[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 and Cooking Products

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

ACTION: Supplemental notice of proposed rulemaking.

SUMMARY: The U.S. Department of Energy (DOE) proposes to amend its test procedures for residential dishwashers to update certain obsolete dishware, flatware and food items, make minor amendments to the definition of the normal cycle, and update the ambient temperature and preconditioning requirements as well as the industry test method referenced in DOE's test procedure. DOE also proposes to add water pressure, drain height, rack position, loading, rinse aid container, and soil preparation specifications to the dishwasher test procedure, DOE additionally proposes to amend the test procedures for both dishwashers and conventional cooking products for the measurement of energy use in fan-only mode.

DATES: DOE will accept comments, data, and information regarding this SNOPR submitted no later than [**INSERT DATE 15 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**]. See section IV, "Public Participation," for details.

ADDRESSES: Any comments submitted must identify the SNOPR for Test Procedures for Residential Dishwashers 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 IV for information on how to submit comments through www.regulations.gov.

For further information on how to submit a comment or review other public comments and the docket, contact Ms. Brenda Edwards at (202) 586-2945 or email: Brenda.Edwards@ee.doe.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.

Ms. Elizabeth Kohl, U.S. Department of Energy, Office of the General Counsel, GC-71, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-7796. E-mail: Elizabeth.Kohl@hq.doe.gov.

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.

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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 include residential dishwashers and conventional cooking products,[3] 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))

[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.
[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).

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 test procedures 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 the Secretary of Energy, and not 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))

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's test procedures for conventional ranges, cooktops, and ovens (including microwave ovens, which are considered separately from the conventional cooking products covered in today's rule) are found at 10 CFR 430, subpart B, appendix I. For background on the establishment of the first DOE test procedures for dishwashers and conventional cooking products, subsequent amendments to those procedures, and the rulemaking history for today's supplemental notice of proposed rulemaking (SNOPR), please see the SNOPR issued on May 25, 2012. (77 FR 31444) (May 2012 SNOPR). In today's SNOPR, DOE considers comments received on the dishwasher test procedure in response to the May 2012 SNOPR and during a public meeting held June 1, 2012 (June 2012 Public Meeting). DOE will provide further response to comments received on the May 2012 SNOPR, as appropriate, in any final rule to establish amended test procedures.

II. Discussion

A. Proposals

Obsolete Dishware and Food Items.

In the May 2012 SNOPR, DOE proposed to update obsolete flatware and detergent specifications. DOE has determined that certain additional flatware, dishware, and food items used in the test procedure are also obsolete, or has received comments in this test procedure rulemaking indicating that the items may be obsolete. These items include: the cup and saucer, the bread and butter plate, the fruit bowl, the dinner fork, the salad fork, the teaspoon, the knife, the margarine, and the coffee. In today's SNOPR, DOE proposes to use the items listed in Table I in place of the obsolete or potentially obsolete items. DOE further proposes that use of these items be required 30 days after publication of any final amended test procedures and seeks comment on whether the specified items can be procured in 30 days.

Item	Obsolete or Potentially Obsolete Item	Proposed Item
Cup	8 oz. Ceramic Cup; Corning Comcor®/Corelle® 6014162; alternatively, Arzberg 3824732100	0.20 liter Coffee Cup; Arzberg 2000-00001-4732-1; alternatively, Arzberg 3824732100
Saucer	6 inch Saucer; Corning Comcor®/Corelle® 6010972; alternatively, Arzberg 3824731100	14 cm Saucer; Arzberg 2000-00001-4731-1; alternatively, Arzberg 3824731100
Bread and butter plate	6.75 inch Bread and Butter; Corning Comcor®/Corelle® 6003887; alternatively, Arzberg 8500217100	6.75 inch Bread and Butter; Corning Comcor®/Corelle® 6003887; alternatively, 17 cm Bread and Butter; Arzberg 2000-00001-0217-1
Fruit bowl	10 oz. Dessert Bowl; Corning Comcor®/Corelle® 6003899; alternatively, Arzberg 3820513100	10 oz. Dessert Bowl; Corning Comcor®/Corelle® 6003899; alternatively, Arzberg 38205131001 or Arzberg 2000-00001-0615-1;

Knife	Oneida® Accent 2619KPVF	Table Knife, WMF "Gastro 0800" 12.0803.6047
Dinner Fork	Oneida® Accent 2619FRSF	Dessert Fork, WMF "Signum 1900" 12.1905.6040
Salad Fork	Oneida® Accent 2619FSLF	Cake Fork, WMF "Signum 1900" 12.1964.6040
Teaspoon	Oneida® Accent 2619STSF	Coffee/Tea Spoon", WMF "Signum 1900" 12.1910.6040
Margarine	Fleischmann's corn oil (6 g of fat per 14 g serving) not whipped	Fleischmann's Original stick margarine
Coffee	Folgers, Decaffeinated Drip Grind	Folgers Classic Decaf

Definition of Normal Cycle.

In the May 2012 SNOPR, DOE stated that the current DOE dishwasher test procedure 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 noted that it 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 proposed to clarify 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 sought 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.

In response to the May 2012 SNOPR, commenters suggested that in the absence of a manufacturer recommendation concerning temperature options for the normal cycle, the highest

energy consumption temperature options should be selected. This approach is consistent with the approach taken in DOE's recent rulemaking to amend the test procedure for residential clothes washers (77 FR 13888, Mar. 7, 2012). In that rulemaking, DOE amended part (B) of the definition of energy test cycle to state that where multiple alternative selections offer a wash/rinse temperature selection for which a temperature use factor has been developed and that is not available on the cycle recommended by the manufacturer for washing cotton or linen clothes described in part (A) of the energy test cycle definition, the alternate cycle selection with the highest energy consumption for that TUF must be included in the energy test cycle. For consistency with the approach taken in the clothes washer test procedure rulemaking, and to ensure that the test procedure does not under-estimate the energy use of the dishwasher, DOE proposes in today's SNOPR that in the definition of normal cycle, in the absence of a manufacturer recommendation on temperature options, the highest energy consumption temperature options for washing and drying must be selected.

Ambient Temperature.

DOE proposed in the May 2012 SNOPR to maintain the current room ambient air temperature requirement of 75 degrees Fahrenheit (ºF) ±5 ºF, while allowing greater tolerance on the room air temperature during standby mode and off mode testing in accordance with provisions incorporated by reference from the International Electrotechnical Commission (IEC) Standard 62301, "Household electrical appliances–Measurement of standby power", Edition 2.0 2011-01 (IEC Standard 62301). DOE received comments that the more stringent active mode ambient temperature conditions should apply to all testing, including standby mode and active mode testing performed separately from active mode testing to ensure accurate, repeatable, and

reproducible results. Commenters also stated that the test procedure should clarify that the tolerances specified indicate the allowable limits of variation in temperature, but do not permit the deliberate variation with those limits. Commenters also suggested that DOE tighten the tolerance on the ambient temperature to ± 2 °F, because a 1 °F ambient temperature change can result in a 1.5 kilowatt-hour (kWh) change in estimated annual energy use (EAEU), although the commenters acknowledged that this tighter tolerance could be burdensome for certain manufacturers or laboratories.

In specifying tolerances in its test procedures, DOE provides a range of temperatures under which the test results are considered valid, regardless of the reasons for why a particular temperature within the range was selected or achieved. Therefore, DOE is not proposing to state that the test should be conducted at the nominal center of the ambient temperature range. DOE recognizes the impact of ambient temperature on the active mode measurement, however, and as an alternative to the ±5 °F tolerance previously proposed, DOE proposes to tighten the tolerance to ±2 °F. DOE seeks comment on the capabilities of test laboratories to maintain this tolerance and the burden associated with it. DOE is not proposing in today's SNOPR to require that standby mode and off mode testing be conducted under the same ambient temperature as active mode testing because no data are available to suggest that the standby mode and off mode power of residential dishwashers varies significantly within the allowable ambient temperature range of IEC Standard 62301, and because this approach would increase the burden for those manufacturers or laboratories that choose to conduct standby mode and off mode testing separately from active mode testing.

Preconditioning.

DOE proposed in the May 2012 SNOPR to require that the preconditioning cycle for soil-sensing dishwashers be run using the cycle setting selected for active mode, and that the power supply to the unit be continuously maintained throughout testing, including after the preconditioning cycle and in between all energy test cycles, to maintain calibration of the turbidity sensor. Comments received from manufacturers indicated that certain dishwashers may be designed to self-calibrate in one cycle, but may sometimes require an additional cycle to perform this calibration. In addition, commenters noted that two preconditioning cycles would help to clean out residual dirt from the machine prior to sensor calibration and energy testing. DOE agrees that two preconditioning cycles would ensure a clean unit at the start of testing and proper sensor calibration in soil-sensing dishwashers that may, under certain conditions, not self-calibrate in one cycle. Therefore, in today's SNOPR, DOE proposes two preconditioning cycles, clarifying that the second preconditioning cycle is to be used to determine detergent dosing. DOE seeks comment on the burden associated with requiring an additional preconditioning cycle.

Updated Industry Test Method.

In the May 2012 SNOPR, DOE referenced AHAM's current dishwasher test method, DW-1-2009, in the discussion of its proposal to update obsolete flatware, but did not propose to incorporate that updated test method. In today's SNOPR, DOE proposes to incorporate by reference the updated industry test standard AHAM DW-1-2009, which upon acceptance by ANSI is designated as ANSI/AHAM DW-1-2010, American National Standard, "Household Electric Dishwashers." DOE seeks comment on whether the incorporation of this standard will

affect the measured energy use of dishwashers tested according to DOE's test procedure, and if so the magnitude of that effect. DOE will determine, as a result of these comments, whether to retain the current industry standard or update the standard to ANSI/AHAM DW-1-2010.

Water Pressure.

In the May 2012 SNOPR, DOE proposed that the water supply pressure during testing be maintained at 35 ±2.5 pounds per square in gauge (psig) when the water is flowing. DOE received comments that, for repeatability and reproducibility, the duration of the transient pressure drop when the water supply valve first opens should be minimized. Commenters suggested allowing a maximum time of 2 seconds to ensure that the water is flowing into the dishwasher at the proper pressure during the test. DOE agrees that transient pressure variations should be minimized for reasons of test stability and reproducibility, and, based on commenters indication of laboratory capabilities, proposes to require that proper pressure by achieved within 2 seconds. DOE seeks comment on this requirement, in particular whether this requirement can be reasonably achieved in all laboratories.

Drain Height.

Drain height is not currently specified in the dishwasher test procedure, and DOE received comments that such a specification should be added to reduce testing variability. The commenters recommended that the drain height should be specified according to the manufacturer's installation instructions. In the absence of such instructions, a drain height of 20 inches would be specified, which according to the commenters is a standard height. DOE agrees that the use of manufacturer's instructions for drain height, or a standard height in the absence of

such information, would improve reproducibility of the test and is proposing in today's SNOPR corresponding amendments to the dishwasher test procedure, including a standard drain height of 20 inches. DOE seeks comment and information on the standard drain height, and may adjust the value accordingly.

Rack Position and Loading.

Commenters on the May 2012 SNOPR noted that the dishwasher test procedure does not specify an upper rack position or where the soiled dishes are placed on the racks, and recommended adjusting the rack position and loading the soiled dishware according to the manufacturer's recommendation. DOE concludes that such clarifications would improve test repeatability and reproducibility, and proposes such amendments to the dishwasher test procedure in today's SNOPR. DOE seeks comment on this proposal.

Rinse Aid Container.

The dishwasher test procedure precludes the use of rinse aid during testing, including preconditioning. DOE was notified by commenters that some laboratories may be filling the rinse aid container in certain dishwashers with water during testing to prevent the energy consumption of an indicator light that is energized when the rinse aid level is low. However, as one commenter noted, the thermal mass of the water in the rinse aid container would necessitate additional water heating energy during the test. For consistency in testing, therefore, DOE clarifies in today's SNOPR that the rinse aid container should not be filled with water for energy testing. DOE welcomes comment on this proposal.

Soil Preparation.

DOE received comments on the May 2012 SNOPR stating that DOE should clarify in the dishwasher test procedure the length of time that soils may sit before they are applied to the dishware to prevent stiffening and settling. DOE therefore proposes in today's SNOPR that the test procedure require the potatoes be used within 30 minutes of preparation and the reconstituted milk be allowed to be stored for use over the course of 1 day, as recommended by commenters. DOE's proposal includes provisions for reconstituting the milk. DOE also proposes to adopt the commenters' recommendation that the 1-pound packages of ground beef shall be stored frozen for no more than 6 months.

Fan-Only Mode Energy Use.

In the May 2012 SNOPR, DOE proposed a test method to measure the energy use of dishwashers and cooking products in fan-only mode. DOE received comments on the May 2012 SNOPR stating that fan-only mode energy use should be measured only if it is not a user-selectable item. Commenters also indicated that DOE's proposal for measuring the energy use of fan-only mode at the end of each test cycle would create a considerable test burden. In response to these comments, DOE continues to consider the approach set forth in the May 2012 SNOPR but is also considering an alternative approach. Under this approach, the energy use of fan-only mode would be measured only if it is not a user-selectable item. DOE understands that this change will not significantly alter the May 2012 proposal because fan-only mode is almost always not a user-selectable item. For cooking products, fan-only mode runs automatically for safety reasons, and for dishwashers, DOE understands that fan-only mode energy use is not typically selected independently but would be a function of the drying option selected as part of the test cycle. Also under the alternative approach, the energy use of fan-only mode would be

measured for a brief time period, such as 10 minutes, and then extrapolated over the length of the entire fan-only mode cycle, which DOE research suggested may range from 10 minutes to several hours for both dishwashers and conventional ovens. To adopt this alternative approach, however, DOE would need additional, representative data on the length of these cycle times, so that the extrapolation provides an accurate measurement of the energy use during the fan-only mode cycle. DOE therefore seeks representative data on the length of the fan-only mode cycle for dishwashers and conventional cooking products. In the absence of such data, DOE may adopt the proposal set forth in the May 2012 SNOPR.

Technical Correction.

In the May 2012 SNOPR, DOE inadvertently proposed in section 4.4.2 of the dishwasher test procedure language that refers to section 1.11 of the test procedure. DOE corrects that proposal in today's SNOPR to properly refer to section 1.13.

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 and May 2012 SNOPRs, 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)), the September 2011 SNOPR (76 FR 58346 (Sept. 20, 2011)), and the May 2012 SNOPR (77 FR 31444 (May 25, 2012)).

B. Compliance with Other EPCA Requirements

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

For the reasons stated in the December 2010 NOPR and September 2011 and May 2012 SNOPRs, 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 because the substituted items replace items that DOE determined to obsolete, or has received comments in this test procedure rulemaking process that the items are obsolete. The replacement items are intended to be inexpensive, representative of commonly-found items, and in some cases already used by manufacturers in testing dishwashers. In addition, DOE is proposing a definition of normal cycle for dishwashers supported by manufacturers because it will lead to consistent, representative results. The updated industry test method for dishwashers was also supported by manufactures because it will lead to, among other things, reduced test variation, as would the proposals for consistent preparation time for the soils used in the test procedure, the positioning of the dishwasher rack during testing, the method of loading, the tighter tolerances on ambient temperature, the added specifications for water pressure measurement and drain height, and the clarifications for the rinse aid container. Finally, DOE is proposing an alternative method of measuring the energy use in fan-only mode for

dishwashers and cooking products that could significantly decrease overall testing time.

III. 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 and May 2012 SNOPRs remain unchanged for this SNOPR. These determinations are set forth in the December 2010 NOPR (75 FR 75290, 75317–19 (Dec. 2, 2010)), the September 2011 SNOPR (76 FR 58346, 58355 (Sept. 20, 2011)), and the May 2012 SNOPR (77 FR 31444, May 25, 2012). 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.

DOE surveyed the AHAM member directory to identify manufacturers of residential dishwashers 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 no small businesses that manufacture dishwashers and two small businesses that manufacture conventional cooking

products. Only one provision of today's supplemental proposal would affect manufacturers of conventional cooking products, the alternative proposal to measure the energy use in fan-only mode. Under today's supplemental proposal, that energy use would not be measured at the end of each test cycle. Rather, the energy use in fan-only mode would be measured for a brief period, such as 10 minutes, and then extrapolated over the duration of the entire cycle. This proposal could significantly decrease the test burden for manufacturers of conventional cooking products.

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 updates to the certification that are set forth above.

IV. Public Participation

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).

V. 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, Buildings and facilities, Business and industry, Energy conservation, Grant programs-energy, Housing, Reporting and recordkeeping requirements, Technical assistance.

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 July 24, 2012.

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 by:

a. Redesignating paragraphs (g)(1) through (g)(5) as (g)(2) through (g)(6);

b. Adding paragraph (g)(1);

c. Revising newly redesginated paragraph (g)(2); and

d. Adding paragraph (l)(2).

The additions and revisions read as follows:

§ 430.3 Materials incorporated by reference.

* * * * *

(g) * * *

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

(2) ANSI/AHAM DW-1-2010, American National Standard, Household Electric Dishwashers, approved September 10, 2010, IBR approved for Appendix C to subpart B and § 430.32.

* * * * *

(l) * * *

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

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

(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 (1)(iii)(A) should calculate EAEU pursuant to paragraph (2)(i)(A). Manufacturers calculating EAOC pursuant to paragraphs

(1)(iii)(B) should calculate EAEU pursuant to paragraph (2)(i)(B). Manufacturers calculating EAOC pursuant to paragraph (1)(iii)(C) should calculate EAEU pursuant to paragraph (2)(ii)(A). Manufacturers calculating EAOC pursuant to paragraph (1)(iii)(D) should calculate EAEU pursuant to paragraph (2)(ii)(B).

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

(1)(i)(B), (1)(ii)(B), or (1)(ii)(B), 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 (2)(ii)(A) should calculate EAOC pursuant to paragraph (1)(i)(C), (1)(ii)(C), or (1)(iii)(C), as appropriate. Manufacturers calculating EAEU pursuant to paragraph (2)(ii)(B) should calculate EAOC pursuant to paragraph (1)(i)(D), (1)(ii)(D), or (1)(iii)(D), 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 (3)(i) should calculate EAOC as described in paragraph (1)(i)(A), (1)(i)(C), (1)(ii)(A), (1)(ii)(C), (1)(iii)(A), or (1)(iii)(C), as appropriate. Manufacturers calculating water consumption pursuant to paragraph (3)(i) should calculate EAUE as described in paragraph (2)(i)(A) or (2)(ii)(A), 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 (3)(iii) should calculate EAOC as described in paragraph (1)(i)(B), (1)(i)(D), (1)(ii)(B), (1)(ii)(D), (1)(iii)(B), or (1)(iii)(D), as appropriate. Manufacturers calculating water consumption pursuant to paragraph (3)(i) should calculate EAUE as described in paragraph (2)(i)(B) or (2)(ii)(B), 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 C) 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 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 Combined low-power mode means the aggregate of available modes other than active mode.

1.4 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.

1.5 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 that is not user-selectable, and 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. In the absence of a manufacturer recommendation on washing and drying temperature options, the highest energy consumption options must be selected.

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 any 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, including drain height. If the manufacture does not provide instructions for a specific drain height, the drain height shall be 20 inches. The racks shall be positioned according to the manufacturer recommendation for washing a full load of normally soiled dishes, and the

rinse aid container shall remain empty. 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, Paragraph 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, Paragraph 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. The pressure shall be achieved within 2 seconds of opening the water supply valve.

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 ±2 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, Paragraph 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 sections 5.3 through 5.7 of ANSI/AHAM DW–1 (incorporated by reference, see § 430.3) and as additionally specified in section 2.7.5 of this Appendix, while the remaining place settings, serving pieces, and all flatware are not soiled. The test load is to be loaded in the dishwasher according to section 5.8 of

ANSI/AHAM DW–1.

(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 sections 5.3 through 5.7 of ANSI/AHAM DW–1 and as additionally specified in section 2.7.5 of this Appendix, while the remaining place settings, serving pieces, and all flatware are not soiled. The test load is to be loaded in the dishwasher according to section 5.8 of ANSI/AHAM DW–1.

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 sections 5.3 through 5.7 of ANSI/AHAM DW–1 (incorporated by reference, see § 430.3) and as additionally specified in section 2.7.5 of this Appendix, while the remaining place settings, serving pieces, and all flatware are not soiled. The test load is to be loaded in the dishwasher according to section 5.8 of ANSI/AHAM DW–1.

(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 sections 5.3 through 5.7 of ANSI/AHAM DW–1 and as additionally specified in section 2.7.5 of this Appendix, while the remaining place settings, serving pieces, and all flatware are not soiled. The test load is to be loaded in the dishwasher according to section 5.8 of ANSI/AHAM DW–1.

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 sections 5.3 through 5.7 of ANSI/AHAM DW–1 (incorporated by reference, see § 430.3) and as additionally specified in section 2.7.5 of this Appendix, while the remaining place settings, serving pieces, and all flatware are not soiled. The test load is to be loaded in the dishwasher according to section 5.8 of ANSI/AHAM DW–1.

(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 sections 5.3 through 5.7 of ANSI/AHAM DW–1 and as additionally specified in section 2.7.5 of this Appendix, while the remaining place settings, serving pieces, and all flatware are not soiled. The test load is to be loaded in the dishwasher according to section 5.8 of ANSI/AHAM DW–1.

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.....	2000-00001-0217-1
Fruit Bowl.....	Corning Comcor®/Corelle®....	10 oz. Dessert Bowl	6003899	Arzberg Arzberg.....	3820513100 2000-00001-0615-1
Cup	Arzberg	0.20 liter Coffee Cup	2000-00001-4732-1	Arzberg.....	3824732100
Saucer	Arzberg	14 cm Saucer	2000-00001-4731-1	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.

2.7.4 Soils. The soils shall be as specified in section 5.4 of ANSI/AHAM DW–1

(incorporated by reference, see § 430.3), except for the following substitutions.

2.7.4.1 Margarine. The margarine shall be Fleischmann's Original stick margarine.

2.7.4.2 Coffee. The coffee shall be Folgers Classic Decaf.

2.7.5 Soil Preparation. Soils shall be prepared according to section 5.5 of ANSI/AHAM DW–1 (incorporated by reference, see § 430.3), with the following additional specifications.

2.7.5.1 Milk. The nonfat dry milk shall be reconstituted with water according by mixing 2/3 cup of nonfat dry milk with 2 cups of water until well mixed. The reconstituted milk may be stored for use over the course of 1 day.

2.7.5.2 Instant mashed potatoes. The potato mixture shall be applied within 30 minutes of preparation.

2.7.5.3 Ground beef. The 1-pound packages of ground beef shall be stored frozen for no more than 6 months.

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 twice by establishing the testing conditions set forth in sections 2.1 through 2.5 of this Appendix. For each preconditioning, set the dishwasher to the preconditioning cycle as defined in section 1.15 of this Appendix, without using a test load, and initiate the cycle. During the second preconditioning, 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

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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, Paragraph 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 in fan-only mode, by measuring the watt-hours consumed for a period of 10 minutes in fan-only mode, using a watt-hour meter as specified in section 3.5 of this Appendix. Multiply that value by [the number of minutes spent in fan-only mode, L_F] and divide by 10,000.

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, Paragraph 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, Paragraph 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 1.13 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 <u>Dishwashers that operate with a nominal inlet water temperature of 120 °F</u>.

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 <u>Dishwashers that operate with a nominal 120 °F inlet water temperature, only</u>.

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 $[H – (N\times(L + L_F))]$ 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. Deleting section 2.9.2.2;

    d. In section 3. Test Methods and Measurements, by:

1. Revising sections 3.1.1, 3.1.1.1, 3.1.1.2, 3.1.2, and 3.1.2.1;
2. Adding new sections 3.1.1.2.1, 3.1.1.2.2, 3.1.2.1.1, and 3.1.2.1.2;
4. Redesignating sections 3.1.3 and 3.1.3.1 as 3.1.4 and 3.1.4.1 and revising newly redesignated section 3.1.4.1;
5. Adding new sections 3.1.3, 3.1.3.1, 3.1.3.2, and 3.1.3.3;
6. Revising sections 3.2.1, 3.2.1.1, 3.2.1.2, 3.2.1.3, and 3.2.1.4;
7. Revising section 3.2.2 and 3.2.2.1 and adding new section 3.2.2.2;
8. Redesignating section 3.2.3 as 3.2.4 and revising newly redesignated section 3.2.4;
9. Adding new section 3.2.3;
10. Revising sections 3.3.7 through 3.3.11; and
11. Deleting sections 3.3.12 and 3.3.13;

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

1. Revising sections 4.1.1 and 4.1.1.1;
2. Deleting section 4.1.2.2;
3. Redesignating sections 4.1.2.3, 4.1.2.3.1, 4.1.2.3.2, 4.1.2.4, 4.2.1.5, 4.1.2.5.1, 4.1.2.5.2, 4.1.2.6, 4.1.2.6.1, and 4.1.2.6.2 as 4.1.2.2, 4.1.2.2.1, 4.1.2.2.2, 4.1.2.3, 4.1.2.4, 4.1.2.4.1, 4.1.2.4.3, 4.1.2.5, 4.1.2.5.1, and 4.1.2.5.3;
4. Revising newly designated section 4.1.2.2.1, 4.1.2.2.2, 4.1.2.3, 4.1.2.4.1, 4.1.2.4.3, 4.1.2.5.1, and 4.1.2.5.3;
5. Adding new sections 4.1.2.4.2 and 4.1.2.5.2;
6. Revising section 4.1.4;

7. Adding new sections 4.1.4.1 and 4.1.4.2;

8. Revising sections 4.2.1.1 and 4.2.1.2;

9. Revising section 4.2.2.1;

10. Adding new sections 4.2.2.1.1 and 4.2.2.1.2;

11. Revising section 4.2.2.2.2;

12. Deleting section 4.2.2.2.3;

13. Revising section 4.2.3;

14. Adding new sections 4.2.3.1 and 4.2.3.2; and

15. Revising section 4.3.

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 that is not user-selectable and 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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

* * * * *

3.1.1 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 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 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, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3), allow sufficient time for the conventional oven to reach the lower power state before proceeding with the test measurement. Follow the test procedure as specified in Section 5, Paragraph 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as described in 3.1.1.2.1 and 3.1.1.2.2. 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, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power

approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 10 minutes +0/-2 sec after an additional stabilization period until the clock time reaches 3:33; or (2) at any starting clock time, allow a stabilization period as described in Section 5, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 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 and described in section 2.6 of this Appendix. Set the test block in the center of the surface unit under test. The small test block, W_2, shall be used on electric surface units of 7 inches (178 mm) or less in diameter. The large test block, W_3, shall be used on electric surface units over 7 inches (178 mm) in diameter and on all gas surface units. Turn on the

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

3.1.2.1 Conventional cooking top standby mode and off mode power. Establish the standby mode and off mode testing conditions set forth in section 2, Test Conditions, of this Appendix. For conventional cooktops that take some time to enter a stable state from a higher power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3), allow sufficient time for the conventional cooking top to reach the lower power state before proceeding with the test measurement. Follow the test procedure as specified in Section 5, Paragraph 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as described in sections 3.1.2.1.1 and 3.1.2.1.2 of this Appendix. For units in which power varies as a function of displayed time in standby mode, either: (1) set the clock time to 3:23 at the end of the stabilization period specified in Section 5, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 10 minutes +0/-2 sec after an additional stabilization period until the clock time reaches 3:33; or (2) at any starting clock time, allow a stabilization period as described in Section 5, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 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, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3), allow sufficient time for the conventional range to reach the lower power state before proceeding with the test measurement. Follow the test procedure as specified in Section 5, Paragraph 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as described in sections 3.1.3.1 and 3.1.3.2 of this Appendix. For units in which power varies as a function of displayed time in standby mode, either: (1) set the clock time to 3:23 at the end of the stabilization period specified in Section 5, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with a single test period of 10 minutes +0/-2 sec after an additional stabilization period until the clock time reaches 3:33; or (2) at any starting clock time, allow a stabilization period as described in Section 5, Paragraph 5.3 of IEC 62301 (First Edition), and use the average power approach described in Section 5, Paragraph 5.3.2(a) of IEC 62301 (First Edition), but with

a single test period of 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, Paragraph 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, Paragraph 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, Paragraph 5.3.2(a), 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.

* * * * *

3.2.1 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 a period of 10 minutes, using a watt-hour meter as specified in section 2.9.1.1 of this Appendix. Multiply this value by [the time in minutes that the conventional oven remains in fan-only mode, t_{OF}] and divide by 10.

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, Paragraph 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.

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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

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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 section 2.2.2.2 and section 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 <u>Average test energy consumption.</u> 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.

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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.

* * * * *

4.1.2.4.1 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.

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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.

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

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:

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

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.

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

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 <u>Conventional gas oven energy consumption.</u> 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:

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

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:

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

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.

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.

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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:

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

Where:

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

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

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.

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4.2.1.1 <u>Electric surface unit cooking efficiency.</u> 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.

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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 X) 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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, Paragraph 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 <u>Integrated energy factor.</u> 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.