[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[Docket No. EERE-2010-BT-TP-0039]

RIN: 1904-AC01

Energy Conservation Program: Test Procedures for Residential Dishwashers, Dehumidifiers, and Conventional Cooking Products (Standby Mode and Off Mode)

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

ACTION: Supplemental notice of proposed rulemaking (SNOPR).

SUMMARY: The U.S. Department of Energy (DOE) proposes to amend its test procedures for residential dishwashers, dehumidifiers, and conventional cooking products (which includes cooktops, ovens, and ranges) to address the measurement of active mode fan-only energy use. This SNOPR also addresses energy and water use associated with dishwasher water softeners, the energy test cycle for dishwashers with a separate soil-sensing cycle, and the normal cycle definition, power supply and detergent dosing for dishwashers. The proposal would also update the industry test method specified in the dehumidifier test procedure, eliminate measurement of gas pilot light energy use in the cooking products test procedure, and remove an obsolete energy efficiency metric in the dishwasher test procedure.

DATES: DOE will accept comments, data, and information regarding this SNOPR submitted no later than [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**]. See section V, "Public Participation," for details.

ADDRESSES: Any comments submitted must identify the SNOPR for Test Procedures for Residential Dishwashers, Dehumidifiers, and Conventional Cooking Products, and provide docket number EERE-2010–BT–TP–0039 and/or Regulatory Information Number (RIN) 1904-AC01. Comments may be submitted using any of the following methods:

1. Federal eRulemaking Portal: www.regulations.gov. Follow the instructions for submitting comments.
2. E-mail: Res-DW-Dehumid-CookingProd-2010-TP-0039@ee.doe.gov. Include docket number EERE-2010-BT-TP-0039 and/or RIN 1904-AC27 in the subject line of the message.
3. Postal Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE-2J, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
4. Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 950 L'Enfant Plaza, SW., Suite 600, Washington, DC, 20024. Telephone: (202) 586-2945. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

Written comments regarding the burden-hour estimates or other aspects of the collection-of-information requirements contained in this proposed rule may be submitted to Office of Energy Efficiency and Renewable Energy through the methods listed above and by e-mail to cwhiteman@omb.eop.gov.

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

Docket: The docket is available for review at www.regulations.gov, including Federal Register notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials. All documents in the docket are listed in the www.regulations.gov index. Not all documents listed in the index may be publicly available, such as information that is exempt from public disclosure.

A link to the docket web page can be found at: www.regulations.gov/#!docketDetail;rpp=10;po=0;D=EERE-2010-BT-TP-0039. This web page contains a link to the docket for this notice on the www.regulations.gov site. The www.regulations.gov web page contains instructions on how to access all documents, including public comments, in the docket. See section V for information on how to submit comments through www.regulations.gov.

FOR FURTHER INFORMATION CONTACT:

Mr. Wes Anderson, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE-2J, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-7335. E-mail: Wes.Anderson@ee.doe.gov.

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For further information on how to submit or review public comments, contact Ms. Brenda Edwards, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE-2J, 1000 Independence Avenue, SW, Washington, DC 20585-0121. Telephone: (202) 586-2945. E-mail: Brenda.Edwards@ee.doe.gov.

SUPPLEMENTARY INFORMATION:

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I. Authority and Background

Title III, Part B[1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Pub. L. 94-163 (42 U.S.C. 6291-6309, as codified) sets forth a variety of provisions designed to improve energy efficiency and established the Energy Conservation Program for Consumer Products Other Than Automobiles, a program covering most major household appliances.[2] These

[1] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.
[2] All references to EPCA in this rulemaking refer to the statute as amended through the Energy Independence and Security Act of 2007, Pub. L. 110-140.

include residential dishwashers, conventional cooking products,[3] and dehumidifiers, the subject of today's notice. (42 U.S.C. 6292(a)(6) and (10); 6295(cc))

Under the Act, this program consists essentially of four parts: (1) testing, (2) labeling, (3) establishing Federal energy conservation standards, and (4) certification and enforcement procedures. The testing requirements consist of test procedures that manufacturers of covered products must use: (1) as the basis for certifying to DOE that their products comply with applicable energy conservation standards adopted pursuant to EPCA, and (2) for making representations about the efficiency of those products. (42 U.S.C. 6293(c); 6295(s)) Similarly, DOE must use these test procedures in any enforcement action to determine whether the products comply with these energy conservation standards. (42 U.S.C. 6295(s))

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 in relevant part 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, as determined by DOE, 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 comments on them. (42 U.S.C. 6293(b)(2))

[3] The term "conventional cooking products," as used in this notice, refers to residential electric and gas kitchen ovens, ranges, and cooktops (other than microwave ovens).

EPCA, in relevant part, require DOE to amend the test procedures for all residential covered products to include measures of standby mode and off mode energy consumption. Specifically, EPCA provides definitions of "standby mode" and "off mode" (42 U.S.C. 6295(gg)(1)(A)) and permits DOE to amend these definitions in the context of a given product (42 U.S.C. 6295(gg)(1)(B)). The statute requires integration of such energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product, unless the Secretary determines that—

(i) the current test procedures for a covered product already fully account for and incorporate the standby mode and off mode energy consumption of the covered product; or

(ii) such an integrated test procedure is technically infeasible for a particular covered product, in which case the Secretary shall prescribe a separate standby mode and off mode energy use test procedure for the covered product, if technically feasible. (42 U.S.C. 6295(gg)(2)(A))

Any such amendment must consider the most current versions of IEC Standard 62301, "Household electrical appliances – Measurement of standby power," and IEC Standard 62087, "Methods of measurement for the power consumption of audio, video, and related equipment."[4] Id.

1. Dishwashers

[4] EISA 2007 directs DOE to also consider IEC Standard 62087 when amending its test procedures to include standby mode and off mode energy consumption. See 42 U.S.C. 6295(gg)(2)(A). IEC Standard 62087 addresses the methods of measuring the power consumption of audio, video, and related equipment and is therefore not applicable to the products at issue in this rulemaking.

DOE's test procedure for dishwashers is found in the Code of Federal Regulations (CFR) at 10 CFR part 430, subpart B, appendix C. DOE originally established its test procedure for dishwashers in 1977. 42 FR 39964 (August 8, 1977). Since that time, the dishwasher test procedure has undergone a number of amendments, as discussed below. In 1983, DOE amended the test procedure to revise the representative average-use cycles to more accurately reflect consumer use and to address dishwashers that use 120 °F inlet water. 48 FR 9202 (March 3, 1983). DOE amended the test procedure again in 1984 to redefine the term "water heating dishwasher." 49 FR 46533 (Nov. 27, 1984). In 1987, DOE amended the test procedure to address models that use 50 °F inlet water. 52 FR 47549 (Dec. 15, 1987). In 2001, DOE revised the test procedure's testing specifications to improve testing repeatability, changed the definitions of "compact dishwasher" and "standard dishwasher," and reduced the average number of use cycles per year from 322 to 264. 66 FR 65091, 65095–97 (Dec. 18, 2001). In 2003, DOE again revised the test procedure to more accurately measure dishwasher efficiency, energy use, and water use. The 2003 dishwasher test procedure amendments included the following revisions: (1) the addition of a method to rate the efficiency of soil-sensing products; (2) the addition of a method to measure standby power; and (3) a reduction in the average-use cycles per year from 264 to 215. 68 FR 51887, 51899–903 (August 29, 2003). The current version of the test procedure includes provisions for determining estimated annual energy use (EAEU), estimated annual operating cost (EAOC), energy factor (EF) expressed in cycles per kilowatt-hour (kWh), and water consumption expressed in gallons per cycle. 10 CFR 430.23(c).

2. Dehumidifiers

The DOE test procedure for dehumidifiers is found at 10 CFR 430, subpart B, appendix X. EPCA specifies that the U.S. Environmental Protection Agency's (EPA) test criteria used under the ENERGY STAR[5] program must serve as the basis for the test procedure for dehumidifiers. (42 U.S.C. 6293(b)(13)) The ENERGY STAR test criteria effective in January 2001 require that American National Standards Institute (ANSI)/Association of Home Appliance Manufacturers (AHAM) Standard DH-1, "Dehumidifiers," be used to measure capacity and that the Canadian Standards Association (CAN/CSA) standard CAN/CSA-C749-1994 (R2005), "Performance of Dehumidifiers," be used to calculate EF. DOE adopted those test criteria, along with related definitions and tolerances, as its test procedure for dehumidifiers. 71 FR 71340, 71347, 71366–68 (Dec. 8, 2006). The DOE test procedure provides methods for determining the EF for dehumidifiers, which is expressed in liters (l) of water condensed per kWh.

3. Conventional Cooking Products

DOE's test procedures for conventional ranges, cooktops, and ovens (including microwave ovens) are found at 10 CFR 430, subpart B, appendix I. DOE first established the test procedures included in appendix I in a final rule published in the Federal Register on May 10, 1978. 43 FR 20108, 20120–28. DOE revised its test procedure 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 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 procedure for conventional cooking products

[5] For more information on the ENERGY STAR program, see: www.energystar.gov.

establishes provisions for determining EAOC, cooking efficiency (defined as the ratio of cooking energy output to cooking energy input), and EF (defined as the ratio of annual useful cooking energy output to total annual energy input). 10 CFR 430.23(i); 10 CFR 430 subpart B, appendix I. There is currently no EnergyGuide[6] labeling program for cooking products.

In today's SNOPR, DOE proposes amendments to its cooking products test procedure for only conventional cooking products. DOE has initiated a separate test procedure rulemaking to address standby mode and off mode power consumption for microwave ovens. The microwaves rulemaking was initiated in response to comments from interested parties on the advance notice of proposed rulemaking (ANOPR) for an earlier rulemaking concerning energy conservation standards for residential dishwashers, dehumidifiers, cooking products, and commercial clothes washers published on November 15, 2007 (hereafter referred to as the November 2007 ANOPR) (72 FR 64432). As discussed in the subsequent notice of proposed rulemaking (NOPR) for that standards rulemaking, interested parties stated generally that DOE should amend the test procedures for all types of cooking products to allow for measurement of standby mode energy use in order to implement a standby power energy conservation standard. 73 FR 62034, 62043–44 (Oct. 17, 2008). DOE published a NOPR proposing amendments to the microwave oven test procedure for standby mode and off mode in the Federal Register on October 17, 2008. 73 FR 62134. DOE subsequently published a supplemental notice of proposed rulemaking (SNOPR) in the Federal Register on this topic on July 22, 2010 (75 FR 42612), and an interim final rule on March 9, 2011 (hereafter referred to as the March 2011 Interim Final Rule) (76 FR 12825). DOE sought comment on a newly issued version of IEC Standard 62301 (which is discussed in more

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

detail in the following section) for measuring standby mode and off mode energy use, the previous version of which was incorporated by reference in the microwave oven test procedure. In response to comments received on the interim final rule, DOE proposed to incorporate by reference the newly issued version of IEC Standard 62301 in an SNOPR published in the Federal Register on November 23, 2011. 76 FR 72332.

B. Standby Mode and Off Mode

EPCA requires DOE to amend the test procedures for covered products to address standby mode and off mode energy consumption. Specifically, the amendments require DOE to integrate standby mode and off mode energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor for that product unless the current test procedures already fully account for such consumption. If integration is technically infeasible, DOE must prescribe a separate standby mode and off mode energy use test procedure, if technically feasible. (42 U.S.C. 6295(gg)(2)(A)) Any such amendment must consider the most current versions of IEC Standard 62301, "Household electrical appliances – Measurement of standby power," and IEC Standard 62087, "Methods of measurement for the power consumption of audio, video, and related equipment." Id.

C. The December 2010 NOPR

On December 2, 2010, DOE published a NOPR (hereafter called the December 2010 NOPR) in which it proposed to incorporate by reference into the test procedures for dishwashers, dehumidifiers, and conventional cooking products specific provisions from IEC Standard 62301 "Household electrical appliances – Measurement of standby power," First Edition 2005-06 (IEC

Standard 62301 (First Edition) or "First Edition") regarding test conditions and test procedures for measuring standby mode and off mode power consumption. 75 FR 75290, 75295–97. DOE also proposed to incorporate into each test procedure definitions of "active mode," "standby mode," and "off mode" based on the definitions for those terms provided in the most current draft of an updated version of IEC Standard 62301. Id. at 75297–300. Further, DOE proposed to include in each test procedure additional language that would clarify the application of clauses from IEC Standard 62301 (First Edition) for measuring standby mode and off mode power consumption.[7] Id. at 75300–04. DOE held a public meeting on December 17, 2010, to receive comments on the December 2010 NOPR, and accepted written comments, data, and information until February 15, 2011. Commenters to the December 2010 NOPR suggested that the draft updated version of IEC Standard 62301 would provide practical improvement to the mode definitions and testing methodology for the test procedures that are the subject of this rulemaking.

D. The September 2011 SNOPR

Based upon the public comment received on the December 2010 NOPR, DOE further analyzed the draft materials associated with IEC Standard 62301 (Second Edition), which were in an advanced stage of development. Shortly thereafter, the IEC adopted and published IEC Standard 62301, "Household electrical appliances – Measurement of standby power," Edition 2.0 2011-01 (IEC Standard 62301 (Second Edition) or "Second Edition") on January 27, 2011. Consistent with its statutory mandate, DOE reviewed this latest version of the IEC standard and

[7] EISA 2007 directs DOE to also consider IEC Standard 62087 when amending its test procedure to include standby mode and off mode energy consumption. See 42 U.S.C. 6295(gg)(2)(A). DOE considered IEC Standard 62087 and determined that the standard addresses the methods of measuring the power consumption of audio, video, and related equipment and is therefore not applicable to the products addressed in today's proposal.

agreed that it improves some measurements of standby mode and off mode energy use. Accordingly, DOE proposed in an SNOPR published in the Federal Register on September 20, 2011 (76 FR 58346) (hereafter called the September 2011 SNOPR), to incorporate certain provisions of the IEC Standard 62301 (Second Edition), along with clarifying language, into the DOE test procedures for residential dishwashers, dehumidifiers, and conventional cooking products. Other than the specific amendments newly proposed in the September 2011 SNOPR, DOE continued to propose the test procedure amendments originally included in the December 2010 NOPR

II. Summary of the Supplemental Notice of Proposed Rulemaking

Upon further review of the public comment received on its proposals, DOE decided to further analyze the energy use of an air-circulating fan during a portion of cycle finished mode for dishwashers and conventional cooking products. DOE's analysis suggests that measurement of the energy use during this "fan-only" mode (considered part of the active mode) could improve the measurement of dishwasher and conventional cooking product energy use. Accordingly, DOE proposes in today's SNOPR to amend the DOE test procedures for residential dishwashers and conventional cooking products to incorporate the measurement of energy use in fan-only mode in the energy efficiency metrics.

DOE also proposes amendments to the dishwasher test procedure to measure the annual energy and water use associated with periodic water softener system regeneration for those dishwashers equipped with such systems. DOE's proposal in today's SNOPR considers: 1) the data on this subject accompanying petitions for waiver from the dishwasher test procedure for

water-softening dishwashers, submitted by manufacturers; the methodology for addressing water softener system regeneration that was provided in waivers that were subsequently granted to manufacturers; and additional research and analysis that DOE conducted for today's SNOPR.

DOE also proposes in today's SNOPR to clarify in the dishwasher test procedure: 1) the normal cycle definition; 2) power supply requirements during testing; 3) energy test cycle requirements for dishwashers with a separate soil-sensing cycle; 4) test load specifications and soiling requirements; and 5) detergent dosing specifications.

The proposal would also update the industry test method specified in the dehumidifier test procedure. As noted above, EPCA specifies that the EPA's test criteria used under the ENERGY STAR program must serve as the basis for the test procedure for dehumidifiers. (42 U.S.C. 6293(b)(13)) The ENERGY STAR test criteria effective in January 2001 require that ANSI/AHAM Standard DH-1, "Dehumidifiers," be used to measure energy use. Because the version of the DH-1 standard was not specified in the ENERGY STAR test criteria, DOE proposes to incorporate the most current version of the DH-1 standard (2008) into the test procedure for dehumidifiers.

Today's proposal would also eliminate measures of pilot light energy consumption from the cooking products test procedure. In a final rule published April 8, 2009, DOE established standards that prohibit constant burning pilot lights in gas cooking products manufactured on or after April 9, 2012. 74 FR 16040. DOE also proposes in today's SNOPR to remove the calculation of an obsolete energy efficiency metric, EF, from the dishwasher test procedure

because the current dishwasher energy conservation standards no longer require it for compliance or representations.

Other than the specific amendments newly proposed in today's SNOPR, DOE continues to propose the test procedure amendments originally included in the December 2010 NOPR and the September 2011 SNOPR. For the reader's convenience, DOE has reproduced in this SNOPR the entire body of proposed regulatory text from the December 2010 NOPR and September 2011 SNOPR, further amended as appropriate according to today's proposals. DOE's supporting analysis and discussion for the portions of the proposed regulatory text not affected by this SNOPR may be found in the December 2010 NOPR (75 FR 75290 (Dec. 2, 2010)) and the September 2011 SNOPR (76 FR 58346 (Sept. 20, 2011)).

III. Discussion

A. Fan-Only Mode

In the December 2010 NOPR, DOE proposed to include the measurement of energy use in "cycle finished" mode for dishwashers and conventional cooking products, defined as "a mode that provides continuous status display following operation in active mode." 75 FR 75290, 75298–99 (Dec. 2, 2010). DOE maintained this proposed definition in the September 2011 SNOPR. 76 FR 58346 (Sept. 20, 2011).

DOE received comments on the December 2010 NOPR and September 2011 SNOPR which noted that certain components in addition to a continuous status display could be energized for at least a portion of cycle finished mode in these products. Appliance Standards

Awareness Project (ASAP) asked whether DOE had identified other energy-consuming sources not covered in by the definition of cycle finished mode, such as fans used in conventional ovens. Southern California Edison (SCE), Southern California Gas Company (SCG), and San Diego Gas and Electric Company (SDG&E), jointly (hereafter referred to as "California Utilities"); ASAP, American Council for Energy Efficient Economy (ACEEE), National Consumer Law Center (NCLC), and Natural Resources Defense Council (NRDC), jointly (hereafter referred to as the "NOPR Joint Comment"); and Pacific Gas and Electric (PG&E) commented that some models of dishwashers and conventional cooking products currently on the market contain fans or other components that continue to run after the active cycles are finished and that may consume significantly more power than a continuous display. ASAP, ACEEE, and NCLC, jointly (hereafter referred to as the "SNOPR Joint Comment"), ASAP individually, the California Utilities, the NOPR Joint Comment, and PG&E stated that DOE should expand the definition of cycle finished mode for dishwashers and conventional cooking products to include any energy-consuming features following operation in active mode. (ASAP, Public Meeting Transcript, No. 10 at pp. 60–61;[8] California Utilities, No. 16 at p. 2; NOPR Joint Comment, No. 13 at pp. 1–2; PG&E, No. 17 at p. 2[9]; SNOPR Joint Comment, No. 22 at p. 1) Northwest Energy Efficiency Alliance (NEEA) stated that many electronically controlled conventional cooking products have a fan-powered cooling function built into the active cooking mode (to protect the electronic

[8] A notation in the form "ASAP, Public Meeting Transcript, No. 10 at pp. 60–61" identifies an oral comment that DOE received during the December 17, 2010, NOPR public meeting, was recorded in the public meeting transcript in the docket for the residential dishwasher, dehumidifier, and conventional cooking products test procedures rulemaking (Docket No. EERE–2010–BT–TP–0039), and is available for review at www.regulations.gov. This particular notation refers to a comment (1) made by the Appliance Standards Awareness Project during the public meeting; (2) recorded in document number 10, which is the public meeting transcript that is filed in the docket of the residential dishwasher, dehumidifier, and conventional cooking products test procedures rulemaking; and (3) which appears on pages 60–61 of document number 10.

[9] A notation in the form "PG&E, No. 17 at p. 2" identifies a written comment: (1) made by Pacific Gas & Electric; (2) recorded in document number 17 that is filed in the docket of the residential dishwasher, dehumidifier, and conventional cooking products test procedures rulemaking (Docket No. EERE–2010–BT–TP–0039) and available for review at www.regulations.gov; and (3) which appears on page 2 of document number 17.

controls from excessive heating) that persists beyond the functions listed in DOE's proposed definition of active mode. According to NEEA, because the period in which the fan operates occurs after the active mode functions end, and the duration of fan operation depends on the temperature at which the main cooking function(s) were conducted, fan-only mode would not meet DOE's proposed definition of inactive (standby) mode. NEEA commented that the inactive mode for a cooking product begins after the cooling fan stops, and therefore the cooling function is part of active mode. For dishwashers, NEEA requested clarification as to whether such functions as a fan operating during the drying cycle are part of the active washing and drying cycle, or are part of cycle finished mode. NEEA commented that this cooling function in dishwashers should be considered as part of active mode. (NEEA, No. 11 at pp. 2–4) The NOPR Joint Comment stated that DOE should measure the duration of cycle finished mode in the absence of user interaction and estimate typical consumer use. According to the NOPR Joint Comment, the current proposal of 1.1 hours per cycle may be low, given that several dishwashers have cooling fans that continue to run for several hours following completion of the active cycle. The NOPR Joint Comment also noted that certain ovens and ranges include a cooling fan that can run up to 2 hours after the end of the active cycle. The NOPR Joint Comment suggested, therefore, that cycle finished mode likely continues on average for much longer than the proposed 5 minutes. The NOPR Joint Comment expressed concern about DOE's use of the use of European data for estimating the duration of cycle finished mode, and suggested that DOE make its own measurements or obtain data from manufacturers. (NOPR Joint Comment, No. 13 at pp. 4–5)

In considering these comments, DOE researched the functions, average power consumption, and duration of operation of air circulation fans in both dishwashers and conventional cooking products at the completion of the active cycle. The following sections discuss the results of these analyses separately for the two product types.

1. Dishwashers

Certain dishwashers incorporate an air circulation fan to transfer moisture from the dishware and out of the unit through an open vent more effectively than natural convection through the vent, The air circulation fan may remain energized for a period after the drying portion of an active cycle is complete, during which time the continuous status display indicates to the consumer that the cycle has finished. DOE research suggests that such fans typically require approximately 12 to 20 watts (W) of additional input power, and run 10 minutes to 4 hours after completion of the active cycle, depending on the type of drying cycle setting selected by the user. Based on this information, DOE calculated the range of annual energy consumption associated with an air circulation fan operating after the end of the active cycle as (12 to 20 W) × (10 minutes to 4 hours) × (215 estimated number of dishwashing cycles according to the DOE test procedure) = 0.4 to 17 kWh. The higher end of the range is greater than 5 percent of the maximum allowable annual energy consumption for a standard dishwasher (355 kWh). DOE proposes to measure the energy consumption associated with an air circulation fan operating at the end of the active cycle as described in section III.C.

In the December 2010 NOPR, DOE proposed to define “standby mode” as any mode where the product is connected to a mains power source and offers one or more of the following

user-oriented or protective functions which may persist for an indefinite time: (a) to facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, or timer; or (b) continuous functions, including information or status displays (including clocks) or sensor-based functions. As noted previously, cycle finished mode was proposed in the December 2010 NOPR as a mode that provides continuous status display following operation in active mode, which would classify cycle finished mode as a standby mode. 75 FR 75290, 75298–99 (Dec. 2, 2010). DOE maintained these proposed definitions in the September 2011 SNOPR. 76 FR 58346, 58349–50 (Sept. 20, 2011). DOE recognizes that the operation of an air circulation fan for a limited duration following the active cycle would preclude such a "fan-only" mode from consideration as cycle finished mode and, more generally, a standby mode under the proposed definitions. Therefore, DOE considers fan-only mode to be an active mode uniquely associated with the active cycle. DOE proposes in today's SNOPR to define fan-only mode as "an active mode in which a fan circulates air for a finite period of time after the end of the cycle, as indicated to the consumer."

2. Conventional Cooking Products

Conventional ovens operate at cavity temperatures typically greater than 300 degrees Fahrenheit (°F) during an active cooking cycle. To maintain safe temperatures of the surrounding surfaces during the active cycle and to cool internal oven components after completion of the cycle, conventional ovens and ranges often incorporate an air circulation fan. DOE research indicates that the air circulation fan may be activated at the end of the active cooking cycle based on some combination of the oven cavity internal temperature and cooking function (e.g., "bake", "broil"), or may be programmed to run for a fixed time. For conventional ovens and ranges

which operate the air circulation fan according to the oven cavity temperature, DOE observed in the sample that it reviewed that the threshold temperature at which the fan would be activated ranged from 100 °F to 360 °F. For those conventional ovens and ranges with time-controlled fan operation, the duration of the "fan-only" mode in the sample that DOE identified ranged from 10 minutes to 3.5 hours after completion of the active mode cycle. DOE found no conventional cooktops with air circulation fans.

DOE research suggests that the air circulation fans in conventional ovens and ranges typically require approximately 16 to 50 W of input power. To estimate the number of annual cooking cycles for each conventional oven and range, DOE reviewed available consumer usage data. DOE's Energy Information Agency (EIA) conducts a Residential Energy Consumption Survey (RECS) that collects energy-related data for occupied primary housing units in the United States. The 2009 RECS collected data from 12,083 housing units representing over 113 million households.[10] The RECS indicates which households in the survey use electric and gas ranges and ovens. With regard to electric cooking products, 2332 household records have standard ovens and 5258 household records have self-cleaning ovens. With regard to gas cooking products, 2075 household records have standard ovens, and 2315 household records have self-cleaning ovens. The above totals represent ovens in households as either a stand-alone unit or as part of a range. Table III.1 presents the weighted-average cooking frequency values of each product class. DOE calculated the range of annual energy consumption associated with an air circulation fan operating after the end of the active cooking cycle as (16 to 50 W) × (10 minutes to 3.5 hours) × (weighted average cooking frequency per day) × (365 days per year). Table III.1

[10] Residential Energy Consumption Survey, 2009 Survey Data. Available online at: http://38.96.246.204/consumption/residential/data/2009/

also shows this range of calculated annual energy consumption associated with air circulation fans for each product class, along with the annual energy consumption in other active modes of a baseline product.[11] The higher end of the range for each class is greater than 11 percent of the baseline annual energy use. DOE proposes to measure the energy consumption associated with an air circulation fan operating at the end of the active cycle as described in section III.C.

Table III.1 DOE Estimate of Annual Energy Use for Conventional Oven and Range Fan-Only Mode

	Weighted-Average Cooking Frequency (Cycles per Day)	Annual Active Mode Energy Consumption	Annual Fan-Only Mode Energy Consumption
Standard Electric Ovens	0.60	166.5 kWh	0.6 to 38.3 kWh
Self-Cleaning Electric Ovens	0.56	171.0 kWh	0.5 to 35.8 kWh
Standard Gas Ovens	0.50	0.92 MMBtu (269 kWh)	0.5 to 31.9 kWh
Self-Cleaning Gas Ovens	0.54	1.04 MMBtu (305 kWh)	0.5 to 34.5 kWh

As with dishwashers, DOE also tentatively concludes that operation of the fan after the end of the active cycle, i.e., in fan-only mode, would classify this mode as part of active mode rather than cycle finished mode or, more generally, standby mode. DOE proposes for conventional cooking products to define fan-only mode as "an active mode in which a fan circulates air internally or externally to the cooking product for a finite period of time after the end of the heating function, as indicated to the consumer."

B. Dishwasher Water Softener Regeneration

The current dishwasher test procedure does not account specifically for the regeneration operation of the water softener in its measurement of energy and water use.

[11] This active mode energy use, derived from the Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Dishwashers, Dehumidifiers, and Cooking Products and Commercial Clothes Washers, March 2009, includes clock power. The technical support document is available online at: http://www1.eere.energy.gov/buildings/appliance_standards/residential/cooking_products_final_rule_tsd.html

Manufacturers have filed petitions for waiver from the test procedure applicable to dishwashers for units that contain a built-in water softener regeneration system, asserting that: 1) the amount of water consumed by the regeneration operation of a water softener in a dishwasher is very small, but varies significantly depending on the adjustment of the softener; 2) the regeneration operation takes place infrequently and is related to the level of water hardness; and 3) including this water use in the measurement of water consumption during an individual energy test cycle could overstate water and energy use.

These manufacturers estimated through in-house measurements that the water softener regeneration occurs once every six active mode cycles, and that the system consumes approximately 23 gallons of water and 4 kWh of electricity per year, assuming an average U.S. water hardness of 217 milligrams per liter (mg/L). One manufacturer also estimated that the system consumes 4.97 L of water per regeneration cycle, and that approximately 50 percent of U.S. households that have hard water have their entire water supply softened. The manufacturers requested approval to measure the water consumption of dishwashers having water softeners without including the water consumed by the dishwasher during softener regeneration, as outlined in European Standard EN 50242, "Electric Dishwashers for Household Use—Methods for Measuring the Performance."

DOE granted waivers to these manufacturers that provided an alternate means to account for the water and energy used during water softener regeneration. The waivers permitted these manufacturers to measure water and energy consumption of the specified dishwasher models that have water softener regeneration systems according to the following methodology:

a) The DOE test is initiated on a cycle immediately following a regeneration cycle.

b) Water and energy consumption shall be measured according to the DOE test procedure in 10 CFR part 430, subpart B, appendix C, ensuring that regeneration does not take place during the test.

c) Constant values of 23 gallons/year of water and 4 kWh/year of energy, representing the water and energy consumption associated with water softener regeneration, shall be added to the estimated annual energy and water use.

d) Should regeneration happen during the DOE test, the water consumed during water softener regeneration can be disregarded for the per cycle water and energy consumption measurement, provided constant values are added to the estimated annual energy and water use. The constant values in the waivers were specified as 23 gallons/year of water and 4 kWh/year of energy and 47.6 gallons/year of water and 8 kWh/year of energy, respectively. (DOE did not find evidence that 50 percent of U.S. households with hard water have their entire water supply softened.)

e) Representations about the energy use of water-softening dishwashers that are the subject of such waivers for compliance, marketing, or other purposes may be made only to the extent that such products have been testing according to this methodology.

In response to the December 2010 NOPR and September 2011 SNOPR, DOE received comments regarding the measurement of energy and water use for dishwasher water softener

regeneration. BSH Home Appliances Corporation (BSH) and Earthjustice noted the waiver granted to Whirlpool Corporation (Whirlpool), and BSH suggested that DOE consider for this rulemaking the same approach of adding the incremental energy use associated with the regeneration process. Earthjustice requested that DOE inform the public of its plans to amend the dishwasher test procedure accordingly. (BSH, Public Meeting Transcript, No. 10 at p. 37; Earthjustice, No. 15 at p. 1) BSH commented that recent interpretations have considered water softener regeneration to be part of active mode, and that DOE treats it differently than the IEC does. According to BSH, the IEC does not consider regeneration as active mode, but as a secondary process separate from washing the dishware. BSH further commented that there are limited data in the United States regarding how many dishwashers have the regeneration function, and how often this function is activated. BSH stated that water softening systems are typically on very high-end products, and that it believes that homes in which these dishwashers are installed typically have home water softening systems, so that the frequency of use could be very low. (BSH, Public Meeting Transcript, No. 10 at pp. 37–39)

In response to these comments, DOE conducted analysis for today's SNOPR in support of potential dishwasher test procedure amendments to address water softener regeneration.

Based on review of the data submitted by manufacturers in their petitions for waiver, product database research, and manufacturer interviews, DOE observed that some areas in the United States have hard municipal or locally supplied water, defined as having calcium ion concentrations higher than 180 parts per million (ppm). Hard water prevents soaps and detergents from properly sudsing, resulting in unsatisfactory cleaning performance. To address

this issue, some residential dishwashers have a built-in water softening system to minimize excess use of detergent and re-cleaning of the dishware due to unsatisfactory washing. The water softener system may consist of a resin bed which provides an ion exchange to remove calcium and magnesium ions from the water, by swapping sodium ions bonded to the resin with the calcium and magnesium ions. Over time, the calcium and magnesium replace all the sodium in the resin bed, which therefore must be periodically recharged with sodium by flushing a saline solution over it, a process which is referred to as regeneration. During a cycle which includes a regeneration process, additional water is mixed with sodium chloride (salt) supplied by the consumer in a compartment separate from the detergent compartment to create the saline solution, and this incremental water consumption requires energy to heat it to the same temperature as is used for the active cycle.

The frequency of the water softener regeneration is dependent on the following:

a) Amount of water consumed in a normal cycle;
b) Hardness of the water at the inlet to the dishwasher; and
c) Hardness level set by the user on the unit as per manufacturer's instructions. Typically, the user is asked to determine the hardness of the water (in ppm) and to set the level in the dishwasher accordingly. If the hardness level in the unit is set to 0, the water softening system will not be used and thus a regeneration process will take place infrequently or never.

As noted previously, according to manufacturer data, the average water hardness in U.S. households is 217 ppm (12.6 grains per gallon), and that at this level, the regeneration process

will take place in their dishwashers equipped with built-in water softening systems approximately once every six active cycles, or 36 times per year. DOE does not have additional information regarding whether this frequency is representative of other dishwashers with built-in water softening systems, the prevalence of home water softening systems, and consumer usage habits. Therefore, DOE is proposing to retain the value of 36 regeneration events per year, but seeks comment and information on a representative frequency.

DOE then examined the electrical and water heating energy consumption, along with water consumption, to determine appropriate test procedure amendments for representative dishwashers with built-in water softening systems. Machine electrical energy consumption associated with the regeneration process primarily consists of the energy consumed to activate a dedicated solenoid valve to the water softening system and additional activation of the drain pump to circulate and flush the saline solution, as well as any electrical energy needed to heat the water internally. Because the regeneration process takes place over approximately 20 seconds, and because the electrical power associated with the water handling components is estimated by DOE based on its research to be less than 100 W, the maximum electrical energy use per regeneration process for the water handling components is 0.0005 kWh. Assuming 36 regeneration events occur per year, the annual electrical energy use associated with water softener regeneration would be only 0.02 kWh, or less than 0.01 percent of the maximum allowable annual energy use in active mode and standby mode for standard dishwashers. (DOE is not aware of any compact dishwashers with built-in water softening systems.) Therefore, the primary machine electrical energy use during water softener regeneration is associated with internal water heating.

According to the data submitted by manufacturers in their petitions for waiver, the volume of water consumed for a water softener regeneration process ranges between 2.4 and 5 L (0.63 to 1.32 gallons) per active cycle that includes regeneration. Since regeneration is estimated to occur once every six active cycles, this would correspond to an average allocation of 0.1 to 0.2 gallons per active cycle for the regeneration process. These average water consumption values should be adjusted to account for the percentage of homes with hard water that use home water softening systems instead of the dishwasher built-in system, but DOE lacks data to assign a value to this percentage, and for the purposes of today's SNOPR is proposing to assume that all dishwashers with built-in water softeners perform the periodic regeneration. The current residential dishwasher energy conservation standards allow for a maximum water consumption of 6.5 gallons per cycle for standard dishwashers, so that water softener water consumption would represent at least 2 percent of the allowable water consumption. DOE proposes to measure the water consumption associated with regeneration for dishwashers with built-in water softening systems. DOE requests data and information on this percentage, as well as the incremental water consumption associated with built-in water softener regeneration.

Similarly, DOE examined the water-heating energy consumption for water softener regeneration, based on the allocation of 0.1 to 0.2 gallons of additional water consumption per active cycle. The water-heating energy use was calculated as (0.1 to 0.2 gallons per active cycle) × (the nominal temperature rise of 90 °F from the nominal cold water temperature of 50 °F to the nominal hot water temperature in the dishwasher of 140 °F) × (specific heat of water, 0.0024 kWh per gallon per °F) × (1 – percentage of households with home water softening systems) ×

(215 active cycles per year). This would be calculated as 4.6 to 9.2 kWh per year if all households with hard water were assumed to require the use of the dishwasher water softening system, which represents at least 1 percent of the maximum allowable annual energy use of 355 kWh for standard dishwashers. Because the water heating may take place internally in the dishwasher or externally in the home water heater, DOE proposes to measure the machine electrical energy consumption as well as the water consumption associated with water softener regeneration. As discussed previously, DOE does not have information regarding the percentage of households with hard water that use home water softening systems and is therefore proposing in today's SNOPR to assign a value of zero to this percentage. DOE seeks comment on this percentage and the inclusion of water-heating energy use associated with water softener regeneration in the proposed amendments to the dishwasher test procedure.

C. Calculation of Energy Consumption in Active, Standby, and Off Modes

In the December 2010 NOPR, DOE proposed two possible approaches for measuring energy consumption in modes other than active washing mode for dishwashers and active cooking mode for conventional cooking products; i.e., inactive (standby) mode and off mode, as well as delay start mode and cycle finished mode.[12] These modes are collectively referred to as low-power modes in this proposal. For the first approach, DOE proposed allocating specific annual hours to each of the active, standby, and off mode hours. Using this approach, the annual energy use associated with inactive, off, delay start, and cycle finished modes would be

[12] Active washing mode for dishwashers includes washing, rinsing, and drying, and active cooking mode for conventional cooking products includes oven self-clean functions. DOE also proposed that delay start mode for both dishwashers and conventional cooking products are part of active mode, along with cycle finished mode for conventional cooking products. Cycle finished mode for cooking products would be considered a part of active mode because it would not persist indefinitely after a cooking cycle. Cycle finished mode for dishwashers was proposed as a standby mode because it could persist indefinitely after an active washing cycle.

calculated by (1) calculating the product of wattage and allocated hours for all possible inactive, off, delay start and cycle finished modes; (2) summing the results; and (3) dividing the sum by 1,000 to convert from Wh to kWh. For the per-cycle energy use metrics, this value would be divided by the proposed annual active use cycles per year.

As an alternate approach, DOE proposed measuring power consumption for only off and inactive modes for the purpose of calculating the total energy consumed in all low-power modes. Using this approach, energy use in delay start and cycle finished mode would be accounted for by allocating all the hours not associated with active washing or cooking mode to the inactive (standby) and off modes and then measuring standby or off mode power. DOE retained these proposals in the September 2011 SNOPR.

DOE received multiple comments in response to the December 2010 NOPR regarding the proposed approaches for measuring energy use in low-power modes as well as the allocation of hours associated with each low-power mode. ASAP and the NOPR Joint Comment stated that, although currently the annual energy consumption in certain non-active modes may represent a small fraction of total annual energy consumption, DOE should establish test procedures that include measurements of energy consumption in each non-active mode to incentivize manufacturers to reduce power consumption in these modes. ASAP commented that DOE should consider not just those products that are currently on the market, but those that may be introduced in the next 5 or 7 years as well. ASAP and the NOPR Joint Comment stated that if the test procedures do not measure power consumption in each non-active mode, the energy consumption of any new features in these modes that are introduced to products will not be

captured. (ASAP, Public Meeting Transcript, No. 10 at pp. 87–88, 109; NOPR Joint Comment, No. 13 at pp. 5–6) The SNOPR Joint Comment supported the approach of measuring delay start and all non-active modes separately. (SNOPR Joint Comment, No. 22 at pp. 1–2) NEEA commented that if DOE defines cycle finished mode as an inactive mode, then the energy consumption in all standby and off modes must be measured as part of the test procedure, and the hours spent in each component of the inactive mode must be based on at least some data from the testing of actual products in the field. (NEEA, No. 11 at p. 5)

Whirlpool supports using the proposed alternate approach, which would specify hours for the off and inactive modes when calculating energy use. According to Whirlpool, delay start and cycle finished modes should not be separately measured because they represent a de minimus amount of annual energy use. (Whirlpool, No. 12 at p. 5) Whirlpool commented that under the original proposal, testing burden is increased by adding requirements to measure cycle finished mode, inactive mode, and off mode. Whirlpool estimated the time required for the measurement of standby mode and off mode power under the alternate approach as 10 minutes per product, as compared to 45 minutes if each standby mode and off mode were measured separately. According to Whirlpool, multiplying the added 35 minutes by the 100 tests it conducts each year results in an increase in test burden of 7–8 man-days per year, which is a 3-percent productivity loss for the company. Whirlpool stated that the cost and complexity of measuring cycle finished and off/inactive modes individually greatly exceeds the value of such an approach. (Whirlpool, No. 21 at pp. 2–3) AHAM stated that, although it objected to the annual hours allocated to the various modes, it believes that the alternative approach is preferable to the measurement of power consumption in each mode for dishwashers and conventional cooking products. (AHAM,

No. 14 at pp. 9, 12)

Today's SNOPR does not propose to include provisions to measure delay start mode or cycle finished mode separately from the active washing or cooking mode. Instead, today's SNOPR proposes the alternate approach, in which all low-power modes are allocated to the inactive and off modes, depending on which of these modes is present. DOE believes that its assumption set forth in the December 2010 NOPR that the power consumption in each of these low-power modes is similar remains valid, and that in such a case, measuring power consumption of each mode separately would introduce significant test burden without a corresponding improvement in a representative measure of annual energy use.

DOE is, however, proposing to require separate measurement of fan-only mode. The power consumption and duration of this mode may vary significantly from product to product, and the energy use associated with this mode may in some cases represent a larger percentage of annual energy consumption than the energy use in the low-power modes. For the dishwasher test procedure, DOE is proposing to require the measurement of the energy consumption and duration of fan-only mode for each cycle run as part of the test procedure, averaging these values when multiple cycles are required (i.e., for soil-sensing dishwashers). This energy consumption would be required to be included in the annual energy consumption metric upon the compliance date of any updated dishwasher energy conservation standards addressing standby mode and off mode energy use. For conventional ovens, DOE is proposing to require measuring the energy consumption and duration of fan-only mode at the end of the active mode heating cycle. This

energy consumption would be included in the integrated energy factor and integrated annual energy consumption metrics.

DOE is also proposing provisions in the amended dishwasher test procedure that would include the machine energy consumption, water consumption, and water-heating energy consumption associated with the active mode function of water softener regeneration. DOE analysis suggests that the water consumption for an active cycle including water softener regeneration is typically more than 10 percent higher than the water consumption for an active cycle without regeneration. Therefore, for machines with built-in water softening systems, one of the proposed methods to measure this additional energy and water consumption would require that two normal cycles be run with no dishware load and with the water softening system set to the setting corresponding to a water hardness of 217 mg/L and with salt provided to the system per the manufacturer's instructions. The resulting water consumption for the two cycles would then be compared. If the water consumption for either cycle is greater than the other by more than 10 percent, then the cycle with the higher water consumption would be deemed to have a regeneration process, and the difference in water consumption between the two cycles would be determined to be the incremental water consumption associated with regeneration, and the incremental machine energy consumption for regeneration would be the difference in machine energy consumption for the two cycles. If neither cycle consumed an amount of water that is 10 percent higher than for the other cycle, additional cycles would be run until the water consumption for a cycle is 10 percent higher than the average of the water use for the previous cycles, with the incremental regeneration water consumption determined to be the highest water consumption minus the average water consumption from the previous cycles. The incremental

machine energy consumption would be the machine energy consumption for cycle with the highest water consumption minus the average machine consumption from the previous cycles. The incremental regeneration machine and water consumption would be apportioned to each active mode cycle, to be considered as part of the energy conservation standard metrics, by multiplying by the number of annual regeneration processes (36) and dividing by the annual use cycles (215). These products should also be multiplied by (1 – percentage of households with home water softening systems), but as noted in section III.B, DOE does not have information on such a percentage and thus is not including this factor in the calculations proposed in today's SNOPR. If a total of 10 cycles are run without meeting the threshold criterion, the dishwasher would be deemed not to be a water-softening dishwasher for the purposes of the dishwasher test procedure. In either case, the DOE test procedure would be conducted immediately following this portion of the test, with the water softener system set to its lowest water hardness setting.

The water-heating energy associated with water-softening dishwashers that operate at a nominal 120 °F or 140 °F inlet temperature would be calculated as (regeneration water consumption per active cycle) × (the temperature rise from the nominal cold water temperature of 50 °F to the nominal inlet water temperature) × (specific heat of water, 0.0024 kWh per gallon per °F) for electric water heaters. For gas-heated or oil-heated water, the water-heating energy would be calculated as (regeneration water consumption per active cycle) × (the temperature rise from the nominal cold water temperature of 50 °F to the nominal inlet water temperature) × (specific heat of water, 8.2 Btus per gallon per °F) / (the nominal heat recovery efficiency of a gas or oil water heater, 0.75).

DOE also proposes an alternate method to account for the machine energy consumption, water consumption, and water heating consumption associated with water softener regeneration. Under the alternate approach, for those units with built-in water softening systems, manufacturers would add constant values for these amounts. Based on manufacturer data, these amounts can range from 23 gallons/year–47.6 gallons/year and 4 kWh/year–8 kWh/year. DOE seeks comments and data on appropriate constant values, as well as whether the constant values should vary based on certain criteria.

D. Dishwasher Test Procedure Clarifications

During recent implementation of the dishwasher test procedure in third-party labs, interested parties raised questions regarding the appropriate interpretation of certain provisions. DOE is proposing clarifications to these provisions in order to ensure that the procedure is uniformly applied during testing. The proposed amendments discussed in this section would apply to all dishwasher testing upon the effective date of the amended test procedure (i.e., 30 days after the date of publication of the test procedure final rule in the Federal Register).

1. Normal Cycle Definition

The DOE dishwasher current defines the normal cycle as "the cycle type recommended by the manufacturer for completely washing a full load of normally soiled dishes including the power-dry feature." (Section 1.6 of 10 CFR part 430, subpart B, appendix C) DOE is aware that certain dishwashers have multiple wash and/or drying temperature options for the cycle setting required under the normal cycle definition. For these dishwashers, DOE clarifies in the definition that the normal cycle shall include the wash and drying temperature options recommended by the

manufacturer for completely washing a full load of normally soiled dishes including the power-dry feature. DOE seeks comment on the wash and drying temperature options to be selected in the case that the cycle setting required under the normal cycle definition has multiple wash and/or drying temperature options but the manufacturer does not provide such a recommendation.

2.Power Supply Requirements

The current DOE dishwasher test procedure defines a soil-sensing dishwasher as "a dishwasher that has the ability to adjust any energy consuming aspect of a wash cycle based on the soil load of the dishes." (Section 1.12 of appendix C) For certain soil-sensing dishwashers, DOE is aware that the turbidity sensor may lose its calibration during a power supply interruption. DOE observed, for example, during its energy testing of a limited sample of soil-sensing dishwashers that the first cycle after a power supply interruption consumed as much as 30-percent higher energy and 50-percent higher water than subsequent cycles. As a result, removing the power supply to these units in between energy test cycles may lead to unrepresentative results. DOE also recognizes that, for soil-sensing units, any turbidity sensor calibration must be completed prior to conducting the water softening regeneration test and active mode cycle according to newly proposed sections 4.1 and 4.2 of appendix C, respectively. Therefore, DOE proposes that, for soil-sensing dishwashers: 1) the cycle setting for the active mode cycle (in which the soil sensor is active) be selected for the preconditioning cycle described in newly proposed section 2.9 of appendix C, and 2) the power supply to the unit be continuously maintained throughout testing, including after the preconditioning cycle and in between all energy test cycles.

3. Energy Test Cycle Selection

DOE is aware of certain soil-sensing dishwasher models that contain a soil-sensing cycle selection separate from a non-soil-sensing normal cycle. Such a cycle, if selected as the test cycle, may lead to lower water and energy use, as the unit would be unable to differentiate between the loads for sensor heavy, sensor medium, and sensor light response as specified in current sections 1.9, 1.10, and 1.11 of appendix C. As a result, testing such units using an energy test cycle without soil-sensing may lead to unrepresentative results. Therefore, DOE proposes that soil-sensing dishwashers be tested on the normal cycle under section 2.6.3 of appendix C if soil-sensing is available as an option in the normal cycle. If soil-sensing is not available for the normal cycle, DOE proposes that the dishwasher be tested by selecting the cycle type that uses the soil-sensing system, and contains all the elements of a normal cycle including the power-dry feature (if such a feature is provided).

4. Test Load Specifications and Soiling Requirements

For soil-sensing dishwashers, the current dishwasher test procedure provides instructions in section 2.6.3 of appendix C on the preparation of the test loads for the sensor heavy, sensor medium, and sensor light response. In each case, the test load is defined as a number of place settings plus serving pieces, as specified in section 2.7 of appendix C, and a subset of those place settings must be soiled according to ANSI/AHAM DW-1-1992, "Household Electric Dishwashers" (DW-1-1992), while the remaining place settings, serving pieces, and all flatware are not soiled. DOE recognizes that while individual dishware, glassware, and flatware items are specified in section 2.7 of appendix C, the test procedure does not define which items a "place

setting" comprises. Although not referenced specifically in appendix C, DW-1-1992 defines a place setting as the dishware, glasses, and flatware associated with a table serving for one person, which consists of one cup, one saucer, one dinner plate, one bread and butter plate, one fruit bowl, one glass, one dinner fork, one salad fork, one knife, and two teaspoons. DW-1-1992 also defines "serving pieces" as the dishware and flatware used on the table, which include one platter, two serving bowls, two serving spoons, and one serving fork. Because DW-1-1992 includes flatware items in a place setting, DOE believes that the instructions in section 2.6.3 of appendix C to soil a certain number of place settings may be interpreted to conflict with the additional requirement that all flatware items remain unsoiled. Therefore, DOE proposes to amend section 2.7 of appendix C to specify the individual items in a place setting and identify the serving pieces, as well as to clarify in section 2.6.3 of appendix C that the flatware that is part of a soiled place setting is to remain unsoiled.

DOE notes that certain items specified for the test load in section 2.7 of appendix C may be obsolete and, thus, may not be obtained for use in the dishwasher test procedure. In particular, DOE believes that the cup and saucer, salad fork, serving fork and serving spoon are no longer available as currently specified. AHAM submitted information to DOE regarding alternative specifications for all flatware and serving pieces, which AHAM considers acceptable for use in its current dishwasher test method, DW-1-2009. AHAM provides specific pattern names and product numbers for each of the flatware and serving piece items. (AHAM, No. 24 at pp. 1–2) DOE believes that AHAM's specifications represent the most reasonable alternative for the obsolete test load flatware and serving pieces, and proposes in today's SNOPR to amend the test load specifications in section 2.7 of appendix C accordingly. DOE also seeks comment on

alternative specifications for other test load items which may be obsolete, including the cup and saucer, and will consider additional amendments to the test load specifications in appendix C if it receives such information.

5. Detergent Dosing Specifications

The current DOE dishwasher test procedure requires the use of half the quantity of detergent specified by DW-1-1992. Section 4.1 of ANSI/AHAM DW-1-1992 requires the use of 0.5-percent concentration by weight of Cascade powder national formula dishwasher detergent in the prewash and main wash cup. Thus, appendix C requires 0.25-percent detergent concentration by weight in the prewash and main wash cup, but it does not specify what water usage should be used as the basis for calculating the concentrations and how the actual detergent weights would be determined.

Therefore, DOE proposes to calculate the required detergent amounts by measuring the volume of water (in gallons) used during the prewash and the main wash portions of the cycle when running the preconditioning cycle as specified in appendix C. To ensure representative water volumes, DOE proposes requiring that the preconditioning cycle be run using the cycle setting for the active mode cycle. The amount of detergent in grams (g) required for the prewash would then be calculated as (volume of water used during the prewash portion) × (water density in pounds (lb)/gallon, which is a function of the nominal inlet water temperature) × (453.6 g/lb, the conversion factor from lb to g) × (0.0025, the conversion factor to obtain 0.25-percent mass concentration). The amount of detergent in grams required for the main wash would be calculated as (volume of water used during the main wash portion) × (water density in lb/gallon,

which is a function of the inlet water temperature) × (453.6 g/ lb, which is the conversion factor from lb to g) × (0.0025, the conversion factor to obtain 0.25-percent mass concentration).

DOE is also aware that the detergent specified in section 4.1 of ANSI/AHAM DW-1-1992, "Cascade powder national formula," is not a currently-marketed formulation. Thus, DOE proposes amending the dishwasher test procedure to specify the use of "Cascade with the Grease Fighting Power of Dawn" powder detergent, which it believes to be the most representative Cascade power national formulation available at this time on the market.

E. Incorporation by Reference of an Updated AHAM Dehumidifier Test Procedure

On July 22, 2011, DOE received a request for guidance from AHAM on interpreting the appropriate version of AHAM's dehumidifier test method, DH-1, "Dehumidifiers" (DH-1), to be used in the DOE dehumidifier test procedure found at 10 CFR part 430, subpart B, appendix X (appendix X). According to AHAM, it is ambiguous as to whether the appropriate version of DH-1 is the one that was in effect at the time that the current DOE test procedure was published (AHAM DH-1-1992 (DH-1-1992)) or the current version that was issued in 2008 (ANSI/AHAM DH-1-2008 (DH-1-2008)). AHAM recommended that the DOE test procedure be interpreted to require the use of DH-1-2008 because it contains technical improvements and clarifications as compared to the earlier version. (AHAM, No. 23 at pp. 1–2)

Currently, section 4 of appendix X requires that dehumidifier capacity and EF be evaluated by means of the ENERGY STAR qualification criteria that were in effect as of January 1, 2001. Those criteria (denoted as version 1.0) in turn require that capacity be measured

according to DH-1, with no version specified, and EF be measured according to CAN/CSA-C749-1994 (R2005), "Performance of Dehumidifiers" (CAN/CSA-C749). DOE agrees that the required test method for capacity measurement could be interpreted as either the version of DH-1 that was in effect as of January 1, 2001 (DH-1-1992), or the version that is currently effective (DH-1-2008).

DOE, therefore, evaluated both the 1992 and 2008 editions of DH-1 to compare results from the 2008 version with results from the 1992 version. A review of each edition reveals that the updated provisions that could affect the capacity measurement refer to measurement equipment accuracy, test room specifications, and data recording frequency. Other changes, including the addition of EF measurement methodology equivalent to that in CAN/CSA-C749, do not impact the capacity measurement. Each of the substantive changes is detailed in the following sections.

1. Temperature Measurement Accuracy

DH-1-1992 requires thermometers measuring wet-bulb and dry-bulb temperatures to be accurate to 0.1 °F, with graduated intervals of no more than 0.2 °F. DH-1-2008 maintains those accuracies for analog temperature measurement devices, but requires a precision of 0.05 °F for digital equipment. DOE believes that many test labs are already using thermocouples and data acquisition systems, and thus achieving the more accurate temperature measurements. In any event, this requirement would maintain or improve the determination of ambient conditions, leading to maintaining or improving test repeatability and reproducibility.

2. Weight Measurement Accuracy

DH-1-2008 allows the use of less accurate weight measurement equipment for measuring the amount of condensate that is collected during the test. This newer version requires a maximum of 0.5 percent variation among individual readings, rather than the 0.2 percent specified in DH-1-1992. Because this allowable variation directly translates to a 0.5-percent uncertainty in the capacity rating, the effect of this change would be to allow the capacity ratings to range from 15 ± .08 pints/day for the smallest unit in DOE's compliance certification database[13] to 150 ± .75 pints/day for the largest unit. While a 0.2-percent uncertainty allows enough variation to produce a change in the significant digits of the metric used for capacity classification, i.e., two digits after the decimal point, this greater allowable uncertainty could result in any dehumidifiers being rated at a lower capacity than they would by using DH-1-1992.

3. Barometric Pressure Measurement Accuracy

DH-1-2008 adds a new requirement that the barometric pressure measuring instrument must be accurate to 0.3 percent. DOE is not aware of the type of pressure instruments that have been or are currently being used by test labs, so it is not known whether this new requirement would have any impact on nominal performance measurements. DOE believes in general, however, that providing such a specification would help ensure test repeatability and reproducibility by aiding in maintaining ambient conditions closely.

4. Test Room Requirements

[13] DOE's Compliance Certification Database is available online at: www.regulations.doe.gov/certification-data/Category.html.

In DH-1-2008, AHAM increased the minimum distance between any room surface and the discharge side of the dehumidifier from 3 feet to 6 feet. This version of DH-1 also adds a requirement that the test room conditioning equipment handle air at a rate of not less than two times the dehumidifier air flow, and that the air flow approaching the dehumidifier be uniform in velocity. Further, DH-1-2008 newly specifies the orientation of the dehumidifier with respect to the air flow within the test room and the position of an air sampling tree in relation to the inlet face of the test unit. DOE interprets that the purpose of these new requirements is to ensure that testing conditions are as stable and uniform as possible, and does not believe that the different requirements would measurably affect the nominal performance of a test unit.

5. Data Recording Intervals

Measurements of the energy use, supply power, and wet- and dry-bulb temperatures are required to be recorded at 30-minute intervals in DH-1-1992. The intervals were shortened to 10 minutes in the 2008 version. This change would not cause a change in the nominal capacity measurement because the final condensate measurement would remain the same. The greater recording frequency helps to ensure that proper test conditions are maintained throughout the test. There is, however, an accompanying increase in test burden, as the new test procedure requires recording 36 events over the 6-hour test period instead of the original 12, but DOE concludes that the incremental burden is small if the data are recorded automatically in a data acquisition system, as is likely for many test labs.

In sum, upon review of the two versions of DH-1, DOE recognizes that there could be minor impacts to the nominal capacity measurement associated with the changes made from DH-

1-1992 to DH-1-2008. However, DOE tentatively concludes that, on balance, the use of either version would produce comparable results for its dehumidifier test procedure. Further, DOE believes that the additional clarity and specificity provided by the 2008 version would improve test accuracy, repeatability, and reproducibility.

DOE further proposes that the dehumidifier test procedure directly reference DH-1-2008 for both the capacity and EF measurements given that the EF methodology has been added to DH-1-2008. The proposed test method is based on the ENERGY STAR criteria (as required by EPCA) and CAN/CSA-C794-1994. DOE proposes the direct reference to DH-1-2008 given the improvements in that version as compared to the test method set forth in DH-1-1992 and referenced in the ENERGY STAR criteria. Therefore, DOE proposes in today's SNOPR to update the reference in its dehumidifier test procedure to DH-1-2008 for both capacity and EF measurements, and eliminate the reference to the ENERGY STAR qualification criteria.

F. Technical Corrections

In sections 5.4.1 and 5.4.2 of the current dishwasher test procedure, water energy consumption is calculated as specified for both non-soil-sensing and soil-sensing dishwashers using electrically heated water "[f]or the normal and truncated normal test cycle." Because the normal and truncated normal test cycles do not apply to soil-sensing dishwashers, DOE proposes to remove this qualification in newly designated sections 5.5.1.1 and 5.5.2.1. Similarly, in sections 5.5.1 and 5.5.2 of the current dishwasher test procedure, water energy consumption is calculated as specified for both non-soil-sensing and soil-sensing dishwashers using gas-heated or oil-heater water "[f]or each test cycle." Because for soil-sensing dishwashers the calculation is

applied to a single weighted-average water consumption measured over the sensor heavy response, sensor medium response, and sensor light response cycles, DOE believes that this qualification may cause confusion. Therefore, DOE proposes to remove this qualification in newly designated sections 5.6.1.1 and 5.6.2.1. DOE also proposes to correct references to the water consumption values used in the calculation of water energy consumption in these sections of the dishwasher test procedure, so that separate references are provided for non-soil-sensing and soil-sensing dishwashers.

Due to a transcription error in publication, the September 2011 SNOPR erroneously specified in the regulatory text for the proposed dishwasher test procedure amendments the calculation of estimated annual operating cost for dishwashers having a truncated normal cycle which operate at 50 °F inlet water temperature. Specifically, the calculation proposed in 10 CFR 430.23(c)(1)(i)(B) contained extraneous variables "B" and "V." DOE proposes in today's SNOPR to remove these extraneous variables to correct the calculation.

G. Removal of Obsolete Measures of Gas Pilot Light Energy Consumption in the Conventional Cooking Products Test Procedure and of Energy Factor Calculations for Dishwashers

The energy conservation standards for cooking products require that gas cooking products manufactured on or after April 9, 2012, shall not be equipped with a constant burning pilot light. 10 CFR 430.32(j). Therefore, the provisions in the cooking products test procedure that measure the energy use of gas pilot lights shall be obsolete at the time any final test procedure amendments become effective. For this reason, DOE proposes to delete existing sections 2.9.2.2 ("Flow meter"), 3.1.1.2 ("Continuously burning pilot lights of a conventional gas

oven"), 3.1.2.1 ("Continuously burning pilot lights of a conventional gas cooking top"), 3.2.1.3 ("Gas consumption of continuously burning pilot lights" [for conventional gas ovens]), 3.2.2.1 ("Gas consumption of continuously burning pilot lights" [for conventional gas cooking tops]), 3.3.7 (recording the gas flow rate or gas consumption and elapsed time for a continuously burning pilot light of a conventional gas oven), 3.3.10 (recording the gas flow rate or gas consumption and elapsed time for a continuously burning pilot light of a conventional gas cooking top), 4.1.2.2 ("Annual energy consumption of any continuously burning pilot lights" [for conventional gas ovens]), and 4.2.2.2.2 ("Annual energy consumption of any continuously burning gas pilots" [for conventional gas cooking tops]) in 10 CFR part 430 subpart B appendix I. DOE also proposes to modify (and renumber where appropriate) existing sections 1.7 ("Normal nonoperating temperature"), 1.14 ("Symbol usage"), 2.9.2.1 ("Positive displacement meters"), 3.1.1 "Conventional oven"), 3.1.1.1 ("Self-cleaning operation of a conventional oven"), 3.1.2 ("Conventional cooking top"), 4.1.2.5.2 ("Conventional gas oven energy consumption"), 4.1.2.6.2 ("Conventional gas oven energy consumption" [for multiple conventional gas ovens"]), 4.2.1.2 ("Gas surface unit cooking efficiency"), and 4.2.2.2.3 ("Total annual energy consumption of a conventional gas cooking top") to eliminate the measures of energy use relating to gas pilot lights.

DOE also proposes to eliminate the calculation of energy factor for dishwashers in 10 CFR 430.23 because this metric is no longer used in DOE's energy conservation standards for dishwashers or to make representations of energy efficiency.

H. Compliance with Other EPCA Requirements

EPCA requires that "[a]ny 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))

For the reasons stated in the December 2010 NOPR and September 2011 SNOPR, DOE tentatively concluded that the amended test procedures would produce test results that measure the standby mode and off mode power consumption during representative use, and that the test procedures would not be unduly burdensome to conduct. DOE continues to make these assertions for today's SNOPR, as explained below.

Regarding the proposal in today's SNOPR to measure energy use in fan-only mode, DOE recognizes that the current specifications for the watt-hour meter to be used for measuring energy consumption in the dishwasher active washing cycle and conventional cooking products cooking cycle may not be sufficient. Therefore, DOE is proposing more stringent specifications for these watt-hour meters. The watt-hour meter in the dishwasher and conventional cooking products test procedures would be required to have a resolution of 0.1 watt-hour or less and a maximum error of no more than 1 percent of the measured value for any demand greater than 5 watts. Today's proposal would allow the measurement of fan-only mode energy consumption as a continuation of the active mode cycle, rather than necessitating a separate cycle to be run to measure the energy use in fan-only mode using the more accurate watt-meter. The proposed approach would minimize test burden associated with the measurement of fan-only mode.

For the proposed amendments to incorporate the energy and water use associated with dishwasher water softener regeneration, manufacturers would need to run up to an additional ten cycles to ensure that a regeneration process is captured. DOE based this proposal on the information supplied by manufacturers that, on average, water-softening dishwashers regenerate approximately once every six cycles. To minimize test burden, particularly for soil-sensing dishwashers, DOE proposes that these cycles would be run with no test load, since DOE believes that a substantial part of the burden for the existing test procedure is incurred by the preparation and application of soils to the dishware. DOE welcomes comment on this approach, as well as the alternative approach to add constant values for this energy and water use, which could reduce the test burden on manufacturers. DOE also seeks comment on any other alternative methods to initiate, identify, and measure the water softener regeneration process.

The proposed clarifications for dishwasher test load and soiling specifications would not impact test burden because the test conduct would remain the same. The proposed clarification of the energy test cycle selection for certain soil-sensing dishwashers could change the test duration if the cycle time for the non-soil-sensing normal cycle and required soil-sensing cycles are different, but the time could be shorter or longer depending on the specific model. For the proposed detergent dosing clarifications, test burden may be reduced, as the amendments would provide clear instructions on the appropriate method by which to determine the dosing amounts. DOE welcomes comment on the impacts of these proposed clarifications.

As discussed in section III.E, today's proposal to reference AHAM DH-1-2008 in the

dehumidifier test procedure would newly specify the precision of digital temperature measurement devices for measuring wet-bulb and dry-bulb temperatures and the accuracy of the barometric pressure measurement instrument. DOE estimates the retail cost of such equipment as approximately $500. The proposed dehumidifier amendments would also allow the use of less accurate weight measurement equipment, which imposes no burden on manufacturers. The proposed test room requirements, however, could require the use of a larger test chamber than is specified under the current test procedure, and could also require different air handling equipment. Many test laboratories may already be using AHAM DH-1-2008 and thus may meet these requirements. In addition, for those laboratories that are recording data manually, the proposed shortened data recording intervals could result in three times the data recording events than are currently required. Because only four parameters are recorded for each event, however, the total increase in operator time is estimated to be less than 1 hour. DOE welcomes comment on the potential burden of the test room and data recording requirements for today's proposal, including the prevalence of automatic data recording.

IV. Procedural Issues and Regulatory Review

DOE has concluded that the determinations made pursuant to the various procedural requirements applicable to the December 2010 NOPR and September 2011 SNOPR remain unchanged for this SNOPR. These determinations are set forth in the December 2010 NOPR (75 FR 75290, 75317–19 (Dec. 2, 2010)) and the September 2011 SNOPR (76 FR 58346, 58355 (Sept. 20, 2011)). An update to the Regulatory Flexibility Act certification is set forth below.

The Regulatory Flexibility Act (5 U.S.C. 601 et seq.) requires preparation of a regulatory flexibility analysis for any rule that by law must be proposed for public comment, 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: www.gc.doe.gov.

DOE reviewed today's supplemental proposed rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE tentatively concluded that the December 2010 NOPR and September 2011 SNOPR would not have a significant impact on a substantial number of small entities, and today's SNOPR contains no revisions to that proposal that would result in a significant impact on a substantial number of small entities. The updates to the factual basis for this certification are as follows:

The Small Business Administration (SBA) considers a business entity to be small business, if, together with its affiliates, it employs less than a threshold number of workers specified in 13 CFR part 121. These size standards and codes are established by the North American Industry Classification System (NAICS). The threshold number for NAICS classification code 335228, titled "Other Major Household Appliance Manufacturing," is 500 employees; this classification specifically includes residential dishwasher manufacturers.

Additionally, the threshold number for NAICS classification code 335221, titled "Household Cooking Appliance Manufacturing," is 750 employees; this classification specifically includes manufacturers of residential conventional cooking products. The threshold number for NAICS classification code 335211, titled "Electric Housewares and Household Fan Manufacturing," is 750 employees; this classification specifically includes manufacturers of dehumidifiers.

Most of the manufacturers supplying residential dishwashers, dehumidifiers and/or conventional cooking products are large multinational corporations. DOE surveyed the AHAM member directory to identify manufacturers of residential dishwashers, dehumidifiers, and conventional cooking products. 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 two small businesses that manufacture conventional cooking products, four small businesses that manufacture dehumidifiers, and no small businesses that manufacture dishwashers.

The proposed rule would amend DOE's test procedures for dishwashers, dehumidifiers and cooking products. Because DOE is unaware of any small businesses that manufacture dishwashers, there would be no impact on such manufacturers due to the proposed amendments to DOE's dishwasher test procedure. The proposed rule would amend DOE's test procedures for dehumidifiers and conventional cooking products by incorporating testing provisions to address standby mode and off mode energy use in these products, as well as cooking products fan-only

mode energy consumption. The test procedure amendments involve measuring power input when the product is in standby mode or off mode, as well as fan-only mode for a conventional cooking product. These tests would be conducted in the same facilities used for the current energy testing of these products, so there would be no additional facilities costs required by the proposed rule. In addition, while the watt-hour meter required for these tests might require greater accuracy than the watt-hour meter used for current energy testing, the investment required for a possible instrumentation upgrade would likely be relatively modest. It is possible that the manufacturers, or their testing facilities, already have equipment that meets the proposed meter requirements, but an Internet search of equipment that specifically meets the proposed requirements reveals a cost of approximately $2,000. The amendments proposed in today's SNOPR would also update the industry test method for dehumidifiers. As discussed in section III.H, this update could impose on manufacturers a cost for new measurement equipment of approximately $500, as well as potentially increasing operator time by less than 1 hour over the course of a 24-hour test. These costs are small compared to the overall financial investment needed to undertake the business enterprise of testing consumer products which involves facilities, qualified staff, and specialized equipment. Based on its review of industry data,[14] DOE estimates that the small dehumidifier and cooking product businesses have annual revenues of $10 million to $60 million.

DOE recognizes that the proposed updated reference to the industry dehumidifier test method could potentially require manufacturers to install a larger test chamber and different air handling equipment. However, DOE believes that manufacturers may already be using AHAM

[14] Annual revenue estimates based on financial reports obtained from Hoover's Inc., available online at www.hoovers.com.

DH-1-2008 in certifying their products. DOE notes that one of the small businesses has products listed in AHAM's current dehumidifier certification database, indicating that those tests were conducted according to DH-1-2008. In addition, AHAM selected an independent test laboratory to conduct dehumidifier testing and verification using DH-1-2008. DOE believes that testing that this laboratory performs for manufacturers to determine compliance with energy conservation standards would be conducted in the same facility. Therefore, DOE tentatively concludes that small businesses would not be likely to require investments in facility upgrades if DOE amends the dehumidifier test procedure to reference DH-1-2008.

Furthermore, the duration of the fan-only mode testing for conventional ovens and conventional ranges is generally not expected to exceed the time required to conduct current energy testing. DOE's research indicates that the duration of fan-only mode for these products ranges from 10 minutes to 3.5 hours. DOE estimates that the total time currently required for conventional oven testing (or for testing the conventional oven portion of a range) to be approximately 4 hours for products which are not equipped with the capability for forced convection or self-cleaning, with an additional 3 hours required for testing forced convection and an additional 4 hours required for testing self-clean operation. DOE's research did not identify any conventional ovens or conventional ranges manufactured by either of the two small cooking products manufacturers that are equipped with either forced convection or self-clean capability. DOE estimates that fan-only mode testing in the absence of such features could increase testing time by 3– 88 percent. However, DOE's research also suggests that none of the conventional ovens and conventional ranges manufactured by the two small cooking products businesses are capable of operation in fan-only mode, and therefore DOE believes it is unlikely that these

manufacturers would be impacted by the proposed fan-only mode testing provisions.

For these reasons, DOE continues to certify that the proposed 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 will transmit 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). DOE seeks comment on the updated certification set forth above.

V. Public Participation

A. Submission of Comments

DOE will accept comments, data, and information regarding this SNOPR no later than the date provided in the **DATES** section at the beginning of this notice. Interested parties may submit comments using any of the methods described in the **ADDRESSES** section at the beginning of this notice.

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

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

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

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

Submitting comments via email, hand delivery, or mail. Comments and documents submitted via email, hand delivery, or mail also will be posted to www.regulations.gov. If you do not want your personal contact information to be publicly viewable, do not include it in your

comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

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

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English, and are free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

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

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure

should submit via email, postal mail, or hand delivery two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) A description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known by or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person which would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and (7) why disclosure of the information would be contrary to the public interest.

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

B. Issues on Which DOE Seeks Comment

Although comments are welcome on all aspects of this rulemaking, DOE is particularly interested in receiving comments and views of interested parties on the following issues:

1. Fan-Only Mode

DOE seeks comment on the proposal to measure energy use in fan-only mode. DOE also seeks comment on its analysis of fan-only mode for dishwashers and conventional cooking products. In particular, DOE welcomes input on its definition of fan-only mode, its determination of fan-only mode as an active mode, its proposed test procedure amendments to measure fan-only mode energy use for dishwashers and conventional ovens, and the inclusion of fan-only mode energy use in the efficiency metrics for these products. (See section III.A)

2. Dishwasher Water Softener Regeneration

DOE seeks comment on the proposal to measure water softener regeneration energy and water consumption for residential dishwashers. DOE also requests data on the number of times per year on average that the water softening regeneration process occurs, the percentage of households with water-softening dishwashers that use home water softening systems, and the average per-cycle and annual water and energy use associated with water softener regeneration. DOE also welcomes input on the methodologies proposed in today's SNOPR to measure the water and energy use during regeneration, including the method of adding constant values for this water and energy use, and what those constant values should be. (See section III.B)

3. Alternative Methodology for Calculating Annual Energy Use

DOE invites comment on the proposed use of the alternative methodology for allocation of annual hours for each product. (See section III.C)

4. Dishwasher Test Procedure Clarifications

DOE invites comment on the approach to ensure the turbidity sensor in soil-sensing dishwashers remains calibrated; the method to select the energy test cycle to be used for soil-sensing dishwasher testing; the clarified definition of normal cycle; the specifications for the test load, including alternatives for obsolete items including flatware, serving pieces, and possibly other items such as the cup and saucer; the method and calculations for preconditioning and determining the quantity of detergent to be added to the prewash and main wash portions of the test cycle; and the proposed detergent formulation. (See section III.C)

5. Updated Dehumidifier Test Procedure

DOE seeks comment on the proposed incorporation by reference of ANSI/AHAM DH-1-2008 for the measurement of capacity and energy factor, and the calculation of integrated energy factor in DOE's dehumidifier test procedure. (See section III.E)

6. Obsolete Measures of Gas Pilot Light Energy Use

DOE welcomes comment on its proposal to remove the provisions in the cooking products test procedure that measure gas pilot light energy consumption. (See section III.G)

7. Test Burden

DOE seeks comment on its analysis of the test burden associated with dishwasher and conventional cooking products fan-only mode testing and dishwasher water softener regeneration testing as proposed in today's SNOPR, as well as its proposals related to the power supply and preconditioning requirements, the energy test cycle for dishwashers with a soil-sensing cycle

selection separate from a non-soil-sensing normal cycle, the test load and soiling requirements, and the detergent dosage for dishwashers. DOE also seeks comment on the burden associated with updating the industry test method for dehumidifiers. (See sections III.A and III.B)

8. Small Businesses

DOE seeks comment on its tentative conclusion and certification that the December 2010 NOPR, as modified by the September 2011 SNOPR and today's SNOPR, would not have a significant economic impact on a substantial number of small entities.

VI. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this supplemental notice of proposed rulemaking.

List of Subjects in

10 CFR Part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Incorporated by reference, and Reporting and recordkeeping requirements.

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 April 25, 2012.

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

For the reasons stated in the preamble, DOE proposes to amend parts 429 and 430 of title 10 of the Code of Federal Regulations, as set forth below:

PART 429 -- CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT

1. The authority citation for part 429 continues to read as follows:

Authority: 42 U.S.C. 6291–6317.

2. Section 429.23 is amended by revising paragraph (a)(2)(ii) introductory text to read as follows:

§ 429.23 Conventional cooking tops, conventional ovens, microwave ovens.

(a) * * *

(2) * * *

(ii) Any represented value of the energy factor, integrated energy factor, or other measure of energy consumption of a basic model for which consumers would favor higher values shall be less than or equal to the lower of:

* * * * *

3. Section 429.36 is amended by revising paragraph (a)(2)(ii) introductory text to read as follows:

§ 429.36 Dehumidifiers.

(a) * * *

(2) * * *

(ii) Any represented value of the energy factor, integrated energy factor, or other measure of energy consumption of a basic model for which consumers would favor higher values shall be less than or equal to the lower of:

* * * * *

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:

a. By redesignating paragraphs (h)(1) through (h)(5) as (h)(2) through (h)(6);

b. By adding paragraph (h)(1); and

c. By revising paragraph (m)(2).

The additions and revisions read as follows:

§ 430.3 Materials incorporated by reference.

* * * * *

(h) * * *

(1) ANSI/AHAM DH-1-2008 ("DH-1-2008"), Dehumidifiers, (2008, ANSI approved May 9, 2008), IBR approved for appendix X to subpart B.

* * * * *

(m) * * *

(2) IEC Standard 62301 ("IEC 62301"), Household electrical appliances–Measurement of standby power (Edition 2.0, 2011-01), IBR approved for appendix C, appendix I, appendix J2, and appendix X to subpart B.

* * * * *

3. Section 430.23 is amended by revising paragraphs (c), (i), and (z) to read as follows:

§ 430.23 Test procedures for the measurement of energy and water consumption.

* * * * *

(c) Dishwashers. (1) The Estimated Annual Operating Cost (EAOC) for dishwashers must be rounded to the nearest dollar per year and is defined as follows:

(i) When cold water (50 °F) is used,

(A) For dishwashers having a truncated normal cycle as defined in section 1.23 of appendix C to this subpart, EAOC = $(D_e \times S) + (D_e \times N \times (M - (E_D/2)))$ may be used for units manufactured until (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***)

(B) For dishwashers having a truncated normal cycle as defined in section 1.23 of appendix C to this subpart, EAOC = $(D_e \times E_{TLP}) + (D_e \times N \times (M + M_{WS} + E_F - (E_D/2)))$ must be used for units manufactured on or after (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***)

(C) For dishwashers not having a truncated normal cycle, EAOC = $(D_e \times S) + (D_e \times N \times M)$ may be used for units manufactured until (*date 180 days after date of publication of test*

*procedure final rule in the **Federal Register***)

(D) For dishwashers not having a truncated normal cycle, EAOC = ($D_e \times E_{TLP}$) + ($D_e \times N \times (M + M_{WS} + E_F)$) must be used for units manufactured on or after (*date 180 days after date of publication of test procedure final rule in the **Federal Register***)

Where,

D_e = the representative average unit cost of electrical energy, in dollars per kilowatt-hour, as provided by the Secretary,

S = the annual simplified standby energy consumption in kilowatt-hours per year and determined according to section 5.7 of appendix C to this subpart,

E_{TLP} = the annual combined low-power mode energy consumption in kilowatt-hours per year and determined according to section 5.8 of appendix C to this subpart,

N = the representative average dishwasher use of 215 cycles per year,

M = the machine energy consumption per cycle for the normal cycle as defined in section 1.12 of appendix C to this subpart, in kilowatt-hours and determined according to section 5.1.1 of appendix C to this subpart for non-soil-sensing dishwashers and section 5.1.2 of appendix C to this subpart for soil-sensing dishwashers,

M_{WS} = the machine energy consumption per cycle for water softener regeneration, in kilowatt-hours and determined according to section 5.1.3 of appendix C to this subpart,

E_F = the fan-only mode energy consumption per cycle, in kilowatt-hours and determined according to section 5.2 of appendix C to this subpart, and

E_D = the drying energy consumption defined as energy consumed using the power-dry feature after the termination of the last rinse option of the normal cycle and determined according to section 5.3 of appendix C to this subpart.

(E) Manufacturers calculating EAOC pursuant to paragraph (c)(1)(i)(A) of this section should calculate EAEU pursuant to paragraph (c)(2)(i)(A) of this section. Manufacturers calculating EAOC pursuant to paragraphs (c)(1)(i)(B) of this section should calculate EAEU pursuant to paragraph (c)(2)(i)(B) of this section. Manufacturers calculating EAOC pursuant to paragraph (c)(1)(i)(C) of this section should calculate EAEU pursuant to paragraph (c)(2)(ii)(A) of this section. Manufacturers calculating EAOC pursuant to paragraph (c)(1)(i)(D) of this section should calculate EAEU pursuant to paragraph (c)(2)(ii)(B) of this section.

(ii) When electrically-heated water (120 °F or 140 °F) is used,

(A) For dishwashers having a truncated normal cycle as defined in section 1.23 of appendix C to this subpart, $EAOC = (D_e \times S) + (D_e \times N \times (M - (E_D/2))) + (D_e \times N \times W)$ may be used for units manufactured until (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***)

(B) For dishwashers having a truncated normal cycle as defined in section 1.23 of appendix C to this subpart,

$EAOC = (D_e \times E_{TLP}) + (D_e \times N \times (M + M_{WS} + E_F - (E_D/2))) + (D_e \times N \times (W + W_{WS}))$ must be used for units manufactured on or after (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***)

(C) For dishwashers not having a truncated normal cycle,

$EAOC = (D_e \times S) + (D_e \times N \times M) + (D_e \times N \times W)$ may be used for units manufactured until (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***)

(D) For dishwashers not having a truncated normal cycle,

$EAOC = (D_e \times E_{TLP}) + (D_e \times N \times (M + M_{WS} + E_F)) + (D_e \times N \times (W + W_{WS}))$ must be used for units manufactured on or after (*date 180 days after date of publication of test procedure final rule in*

*the **Federal Register***)

Where,

D_e, S, E_{TLP}, N, M, M_{WS}, E_F, and E_D, are defined in paragraph (c)(1)(i) of this section,

W = the water energy consumption per cycle for the normal cycle as defined in section 1.12 of appendix C to this subpart, in kilowatt-hours per cycle and determined according to section 5.5 of appendix C to this subpart, and

W_{WS} = the water softener regeneration water energy consumption per cycle in kilowatt-hours per cycle and determined according to section 5.5 of appendix C to this subpart.

(E) Manufacturers calculating EAOC pursuant to paragraph (c)(1)(ii)(A) of this section should calculate EAEU pursuant to paragraph (c)(2)(i)(A) of this section. Manufacturers calculating EAOC pursuant to paragraphs (c)(1)(ii)(B) of this section should calculate EAEU pursuant to paragraph (c)(2)(i)(B) of this section. Manufacturers calculating EAOC pursuant to paragraph (c)(1)(ii)(C) of this section should calculate EAEU pursuant to paragraph (c)(2)(ii)(A) of this section. Manufacturers calculating EAOC pursuant to paragraph (c)(1)(ii)(D) of this section should calculate EAEU pursuant to paragraph (c)(2)(ii)(B) of this section.

(iii) When gas-heated or oil-heated water is used,

(A) For dishwashers having a truncated normal cycle as defined in section 1.23 of appendix C to this subpart,

$EAOC_g = (D_e \times S) + (D_e \times N \times (M - (E_D/2))) + (D_g \times N \times W_g)$ may be used for units manufactured until (*date 180 days after date of publication of test procedure final rule in the **Federal Register***)

(B) For dishwashers having a truncated normal cycle as defined in section 1.23 of appendix C to this subpart,

$EAOC_g = (D_e \times E_{TLP}) + (D_e \times N \times (M + M_{WS} + E_F - (E_D/2))) + (D_g \times N \times (W_g + W_{WSg}))$ must be used for

units manufactured on or after (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***)

(C) For dishwashers not having a truncated normal cycle,

$EAOC_g = (D_e \times S) + (D_e \times N \times M) + (D_g \times N \times W_g)$ may be used for units manufactured until (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***)

(D) For dishwashers not having a truncated normal cycle,

$EAOC_g = (D_e \times E_{TLP}) + (D_e \times N \times (M + M_{WS} + E_F)) + (D_g \times N \times (W_g + W_{WSg}))$ must be used for units manufactured on or after (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***)

Where,

D_e, S, E_{TLP}, N, M, M_{WS}, E_F, and E_D are defined in paragraph (c)(1)(i) of this section,

D_g = the representative average unit cost of gas or oil, as appropriate, in dollars per Btu, as provided by the Secretary,

W_g = the water energy consumption per cycle for the normal cycle as defined in section 1.12 of appendix C to this subpart, in Btus per cycle and determined according to section 5.6 of appendix C to this subpart, and

W_{WSg} = the water softener regeneration energy consumption per cycle in Btu per cycle and determined according to section 5.6 of appendix C to this subpart.

(E) Manufacturers calculating EAOC pursuant to paragraph (c)(1)(iii)(A) of this section should calculate EAEU pursuant to paragraph (c)(2)(i)(A) of this section. Manufacturers calculating EAOC pursuant to paragraphs (c)(1)(iii)(B) of this section should calculate EAEU pursuant to paragraph (c)(2)(i)(B) of this section. Manufacturers calculating EAOC pursuant to paragraph (c)(1)(iii)(C) of this section should calculate EAEU pursuant to paragraph (c)(2)(ii)(A)

of this section. Manufacturers calculating EAOC pursuant to paragraph (c)(1)(iii)(D) of this section should calculate EAEU pursuant to paragraph (c)(2)(ii)(B) of this section.

(2) The estimated annual energy use, EAEU, expressed in kilowatt-hours per year must be rounded to the nearest kilowatt-hour per year and is defined as follows:

(i) For dishwashers having a truncated normal cycle as defined in section 1.23 of appendix C to this subpart,

(A) EAEU = $(M-(E_D/2)+W)\times N+S$ may be used for units manufactured:

(i) Before (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***) to make representations of energy efficiency; and

(ii) Before the compliance date of any amended standards to demonstrate compliance.

(B) EAEU = $(M+M_{WS}+E_F-(E_D/2)+W+W_{WS})\times N+(E_{TLP})$ must be used for units manufactured:

(i) On or after (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***) to make representations of energy efficiency; and

(ii) On or after the compliance date of any amended standards to demonstrate compliance.

Where,

M, M_{WS}, S, E_D, N, E_F, and E_{TLP} are defined in paragraph (c)(1)(i) of this section, and W and W_{WS}, are defined in paragraph (c)(1)(ii) of this section.

(C) Manufacturers calculating EAEU pursuant to paragraph (c)(2)(i)(A) of this section should calculate EAOC pursuant to paragraph (c)(1)(i)(A), (c)(1)(ii)A, or (c)(1)(iii)(A) of this section, as appropriate. Manufacturers calculating EAEU pursuant to paragraph (c)(2)(i)(B) of this section should calculate EAOC pursuant to paragraph (c)(1)(i)(B), (c)(1)(ii)(B), or

(c)(1)(ii)(B) of this section, as appropriate.

(ii) For dishwashers not having a truncated normal cycle:

(A) EAEU = (M+W)×N+S may be used for units manufactured:

(i) Before (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***) to make representations of energy efficiency; and

(ii) Before the compliance date of any amended standards to demonstrate compliance.

(B) EAEU = $(M+M_{WS}+E_F+W+W_{WS})\times N+E_{TLP}$ must be used for units manufactured:

(i) On or after (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***) to make representations of energy efficiency; and

(ii) On or after the compliance date of any amended standards to demonstrate compliance.

Where,

M, M_{WS}, S, N, E_F, and E_{TLP} are defined in paragraph (c)(1)(i) of this section, and W and W_{WS} are defined in paragraph (c)(1)(ii) of this section.

(C) Manufacturers calculating EAEU pursuant to paragraph (c)(2)(ii)(A) of this section should calculate EAOC pursuant to paragraph (c)(1)(i)(C), (c)(1)(ii)(C), or (c)(1)(iii)(C) of this section, as appropriate. Manufacturers calculating EAEU pursuant to paragraph (c)(2)(ii)(B) of this section should calculate EAOC pursuant to paragraph (c)(1)(i)(D), (c)(1)(ii)(D), or (c)(1)(iii)(D) of this section, as appropriate.

(3) The water consumption, V, and the sum of the water consumption, V, and the water consumption during water softener regeneration, V_{WS}, expressed in gallons per cycle and defined

in section 5.4 of appendix C to this subpart, must be rounded to one decimal place.

(i) Water consumption, V, may be measured for units manufactured:

(A) Before (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***) to make representations of energy efficiency; and

(B) Before the compliance date of any amended standards to demonstrate compliance.

(ii) Manufacturers calculating water consumption pursuant to paragraph (c)(3)(i) of this section should calculate EAOC as described in paragraph (c)(1)(i)(A), (c)(1)(i)(C), (c)(1)(ii)(A), (c)(1)(ii)(C), (c)(1)(iii)(A), or (c)(1)(iii)(C) of this section, as appropriate. Manufacturers calculating water consumption pursuant to paragraph (c)(3)(i) of this section should calculate EAUE as described in paragraph (c)(2)(i)(A) or (c)(2)(ii)(A) of this section, as appropriate.

(iii) The sum of the water consumption, V, and the water consumption during water softener regeneration, V_{WS}, must be measured for units manufactured:

(A) On or after (*date 180 days after date of publication of test procedure final rule in the* ***Federal Register***) to make representations of energy efficiency; and

(B) On or after the compliance date of any amended standards to demonstrate compliance.

(C) Manufacturers calculating water consumption pursuant to paragraph (c)(3)(iii) of this section should calculate EAOC as described in paragraph (c)(1)(i)(B), (c)(1)(i)(D), (c)(1)(ii)(B), (c)(1)(ii)(D), (c)(1)(iii)(B), or (c)(1)(iii)(D) of this section, as appropriate. Manufacturers calculating water consumption pursuant to paragraph (c)(3)(i) of this section should calculate EAUE as described in paragraph (c)(2)(i)(B) or (c)(2)(ii)(B) of this section, as appropriate.

(4) Other useful measures of energy consumption for dishwashers are those which the

Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix C to this subpart.

* * * * *

(i) Kitchen ranges and ovens. (1) The estimated annual operating cost for conventional ranges, conventional cooking tops, and conventional ovens shall be the sum of the following products:

(i) The total integrated annual electrical energy consumption for any electrical energy usage, in kilowatt-hours (kWhs) per year, times the representative average unit cost for electricity, in dollars per kWh, as provided pursuant to section 323(b)(2) of the Act; plus

(ii) The total annual gas energy consumption for any natural gas usage, in British thermal units (Btus) per year, times the representative average unit cost for natural gas, in dollars per Btu, as provided pursuant to section 323(b)(2) of the Act; plus

(iii) The total annual gas energy consumption for any propane usage, in Btus per year, times the representative average unit cost for propane, in dollars per Btu, as provided pursuant to section 323(b)(2) of the Act. The total annual energy consumption for conventional ranges, conventional cooking tops, and conventional ovens shall be as determined according to sections 4.3, 4.2.2, and 4.1.2, respectively, of appendix I to this subpart. For conventional gas cooking tops, total integrated annual electrical energy consumption shall be equal to E_{CTSO}, defined in section 4.2.2.2.4 of appendix I to this subpart. The estimated annual operating cost shall be rounded off to the nearest dollar per year.

(2) The cooking efficiency for conventional cooking tops and conventional ovens shall be the ratio of the cooking energy output for the test to the cooking energy input for the test, as determined according to sections 4.2.1 and 4.1.3, respectively, of appendix I to this subpart. The

final cooking efficiency values shall be rounded off to three significant digits.

(3) [Reserved]

(4) The energy factor for conventional ranges, conventional cooking tops, and conventional ovens shall be the ratio of the annual useful cooking energy output to the total annual energy input, as determined according to sections 4.3, 4.2.3.1, and 4.1.4.1, respectively, of appendix I to this subpart. The final energy factor values shall be rounded off to three significant digits.

(5) The integrated energy factor for conventional ranges, conventional cooking tops, and conventional ovens shall be the ratio of the annual useful cooking energy output to the total integrated annual energy input, as determined according to sections 4.3, 4.2.3.2, and 4.1.4.2, respectively, of appendix I to this subpart. The final integrated energy factor values shall be rounded off to three significant digits.

(6) There shall be two estimated annual operating costs, two cooking efficiencies, and two energy factors for convertible cooking appliances—

(i) An estimated annual operating cost, a cooking efficiency, and an energy factor which represent values for those three measures of energy consumption for the operation of the appliance with natural gas; and

(ii) An estimated annual operating cost, a cooking efficiency, and an energy factor which represent values for those three measures of energy consumption for the operation of the appliance with LP-gas.

(7) There shall be two integrated energy factors for convertible cooking appliances—

(i) An integrated energy factor which represents the value for this measure of energy consumption for the operation of the appliance with natural gas; and

(ii) An integrated energy factor which represents the value for this measure of energy consumption for the operation of the appliance with LP-gas.

(8) The estimated annual operating cost for convertible cooking appliances which represents natural gas usage, as described in paragraph (i)(6)(i) of this section, shall be determined according to paragraph (i)(1) of this section using the total annual gas energy consumption for natural gas times the representative average unit cost for natural gas.

(9) The estimated annual operating cost for convertible cooking appliances which represents LP-gas usage, as described in paragraph (i)(6)(ii) of this section, shall be determined according to paragraph (i)(1) of this section using the representative average unit cost for propane times the total annual energy consumption of the test gas, either propane or natural gas.

(10) The cooking efficiency for convertible cooking appliances which represents natural gas usage, as described in paragraph (i)(6)(i) of this section, shall be determined according to paragraph (i)(2) of this section when the appliance is tested with natural gas.

(11) The cooking efficiency for convertible cooking appliances which represents LP-gas usage, as described in paragraph (i)(6)(ii) of this section, shall be determined according to paragraph (i)(2) of this section, when the appliance is tested with either natural gas or propane.

(12) The energy factor for convertible cooking appliances which represents natural gas usage, as described in paragraph (i)(6)(i) of this section, shall be determined according to paragraph (i)(4) of this section when the appliance is tested with natural gas.

(13) The integrated energy factor for convertible cooking appliances which represents natural gas usage, as described in paragraph (i)(7)(i) of this section, shall be determined according to paragraph (i)(5) of this section when the appliance is tested with natural gas.

(14) The energy factor for convertible cooking appliances which represents LP-gas

usage, as described in paragraph (i)(6)(ii) of this section, shall be determined according to paragraph (i)(4) of this section when the appliance is tested with either natural gas or propane.

(15) The integrated energy factor for convertible cooking appliances which represents LP-gas usage, as described in paragraph (i)(7)(ii) of this section, shall be determined according to paragraph (i)(5) of this section when the appliance is tested with natural gas or propane.

(16) Other useful measures of energy consumption for conventional ranges, conventional cooking tops, and conventional ovens shall be those measures of energy consumption which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix I to this subpart.

* * * * *

(z) Dehumidifiers. (1) The energy factor for dehumidifiers, expressed in liters per kilowatt hour (L/kWh), shall be measured in accordance with section 4.1 of appendix X of this subpart.

(2) The integrated energy factor for dehumidifiers, expressed in L/kWh, shall be determined according to paragraph 5.2 of appendix X to this subpart.

* * * * *

Appendix C—[Amended]

4. Appendix C to subpart B of part 430 is amended:

a. By revising the introductory text after the appendix heading;

b. By revising section 1, Definitions;

c. By revising section 2, Testing Conditions;

d. In section 3. Instrumentation, by:

1. Revising section 3.5; and

2. Adding new section 3.8;

e. By revising section 4, Test Cycle and Measurements: and

f. By revising section 5, Calculation of Derived Results From Test Measurements.

The additions and revisions read as follows:

APPENDIX C TO SUBPART B OF PART 430–UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF DISHWASHERS

Note: The procedures and calculations that refer to the combined low-power mode, fan-only mode, and water softener energy consumption (i.e., sections 2.6.1.1, 2.6.2.1, 2.6.3.1, 4.1, 4.1.1, 4.1.2, 4.2.2, 4.4, 4.4.1, 4.4.2, 5.1.3, 5.2, 5.2.1, 5.2.2, 5.4.3, 5.5.1.2, 5.5.2.2, 5.6.1.2, 5.6.2.2, and 5.8 of this appendix) need not be performed to determine compliance with energy conservation standards for dishwashers at this time. However, any representation related to standby mode and off mode energy consumption of these products made after (*date 180 days after date of publication of the test procedure final rule in the* ***Federal Register***) must be based upon results generated under this test procedure using sections 4.4, 4.4.1, 4.4.2, and 5.8 of this appendix and disregarding sections 4.3 and 5.7 of this appendix, consistent with the requirements of 42 U.S.C. 6293(c)(2). Upon the compliance date for any amended energy conservation standards that incorporate standby mode and off mode energy consumption, compliance with the applicable provisions of this test procedure will also be required.

1. Definitions

1.1 Active mode means a mode in which the dishwasher is connected to a mains power source, has been activated, and is performing one of the main functions of washing, rinsing, or drying (when a drying process is included) dishware, glassware, eating utensils, and most cooking utensils by chemical, mechanical, and/or electrical means, or is involved in functions necessary for these main functions, such as admitting water into the dishwasher, pumping water out of the dishwasher, circulating air, or regenerating an internal water softener.

1.2 AHAM means the Association of Home Appliance Manufacturers.

1.3 Compact dishwasher means a dishwasher that has a capacity of less than eight place settings plus six serving pieces as specified in ANSI/AHAM DW-1 (incorporated by reference; see §430.3), using the test load specified in section 2.7 of this appendix.

1.4 Combined low-power mode means the aggregate of available modes other than active mode.

1.5 Cycle means a sequence of operations of a dishwasher which performs a complete dishwashing function, and may include variations or combinations of washing, rinsing, and drying.

1.6 Cycle finished mode means a standby mode which provides continuous status display following operation in active mode.

1.7 Cycle type means any complete sequence of operations capable of being preset on the dishwasher prior to the initiation of machine operation.

1.8 Fan-only mode means an active mode in which a fan circulates air for a finite period of time after the end of the cycle, as indicated to the consumer.

1.9 IEC 62301 means the standard published by the International Electrotechnical

Commission, titled "Household electrical appliances-Measurement of standby power," Publication 62301 (Edition 2.0, 2011-01) (incorporated by reference; see §430.3).

1.10 Inactive mode means a standby mode that facilitates the activation of active mode by remote switch (including remote control), internal sensor, or timer, or that provides continuous status display.

1.11 Non-soil-sensing dishwasher means a dishwasher that does not have the ability to adjust automatically any energy consuming aspect of a wash cycle based on the soil load of the dishes.

1.12 Normal cycle means the cycle type, including wash and drying temperature options, recommended by the manufacturer for completely washing a full load of normally soiled dishes including the power-dry feature.

1.13 Off mode means a mode in which the dishwasher is connected to a mains power source and is not providing any active mode or standby mode function, and where the mode may persist for an indefinite time. An indicator that only shows the user that the product is in the off position is included within the classification of an off mode.

1.14 Power-dry feature means the introduction of electrically-generated heat into the washing chamber for the purpose of improving the drying performance of the dishwasher.

1.15 Preconditioning cycle means a cycle that includes a fill, circulation, and drain to ensure that the water lines and sump area of the pump are primed.

1.16 Sensor heavy response means, for standard dishwashers, the set of operations in a soil-sensing dishwasher for completely washing a load of dishes, four place settings of which are soiled according to ANSI/AHAM DW-1 (incorporated by reference; see §430.3). For compact dishwashers, this definition is the same, except that two soiled place settings are used instead of

four.

1.17 Sensor light response means, for both standard and compact dishwashers, the set of operations in a soil-sensing dishwasher for completely washing a load of dishes, one place setting of which is soiled with half of the gram weight of soils for each item specified in a single place setting according to ANSI/AHAM DW-1 (incorporated by reference; see §430.3).

1.18 Sensor medium response means, for standard dishwashers, the set of operations in a soil-sensing dishwasher for completely washing a load of dishes, two place settings of which are soiled according to ANSI/AHAM DW-1 (incorporated by reference; see §430.3). For compact dishwashers, this definition is the same, except that one soiled place setting is used instead of two.

1.19 Simplified standby mode means the lowest power consumption mode which cannot be switched off or influenced by the user and that may persist for an indefinite time when the dishwasher is connected to the main electricity supply and used in accordance with the manufacturer's instructions.

1.20 Soil-sensing dishwasher means a dishwasher that has the ability to adjust any energy-consuming aspect of a wash cycle based on the soil load of the dishes.

1.21 Standard dishwasher means a dishwasher that has a capacity equal to or greater than eight place settings plus six serving pieces as specified in ANSI/AHAM DW-1 (incorporated by reference; see §430.3), using the test load specified in section 2.7 of this appendix.

1.22 Standby mode means a mode in which the dishwasher is connected to a mains power source and offers one or more of the following user-oriented or protective functions which may persist for an indefinite time: (a) to facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal

sensor, or timer; (b) continuous functions, including information or status displays (including clocks) or sensor-based functions. A timer is a continuous clock function (which may or may not be associated with a display) that provides regular scheduled tasks (e.g., switching) and that operates on a continuous basis.

1.23 Truncated normal cycle means the normal cycle interrupted to eliminate the power-dry feature after the termination of the last rinse operation.

1.24 Truncated sensor heavy response means the sensor heavy response interrupted to eliminate the power-dry feature after the termination of the last rinse operation.

1.25 Truncated sensor light response means the sensor light response interrupted to eliminate the power-dry feature after the termination of the last rinse operation.

1.26 Truncated sensor medium response means the sensor medium response interrupted to eliminate the power-dry feature after the termination of the last rinse operation.

1.27 Water-heating dishwasher means a dishwasher which, as recommended by the manufacturer, is designed for heating cold inlet water (nominal 50 °F) or designed for heating water with a nominal inlet temperature of 120 °F. Any dishwasher designated as water-heating (50 °F or 120 °F inlet water) must provide internal water heating to above 120 °F in a least one wash phase of the normal cycle.

1.28 Water-softening dishwasher means a dishwasher which incorporates a water softening system that periodically consumes additional water and energy during the cycle to regenerate.

2. Testing Conditions

2.1 Installation requirements. Install the dishwasher according to the manufacturer's

instructions. A standard or compact under-counter or under-sink dishwasher must be tested in a rectangular enclosure constructed of nominal 0.374 inch (9.5 mm) plywood painted black. The enclosure must consist of a top, a bottom, a back, and two sides. If the dishwasher includes a counter top as part of the appliance, omit the top of the enclosure. Bring the enclosure into the closest contact with the appliance that the configuration of the dishwasher will allow. For standby mode and off mode testing, these products shall also be installed in accordance with section 5.2 of IEC 62301 (incorporated by reference; see §430.3), disregarding the provisions regarding batteries and the determination, classification, and testing of relevant modes.

2.2 Electrical energy supply.

2.2.1 Dishwashers that operate with an electrical supply of 115 volts. Maintain the electrical supply to the dishwasher at 115 volts ±2 percent and within 1 percent of the nameplate frequency as specified by the manufacturer. Maintain a continuous electrical supply to the unit throughout testing, including the preconditioning cycle, specified in section 2.9 of this appendix, and in between all test cycles.

2.2.2 Dishwashers that operate with an electrical supply of 240 volts. Maintain the electrical supply to the dishwasher at 240 volts ±2 percent and within 1 percent of the nameplate frequency as specified by the manufacturer. Maintain a continuous electrical supply to the unit throughout testing, including the preconditioning cycle, specified in section 2.9 of this appendix, and in between all test cycles.

2.2.3 Supply voltage waveform. For the standby mode and off mode testing, maintain the electrical supply voltage waveform indicated in section 4.3.2 of IEC 62301 (incorporated by reference; see §430.3).

2.3 Water temperature. Measure the temperature of the water supplied to the dishwasher

using a temperature measuring device as specified in section 3.1 of this appendix.

2.3.1 Dishwashers to be tested at a nominal 140 ºF inlet water temperature. Maintain the water supply temperature at 140º ±2 ºF.

2.3.2 Dishwashers to be tested at a nominal 120 ºF inlet water temperature. Maintain the water supply temperature at 120º ±2 ºF.

2.3.3 Dishwashers to be tested at a nominal 50 ºF inlet water temperature. Maintain the water supply temperature at 50º ±2 ºF.

2.4 Water pressure. Using a water pressure gauge as specified in section 3.4 of this appendix, maintain the pressure of the water supply at 35 ±2.5 pounds per square inch gauge (psig) when the water is flowing.

2.5 Ambient temperature.

2.5.1 Active mode ambient and machine temperature. Using a temperature measuring device as specified in section 3.1 of this appendix, maintain the room ambient air temperature at 75 º ±5 ºF and ensure that the dishwasher and the test load are at room ambient temperature at the start of each test cycle.

2.5.2 Standby mode and off mode ambient temperature. For standby mode and off mode testing, maintain room ambient air temperature conditions as specified in section 4.2 of IEC 62301 (incorporated by reference; see §430.3).

2.6 Test cycle and load.

2.6.1 Non-soil-sensing dishwashers to be tested at a nominal inlet temperature of 140 ºF.

2.6.1.1 If the unit is a water-softening dishwasher, it must be tested first on the normal cycle without a test load for water softener regeneration, as specified in section 4.1 of this appendix. The water softener setting shall be selected according to manufacturer instructions for

a water hardness of 217 mg/L (217 ppm or 12.6 grains per gallon). Ensure that dishwasher salt is supplied to the water softener system according to the manufacturer's instructions.

2.6.1.2 All non-soil-sensing dishwashers to be tested according to section 4.2 of this appendix at a nominal inlet temperature of 140 ºF must then be tested on the normal cycle and truncated normal cycle without a test load if the dishwasher does not heat water in the normal cycle. Water-softening dishwashers shall be tested using the lowest water hardness water softener setting.

2.6.2 Non-soil-sensing dishwashers to be tested at a nominal inlet temperature of 50 ºF or 120 ºF.

2.6.2.1 If the unit is a water-softening dishwasher, it must be tested first without a test load on the normal cycle for water softener regeneration, as specified in section 4.1 of this appendix. The water softener setting shall be selected according to manufacturer instructions for a water hardness of 217 mg/L (217 ppm or 12.6 grains per gallon). Ensure that dishwasher salt is supplied to the water softener system according to the manufacturer's instructions.

2.6.2.2 All non-soil-sensing dishwashers to be tested at a nominal inlet temperature of 50 ºF or 120 ºF must then be tested according to section 4.2 of this appendix on the normal cycle with a clean load of eight place settings plus six serving pieces, as specified in section 2.7 of this appendix. If the capacity of the dishwasher, as stated by the manufacturer, is less than eight place settings, then the test load must be the stated capacity. Water-softening dishwashers shall be tested using the lowest water hardness water softener setting.

2.6.3 Soil-sensing dishwashers to be tested at a nominal inlet temperature of 50 ºF, 120 ºF, or 140 ºF.

2.6.3.1 Water-softening dishwashers must be tested first without a test load on the

normal cycle for water softener regeneration, as specified in section 4.1 of this appendix. The water softener setting shall be selected according to manufacturer instructions for a water hardness of 217 mg/L (217 ppm or 12.6 grains per gallon). Ensure that dishwasher salt is supplied to the water softener system according to the manufacturer's instructions.

2.6.3.2 All soil-sensing dishwashers shall then be tested according to section 4.2 of this appendix. If soil-sensing is available as an option in the normal cycle, the normal cycle shall be selected, with the soil-sensing option if necessary. If soil-sensing is not available for the normal cycle, the cycle type that uses the soil-sensing system, and contains all the elements of a normal cycle including the power-dry feature (if such a feature is provided) shall be selected. The dishwasher shall be tested first for the sensor heavy response, then tested for the sensor medium response, and finally for the sensor light response with the following combinations of soiled and clean test loads. Water-softening dishwashers shall be tested using the lowest water hardness water softener setting.

2.6.3.2.1 For tests of the sensor heavy response, as defined in section 1.16 of this appendix:

(A) For standard dishwashers, the test unit is to be loaded with a total of eight place settings plus six serving pieces as specified in section 2.7 of this appendix. Four of the eight place settings, except for the flatware, must be soiled according to ANSI/AHAM DW–1 (incorporated by reference, see §430.3) while the remaining place settings, serving pieces, and all flatware are not soiled.

(B) For compact dishwashers, the test unit is to be loaded with four place settings plus six serving pieces as specified in section 2.7 of this appendix. Two of the four place settings, except for the flatware, must be soiled according to ANSI/AHAM DW–1 while the remaining place

settings, serving pieces, and all flatware are not soiled.

2.6.3.2.2 For tests of the sensor medium response, as defined in section 1.18 of this appendix:

(A) For standard dishwashers, the test unit is to be loaded with a total of eight place settings plus six serving pieces as specified in section 2.7 of this appendix. Two of the eight place settings, except for the flatware must be soiled according to ANSI/AHAM DW–1 (incorporated by reference, see §430.3) while the remaining place settings, serving pieces, and all flatware are not soiled.

(B) For compact dishwashers, the test unit is to be loaded with four place settings plus six serving pieces as specified in section 2.7 of this appendix. One of the four place settings, except for the flatware, must be soiled according to ANSI/AHAM DW–1 while the remaining place settings, serving pieces, and all flatware are not soiled.

2.6.3.2.3 For tests of the sensor light response, as defined in section 1.17 of this appendix:

(A) For standard dishwashers, the test unit is to be loaded with a total of eight place settings plus six serving pieces as specified in section 2.7 of this appendix. One of the eight place settings, except for the flatware, must be soiled with half of the soil load specified for a single place setting according to ANSI/AHAM DW–1 (incorporated by reference, see §430.3) while the remaining place settings, serving pieces, and all flatware are not soiled.

(B) For compact dishwashers, the test unit is to be loaded with four place settings plus six serving pieces as specified in section 2.7 of this appendix. One of the four place settings, except for the flatware, must be soiled with half of the soil load specified for a single place setting according to the ANSI/AHAM DW–1 while the remaining place settings, serving pieces, and all

flatware are not soiled.

2.7 Test load.

2.7.1 Test load items.

Dishware/glassware/ flatware item	Primary source	Description	Primary No.	Alternate source	Alternate source No.
Dinner Plate	Corning Comcor®/Corelle®	10 inch Dinner Plate	6003893		
Bread and Butter Plate	Corning Comcor®/Corelle®	6.75 inch Bread & Butter	6003887	Arzberg	8500217100
Fruit Bowl	Corning Comcor®/Corelle®	10 oz. Dessert Bowl	6003899	Arzberg	3820513100
Cup	Corning Comcor®/Corelle®	8 oz. Ceramic Cup	6014162	Arzberg	3824732100
Saucer	Corning Comcor®/Corelle®	6 inch Saucer	6010972	Arzberg	3824731100
Serving Bowl	Corning Comcor®/Corelle®	1 qt. Serving Bowl	6003911		
Platter	Corning Comcor®/Corelle®	9.5 inch Oval Platter	6011655		
Glass—Iced Tea	Libbey		551 HT		
Flatware—Knife	Oneida®—Accent		2619KPVF	WMF—Gastro 0800	12.0803.6047
Flatware—Dinner Fork	Oneida®—Accent		2619FRSF	WMF—Signum 1900	12.1905.6040
Flatware—Salad Fork	Oneida®—Accent		2619FSLF	WMF—Signum 1900	12.1964.6040
Flatware—Teaspoon	Oneida®—Accent		2619STSF	WMF—Signum 1900	12.1910.6040
Flatware—Serving Fork	Oneida®—Flight		2865FCM	WMF—Signum 1900	12.1902.6040
Flatware—Serving Spoon	Oneida®—Accent		2619STBF	WMF—Signum 1900	12.1904.6040

2.7.2 Place setting. A place setting shall consist of one cup, one saucer, one dinner plate, one bread and butter plate, one fruit bowl, one iced tea glass, one dinner fork, one salad fork, one knife, and two teaspoons.

2.7.3 Serving pieces. Serving pieces shall consist of two serving bowls, one platter, one serving fork, and two serving spoons.

2.8 Testing requirements. Provisions in this appendix pertaining to dishwashers that operate with a nominal inlet temperature of 50 °F or 120 °F apply only to water-heating dishwashers as defined in section 1.27 of this appendix.

2.9 Preconditioning requirements. Precondition the dishwasher by establishing the testing conditions set forth in sections 2.1 through 2.5 of this appendix. Set the dishwasher to the preconditioning cycle as defined in section 1.15 of this appendix, using the cycle setting for the test cycle according to section 2.6.1.2, 2.6.2.2, or 2.6.3.2 of this appendix and without using a test load, and initiate the cycle. Measure the prewash fill water volume, V_{pw}, if any, and the main wash fill water volume, V_{mw}.

2.10 Detergent. Use half the quantity of detergent specified according to ANSI/AHAM DW–1 (incorporated by reference, see §430.3), using Cascade with the Grease Fighting Power of Dawn powder as the detergent formulation. Determine the amount of detergent (in grams) to be added to the prewash compartment (if provided) or elsewhere in the dishwasher (if recommended by the manufacturer) and the main wash compartment according to sections 2.10.1 and 2.10.2 of this appendix.

2.10.1 Prewash Detergent Dosing. If the cycle setting for the test cycle includes prewash, determine the quantity of dry prewash detergent, D_{pw}, in grams (g) that results in 0.25 percent concentration by mass in the prewash fill water as:

$D_{pw} = V_{pw} \times \rho \times k \times 0.25/100$

where,

V_{pw} = the prewash fill volume of water in gallons,

ρ = water density = 8.343 pounds (lb)/gallon for dishwashers to be tested at a nominal inlet water temperature of 50 °F (10 °C), 8.250 lb/gallon for dishwashers to be tested at a nominal

inlet water temperature of 120 °F (49 °C), and 8.205 lb/gallon for dishwashers to be tested at a nominal inlet water temperature of 140 °F (60 °C), and

k = conversion factor from lb to g = 453.6 g/lb.

2.10.2 Main Wash Detergent Dosing. Determine the quantity of dry main wash detergent, D_{mw}, in grams (g) that results in 0.25 percent concentration by mass in the main wash fill water as:

$D_{mw} = V_{mw} \times \rho \times k \times 0.25/100$

where,

V_{mw} = the main wash fill volume of water in gallons, and

ρ, and k are defined in section 2.10.1 of this appendix.

3. Instrumentation

* * * * *

3.5 Watt-hour meter. The watt-hour meter must have a resolution of .1 watt-hour or less and a maximum error of no more than 1 percent of the measured value for any demand greater than 5 watts.

* * * * *

3.8 Standby mode and off mode watt meter. The watt meter used to measure standby mode and off mode power consumption shall meet the requirements specified in section 4.4 of IEC 62301 (incorporated by reference, see §430.3).

4. Test Cycle and Measurements

4.1 Water softener regeneration for water-softening dishwashers. Perform a test cycle by establishing the testing conditions set forth in section 2 of this appendix, setting the dishwasher to the cycle type to be tested according to section 2.6.1.1, 2.6.2.1, or 2.6.3.1 of this appendix,

initiating the cycle, and allowing the cycle to proceed to completion.

4.1.1 Measure the water consumption, $V_{WS,i}$, expressed as the number of gallons of water delivered to the machine during the entire test cycle, using a water meter as specified in section 3.3 of this appendix, where i is the number of times the cycle has been conducted. Measure the machine electrical energy consumption, $M_{WS,i}$, expressed as the number of kilowatt-hours of electricity consumed by the machine during the entire test cycle, using a watt-hour meter as specified in section 3.5 of this appendix.

4.1.2 Repeat the cycle as specified in section 4.1.1 of this appendix. If:

$$\left|V_{WS,1} - V_{WS,2}\right| > 1.1$$

Then V_{WSmax} is defined as the larger of $V_{WS,1}$ and $V_{WS,2}$, and V_{WSavg} is defined as the smaller of $V_{WS,1}$ and $V_{WS,2}$; and M_{WSmax} is defined as the machine electrical energy consumption for the cycle associated with V_{WSmax} , and M_{WSavg} is defined as the machine electrical energy consumption for the cycle associated with V_{WSavg};

Otherwise, repeat the cycle as specified in section 4.1.1 of this appendix until:

$$V_{WS,i} > 1.1 \times \frac{\left(\sum_{j=1}^{i-1} V_{WS,j}\right)}{(i-1)}$$

Then,

$V_{WSmax} = V_{WS,i}$

$M_{WSmax} = M_{WS,i}$

$$V_{WSavg} = \frac{\left(\sum_{j=1}^{i-1} V_{WS,j}\right)}{(i-1)}$$

and

$$M_{WSavg} = \frac{\left(\sum_{j=1}^{i-1} M_{WS,j}\right)}{(i-1)}$$

Otherwise, if a maximum total of 10 cycles have been conducted and no cycle is determined to have water consumption that is 10 percent higher than the average water consumption of the other cycles, then the unit shall be deemed not a water-softening dishwasher.

4.2 Active mode cycle. Perform a test cycle by establishing the testing conditions set forth in section 2 of this appendix, setting the dishwasher to the cycle type to be tested according to section 2.6.1.2, 2.6.2.2, or 2.6.3.2 of this appendix, initiating the cycle, and allowing the cycle to proceed to completion.

4.2.1 Machine electrical energy consumption. Measure the machine electrical energy consumption, M, expressed as the number of kilowatt-hours of electricity consumed by the machine during the entire test cycle, using a water supply temperature as set forth in section 2.3 of this appendix and using a watt-hour meter as specified in section 3.5 of this appendix.

4.2.2 Fan electrical energy consumption. If the dishwasher is capable of operation in fan-only mode, measure the fan electrical energy consumption, M_F, expressed as the number of kilowatt-hours of electricity consumed by the machine for the duration of the fan-only mode after the completion of each test cycle, using a watt-hour meter as specified in section 3.5 of this

appendix. Record the time in minutes that the machine remains in fan-only mode, L_F.

4.2.3 Water consumption. Measure the water consumption, V, expressed as the number of gallons of water delivered to the machine during the entire test cycle, using a water meter specified in section 3.3 of this appendix.

4.3 Simplified standby mode power. Connect the dishwasher to a standby wattmeter or a standby watt-hour meter as specified in sections 3.6 and 3.7, respectively, of this appendix. Select the conditions necessary to achieve operation in the simplified standby mode as defined in section 1.19 of this appendix. Monitor the power consumption but allow the dishwasher to stabilize for at least 5 minutes. Then monitor the power consumption for at least an additional 5 minutes. If the power level does not change by more than 5 percent from the maximum observed value during the later 5 minutes and if there is no cyclic or pulsing behavior of the load, the load can be considered stable. For stable operation, simplified standby mode power, S_m, can be recorded directly from the standby watt meter in watts or accumulated using the standby watt-hour meter over a period of at least 5 minutes. For unstable operation, the energy must be accumulated using the standby watt-hour meter over a period of at least 5 minutes and must capture the energy use over one or more complete cycles. Calculate the average simplified standby mode power, S_m, expressed in watts by dividing the accumulated energy consumption by the duration of the measurement period.

4.4 Standby mode and off mode power. Connect the dishwasher to a standby mode and off mode watt meter as specified in section 3.8 of this appendix. Establish the testing conditions set forth in sections 2.1, 2.2, and 2.5.2 of this appendix. For dishwashers that take some time to enter a stable state from a higher power state as discussed in section 5.1, note 1 of IEC 62301 (incorporated by reference; see §430.3), allow sufficient time for the dishwasher to reach the

lower power state before proceeding with the test measurement. Follow the test procedure specified in section 5.3.2 of IEC 62301 for testing in each possible mode as described in sections 4.4.1 and 4.4.2 of this appendix.

4.4.1 If the dishwasher has an inactive mode, as defined in section 1.10 of this appendix, measure and record the average inactive mode power of the dishwasher, P_{IA}, in watts.

4.4.2 If the dishwasher has an off mode, as defined in section 1.11 of this appendix, measure and record the average off mode power, P_{OM}, in watts.

5. Calculation of Derived Results From Test Measurements

5.1 Machine energy consumption.

5.1.1 Machine energy consumption for non-soil-sensing electric dishwashers. Take the value recorded in section 4.2.1 of this appendix as the per-cycle machine electrical energy consumption. Express the value, M, in kilowatt-hours per cycle.

5.1.2 Machine energy consumption for soil-sensing electric dishwashers. The machine energy consumption for the sensor normal cycle, M, is defined as:

$M = (M_{hr} \times F_{hr}) + (M_{mr} \times F_{mr}) + (M_{lr} \times F_{lr})$

where,

M_{hr} = the value recorded in section 4.2.1 of this appendix for the test of the sensor heavy response, expressed in kilowatt-hours per cycle,

M_{mr} = the value recorded in section 4.2.1 of this appendix for the test of the sensor medium response, expressed in kilowatt-hours per cycle,

M_{lr} = the value recorded in section 4.2.1 of this appendix for the test of the sensor light response, expressed in kilowatt-hours per cycle,

F_{hr} = the weighting factor based on consumer use of heavy response = 0.05,

F_{mr} = the weighting factor based on consumer use of medium response = 0.33, and

F_{lr} = the weighting factor based on consumer use of light response = 0.62.

5.1.3 Machine energy consumption during water softener regeneration for water-softening dishwashers. The machine energy consumption for water softener regeneration, M_{WS}, is defined as:

$M_{WS} = (M_{WSmax} - M_{WSavg}) \times N_{WS}/N$

where,

M_{WSmax} = the value of the machine electrical energy consumption during a cycle including water softener regeneration recorded in section 4.1 of this appendix, expressed in kilowatt-hours,

M_{WSavg} = the value of the average machine electrical energy consumption during cycles not including water softener regeneration recorded in section 4.1 of this appendix, expressed in kilowatt-hours,

N_{WS} = the representative average number of water softener regeneration cycles per year = 36 cycles per year, and

N = the representative average dishwasher use of 215 cycles per year.

5.2 Fan-only mode energy consumption.

5.2.1 Electrical energy consumption for fan-only mode for non-soil-sensing electric dishwashers. Take the value recorded in section 4.2.2 of this appendix as the per-cycle electrical energy consumption for fan-only mode. Express the value, E_F, in kilowatt-hours per cycle. If the dishwasher is not capable of operation in fan-only mode, $E_F = 0$.

5.2.2 Electrical energy consumption for fan-only mode for soil-sensing electric dishwashers. The fan-only mode electrical energy consumption, E_F, for the sensor normal cycle

is defined as:

$E_F = (E_{Fhr} + E_{Fmr} + E_{Flr})/3$

where,

E_{Fhr} = the value recorded in section 4.2.2 of this appendix for the test of the sensor heavy response, expressed in kilowatt-hours per cycle,

E_{Fmr} = the value recorded in section 4.2.2 of this appendix for the test of the sensor medium response, expressed in kilowatt-hours per cycle,

E_{Flr} = the value recorded in section 4.2.2 of this appendix for the test of the sensor light response, expressed in kilowatt-hours per cycle,

If the dishwasher is not capable of operation in fan-only mode, $E_F = 0$.

5.3 Drying energy.

5.3.1 Drying energy consumption for non-soil-sensing electric dishwashers. Calculate the amount of energy consumed using the power-dry feature after the termination of the last rinse option of the normal cycle. Express the value, E_D, in kilowatt-hours per cycle.

5.3.2 Drying energy consumption for soil-sensing electric dishwashers. The drying energy consumption, E_D, for the sensor normal cycle is defined as:

$E_D = (E_{Dhr} + E_{Dmr} + E_{Dlr})/3$

where,

E_{Dhr} = energy consumed using the power-dry feature after the termination of the last rinse option of the sensor heavy response, expressed in kilowatt-hours per cycle,

E_{Dmr} = energy consumed using the power-dry feature after the termination of the last rinse option of the sensor medium response, expressed in kilowatt-hours per cycle,

E_{Dlr} = energy consumed using the power-dry feature after the termination of the last rinse option

of the sensor light response, expressed in kilowatt-hours per cycle,

5.4 Water consumption.

5.4.1 Water consumption for non-soil-sensing electric dishwashers using electrically heated, gas-heated, or oil-heated water. Take the value recorded in section 4.2.3 of this appendix as the per-cycle water consumption. Express the value, V, in gallons per cycle.

5.4.2 Water consumption for soil-sensing electric dishwashers using electrically heated, gas-heated, or oil-heated water. The water consumption for the sensor normal cycle, V, is defined as:

$V = (V_{hr} \times F_{hr}) + (V_{mr} \times F_{mr}) + (V_{lr} \times F_{lr})$

where,

V_{hr} = the value recorded in section 4.2.3 of this appendix for the test of the sensor heavy response, expressed in gallons per cycle,

V_{mr} = the value recorded in section 4.2.3 of this appendix for the test of the sensor medium response, expressed in gallons per cycle,

V_{lr} = the value recorded in section 4.2.3 of this appendix for the test of the sensor light response, expressed in gallons per cycle,

F_{hr} = the weighting factor based on consumer use of heavy response = 0.05,

F_{mr} = the weighting factor based on consumer use of medium response = 0.33, and

F_{lr} = the weighting factor based on consumer use of light response = 0.62.

5.4.3 Water consumption during water softener regeneration for water-softening dishwashers using electrically heated, gas-heated, or oil-heated water. The water consumption for water softener regeneration, V_{WS}, is defined as:

$V_{WS} = (V_{WSmax} - V_{WSavg}) \times N_{WS}/N$

where,

V_{WSmax} = the value of the total water consumption during a cycle including water softener regeneration recorded in section 4.1 of this appendix, expressed in gallons per cycle,

V_{WSavg} = the value of the average total water consumption during cycles not including water softener regeneration recorded in section 4.1 of this appendix, expressed in gallons per cycle,

N_{WS} = the representative average number of water softener regeneration cycles per year = 36 cycles per year, and

N = the representative average dishwasher use of 215 cycles per year.

5.5 Water energy consumption for non-soil-sensing or soil-sensing dishwashers using electrically heated water.

5.5.1 Dishwashers that operate with a nominal 140 °F inlet water temperature, only.

5.5.1.1 Calculate the water energy consumption, W, expressed in kilowatt-hours per cycle and defined as:

$W = V \times T \times K$

where,

V = water consumption in gallons per cycle, as determined in section 5.4.1 of this appendix for non-soil-sensing dishwashers and section 5.4.2 of this appendix for soil-sensing dishwashers,

T = nominal water heater temperature rise = 90 °F, and

K = specific heat of water in kilowatt-hours per gallon per degree Fahrenheit = 0.0024.

5.5.1.2 For water-softening dishwashers, calculate the water softener regeneration water energy consumption, W_{WS}, expressed in kilowatt-hours per cycle and defined as:

$W_{WS} = V_{WS} \times T \times K$

where,

V_{WS} = water consumption during water softener regeneration in gallons per cycle which includes regeneration, as determined in section 5.4.3 of this appendix,

T = nominal water heater temperature rise = 90 °F, and

K = specific heat of water in kilowatt-hours per gallon per degree Fahrenheit = 0.0024.

5.5.2 Dishwashers that operate with a nominal inlet water temperature of 120 °F.

5.5.2.1 Calculate the water energy consumption, W, expressed in kilowatt-hours per cycle and defined as:

$W = V \times T \times K$

where,

V = water consumption in gallons per cycle, as determined in section 5.4.1 of this appendix for non-soil-sensing dishwashers and section 5.4.2 of this appendix for soil-sensing dishwashers,

T = nominal water heater temperature rise = 70 °F, and

K = specific heat of water in kilowatt-hours per gallon per degree Fahrenheit = 0.0024,

5.5.2.2 For water-softening dishwashers, calculate the water softener regeneration water energy consumption, W_{WS}, expressed in kilowatt-hours per cycle and defined as:

$W_{WS} = V_{WS} \times T \times K$

where,

V_{WS} = water consumption during water softener regeneration in gallons per cycle which includes regeneration, as determined in section 5.4.3 of this appendix,

T = nominal water heater temperature rise = 70 °F, and

K = specific heat of water in kilowatt-hours per gallon per degree Fahrenheit = 0.0024.

5.6 Water energy consumption per cycle using gas-heated or oil-heated water.

5.6.1 Dishwashers that operate with a nominal 140 °F inlet water temperature, only.

5.6.1.1 Calculate the water energy consumption using gas-heated or oil-heated water, W_g, expressed in Btu's per cycle and defined as:

$W_g = V \times T \times C/e$

where,

V = water consumption in gallons per cycle, as determined in section 5.4.1 of this appendix for non-soil-sensing dishwashers and section 5.4.2 of this appendix for soil-sensing dishwashers,

T = nominal water heater temperature rise = 90 °F,

C = specific heat of water in Btu's per gallon per degree Fahrenheit = 8.2, and

e = nominal gas or oil water heater recovery efficiency = 0.75,

5.6.1.2 For water-softening dishwashers, calculate the water softener regeneration water energy consumption, W_{WSg}, expressed in kilowatt-hours per cycle and defined as:

$W_{WSg} = V_{WS} \times T \times C/e$

where,

V_{WS} = water consumption during water softener regeneration in gallons per cycle which includes regeneration, as determined in section 5.4.3 of this appendix,

T = nominal water heater temperature rise = 90 °F,

C = specific heat of water in Btu's per gallon per degree Fahrenheit = 8.2, and

e = nominal gas or oil water heater recovery efficiency = 0.75.

5.6.2 Dishwashers that operate with a nominal 120 °F inlet water temperature, only.

5.6.2.1 Calculate the water energy consumption using gas-heated or oil-heated water, W_g, expressed in Btu's per cycle and defined as:

$W_g = V \times T \times C/e$

where,

V = water consumption in gallons per cycle, as determined in section 5.4.1 of this appendix for non-soil-sensing dishwashers and section 5.4.2 of this appendix for soil-sensing dishwashers,

T = nominal water heater temperature rise = 70 °F,

C = specific heat of water in Btu's per gallon per degree Fahrenheit = 8.2, and

e = nominal gas or oil water heater recovery efficiency = 0.75.

5.6.2.2 For water-softening dishwashers, calculate the water softener regeneration water energy consumption, W_{WSg}, expressed in kilowatt-hours per cycle and defined as:

$W_{WSg} = V_{WS} \times T \times C/e$

where,

V_{WS} = water consumption during water softener regeneration in gallons per cycle which includes regeneration, as determined in section 5.4.3 of this appendix,

T = nominal water heater temperature rise = 70 °F,

C = specific heat of water in Btu's per gallon per degree Fahrenheit = 8.2, and

e = nominal gas or oil water heater recovery efficiency = 0.75.

5.7 Annual simplified standby energy consumption. Calculate the estimated annual simplified standby energy consumption. First determine the number of standby hours per year, H_s, defined as:

$H_s = H - (N \times L)$

where,

H = the total number of hours per year = 8766 hours per year,

N = the representative average dishwasher use of 215 cycles per year, and

L = the average of the duration of the normal cycle and truncated normal cycle, for non-soil-sensing dishwashers with a truncated normal cycle; the duration of the normal cycle, for non-soil-sensing dishwashers without a truncated normal cycle; the average duration of the sensor light response, truncated sensor light response, sensor medium response, truncated sensor medium response, sensor heavy response, and truncated sensor heavy response, for soil-sensing dishwashers with a truncated cycle option; the average duration of the sensor light response, sensor medium response, and sensor heavy response, for soil-sensing dishwashers without a truncated cycle option.

Then calculate the estimated annual simplified standby power use, S, expressed in kilowatt-hours per year and defined as:

$S = S_m \times ((H_s)/1000)$

where,

S_m = the simplified standby mode power in watts as determined in section 4.3 of this appendix.

5.8 Annual combined low-power mode energy consumption. Calculate the annual combined low-power mode energy consumption for dishwashers, E_{TLP}, expressed in kilowatt-hours per year, according to the following:

$E_{TLP} = [(P_{IA} \times S_{IA}) + (P_{OM} \times S_{OM})] \times K$

where:

P_{IA} = dishwasher inactive mode power, in watts, as measured in section 4.4.1 of this appendix for dishwashers capable of operating in inactive mode; otherwise, $P_{IA}=0$,

P_{OM} = dishwasher off mode power, in watts, as measured in section 4.4.2 of this appendix for dishwashers capable of operating in off mode; otherwise, P_{OM}=0,

S_{IA} = annual hours in inactive mode as defined as S_{LP} if no off mode is possible, [S_{LP}/ 2] if both inactive mode and off mode are possible, and 0 if no inactive mode is possible,

S_{OM} = annual hours in off mode as defined as S_{LP} if no inactive mode is possible, [S_{LP}/ 2] if both inactive mode and off mode are possible, and 0 if no off mode is possible,

S_{LP} = combined low-power annual hours for cycle finished, off, and inactive mode as defined as [$H – (N×(L + L_F))$] for dishwashers capable of operating in fan-only mode; otherwise, S_{LP}=8,465,

H = the total number of hours per year = 8766 hours per year,

N = the representative average dishwasher use of 215 cycles per year,

L = the average of the duration of the normal cycle and truncated normal cycle, for non-soil-sensing dishwashers with a truncated normal cycle; the duration of the normal cycle, for non-soil-sensing dishwashers without a truncated normal cycle; the average duration of the sensor light response, truncated sensor light response, sensor medium response, truncated sensor medium response, sensor heavy response, and truncated sensor heavy response, for soil-sensing dishwashers with a truncated cycle option; the average duration of the sensor light response, sensor medium response, and sensor heavy response, for soil-sensing dishwashers without a truncated cycle option,

L_F = the duration of the fan-only mode for the normal cycle for non-soil-sensing dishwashers; the average duration of the fan-only mode for sensor light response, sensor medium response, and sensor heavy response for soil-sensing dishwashers, and

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

Appendix I–[Amended]

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

a. By revising the Note after the appendix heading;

b. By revising section 1. Definitions;

c. In section 2. Test Conditions, by:

1. Revising sections 2.1, 2.1.1, 2.1.2, 2.1.3, 2.2.1.2, 2.5.2, 2.6, 2.9.1.1, 2.9.1.3, and 2.9.2.1;

2. Removing section 2.9.2.2;

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

e. By revising section 4. Calculation of Derived Results From Test Measurements

The additions and revisions 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: The procedures and calculations in this Appendix I need not be performed to determine compliance with energy conservation standards for conventional ranges, conventional cooking tops, conventional ovens, and microwave ovens at this time. However, any representation related to standby mode and off mode energy consumption of conventional ranges, conventional cooking tops, and conventional ovens made after (*date 180 days after date of publication of the*

test procedure final rule in the ***Federal Register***) and of microwave ovens made after September 6, 2011 must be based upon results generated under this test procedure, consistent with the requirements of 42 U.S.C. 6293(c)(2). Upon the compliance date of any energy conservation standard that incorporates standby mode and off mode energy consumption, compliance with the applicable provisions of this test procedure will also be required. Future revisions may add relevant provisions for measuring active mode in microwave ovens.

1. Definitions

1.1 Active mode means a mode in which the product is connected to a mains power source, has been activated, and is performing the main functions of producing heat by means of a gas flame, electric resistance heating, or microwave energy, or circulating air internally or externally to the cooking product. Delay start mode is a one-off, user-initiated, short-duration function that is associated with an active mode.

1.2 Built-in means the product is supported by surrounding cabinetry, walls, or other similar structures.

1.3 Combined low-power mode means the aggregate of available modes other than active mode.

1.4 Cycle finished mode means a standby mode in which a conventional cooking top, conventional oven, or conventional range provides continuous status display following operation in active mode.

1.5 Drop-in means the product is supported by horizontal surface cabinetry.

1.6 Fan-only mode means an active mode in which a fan circulates air internally or externally to the cooking product for a finite period of time after the end of the heating function,

as indicated to the consumer.

1.7 Forced convection means a mode of conventional oven operation in which a fan is used to circulate the heated air within the oven compartment during cooking.

1.8 Freestanding means the product is not supported by surrounding cabinetry, walls, or other similar structures.

1.9 IEC 62301 First Edition means the test standard published by the International Electrotechnical Commission, titled "Household electrical appliances–Measurement of standby power," Publication 62301 (First Edition 2005-06) (incorporated by reference; see §430.3).

1.10 IEC 62301 Second Edition means the test standard published by the International Electrotechnical Commission, titled "Household electrical appliances–Measurement of standby power," Publication 62301 (Edition 2.0 2011-01) (incorporated by reference; see §430.3).

1.11 Inactive mode means a standby mode that facilitates the activation of active mode by remote switch (including remote control), internal sensor, or timer, or that provides continuous status display.

1.12 Normal nonoperating temperature means the temperature of all areas of an appliance to be tested are within 5 °F (2.8 °C) of the temperature that the identical areas of the same basic model of the appliance would attain if it remained in the test room for 24 hours while not operating with all oven doors closed.

1.13 Off mode means a mode in which the product is connected to a mains power source and is not providing any active mode or standby mode function, and where the mode may persist for an indefinite time. An indicator that only shows the user that the product is in the off position is included within the classification of an off mode.

1.14 Primary energy consumption means either the electrical energy consumption of a conventional electric oven or the gas energy consumption of a conventional gas oven.

1.15 Secondary energy consumption means any electrical energy consumption of a conventional gas oven.

1.16 Standard cubic foot (L) of gas means that quantity of gas that occupies 1 cubic foot (L) when saturated with water vapor at a temperature of 60 °F (15.6 °C) and a pressure of 30 inches of mercury (101.6 kPa) (density of mercury equals 13.595 grams per cubic centimeter).

1.17 Standby mode means any modes where the product is connected to a mains power source and offers one or more of the following user-oriented or protective functions which may persist for an indefinite time: (a) to facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, or timer; (b) continuous functions, including information or status displays (including clocks) or sensor-based functions. A timer is a continuous clock function (which may or may not be associated with a display) that provides regular scheduled tasks (e.g., switching) and that operates on a continuous basis.

1.18 Thermocouple means a device consisting of two dissimilar metals which are joined together and, with their associated wires, are used to measure temperature by means of electromotive force.

1.19 Symbol usage. The following identity relationships are provided to help clarify the symbology used throughout this procedure.

A—Number of Hours in a Year

C—Specific Heat

E—Energy Consumed

Eff—Cooking Efficiency

H—Heating Value of Gas

K—Conversion for Watt-hours to Kilowatt-hours

K_e—3.412 Btu/Wh, Conversion for Watt-hours to Btu's

M—Mass

n—Number of Units

O—Annual Useful Cooking Energy Output

P—Power

Q—Gas Flow Rate

R—Energy Factor, Ratio of Useful Cooking Energy Output to Total Energy Input

S—Number of Self-Cleaning Operations per Year

T—Temperature

t—Time

V—Volume of Gas Consumed

W—Weight of Test Block

2. Test Conditions

2.1 Installation. A free standing kitchen range 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. These appliances are to be completely assembled with all handles, knobs, guards, and the like 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.

2.1.1 Conventional electric ranges, ovens, and cooking tops. These products shall be connected to an electrical supply circuit with voltage as specified in section 2.2.1 of this appendix with a watt-hour meter installed in the circuit. The watt-hour meter shall be as described in section 2.9.1.1 of this appendix. For standby mode and off mode testing, these products shall also be installed in accordance with section 5.2 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3), disregarding the provisions regarding batteries and the determination, classification, and testing of relevant modes.

2.1.2 Conventional gas ranges, ovens, and cooking tops. These products shall be connected to a gas supply line with a gas meter installed between the supply line and the appliance being tested, according to manufacturer's specifications. The gas meter shall be as described in section 2.9.2 of this appendix. Conventional gas ranges, ovens, and cooking tops with electrical ignition devices or other electrical components shall be connected to an electrical supply circuit of nameplate voltage with a watt-hour meter installed in the circuit. The watt-hour meter shall be as described in section 2.9.1.1 of this appendix. For standby mode and off mode testing, these products shall also be installed in accordance with section 5.2 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3), disregarding the provisions regarding batteries and the determination, classification, and testing of relevant modes.

2.1.3 Microwave ovens. Install the microwave oven in accordance with the manufacturer's instructions and connect to an electrical supply circuit with voltage as specified in section 2.2.1 of this appendix. The microwave oven shall also be installed in accordance with section 5.2 of IEC 62301 (First Edition) (incorporated by reference; see §430.3). A watt meter

shall be installed in the circuit and shall be as described in section 2.9.1.3 of this appendix.

* * * * *

2.2.1.2 Supply voltage waveform. For conventional range, conventional cooking top, and conventional oven standby mode and off mode testing, maintain the electrical supply voltage waveform indicated in section 4.3.2 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3). For microwave oven standby mode and off mode testing, maintain the electrical supply voltage waveform indicated in section 4.4 of IEC 62301 (First Edition) (incorporated by reference; see §430.3).

* * * * *

2.5.2 Standby mode and off mode ambient temperature. For conventional range, conventional cooking top, and conventional oven standby mode and off mode testing, maintain room ambient air temperature conditions as specified in section 4.2 of IEC 62301 (Second Edition) (incorporated by reference; see §430.3). For microwave oven standby mode and off mode testing, maintain room ambient air temperature conditions as specified in section 4.2 of IEC 62301 (First Edition) (incorporated by reference; see §430.3).

2.6 Normal nonoperating temperature. All areas of the appliance to be tested shall attain the normal nonoperating temperature, as defined in section 1.12 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.

* * * * *

2.9.1.1 Watt-hour meter. The watt-hour meter for measuring the electrical energy consumption of conventional ovens and cooking tops shall have a resolution of 1 watt-hour (3.6

kJ) or less and a maximum error no greater than 1.5 percent of the measured value for any demand greater than 5 watts. The watt-hour meter for measuring the energy consumption of microwave ovens shall have resolution of 0.1 watt-hour (0.36 kJ) or less and a maximum error no greater than 1.5 percent of the measured value.

* * * * *

2.9.1.3 Standby mode and off mode watt meter. The watt meter used to measure conventional range, conventional cooking top, and conventional oven standby mode and off mode power consumption shall have a resolution as specified in section 4.4 of IEC 62301 (Second Edition) (incorporated by reference, see §430.3). The watt meter used to measure microwave oven standby mode and off mode power consumption shall have a resolution as specified in section 4.5 of IEC 62301 (First Edition) (incorporated by reference, see §430.3), and shall also be able to record a "true" average power as specified in section 5.3.2(a) of IEC 62301 (First Edition).

2.9.2 Gas Measurements.

2.9.2.1 Positive displacement meters. The gas meter to be used for measuring the gas consumed by the gas burners of the oven or cooking top shall have a resolution of 0.01 cubic foot (0.28 L) or less and a maximum error no greater than 1 percent of the measured valued for any demand greater than 2.2 cubic feet per hour (62.3 L/h).

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 nonoperating temperature as defined in section 1.12 of this appendix 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. 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 nonoperating temperature as defined in section 1.12 of this appendix and described in section 2.6 of this appendix. Then set 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 5.1, 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 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as described in sections 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, either: (1) set the clock time to 3:23 at the end of the stabilization period specified in section 5.3 of IEC 62301 (First Edition) (incorporated by reference; see §430.3), and use the average power approach described in section 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; or (2) at any starting clock time, allow a stabilization period as described in section 5.3 of IEC 62301 (First Edition), and use the average power approach described in section 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 12 hours +0/-30 sec. Testing may be conducted using either a 12-hour test, a 10-minute test, or both tests; however, if a manufacturer elects to perform both tests on a unit, the manufacturer may only use the results from one of the test (i.e., the 12-hour test or the 10-minute test) as the test results for that unit. Results of the 10-minute test that are within ±2 percent of the 12-hour test are deemed to be representative of average energy use.

3.1.1.2.1 If the conventional oven has an inactive mode, as defined in section 1.11 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 1.13 of this appendix, measure and record the average off mode power of the conventional oven, P_{OM}, in watts.

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 1.12 of this appendix 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 5.1, 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 5.3.2 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, either: (1) set the clock time to 3:23 at the end of the stabilization period specified in section 5.3 of IEC 62301 (First Edition) (incorporated by reference; see §430.3), and use the average power approach described in section 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; or (2) at any starting clock time, allow a stabilization period as described in section 5.3 of IEC 62301 (First Edition), and use the average power approach described in section 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 12 hours +0/-30 sec. Testing may be conducted using either a 12-hour test, a 10-minute test, or both tests; however, if a manufacturer elects to perform both tests on a unit, the

manufacturer may only use the results from one of the test (i.e., the 12-hour test or the 10-minute test) as the test results for that unit. Results of the 10-minute test that are within ±2 percent of the 12-hour test are deemed to be representative of average energy use.

3.1.2.1.1 If the conventional cooking top has an inactive mode, as defined in section 1.11 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 1.13 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 5.1, 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 5.3.2 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, either: (1) set the clock time to 3:23 at the end of the stabilization period specified in section 5.3 of IEC 62301 (First Edition) (incorporated by reference; see §430.3), and use the average power approach described in section 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; or (2) at any starting clock time, allow a stabilization period as described in section 5.3 of IEC 62301 (First Edition), and use the average power approach described in

section 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 12 hours +0/-30 sec. Testing may be conducted using either a 12-hour test, a 10-minute test, or both tests; however, if a manufacturer elects to perform both tests on a unit, the manufacturer may only use the results from one of the test (i.e., the 12-hour test or the 10-minute test) as the test results for that unit. Results of the 10-minute test that are within ±2 percent of the 12-hour test are deemed to be representative of average energy use.

3.1.3.1 If the conventional range has an inactive mode, as defined in section 1.11 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 1.13 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 5.1, Note 1 of IEC 62301 (First 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 5.3 of IEC 62301 (First 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 5.3.2(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 1.17 or 1.13 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, 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, 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 watt-hours (kJ) of electricity consumed by the conventional oven for the duration of the fan-only mode immediately after the completion of the measurement of test energy consumption set forth in section 3.2.1 of this appendix, using a watt-hour meter as specified in section 2.9.1.1 of this appendix. Record the time in minutes that the conventional oven remains

in fan-only mode, t_{OF}

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 1.11 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 1.13 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.

3.2.2 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 1.11 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 1.13 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 1.11 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 1.13 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 5.3 of IEC 62301 (First Edition) (incorporated by reference; see §430.3). If the microwave oven is capable of operating in standby mode, as defined in section 1.17 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 1.13 of this appendix, measure the average off mode power of the microwave oven, P_{OM}, as specified in section 3.1.4.1 of this appendix.

3.3 Recorded values.

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

3.3.2 Record measured test block 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, 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, 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 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 E_{IC}.

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

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

3.3.11 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

4.1 Conventional oven.

4.1.1 Test energy consumption. For a conventional oven with a thermostat which operates by cycling on and off, calculate the test energy consumption, E_O, expressed in watt-hours (kJ) for electric ovens and in Btus (kJ) for gas ovens, and defined as:

$$E_O = E_{AB} + \left[\left(\frac{T_O - T_{AB}}{T_{CD} - T_{AB}} \right) \times \left(E_{CD} - E_{AB} \right) \right]$$

for electric ovens, and,

$$E_O = (V_{AB} \times H) + \left[\left(\frac{T_O - T_{AB}}{T_{CD} - T_{AB}} \right) \times (V_{CD} - V_{AB}) \times H \right]$$

for gas ovens,

Where:

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).

T_O = 234 °F (130 °C) plus the initial test block temperature.

and,

$$E_{AB} = \frac{(E_A + E_B)}{2}, \quad E_{CD} = \frac{(E_C + E_D)}{2},$$

$$V_{AB} = \frac{(V_A + V_B)}{2}, \quad V_{CD} = \frac{(V_C + V_D)}{2},$$

$$T_{AB} = \frac{(T_A + T_B)}{2}, \quad T_{CD} = \frac{(T_C + T_D)}{2},$$

Where:

T_A = block temperature in °F (°C) at the end of the last ‘‘ON’’ period of the conventional oven before the test block reaches T_O.

T_B = block temperature in °F (°C) at the beginning of the ‘‘ON’’ period following the measurement of T_A.

T_C = block temperature in °F (°C) at the end of the ‘‘ON’’ period which starts with T_B.

T_D = block temperature in °F (°C) at the beginning of the ‘‘ON’’ period which follows the measurement of T_C.

E_A = electric energy consumed in Wh (kJ) at the end of the last ‘‘ON’’ period before the test

block reaches T_O.

E_B = electric energy consumed in Wh (kJ) at the beginning of the ‘‘ON’’ period following the measurement of T_A.

E_C = electric energy consumed in Wh (kJ) at the end of the ‘‘ON’’ period which starts with T_B.

E_D = electric energy consumed in Wh (kJ) at the beginning of the ‘‘ON’’ period which follows the measurement of T_C.

V_A = volume of gas consumed in standard cubic feet (L) at the end of the last ‘‘ON’’ period before the test block reaches T_O.

V_B = volume of gas consumed in standard cubic feet (L) at the beginning of the ‘‘ON’’ period following the measurement of T_A.

V_C = volume of gas consumed in standard cubic feet (L) at the end of the ‘‘ON’’ period which starts with T_B.

V_D = volume of gas consumed in standard cubic feet (L) at the beginning of the ‘‘ON’’ period which follows the measurement of T_C.

4.1.1.1 Average test energy consumption. If the conventional oven can be operated with or without forced convection, determine the average test energy consumption, E_O and E_{IO}, in watt-hours (kJ) for electric ovens and Btus (kJ) for gas ovens using the following equations:

$$E_O = \frac{(E_O)_1 + (E_O)_2}{2}$$

$$E_{IO} = \frac{(E_{IO})_1 + (E_{IO})_2}{2}$$

Where:

$(E_O)_1$= test energy consumption using the forced convection mode in watt-hours (kJ) for electric

ovens and in Btus (kJ) for gas ovens as measured in section 3.2.1.1 of this appendix.

$(E_O)_2$= test energy consumption without using the forced convection mode in watt-hours (kJ) for electric ovens and in Btus (kJ) for gas ovens as measured in section 3.2.1.1 of this appendix.

$(E_{IO})_1$= electrical energy consumption in watt-hours (kJ) of a gas oven in forced convection mode as measured in section 3.2.1.1 of this appendix.

$(E_{IO})_2$= electrical energy consumption in watt-hours (kJ) of a gas oven without using the forced convection mode as measured in section 3.2.1.1 of this appendix.

4.1.2 Conventional oven annual energy consumption.

4.1.2.1 Annual cooking energy consumption.

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 Btus (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 of this appendix or as calculated in sections 4.1.1 or 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 of this appendix or as calculated in sections 4.1.1 or 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.

4.1.2.1.2 Annual secondary energy consumption for cooking of gas ovens. Calculate the annual secondary energy consumption for cooking, E_{SO}, expressed in kilowatt-hours (kJ) per year and defined as:

$$E_{SO} = \frac{E_{IO} \times K_e \times O_O}{W_1 \times C_p \times T_S},$$

Where:

E_{IO}= electrical test energy consumption as measured in section 3.2.1 of this appendix or as calculated in section 4.1.1.1 of this appendix.

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

K_e, W_1, C_p, and T_S are as defined in section 4.1.2.1.1 of this appendix.

4.1.2.2 Annual conventional oven self-cleaning energy.

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 Btus (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

$E_{SC}=V_S\times H\times S_g$, 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.

4.1.2.2.2 Annual secondary energy consumption for self-cleaning operation of gas ovens.

Calculate the annual secondary energy consumption for self-cleaning operations of a gas oven, E_{SS}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{SS} = E_{IS} \times S_g \times K$,

Where:

E_{IS}= electrical energy consumed during the self-cleaning operation of a conventional gas oven, as measured in section 3.2.1.3 of this appendix.

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

per year.

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

4.1.2.3 Annual combined low-power mode energy consumption of a single conventional oven. Calculate the annual standby mode and off mode energy consumption for conventional ovens, E_{OTLP}, expressed in kilowatt-hours (kJ) per year and defined as:

$E_{OTLP} = [(P_{IA} \times S_{IA}) + (P_{OM} \times S_{OM})] \times K$,

Where:

P_{IA}= conventional oven inactive mode power, in watts, as measured in section 3.2.1.4 of this appendix.

P_{OM} = conventional oven off mode power, in watts, as measured in section 3.2.1.4 of this appendix.

S_{TOT} equals the total number of inactive mode and off mode hours per year;

If the conventional oven has fan-only mode, S_{TOT} equals $(8{,}540.1 – (t_{OF}/60))$ hours, where t_{OF} is the conventional oven fan-only mode duration, in minutes, as measured in section 3.2.1.2 of this appendix, and 60 is the conversion factor for minutes to hours; otherwise, S_{TOT} is equal to 8,540.1 hours.

If the conventional oven has both inactive mode and off mode, S_{IA} and S_{OM} both equal $S_{TOT}/2$;

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

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

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

4.1.2.4 Total annual energy consumption of a single conventional oven.

4.1.2.4.1 Conventional electric oven energy consumption. Calculate the total annual energy consumption of a conventional electric oven, E_{AO}, expressed in kilowatt-hours (kJ) per year and defined as:

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

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.

4.1.2.4.2 Conventional electric oven integrated energy consumption. Calculate the total integrated annual electrical energy consumption of a conventional electric oven, IE_{AO}, expressed in kilowatt-hours (kJ) per year and defined as:

$IE_{AO} = E_{CO} + E_{SC} + E_{OTLP}$,+ $(E_{OF} \times N_{OE})$,

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.

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_{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.

4.1.2.4.3 Conventional gas oven energy consumption. Calculate the total annual gas energy consumption of a conventional gas oven, E_{AOG}, expressed in Btus (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. If the cooking appliance includes more than one conventional oven, calculate the total annual energy consumption of the conventional ovens 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:

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

is the average annual primary energy consumption for cooking,

and where:

n = number of conventional ovens in the basic model.

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

appendix.

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

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 basic model.

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

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

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 Btus (kJ) per year and defined as:

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

Where:

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

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

Where:

n = number of conventional ovens in the basic model.

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 Btus (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.

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:

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

is the average annual secondary energy consumption for cooking,

Where:

n= number of conventional ovens in the basic model.

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

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

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.

4.1.3 Conventional oven cooking efficiency.

4.1.3.1 Single conventional oven. Calculate the conventional oven cooking efficiency, Eff_{AO}, using the following equations:

For electric ovens:

$$Eff_{AO} = \frac{W_1 \times C_p \times T_S}{E_O \times K_e}$$

and,

For gas ovens:

$$Eff_{AO} = \frac{W_1 \times C_p \times T_S}{E_O + (E_{IO} \times K_e)}$$

Where:

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

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

E_{IO}= electrical test energy consumption according to section 3.2.1 of this appendix or as calculated in section 4.1.1.1 of this appendix.

4.1.3.2 Multiple conventional ovens. If the cooking appliance includes more than one conventional oven, calculate the cooking efficiency for all of the conventional ovens in the appliance, Eff_{TO}, using the following equation:

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

Where:

n= number of conventional ovens in the cooking appliance.

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

4.1.4 Conventional oven energy factor and integrated energy factor.

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:

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

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 Btu/kWh (3,600 kJ/kWh), conversion factor for kilowatt-hours to Btu's.

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:

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

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 Btu/kWh (3,600 kJ/kWh), conversion factor for kilowatt-hours to Btus.

4.2 Conventional cooking top.

4.2.1 Conventional cooking top cooking efficiency.

4.2.1.1 Electric surface unit cooking efficiency. Calculate the cooking efficiency, Eff_{SU}, of the electric surface unit under test, defined as:

$$Eff_{SU} = W \times C_P \times \left(\frac{T_{SU}}{K_e \times E_{CT}} \right),$$

Where:

W= measured weight of test block, W_2 or W_3, expressed in pounds (kg).

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

T_{SU}= temperature rise of the test block: final test block temperature, T_{CT}, as determined in section 3.2.2 of this appendix, minus the initial test block temperature, T_I, expressed in °F (°C) as determined in section 2.7.5 of this appendix.

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

E_{CT}= measured energy consumption, as determined according to section 3.2.2.1 of this appendix, expressed in watt-hours (kJ).

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

$$Eff_{SU} = \left(\frac{W_3 \times C_P \times T_{SU}}{E} \right),$$

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,

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

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.

4.2.1.3 Conventional cooking top cooking efficiency. Calculate the conventional cooking top cooking efficiency, Eff_{CT}, using the following equation:

$$Eff_{CT} = \frac{1}{n}\sum_{i=1}^{n}\left(Eff_{SU}\right)_i$$

Where:

n= number of surface units in the cooking top.

Eff_{SU}= the efficiency of each of the surface units, as determined according to sections 4.2.1.1 or 4.2.1.2 of this appendix.

4.2.2 Conventional cooking top annual energy consumption.

4.2.2.1 Conventional electric cooking top.

4.2.2.1.1 Annual energy consumption of a conventional electric cooking top. Calculate the annual electrical energy consumption of an electric cooking top, E_{CA}, in kilowatt-hours (kJ)

per year, defined as:

$$E_{CA} = \frac{O_{CT}}{Eff_{CT}},$$

Where:

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

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

4.2.2.1.2 Integrated annual energy consumption of a conventional electric cooking top.

Calculate the total integrated annual electrical energy consumption of an electric cooking top, IE_{CA}, in kilowatt-hours (kJ) per year, defined as:

$$IE_{CA} = \frac{O_{CT}}{Eff_{CT}} + E_{CTLP},$$

Where:

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

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

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

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.

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 Btus (kJ) per year, defined as:

$IE_{CA}=E_{CC} + E_{CTSO}$,

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 = $[(P_{IA} \times S_{IA}) + (P_{OM} \times S_{OM})] \times K$,

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.

4.2.3 Conventional cooking top energy factor and integrated energy factor.

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

For an electric cooking top, the energy factor is the same as the cooking efficiency as determined according to section 4.2.1.3 of this appendix.

For gas cooking tops,

$$R_{CT} = \frac{O_{CT}}{E_{CC}},$$

Where:

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

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

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}= 527.6 kBtu (556,618 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.

4.3 Combined components. The annual energy consumption of a kitchen range (e.g., a cooking top and oven combined) shall be the sum of the annual energy consumption of each of its components. The integrated annual energy consumption of a kitchen range shall be the sum of the annual energy consumption of each of its components plus the total annual fan-only mode energy consumption for the oven component, E_{TOF}, defined as:

$E_{TOF} = E_{OF} \times N_R$,

Where,

N_R = representative number of annual conventional oven cooking cycles per year, which is equal to 219 cycles for a conventional electric oven without self-clean capability, 204 cycles for a conventional electric oven with self-clean capability, 183 cycles for a conventional gas oven without self-clean capability, and 197 cycles for a conventional gas oven with self-clean capability,

plus the conventional range integrated annual combined low-power mode energy consumption, E_{RTLP}, defined as:

$E_{RTLP} = [(P_{IA} \times S_{IA}) + (P_{OM} \times S_{OM})] \times K$

Where:

P_{IA} = conventional range inactive mode power, in watts, as measured in section 3.1.3.1 of this appendix.

P_{OM} = conventional range off mode power, in watts, as measured in section 3.1.3.2 of this appendix.

S_{TOT} equals the total number of inactive mode and off mode hours per year;

If the conventional oven component of the conventional range has fan-only mode, S_{TOT} equals (8,329.2 – (t_{OF}/60)) hours, where t_{OF} is the conventional oven fan-only mode duration, in minutes, as measured in section 3.2.1.2 of this appendix, and 60 is the conversion factor for minutes to hours; otherwise, S_{TOT} is equal to 8,329.2 hours.

If the conventional range has both inactive mode and off mode, S_{IA} and S_{OM} both equal S_{TOT}/2;

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

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

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

The annual energy consumption for other combinations of ovens and cooktops will also

be treated as the sum of the annual energy consumption of each of its components. The energy factor of a combined component is the sum of the annual useful cooking energy output of each component divided by the sum of the total annual energy consumption of each component. The integrated energy factor of other combinations of ovens and cooktops is the sum of the annual useful cooking energy output of each component divided by the sum of the total integrated annual energy consumption of each component.

6. Appendix X to subpart B of part 430 is revised to read as follows:

APPENDIX X TO SUBPART B OF PART 430–UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF DEHUMIDIFIERS

Note: The procedures and calculations that refer to standby mode and off mode energy consumption (i.e., sections 3.2, 3.2.1 through 3.2.4, 4.2, 4.2.1 through 4.2.4, 5.1, and 5.2 of this appendix) need not be performed to determine compliance with energy conservation standards for dehumidifiers at this time. However, any representation related to standby mode and off mode energy consumption of these products made after (*date 180 days after date of publication of the test procedure final rule in the* ***Federal Register***) must be based upon results generated under this test procedure, consistent with the requirements of 42 U.S.C. 6293(c)(2). Upon the compliance date for any energy conservation standards that incorporate standby mode and off mode energy consumption, compliance with the applicable provisions of this test procedure will be required.

1. Scope

This appendix covers the test requirements used to measure the energy performance of dehumidifiers.

2. Definitions

a. ANSI/AHAM DH-1 means the test standard published by the American National Standards Institute and the Association of Home Appliance Manufacturers, titled "Dehumidifiers," ANSI/AHAM DH-1-2008, (incorporated by reference; see §430.3).

b. Active mode means a mode in which a dehumidifier is connected to a mains power source, has been activated, and is performing the main functions of removing moisture from air by drawing moist air over a refrigerated coil using a fan, or circulating air through activation of the fan without activation of the refrigeration system.

c. Bucket full/removed mode means a standby mode in which the dehumidifier has automatically powered off its main function by detecting when the water bucket is full or has been removed.

d. Energy factor for dehumidifiers means a measure of energy efficiency of a dehumidifier calculated by dividing the water removed from the air by the energy consumed, measured in liters per kilowatt-hour (L/kWh).

e. IEC 62301 means the test standard published by the International Electrotechnical Commission, titled "Household electrical appliances–Measurement of standby power," Publication 62301 (Edition 2.0 2011-01) (incorporated by reference; see §430.3).

f. Inactive mode means a standby mode that facilitates the activation of active mode by remote switch (including remote control), internal sensor, or timer, or that provides continuous status display.

g. Off mode means a mode in which the dehumidifier is connected to a mains power

source and is not providing any active mode or standby mode function, and where the mode may persist for an indefinite time. An indicator that only shows the user that the dehumidifier is in the off position is included within the classification of an off mode.

h. Off-cycle mode means a standby mode in which the dehumidifier:

(1) Has cycled off its main function by humidistat or humidity sensor;

(2) Does not have its fan or blower operating; and

(3) Will reactivate the main function according to the humidistat or humidity sensor signal.

i. Product capacity for dehumidifiers means a measure of the ability of the dehumidifier to remove moisture from its surrounding atmosphere, measured in pints collected per 24 hours of continuous operation.

j. Standby mode means any modes where the dehumidifier is connected to a mains power source and offers one or more of the following user-oriented or protective functions which may persist for an indefinite time:

(1) To facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, or timer;

(2) Continuous functions, including information or status displays (including clocks) or sensor-based functions. A timer is a continuous clock function (which may or may not be associated with a display) that provides regular scheduled tasks (e.g., switching) and that operates on a continuous basis.

3. Test Apparatus and General Instructions

3.1 Active mode. The test apparatus and instructions for testing dehumidifiers shall conform to the requirements specified in section 3, “Definitions,” section 4, “Instrumentation,”

and section 5, "Test Procedure," of ANSI/AHAM DH-1 (incorporated by reference, see §430.3). Record measurements at the resolution of the test instrumentation. Round off calculations to the same number of significant digits as the previous step. Round the final minimum energy factor value to two decimal places as follows:

(i) A fractional number at or above the midpoint between two consecutive decimal places shall be rounded up to the higher of the two decimal places; or

(ii) A fractional number below the midpoint between two consecutive decimal places shall be rounded down to the lower of the two decimal places.

3.2 Standby mode and off mode.

3.2.1 Installation requirements. For the standby mode and off mode testing, the dehumidifier shall be installed in accordance with section 5.2 of IEC 62301 (incorporated by reference, see §430.3), disregarding the provisions regarding batteries and the determination, classification, and testing of relevant modes.

3.2.2 Electrical energy supply.

3.2.2.1 Electrical supply. For the standby mode and off mode testing, maintain the electrical supply voltage and frequency indicated in section 7.1.3, "Standard Test Voltage," of ANSI/AHAM DH-1, (incorporated by reference, see §430.3). The electrical supply frequency shall be maintained ± 1 percent.

3.2.2.2 Supply voltage waveform. For the standby mode and off mode testing, maintain the electrical supply voltage waveform indicated in section 4, paragraph 4.3.2 of IEC 62301, (incorporated by reference; see §430.3).

3.2.3 Standby mode and off mode watt meter. The watt meter used to measure standby mode and off mode power consumption shall meet the requirements specified in section 4.4 of

IEC 62301 (incorporated by reference, see §430.3).

3.2.4 Standby mode and off mode ambient temperature. For standby mode and off mode testing, maintain room ambient air temperature conditions as specified in section 4.2 of IEC 62301 (incorporated by reference; see §430.3).

4. Test Measurement

4.1 Active mode. Measure the energy factor for dehumidifiers, expressed in liters per kilowatt hour (L/kWh) and product capacity in pints per day (pints/day), in accordance with the test requirements specified in section 7, "Capacity Test and Energy Consumption Test," of ANSI/AHAM DH-1 (incorporated by reference, see §430.3).

4.2 Standby mode and off mode. Establish the testing conditions set forth in section 3.2 of this appendix. For dehumidifiers that take some time to enter a stable state from a higher power state as discussed in section 5.1, Note 1 of IEC 62301, (incorporated by reference; see §430.3), allow sufficient time for the dehumidifier to reach the lower power state before proceeding with the test measurement. Follow the test procedure specified in section 5.3.2 of IEC 62301 for testing in each possible mode as described in sections 4.2.1 through 4.2.4 of this appendix.

4.2.1 If the dehumidifier has an inactive mode, as defined in section 2(f) of this appendix, measure and record the average inactive mode power of the dehumidifier, P_{IA}, in watts.

4.2.2 If the dehumidifier has an off-cycle mode, as defined in section 2(h) of this appendix, measure and record the average off-cycle mode power of the dehumidifier, P_{OC}, in watts.

4.2.3 If the dehumidifier has a bucket full/removed mode, as defined in section 2(c) of

this appendix, measure and record the average bucket full/removed mode power of the dehumidifier, P_{BFR}, in watts.

4.2.4 If the dehumidifier has an off mode, as defined in section 2(g) of this appendix, measure and record the average off mode power, P_{OM}, in watts.

5. Calculation of Derived Results From Test Measurements

5.1 Standby mode and off mode annual energy consumption. Calculate the standby mode and off mode annual energy consumption for dehumidifiers, E_{TSO}, expressed in kilowatt-hours per year, according to the following:

$$E_{TSO} = [(P_{IA} \times S_{IA}) + (P_{OC} \times S_{OC}) + (P_{BFR} \times S_{BFR}) + (P_{OM} \times S_{OM})] \times K$$

Where:

P_{IA} = dehumidifier inactive mode power, in watts, as measured in section 4.2.1 of this appendix.

P_{OC} = dehumidifier off-cycle mode power, in watts, as measured in section 4.2.2 of this appendix.

P_{BFR} = dehumidifier bucket full/removed mode power, in watts, as measured in section 4.2.3 of this appendix.

P_{OM} = dehumidifier off mode power, in watts, as measured in section 4.2.4 of this appendix.

If the dehumidifier has an inactive mode and off-cycle mode but no off mode, the inactive mode annual hours, S_{IA}, is equal to $S_{TOT}/2$; the off-cycle mode annual hours, S_{OC}, is equal to $S_{TOT}/2$; and the off mode annual hours, S_{OM}, is equal to 0;

S_{TOT} equals the total number of inactive mode, off-cycle mode, and off mode hours per year, defined as:

If the dehumidifier has bucket full/removed mode, S_{TOT} equals 3,024 hours;

If the dehumidifier does not have bucket full/removed mode, S_{TOT} equals 3,681 hours;

If the dehumidifier has an inactive mode and off mode but no off-cycle mode, the inactive mode annual hours, S_{IA}, is equal to $S_{TOT}/2$; the off mode annual hours, S_{OM}, is equal to $S_{TOT}/2$; and the off-cycle mode annual hours, S_{OC}, is equal to 0;

If the dehumidifier has an inactive mode but no off-cycle mode or off mode, the inactive mode annual hours, S_{IA}, is equal to S_{TOT}, and the off-cycle mode annual hours, S_{OC}, and the off mode annual hours, S_{OM}, are each equal to 0;

If the dehumidifier has an off-cycle mode and off mode but no inactive mode, the off-cycle mode annual hours, S_{OC}, is equal to $S_{TOT}/2$; the off mode annual hours, S_{OM}, is equal to $S_{TOT}/2$; and the inactive mode annual hours, S_{IA}, is equal to 0;

If the dehumidifier has an off-cycle mode but no off mode or inactive mode, the off-cycle mode annual hours, S_{OC}, is equal to S_{TOT}, and the off mode annual hours, S_{OM}, and the inactive mode annual hours, S_{IA}, are each equal to 0;

If the dehumidifier has an off mode but no inactive mode or off-cycle mode, the off mode annual hours, S_{OM}, is equal to S_{TOT}, and the inactive mode annual hours, S_{IA}, and the off-cycle mode annual hours, S_{OC}, are both equal to 0;

If the dehumidifier has an inactive mode, off-cycle mode, and off mode, the inactive mode annual hours, S_{IA}, is equal to $S_{TOT}/3$; the off-cycle mode annual hours, S_{OC}, is equal to $S_{TOT}/3$; and the off mode annual hours, S_{OM}, is equal to $S_{TOT}/3$;

S_{BFR} = 657, dehumidifier bucket full/removed mode annual hours;

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

5.2 Integrated energy factor. Calculate the integrated energy factor, IEF, expressed in liters per kilowatt-hour, rounded to two decimal places, according to the following:

$IEF = L_W / (E_{active} + ((E_{TSO} \times 24) / S_{active}))$

Where:

L_W = water removed from the air during dehumidifier energy factor test, in liters, as measured in section 4.1 of this appendix.

E_{active} = dehumidifier energy factor test energy consumption, in kilowatt-hours, as measured in section 4.1 of this appendix.

E_{TSO} = standby mode and off mode annual energy consumption, in kilowatt-hours per year, as calculated in section 5.1 of this appendix.

24 = hours per day.

S_{active} = 1,095, dehumidifier active mode annual hours.

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