding ovens using the definitions provided in Appendix I. 80 FR 33030, 33045–46 (June 10, 2015). DOE also recognizes that the current definition of built-in configurations does not adequately describe the installation conditions that require built-in ovens to have a separate fan assembly and fan-only mode.

In this final rule, DOE is clarifying that conventional ovens or ranges that may be used in either a freestanding or built-in configuration are to be tested in the built-in configuration to account for any additional energy-consumption related to fan-only mode in this configuration.

DOE is also clarifying that the definition of built-in means the product is enclosed in surrounding cabinetry, walls, or other similar structures on at least three sides.

J. Clarifying Definitions for Oven Self-Cleaning Operation

The existing test procedure in Appendix I does not include a definition for the self-cleaning operation or self-cleaning process of conventional ovens, although it specifies the measurement energy consumption during self-cleaning operation in section 3 Test Methods and Measurements. The existing test procedure specifies setting the conventional oven's self-cleaning process in accordance with the manufacturer's instructions, and if the self-cleaning process is adjustable, using the average time recommended by the manufacturer for a moderately soiled oven. DOE is clarifying in the final rule that self-cleaning operation is an active mode not intended to heat or cook food that is user-selectable, separate from the normal baking mode, and dedicated to cleaning and removing cooking deposits from the oven cavity walls.

K. Compliance with Other EPCA Requirements

EPCA requires that any new or amended test procedures for consumer products 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 must not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

As part of the December 2014 SNOPR, DOE tentatively concluded that the amended test procedures would produce test results that measure the energy consumption of conventional ovens during representative use, and that the test procedures would not be unduly burdensome to conduct. 79 FR 71917-71918 (Dec. 3, 2014).

As discussed in section III.C of this document, the final rule amends the test procedure for gas ovens to require that the existing test block be used for all ovens, including ovens with high input rates. DOE does not expect any increase in testing burden compared to the existing test procedure, since these tests follow the same methodology, use the same test equipment, and can be conducted in the same facilities used for the current energy testing of conventional ovens. As discussed in section III.D of this document, the final rule also incorporates by reference AHAM-OV-1-2011 for measuring the overall oven cavity volume. DOE estimates that it would take on the order of one-half to one hour to conduct the cavity volume measurement for a single oven, and $50 to $100 per test for labor. Additionally, because manufacturers may already be using the AHAM procedure to measure oven cavity volume, DOE does not anticipate this measurement to be unduly burdensome to conduct. As discussed in section III.E of this document, the final rule amends the test procedure so that conventional ovens equipped with an oven separator are tested in each possible oven configuration. DOE notes, based on its testing, that this may add two oven tests for the additional cavity configurations, and add approximately $2,750 for labor. DOE does not believe this additional cost represents an excessive burden for test laboratories or manufacturers given the significant investments necessary to manufacture, test and market consumer appliances.

IV.Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (OMB) has determined that test procedure rulemakings do not constitute "significant regulatory actions" under section 3(f) of Executive Order 12866, Regulatory Planning and Review, 58 FR 51735 (Oct. 4, 1993). Accordingly, this

action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB).

B. Review under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 et seq.) requires preparation of an initial regulatory flexibility analysis (IFRA) for any rule that by law must be proposed for public comment and a final regulatory flexibility analysis for any such rule that an agency adopts as a final rule, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, "Proper Consideration of Small Entities in Agency Rulemaking," 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003 to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website: http://energy.gov/gc/office-general-counsel.

DOE reviewed this final rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. The final rule clarifies that the existing test method for ovens is applicable to gas ovens with higher input rates. The final rule also includes a test method for conventional ovens with oven separators and incorporates by reference a test method to measure oven cavity volume.

The Small Business Administration (SBA) considers a business entity to be a small business, if, together with its affiliates, it employs less than a threshold number of workers or earns less than the average annual receipts specified in 13 CFR part 121. The threshold values set

forth in these regulations use size standards and codes established by the North American Industry Classification System (NAICS) that are available at: http://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf. The threshold number for NAICS classification code 335221, titled "Household Cooking Appliance Manufacturing," is 750 employees; this classification includes manufacturers of residential conventional ovens.

Most of the manufacturers supplying conventional ovens are large multinational corporations. DOE surveyed the AHAM member directory to identify manufacturers of conventional ovens and conventional ranges. DOE then consulted publicly-available data, purchased company reports from vendors such as Dun and Bradstreet, and contacted manufacturers, where needed, to determine if they meet the SBA's definition of a "small business manufacturing facility" and have their manufacturing facilities located within the United States. Based on this analysis, DOE estimates that there are seven small businesses that manufacture conventional ovens and conventional ranges subject to the proposed test procedure amendments.

For the reasons stated in the preamble, DOE has concluded that the final rule would not have a significant impact on small manufacturers under the applicable provisions of the Regulatory Flexibility Act. The final rule clarifies that DOE's existing test procedures in Appendix I for conventional ovens are applicable to conventional ovens with higher input rates. These tests follow the same methodology, use the same test equipment, and can be conducted in the same facilities used for the current energy testing of conventional ovens, so there would be no additional facility costs required by the final rule. Additionally, the incorporation by reference of AHAM-OV-1-2011 to measure oven cavity volume and the addition of a test method to

measure conventional ovens with an oven separator will not significantly impact small manufacturers under the applicable provisions of the Regulatory Flexibility Act. DOE estimates a cost of $4,500 for an average small manufacturer to measure the cavity volume of all of its product offerings which is only 0.03 percent of the average annual revenue of the seven identified small businesses. This estimate assumes $100 per test as described in section III.K of this notice, with up to 44 tests per manufacturer. Additionally, no small conventional oven manufacturer, as defined by the SBA, offers a product with an oven separator.

For these reasons, DOE concludes and certifies that this final rule would not have a significant economic impact on a substantial number of small entities. Accordingly, DOE has not prepared a regulatory flexibility analysis for this rulemaking. DOE has transmitted the certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the SBA for review under 5 U.S.C. 605(b).

C.Review Under the Paperwork Reduction Act of 1995

Manufacturers of conventional ovens must certify to DOE that their products comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their products according to the DOE test procedures for conventional ovens, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including conventional ovens. 76 FR 12422 (March 7, 2011). The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910-1400. In an application to renew the OMB information

collection approval for DOE's certification and recordkeeping requirements, DOE included an estimated burden for manufacturers of conventional ovens. OMB has approved the revised information collection for DOE's certification and recordkeeping requirements through November 30, 2017. 80 FR 5099 (January 30, 2015). DOE estimated that it will take each respondent approximately 30 hours total per company per year to comply with the certification and recordkeeping requirements based on 20 hours of technician/technical work and 10 hours clerical work to submit the Compliance and Certification Management System templates. This rulemaking would include recordkeeping requirements on manufacturers that are associated with executing and maintaining the test data for this equipment. DOE recognizes that recordkeeping burden may vary substantially based on company preferences and practices.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

D.Review Under the National Environmental Policy Act of 1969

In this final rule, DOE amends its test procedure for conventional ovens. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and DOE's implementing regulations at 10 CFR part 1021. Specifically, this rule amends an existing rule without affecting the amount, quality or distribution of energy usage, and, therefore, will not result in any environmental impacts. Thus, this rulemaking is covered by Categorical Exclusion

A5 under 10 CFR part 1021, subpart D, which applies to any rulemaking that interprets or amends an existing rule without changing the environmental effect of that rule. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E.Review Under Executive Order 13132

Executive Order 13132, "Federalism," 64 FR 43255 (August 4, 1999), imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have Federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE examined this final rule and determined that it will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this final rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, "Civil Justice Reform," 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. Section 3(b) of Executive Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this final rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. No. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action resulting in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted

annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed "significant intergovernmental mandate," and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at http://energy.gov/gc/office-general-counsel. DOE examined this final rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This final rule will not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I.Review Under Executive Order 12630

DOE has determined, under Executive Order 12630, "Governmental Actions and Interference with Constitutionally Protected Property Rights" 53 FR 8859 (March 18, 1988), that

this regulation will not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

J. Review Under Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed this final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any significant energy action. A "significant energy action" is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that: (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

This regulatory action is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

L. Review Under Section 32 of the Federal Energy Administration Act of 1974

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; FEAA) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (FTC) concerning the impact of the commercial or industry standards on competition.

The proposed modifications to the test procedures addressed by this action incorporate testing methods contained in the AHAM OV-1-2011 standard, "Procedures for the Determination and Expression of the Volume of Household Microwave and Conventional Ovens." DOE has evaluated this standard and is unable to conclude whether this industry standard fully complies with the requirements of section 32(b) of the FEAA, (i.e., that it was developed in a manner that fully provides for public participation, comment, and review). DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on

competition of using the methods contained in these standards and has received no comments objecting to their use.

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that it has been determined that the rule is not a "major rule" as defined by 5 U.S.C. 804(2).

N. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final rule.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Intergovernmental relations, Small businesses.

Issued in Washington, DC, on June 18, 2015.

Kathleen B. Hogan
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy

For the reasons stated in the preamble, DOE amends part 430 of Chapter II of Title 10, Code of Federal Regulations as set forth below:

PART 430--ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

1. The authority citation for part 430 continues to read as follows:

Authority: 42 U.S.C. 6291–6309; 28 U.S.C. 2461 note.

2. Section 430.3 is amended by redesignating paragraph (h)(7) as (h)(8) and adding new paragraph (h)(7) to read as follows:

§430.3 Materials incorporated by reference.

* * * * *

(h) * * *

(7) AHAM OV-1-2011, ("AHAM OV-1"), Procedures for the Determination and Expression of the Volume of Household Microwave and Conventional Ovens, (2011), IBR approved for appendix I to subpart B.

* * * * *

Appendix I—[Amended]

3. Appendix I to subpart B of part 430 is amended:

a. By revising the Note;

b. In section 1. Definitions, by:

1. Redesignating sections 1.2 through 1.19 as sections 1.3 through 1.20, respectively; and

2. Adding section 1.2;

3. Revising newly redesignated section 1.3;

c. In section 2. Test Conditions, by revising sections 2.1 and 2.6;

d. By revising section 3. Test Methods and Measurements;

e. In section 4. Calculation of Derived Results From Test Measurements, by:

1. Revising sections 4.1.2.1.1, 4.1.2.2.1, 4.1.2.4.3, 4.1.2.5, 4.1.2.5.1, 4.1.2.5.2, 4.1.2.5.3. 4.1.3.2, 4.1.4.1, 4.1.4.2, 4.2.1.2, 4.2.2.2.1, 4.2.2.2.2, and 4.2.3.2; and

2. Adding sections 4.2 and 4.2.1.

The revisions and additions read as follows:

APPENDIX I TO SUBPART B OF PART 430—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF CONVENTIONAL RANGES, CONVENTIONAL COOKING TOPS, CONVENTIONAL OVENS, AND MICROWAVE OVENS

Note: Any representation related to active mode energy consumption of conventional ranges, conventional cooking tops, and conventional ovens made after **[INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]** must be based upon results generated under this test procedure. Any representation related to standby mode and off mode energy consumption of conventional ranges, conventional cooking tops, conventional ovens, and microwave ovens must be based upon results generated under this test procedure.

Upon the compliance date(s) of any energy conservation standard(s) for conventional ranges, conventional cooking tops, conventional ovens, and microwave ovens, use of the applicable provisions of this test procedure to demonstrate compliance with the energy conservation standard(s) will also be required.

1. Definitions

* * * * *

1.2 AHAM-OV-1 means the test standard published by the Association of Home Appliance Manufacturers titled, "Procedures for the Determination and Expression of the Volume of Household Microwave and Conventional Ovens," AHAM OV-1-2011 (incorporated by reference; see §430.3).

1.3 Built-in means the product is enclosed in surrounding cabinetry, walls, or other similar structures on at least three sides.

* * * * *

2. Test Conditions

2.1 Installation A freestanding conventional range or oven shall be installed with the back directly against, or as near as possible to, a vertical wall which extends at least 1 foot above and on either side of the appliance. There shall be no side walls. A drop-in, built-in, or wall-mounted appliance shall be installed in an enclosure in accordance with the manufacturer's instructions. If the manufacturer's instructions specify that the appliance may be used in multiple installation conditions, the appliance shall be installed according to the built-in configuration. Regardless of the installation condition, conventional cooking products are to be completely assembled with all

handles, knobs, guards, etc. mounted in place. Any electric resistance heaters, gas burners, baking racks, and baffles shall be in place in accordance with the manufacturer's instructions; however, broiler pans are to be removed from the oven's baking compartment.

* * * * *

2.6 Normal nonoperating temperature. All areas of the appliance to be tested shall attain the normal nonoperating temperature, as defined in section 1.13 of this appendix, before any testing begins. The equipment for measuring the applicable normal nonoperating temperature shall be as described in sections 2.9.3.1, 2.9.3.2, 2.9.3.3, and 2.9.3.4 of this appendix, as applicable.

* * * * *

3. Test Methods and Measurements

3.1. Test methods.

3.1.1 Conventional oven. Perform a test by establishing the testing conditions set forth in section 2, Test Conditions, of this appendix and turn off the gas flow to the conventional cooking top, if so equipped. Before beginning the test, the conventional oven shall be at its normal non-operating temperature as defined in section 1.13 and described in section 2.6 of this appendix. Set the conventional oven test block W_1 approximately in the center of the usable baking space. If there is a selector switch for selecting the mode of operation of the oven, set it for normal baking. If an oven permits baking by either forced convection by using a fan, or without forced convection, the oven is to be tested in each of those two modes. The oven shall remain on for one complete thermostat “cut-off/cut-on” of the electrical resistance heaters or gas burners after the test block temperature has increased 234 °F (130 °C) above its initial temperature.

3.1.1.1 Self-cleaning operation of a conventional oven. If the conventional oven is capable of operating in a user-selectable self-cleaning mode, separate from the normal baking mode and dedicated to cleaning and removing cooking deposits from the oven cavity walls, establish the test conditions set forth in section 2, Test Conditions, of this appendix. Turn off the gas flow to the conventional cooking top. The temperature of the conventional oven shall be its normal non-operating temperature as defined in section 1.13 and described in section 2.6 of this appendix. Then set and start the conventional oven's self-cleaning process in accordance with the manufacturer's instructions. If the self-cleaning process is adjustable, use the average time recommended by the manufacturer for a moderately soiled oven.

3.1.1.2 Conventional oven standby mode and off mode power. Establish the standby mode and off mode testing conditions set forth in section 2, Test Conditions, of this appendix. For conventional ovens that take some time to enter a stable state from a higher power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3), allow sufficient time for the conventional oven to reach the lower power state before proceeding with the test measurement. Follow the test procedure as specified in Section 5, Paragraph 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as described in 3.1.1.2.1 and 3.1.1.2.2 of this appendix. For units in which power varies as a function of displayed time in standby mode, set the clock time to 3:23 at the end of the stabilization period specified in Section 5, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 10 minutes +0/−2 sec after an additional stabilization period until the clock time reaches 3:33.

3.1.1.2.1 If the conventional oven has an inactive mode, as defined in section 1.12 of this appendix, measure and record the average inactive mode power of the conventional oven, P_{IA}, in watts.

3.1.1.2.2 If the conventional oven has an off mode, as defined in section 1.14 of this appendix, measure and record the average off mode power of the conventional oven, P_{OM}, in watts.

3.1.1.3 Conventional oven cavity volume. Measure the oven cavity volume according to the test procedure specified in Sections 3, 5.1 and 5.2 of AHAM-OV-1 (incorporated by reference; see §430.3).

3.1.2 Conventional cooking top. Establish the test conditions set forth in section 2, Test Conditions, of this appendix. Turn off the gas flow to the conventional oven(s), if so equipped. The temperature of the conventional cooking top shall be its normal nonoperating temperature as defined in section 1.13 and described in section 2.6 of this appendix. Set the test block in the center of the surface unit under test. The small test block, W_2, shall be used on electric surface units of 7 inches (178 mm) or less in diameter. The large test block, W_3, shall be used on electric surface units over 7 inches (178 mm) in diameter and on all gas surface units.

Turn on the surface unit under test and set its energy input rate to the maximum setting. When the test block reaches 144 °F (80 °C) above its initial test block temperature, immediately reduce the energy input rate to 25±5 percent of the maximum energy input rate. After 15±0.1 minutes at the reduced energy setting, turn off the surface unit under test.

3.1.2.1 Conventional cooking top standby mode and off mode power. Establish the standby mode and off mode testing conditions set forth in section 2, Test Conditions, of this appendix. For conventional cooktops that take some time to enter a stable state from a higher

power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3), allow sufficient time for the conventional cooking top to reach the lower power state before proceeding with the test measurement. Follow the test procedure as specified in Section 5, Paragraph 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as described in sections 3.1.2.1.1 and 3.1.2.1.2 of this appendix. For units in which power varies as a function of displayed time in standby mode, set the clock time to 3:23 at the end of the stabilization period specified in Section 5, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 10 minutes +0/-2 sec after an additional stabilization period until the clock time reaches 3:33.

3.1.2.1.1 If the conventional cooking top has an inactive mode, as defined in section 1.12 of this appendix, measure and record the average inactive mode power of the conventional cooking top, P_{IA}, in watts.

3.1.2.1.2 If the conventional cooking top has an off mode, as defined in section 1.14 of this appendix, measure and record the average off mode power of the conventional cooking top, P_{OM}, in watts.

3.1.3 Conventional range standby mode and off mode power. Establish the standby mode and off mode testing conditions set forth in section 2, Test Conditions, of this appendix. For conventional ranges that take some time to enter a stable state from a higher power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3), allow sufficient time for the conventional range to reach the lower power state before proceeding with the test measurement. Follow the test procedure as specified in Section 5, Paragraph 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as

described in sections 3.1.3.1 and 3.1.3.2 of this appendix. For units in which power varies as a function of displayed time in standby mode, set the clock time to 3:23 at the end of the stabilization period specified in Section 5, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 10 minutes +0/−2 sec after an additional stabilization period until the clock time reaches 3:33.

3.1.3.1 If the conventional range has an inactive mode, as defined in section 1.12 of this appendix, measure and record the average inactive mode power of the conventional range, P_{IA}, in watts.

3.1.3.2 If the conventional range has an off mode, as defined in section 1.14 of this appendix, measure and record the average off mode power of the conventional range, P_{OM}, in watts.

3.1.4 Microwave oven.

3.1.4.1 Microwave oven test standby mode and off mode power. Establish the testing conditions set forth in section 2, Test Conditions, of this appendix. For microwave ovens that drop from a higher power state to a lower power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3), allow sufficient time for the microwave oven to reach the lower power state before proceeding with the test measurement. Follow the test procedure as specified in Section 5, Paragraph 5.3.2 of IEC 62301 (Second Edition). For units in which power varies as a function of displayed time in standby mode, set the clock time to 3:23 and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 10 minutes +0/−2 sec after an additional stabilization period until the clock time reaches 3:33. If a

microwave oven is capable of operation in either standby mode or off mode, as defined in sections 1.18 and 1.14 of this appendix, respectively, or both, test the microwave oven in each mode in which it can operate.

3.2 Test measurements.

3.2.1 Conventional oven test energy consumption. If the oven thermostat controls the oven temperature without cycling on and off, measure the energy consumed, E_O, when the temperature of the block reaches T_O (T_O is 234 °F (130 °C) above the initial block temperature, T_I). If the oven thermostat operates by cycling on and off, make the following series of measurements: Measure the block temperature, T_A, and the energy consumed, E_A, or volume of gas consumed, V_A, at the end of the last "ON" period of the conventional oven before the block reaches T_O. Measure the block temperature, T_B, and the energy consumed, E_B, or volume of gas consumed, V_B, at the beginning of the next "ON" period. Measure the block temperature, T_C, and the energy consumed, E_C, or volume of gas consumed, VC, at the end of that "ON" period. Measure the block temperature, T_D, and the energy consumed, E_D, or volume of gas consumed, V_D, at the beginning of the following "ON" period. Energy measurements for E_O, E_A, E_B, E_C, and E_D should be expressed in watt-hours (kJ) for conventional electric ovens, and volume measurements for V_A, V_B, V_C, and V_D should be expressed in standard cubic feet (L) of gas for conventional gas ovens. For a gas oven, measure in watt-hours (kJ) any electrical energy, E_{IO}, consumed by an ignition device or other electrical components required for the operation of a conventional gas oven while heating the test block to T_O.

3.2.1.1 Conventional oven average test energy consumption. If the conventional oven permits baking by either forced convection or without forced convection and the oven thermostat does not cycle on and off, measure the energy consumed with the forced convection mode, $(E_O)_1$,

and without the forced convection mode, $(E_O)_2$, when the temperature of the block reaches T_O (T_O is 234 °F (130 °C) above the initial block temperature, T_I). If the conventional oven permits baking by either forced convection or without forced convection and the oven thermostat operates by cycling on and off, make the following series of measurements with and without the forced convection mode: Measure the block temperature, T_A, and the energy consumed, E_A, or volume of gas consumed, V_A, at the end of the last "ON" period of the conventional oven before the block reaches T_O. Measure the block temperature, T_B, and the energy consumed, E_B, or volume of gas consumed, V_B, at the beginning of the next "ON" period. Measure the block temperature, T_C, and the energy consumed, E_C, or volume of gas consumed, V_C, at the end of that "ON" period. Measure the block temperature, T_D, and the energy consumed, E_D, or volume of gas consumed, V_D, at the beginning of the following "ON" period. Energy measurements for E_O, E_A, E_B, E_C, and E_D should be expressed in watt-hours (kJ) for conventional electric ovens, and volume measurements for V_A, V_B, V_C, and V_D should be expressed in standard cubic feet (L) of gas for conventional gas ovens. For a gas oven that can be operated with or without forced convection, measure in watt-hours (kJ) any electrical energy consumed by an ignition device or other electrical components required for the operation of a conventional gas oven while heating the test block to T_O using the forced convection mode, $(E_{IO})_1$, and without using the forced convection mode, $(E_{IO})_2$.

3.2.1.2 Conventional oven fan-only mode energy consumption. If the conventional oven is capable of operation in fan-only mode, measure the fan-only mode energy consumption, E_{OF}, expressed in kilowatt-hours (kJ) of electricity consumed by the conventional oven for the duration of fan-only mode, using a watt-hour meter as specified in section 2.9.1.1 of this appendix. Alternatively, if the duration of fan-only mode is known, the watt-hours consumed

may be measured for a period of 10 minutes in fan-only mode, using a watt-hour meter as specified in section 2.9.1.1 of this appendix. Multiply this value by the time in minutes that the conventional oven remains in fan-only mode, t_{OF}, and divide by 10,000 to obtain E_{OF}. The alternative approach may be used only if the resulting E_{OF} is representative of energy use during the entire fan-only mode.

3.2.1.3 Energy consumption of self-cleaning operation. Measure the energy consumption, E_S, in watt-hours (kJ) of electricity or the volume of gas consumption, V_S, in standard cubic feet (L) during the self-cleaning test set forth in section 3.1.1.1 of this appendix. For a gas oven, also measure in watt-hours (kJ) any electrical energy, E_{IS}, consumed by ignition devices or other electrical components required during the self-cleaning test.

3.2.1.4 Standby mode and off mode energy consumption. Make measurements as specified in section 3.1.1.2 of this appendix. If the conventional oven is capable of operating in inactive mode, as defined in section 1.12 of this appendix, measure the average inactive mode power of the conventional oven, P_{IA}, in watts as specified in section 3.1.1.2.1 of this appendix. If the conventional oven is capable of operating in off mode, as defined in section 1.14 of this appendix, measure the average off mode power of the conventional oven, P_{OM}, in watts as specified in section 3.1.1.2.2 of this appendix.

3.2.1.5 Conventional oven cavity volume. Measure the oven cavity volume, CV_O, in cubic feet (L), as specified in section 3.1.1.3 of this appendix.

3.2.2 Conventional surface unit test energy consumption.

3.2.2.1 Conventional surface unit average test energy consumption. For the surface unit under test, measure the energy consumption, E_{CT}, in watt-hours (kJ) of electricity or the volume of gas consumption, V_{CT}, in standard cubic feet (L) of gas and the test block temperature, T_{CT}, at

the end of the 15 minute (reduced input setting) test interval for the test specified in section 3.1.2 of this appendix and the total time, t_{CT}, in hours, that the unit is under test. Measure any electrical energy, E_{IC}, consumed by an ignition device of a gas heating element or other electrical components required for the operation of the conventional gas cooking top in watt-hours (kJ).

3.2.2.2 Conventional surface unit standby mode and off mode energy consumption. Make measurements as specified in section 3.1.2.1 of this appendix. If the conventional surface unit is capable of operating in inactive mode, as defined in section 1.12 of this appendix, measure the average inactive mode power of the conventional surface unit, $P_{IA,}$ in watts as specified in section 3.1.2.1.1 of this appendix. If the conventional surface unit is capable of operating in off mode, as defined in section 1.14 of this appendix, measure the average off mode power of the conventional surface unit, P_{OM}, in watts as specified in section 3.1.2.1.2 of this appendix.

3.2.3 Conventional range standby mode and off mode energy consumption. Make measurements as specified in section 3.1.3 of this appendix. If the conventional range is capable of operating in inactive mode, as defined in section 1.13 of this appendix, measure the average inactive mode power of the conventional range, $P_{IA,}$ in watts as specified in section 3.1.3.1 of this appendix. If the conventional range is capable of operating in off mode, as defined in section 1.14 of this appendix, measure the average off mode power of the conventional range, P_{OM}, in watts as specified in section 3.1.3.2 of this appendix.

3.2.4 Microwave oven test standby mode and off mode power. Make measurements as specified in Section 5, Paragraph 5.3 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3). If the microwave oven is capable of operating in standby mode, as defined in section 1.18 of this appendix, measure the average standby mode power of the microwave oven, P_{SB}, in watts as specified in section 3.1.4.1 of this appendix. If the microwave oven is capable of

operating in off mode, as defined in section 1.14 of this appendix, measure the average off mode power of the microwave oven, P_{OM}, as specified in section 3.1.4.1.

3.3 Recorded values.

3.3.1 Record the test room temperature, T_R, at the start and end of each range, oven or cooktop test, as determined in section 2.5 of this appendix.

3.3.2 Record the measured test block, test block body, and test block base weights W_1, W_2, and W_3 in pounds (kg).

3.3.3 Record the initial temperature, T_1, of the test block under test.

3.3.4 For a conventional oven with a thermostat which operates by cycling on and off, record the conventional oven test measurements T_A, E_A, T_B, E_B, T_C, E_C, T_D, and E_D for conventional electric ovens or T_A, V_A, T_B, V_B, T_C, V_C, T_D, and V_D for conventional gas ovens. If the thermostat controls the oven temperature without cycling on and off, record E_O. For a gas oven which also uses electrical energy for the ignition or operation of the oven, also record E_{IO}.

3.3.5 For a conventional oven that can be operated with or without forced convection and the oven thermostat controls the oven temperature without cycling on and off, measure the energy consumed with the forced convection mode, $(E_O)_1$, and without the forced convection mode, $(E_O)_2$. If the conventional oven operates with or without forced convection and the thermostat controls the oven temperature by cycling on and off, record the conventional oven test measurements T_A, E_A, T_B, E_B, T_C, E_C, T_D, and E_D for conventional electric ovens or T_A, V_A, T_B, V_B, T_C, V_C, T_D, and V_D for conventional gas ovens. For a gas oven that can be operated with or without forced convection, measure any electrical energy consumed by an ignition device or other electrical components used during the forced convection mode, $(E_{IO})_1$, and without using the forced convection mode, $(E_{IO})_2$.

3.3.6 Record the measured energy consumption, E_S, or gas consumption, V_S, and for a gas oven, any electrical energy, E_{IS}, for the test of the self-cleaning operation of a conventional oven.

3.3.7 For conventional ovens, record the conventional oven standby mode and off mode test measurements P_{IA} and P_{OM}, if applicable. For conventional cooktops, record the conventional cooking top standby mode and off mode test measurements P_{IA} and P_{OM}, if applicable. For conventional ranges, record the conventional range standby mode and off mode test measurements P_{IA} and P_{OM}, if applicable.

3.3.8 For conventional ovens, record the measured oven cavity volume, CV_O, in cubic feet (L), rounded to the nearest tenth of a cubic foot (nearest L).

3.3.9 For the surface unit under test, record the electric energy consumption, E_{CT}, or the gas volume consumption, V_{CT}, the final test block temperature, T_{CT}, and the total test time, t_{CT}. For a gas cooking top which uses electrical energy for ignition of the burners, also record EIC.

3.3.10 Record the heating value, H_n, as determined in section 2.2.2.2 of this appendix for the natural gas supply.

3.3.11 Record the heating value, H_p, as determined in section 2.2.2.3 of this appendix for the propane supply.

3.3.12 Record the average standby mode power, P_{SB}, for the microwave oven standby mode, as determined in section 3.2.4 of this appendix for a microwave oven capable of operating in standby mode. Record the average off mode power, P_{OM}, for the microwave oven off mode power test, as determined in section 3.2.4 of this appendix for a microwave oven capable of operating in off mode.

4. Calculation of Derived Results From Test Measurements

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4.1.2.1.1 Annual primary energy consumption. Calculate the annual primary energy consumption for cooking, E_{CO}, expressed in kilowatt-hours (kJ) per year for electric ovens and in kBtus (kJ) per year for gas ovens, and defined as:

$$E_{CO} = \frac{E_O \times K_e \times O_O}{W_1 \times C_p \times T_S}$$

for electric ovens,

Where:

E_O = test energy consumption as measured in section 3.2.1 or as calculated in section 4.1.1 or section 4.1.1.1 of this appendix.

K_e = 3.412 Btu/Wh (3.6 kJ/Wh,) conversion factor of watt-hours to Btus.

O_O = 29.3 kWh (105,480 kJ) per year, annual useful cooking energy output of conventional electric oven.

W_1 = measured weight of test block in pounds (kg).

C_p = 0.23 Btu/lb-°F (0.96 kJ/kg ÷ °C), specific heat of test block.

T_S = 234 °F (130 °C), temperature rise of test block.

$$E_{CO} = \frac{E_O \times O_O}{W_1 \times C_p \times T_S}$$

for gas ovens,

Where:

E_O = test energy consumption as measured in section 3.2.1 or as calculated in section 4.1.1 or section 4.1.1.1 of this appendix.

O_O = 88.8 kBtu (93,684 kJ) per year, annual useful cooking energy output of conventional gas oven.

W_1, C_p and T_S are the same as defined above.

* * * * *

4.1.2.2.1 Annual primary energy consumption. Calculate the annual primary energy consumption for conventional oven self-cleaning operations, E_{SC}, expressed in kilowatt-hours (kJ) per year for electric ovens and in kBtus (kJ) for gas ovens, and defined as:

$E_{SC} = E_S \times S_e \times K$, for electric ovens,

Where:

E_S = energy consumption in watt-hours, as measured in section 3.2.1.3 of this appendix.

S_e = 4, average number of times a self-cleaning operation of a conventional electric oven is used per year.

K = 0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

or

$E_{SC} = V_S \times H \times S_g \times K$, for gas ovens,

Where:

V_S = gas consumption in standard cubic feet (L), as measured in section 3.2.1.3 of this appendix.

H = H_n or H_p, the heating value of the gas used in the test as specified in sections 2.2.2.2 and 2.2.2.3 of this appendix in Btus per standard cubic foot (kJ/L).

S_g = 4, average number of times a self-cleaning operation of a conventional gas oven is used per year.

K = 0.001 kBtu/Btu conversion factor for Btus to kBtus

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4.1.2.4.3 Conventional gas oven energy consumption. Calculate the total annual gas energy consumption of a conventional gas oven, E_{AOG}, expressed in kBtus (kJ) per year and defined as:

$$E_{AOG} = E_{CO} + E_{SC},$$

Where:

E_{CO} = annual primary cooking energy consumption as determined in section 4.1.2.1.1 of this appendix.

E_{SC} = annual primary self-cleaning energy consumption as determined in section 4.1.2.2.1 of this appendix.

If the conventional gas oven uses electrical energy, calculate the total annual electrical energy consumption, E_{AOE}, expressed in kilowatt-hours (kJ) per year and defined as:

$$E_{AOE} = E_{SO} + E_{SS},$$

Where:

E_{SO} = annual secondary cooking energy consumption as determined in section 4.1.2.1.2 of this appendix.

E_{SS} = annual secondary self-cleaning energy consumption as determined in section 4.1.2.2.2 of this appendix.

If the conventional gas oven uses electrical energy, also calculate the total integrated annual electrical energy consumption, IE_{AOE}, expressed in kilowatt-hours (kJ) per year and defined as:

$$IE_{AOE} = E_{SO} + E_{SS} + E_{OTLP} + (E_{OF} \times N_{OG}),$$

Where:

E_{SO} = annual secondary cooking energy consumption as determined in section 4.1.2.1.2 of this appendix.

E_{SS} = annual secondary self-cleaning energy consumption as determined in section 4.1.2.2.2 of this appendix.

E_{OTLP} = annual combined low-power mode energy consumption as determined in section 4.1.2.3 of this appendix.

E_{OF} = fan-only mode energy consumption as measured in section 3.2.1.2 of this appendix.

N_{OG} = representative number of annual conventional gas oven cooking cycles per year, which is equal to 183 cycles for a conventional gas oven without self-clean capability and 197 cycles for a conventional gas oven with self-clean capability.

4.1.2.5 Total annual energy consumption of multiple conventional ovens and conventional ovens with an oven separator. If the cooking appliance includes more than one conventional oven or consists of a conventional oven equipped with an oven separator that allows for cooking using the entire oven cavity or, if the separator is installed, splitting the oven into two smaller cavities, calculate the total annual energy consumption of the conventional oven(s) using the following equations:

4.1.2.5.1 Conventional electric oven energy consumption. Calculate the total annual energy consumption, E_{TO}, in kilowatt-hours (kJ) per year and defined as:

$$E_{TO} = E_{ACO} + E_{ASC}$$

Where:

$$E_{ACO} = \frac{1}{n}\sum_{i=1}^{n}(E_{CO})_i$$

is the average annual primary energy consumption for cooking, and where:

n = number of conventional ovens in the basic model or, if the cooking appliance is equipped with an oven separator, the number of oven cavity configurations.

E_{CO} = annual primary energy consumption for cooking as determined in section 4.1.2.1.1 of this appendix.

$$E_{ASC} = \frac{1}{n}\sum_{i=1}^{n}(E_{SC})_i$$

is the average annual self-cleaning energy consumption,

Where:

n = number of self-cleaning conventional ovens in the basic model.

E_{SC} = annual primary self-cleaning energy consumption as determined according to section 4.1.2.2.1 of this appendix.

4.1.2.5.2 Conventional electric oven integrated energy consumption. Calculate the total integrated annual energy consumption, IE_{TO}, in kilowatt-hours (kJ) per year and defined as:

$$IE_{TO} = E_{ACO} + E_{ASC} + E_{OTLP} + (E_{OF} \times N_{OE})$$

Where

$$E_{ACO} = \frac{1}{n}\sum_{i=1}^{n}(E_{CO})_i$$

is the average annual primary energy consumption for cooking, and where:

n = number of conventional ovens in the cooking appliance or, if the cooking appliance is equipped with an oven separator, the number of oven cavity configurations.

E_{CO} = annual primary energy consumption for cooking as determined in section 4.1.2.1.1 of this appendix.

$$E_{ASC} = \frac{1}{n}\sum_{i=1}^{n}(E_{SC})_i$$

is the average annual self-cleaning energy consumption,

Where:

n = number of self-cleaning conventional ovens in the basic model.

E_{SC} = annual primary self-cleaning energy consumption as determined according to section 4.1.2.2.1 of this appendix.

E_{OTLP} = annual combined low-power mode energy consumption for the cooking appliance as determined in section 4.1.2.3 of this appendix.

E_{OF} = fan-only mode energy consumption as measured in section 3.2.1.2 of this appendix.

N_{OE} = representative number of annual conventional electric oven cooking cycles per year, which is equal to 219 cycles for a conventional electric oven without self-clean capability and 204 cycles for a conventional electric oven with self-clean capability.

4.1.2.5.3 Conventional gas oven energy consumption. Calculate the total annual gas energy consumption, E_{TOG}, in kBtus (kJ) per year and defined as:

$$E_{TOG} = E_{ACO} + E_{ASC}$$

Where:

E_{ACO} = average annual primary energy consumption for cooking in kBtus (kJ) per year and is calculated as:

$$E_{ACO} = \frac{1}{n}\sum_{i=1}^{n}(E_{CO})_i$$

Where:

n = number of conventional ovens in the cooking appliance or, if the cooking appliance is equipped with an oven separator, the number of oven cavity configurations.

E_{CO} = annual primary energy consumption for cooking as determined in section 4.1.2.1.1 of this appendix.

and,

E_{ASC} = average annual self-cleaning energy consumption in kBtus (kJ) per year and is calculated as:

$$E_{ASC} = \frac{1}{n}\sum_{i=1}^{n}(E_{SC})_i$$

Where:

n = number of self-cleaning conventional ovens in the basic model.

E_{SC} = annual primary self-cleaning energy consumption as determined according to section 4.1.2.2.1 of this appendix.

If the oven also uses electrical energy, calculate the total annual electrical energy consumption, E_{TOE}, in kilowatt-hours (kJ) per year and defined as:

$$E_{TOE} = E_{ASO} + E_{AAS}$$

Where:

$$E_{ASO} = \frac{1}{n}\sum_{i=1}^{n}(E_{SO})_i$$

is the average annual secondary energy consumption for cooking,

Where:

n = number of conventional ovens in the basic model or, if the cooking appliance is equipped with an oven separator, the number of oven cavity configurations.

E_{SO} = annual secondary energy consumption for cooking of gas ovens as determined in section 4.1.2.1.2 of this appendix.

$$E_{AAS} = \frac{1}{n}\sum_{i=1}^{n}(E_{SS})_i$$

is the average annual secondary self-cleaning energy consumption,

Where:

n = number of self-cleaning ovens in the basic model.

E_{SS} = annual secondary self-cleaning energy consumption of gas ovens as determined in section 4.1.2.2.2 of this appendix.

If the oven also uses electrical energy, also calculate the total integrated annual electrical energy consumption, IE_{TOE}, in kilowatt-hours (kJ) per year and defined as:

$$IE_{TOE} = E_{ASO} + E_{AAS} + E_{OTLP} + (E_{OF} \times N_{OG})$$

Where:

$$E_{ASO} = \frac{1}{n}\sum_{i=1}^{n}(E_{SO})_i$$

is the average annual secondary energy consumption for cooking,

Where:

n = number of conventional ovens in the basic model or, if the cooking appliance is equipped with an oven separator, the number of oven cavity configurations.

E_{SO} = annual secondary energy consumption for cooking of gas ovens as determined in section 4.1.2.1.2 of this appendix.

$$E_{AAS} = \frac{1}{n}\sum_{i=1}^{n}(E_{SS})_i$$

is the average annual secondary self-cleaning energy consumption,

Where:

n = number of self-cleaning ovens in the basic model.

E_{SS} = annual secondary self-cleaning energy consumption of gas ovens as determined in section 4.1.2.2.2 of this appendix.

E_{OTLP} = annual combined low-power mode energy consumption as determined in section 4.1.2.3 of this appendix.

E_{OF} = fan-only mode energy consumption as measured in section 3.2.1.2 of this appendix.

N_{OG} = representative number of annual conventional gas oven cooking cycles per year, which is equal to 183 cycles for a conventional gas oven without self-clean capability and 197 cycles for a conventional gas oven with self-clean capability.

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4.1.3.2 Multiple conventional ovens and conventional ovens with an oven separator. If the cooking appliance includes more than one conventional oven or consists of a conventional oven equipped with an oven separator that allows for cooking using the entire oven cavity or, if the separator is installed, splitting the oven into two smaller cavities, calculate the cooking efficiency of the conventional oven(s), Eff_{TO}, using the following equation:

$$Eff_{TO} = \frac{n}{\sum_{i=1}^{n}(\frac{1}{Eff_{AO}})_i}$$

Where:

n = number of conventional ovens in the cooking appliance or, if the cooking appliance is equipped with an oven separator, the number of oven cavity configurations.

Eff_{AO} = cooking efficiency of each oven determined according to section 4.1.3.1 of this appendix.

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4.1.4.1 Conventional oven energy factor. Calculate the energy factor, or the ratio of useful cooking energy output to the total energy input, R_O, using the following equations:

$$R_O = \frac{O_O}{E_{AO}}$$

For electric ovens,

Where:

O_O = 29.3 kWh (105,480 kJ) per year, annual useful cooking energy output.

E_{AO} = total annual energy consumption for electric ovens as determined in section 4.1.2.4.1 of this appendix.

For gas ovens:

$$R_O = \frac{O_O}{E_{AOG} + (E_{AOE} \times K_e)}$$

Where:

O_O = 88.8 kBtu (93,684 kJ) per year, annual useful cooking energy output.

E_{AOG} = total annual gas energy consumption for conventional gas ovens as determined in section 4.1.2.4.3 of this appendix.

E_{AOE} = total annual electrical energy consumption for conventional gas ovens as determined in section 4.1.2.4.3 of this appendix.

K_e = 3.412 kBtu/kWh (3,600 kJ/kWh), conversion factor for kilowatt-hours to kBtus.

4.1.4.2 Conventional oven integrated energy factor. Calculate the integrated energy factor, or the ratio of useful cooking energy output to the total integrated energy input, IR_O, using the following equations:

$$IR_O = \frac{O_O}{IE_{AO}}$$

For electric ovens,

Where:

O_O = 29.3 kWh (105,480 kJ) per year, annual useful cooking energy output.

IE_{AO} = total integrated annual energy consumption for electric ovens as determined in section 4.1.2.4.2 of this appendix.

For gas ovens:

$$IR_O = \frac{O_O}{E_{AOG} + (IE_{AOE} \times K_e)}$$

Where:

O_O = 88.8 kBtu (93,684 kJ) per year, annual useful cooking energy output.

E_{AOG} = total annual gas energy consumption for conventional gas ovens as determined in section 4.1.2.4.3 of this appendix.

IE_{AOE} = total integrated annual electrical energy consumption for conventional gas ovens as determined in section 4.1.2.4.3 of this appendix.

K_e = 3.412 kBtu/kWh (3,600 kJ/kWh), conversion factor for kilowatt-hours to kBtus.

4.2 Conventional cooking top.

4.2.1 Surface unit cooking efficiency.

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4.2.1.2 Gas surface unit cooking efficiency. Calculate the cooking efficiency, Eff_{SU}, of the gas surface unit under test, defined as:

$$Eff_{SU} = \frac{(W_3 \times C_p) \times T_{SU}}{E}$$

Where:

W_3=measured weight of test block as measured in section 3.3.2 of this appendix, expressed in pounds (kg).

$C_{p,}$ and T_{SU} are the same as defined in section 4.2.1.1 of this appendix.

and,

$E=(V_{CT}\times H) + (E_{IC}\times K_e)$,

Where:

V_{CT}=total gas consumption in standard cubic feet (L) for the gas surface unit test as measured in section 3.2.2.1 of this appendix.

E_{IC}=electrical energy consumed in watt-hours (kJ) by an ignition device of a gas surface unit as measured in section 3.2.2.1 of this appendix.

K_e=3.412 Btu/Wh (3.6 kJ/Wh), conversion factor of watt-hours to Btus.

H=either H_n or H_p, the heating value of the gas used in the test as specified in sections 2.2.2.2 and 2.2.2.3 of this appendix, expressed in Btus per standard cubic foot (kJ/L) of gas.

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4.2.2.2.1 Annual cooking energy consumption. Calculate the annual energy consumption for cooking, E_{CC}, in kBtus (kJ) per year for a gas cooking top, defined as:

$$E_{CC} = \frac{O_{CT}}{Eff_{CT}}$$

Where:

O_{CT} = 527.6 kBtu (556,618 kJ) per year, annual useful cooking energy output.

Eff_{CT} = the gas cooking top efficiency as defined in section 4.2.1.3 of this appendix.

4.2.2.2.2 Total integrated annual energy consumption of a conventional gas cooking top. Calculate the total integrated annual energy consumption of a conventional gas cooking top, IE_{CA}, in kBtus (kJ) per year, defined as:

$$IE_{CA} = E_{CC} + (E_{CTSO} \times K_e)$$

Where:

E_{CC} = energy consumption for cooking as determined in section 4.2.2.2.1 of this appendix.

E_{CTSO} = conventional cooking top combined low-power mode energy consumption = [(P_{IA} × S_{IA}) + (P_{OM} × S_{OM})] × K,

Where:

P_{IA} = conventional cooking top inactive mode power, in watts, as measured in section 3.1.2.1.1 of this appendix.

P_{OM} = conventional cooking top off mode power, in watts, as measured in section 3.1.2.1.2 of this appendix.

If the conventional cooking top has both inactive mode and off mode annual hours, S_{IA} and S_{OM} both equal 4273.4;

If the conventional cooking top has an inactive mode but no off mode, the inactive mode annual hours, S_{IA}, is equal to 8546.9, and the off mode annual hours, S_{OM}, is equal to 0;

If the conventional cooking top has an off mode but no inactive mode, S_{IA} is equal to 0, and S_{OM} is equal to 8546.9;

K = 0.001 kWh/Wh conversion factor for watt-hours to kilowatt-hours.

K_e = 3.412 kBtu/kWh (3,600 kJ/kWh), conversion factor for kilowatt-hours to kBtus.

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4.2.3.2 Conventional cooking top integrated energy factor. Calculate the integrated energy factor or ratio of useful cooking energy output for cooking to the total integrated energy input, IR_{CT}, as follows:

For electric cooking tops,

$$IR_{CT} = \frac{O_{CT}}{IE_{CA}}$$

Where:

O_{CT} = 173.1 kWh (623,160 kJ) per year, annual useful cooking energy output of cooking top.

IE_{CA} = total annual integrated energy consumption of cooking top determined according to section 4.2.2.1.2 of this appendix.

For gas cooking tops,

$$IR_{CT} = \frac{O_{CT}}{IE_{CA}}$$

Where:

O_{CT} = 527.6 kBtu (556,618 kJ) per year, annual useful cooking energy output of cooking top.

IE_{CA} = total integrated annual energy consumption of cooking top determined according to section 4.2.2.2.2 of this appendix.

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