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[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 430

EERE-2016-BT-TP-0012

RIN 1904-AD96

Energy Conservation Program: Test Procedure for Dishwashers

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

ACTION: Notice of proposed rulemaking and request for comment.

SUMMARY: The U.S. Department of Energy (“DOE”) proposes to amend the test procedures for dishwashers at appendix C1, adopt a new test procedure at appendix C2, incorporate by reference newly published Association of Home Appliance Manufacturers (“AHAM”) standards – AHAM DW-1-2020 and DW-2-2020 –, and apply certain provisions of the industry standards to appendices C1 and C2. The proposed amendments to appendix C1 would establish requirements for water hardness, relative humidity, and loading pattern; update requirements for ambient temperature, detergent dosage, and standby power measurement; include testing approaches from recently published waivers for dishwashers; and include provisions for a minimum cleaning index threshold to validate the selected test cycle. The proposed appendix C2 would additionally include updated annual number of cycles and low-power mode hours for the

calculation of energy consumption. DOE is seeking comments from interested parties on the proposal.

DATES: *Meeting:* DOE will hold a webinar on Thursday, February 3, 2022, from 12:30 p.m. to 4:30 p.m. See Section V, “Public Participation,” for webinar registration information, participant instructions, and information about the capabilities available to webinar participants. If no participants register for the webinar, it will be cancelled.

Comments: DOE will accept comments, data, and information regarding this proposal no later than **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. See Section V, “Public Participation,” for details.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov*. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE-2016-BT-TP-0012, by any of the following methods:

1. *Federal eRulemaking Portal:* *www.regulations.gov*. Follow the instructions for submitting comments.
2. *Email:* *ResDishwasher2016TP0012@ee.doe.gov*. Include docket number EERE-2016-BT-TP-0012 and/or RIN number 1904-AD96 in the subject line of the message.

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.

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

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

The docket web page can be found at www.regulations.gov/docket?D=EERE-2016-BT-TP-0012. The docket web page contains instructions on how to access all documents, including public comments, in the docket. See Section V of this document for information on how to submit comments through www.regulations.gov.

FOR FURTHER INFORMATION CONTACT:

Mr. Bryan Berringer, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-0371. E-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

Ms. Amelia Whiting, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-2588. E-mail: *Amelia.Whiting@hq.doe.gov*.

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

SUPPLEMENTARY INFORMATION:

DOE proposes to maintain a previously approved incorporation by reference and to incorporate by reference the following additional industry standards into part 430:

ANSI/AHAM DW-1-2020, (“AHAM DW-1-2020”), “Uniform Test Method for Measuring the Energy Consumption of Dishwashers,” approved October 2020.

AHAM DW-2-2020, (“AHAM DW-2-2020”), “Household Electric Dishwashers,” approved 2020.

Copies of AHAM DW-1-2020 and AHAM DW-2-2020 can be obtained from AHAM at 1111 19th Street NW, Suite 402, Washington, DC 20036; or by going to AHAM's online store at www.aham.org/AHAM/AuxStore.

IEC 62301 ("IEC 62301 Ed. 2.0"), Household electrical appliances—
Measurement of standby power, (Edition 2.0, 2011-01).

A copy of IEC 62301 Ed. 2.0 can be obtained from the International Electrotechnical Commission, available from the American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, (212) 642-4900, or go to webstore.ansi.org.

For a further discussion of these standards, see Section IV.M of this document.

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I. Authority and Background

Dishwashers are included in the list of “covered products” for which DOE is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6292(a)(6)) DOE’s test procedures for dishwashers are currently prescribed at 10 CFR 430.23(c) and appendix C1 to subpart B of part 430 (“appendix C1”). The following sections discuss DOE’s authority to establish test procedures for dishwashers and relevant background information regarding DOE’s consideration of test procedures for this product.

A. Authority

The Energy Policy and Conservation Act, as amended (“EPCA”),¹ authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B² of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles, which sets forth a variety of provisions designed to improve energy efficiency. These products include dishwashers, the subject of this document. (42 U.S.C. 6292(a)(6))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification

¹ All references to EPCA in this NOPR refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020).

² For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

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

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

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 requires that any test procedures prescribed or amended under this section be reasonably designed to produce test results which measure energy efficiency, energy use or

estimated annual operating cost of a covered product during a representative average use cycle or period of use and not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including dishwashers, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A))

If the Secretary determines, on her own behalf or in response to a petition by any interested person, that a test procedure should be prescribed or amended, the Secretary shall promptly publish in the *Federal Register* proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such procedures. The comment period on a proposed rule to amend a test procedure shall be at least 60 days and may not exceed 270 days. In prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved. (42 U.S.C. 6293(b)(2)) If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. DOE is publishing this notice of proposed rulemaking (“NOPR”) in satisfaction of its requirements under EPCA. (42 U.S.C. 6293(b)(1)(A))

In addition, EPCA requires that DOE amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption. (42 U.S.C. 6295(gg)(2)(A)) Standby mode and off mode energy consumption must be incorporated into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product unless the current test procedures already account for and incorporate standby and off mode energy consumption or such integration is technically infeasible. If an integrated test procedure is technically infeasible, DOE must prescribe a separate standby mode and off mode energy use test procedure for the covered product, if technically feasible. (42 U.S.C. 6295(gg)(2)(A)(ii)) Any such amendment must consider the most current versions of the International Electrotechnical Commission (“IEC”) Standard 62301³ and IEC Standard 62087⁴ as applicable. (42 U.S.C. 6295(gg)(2)(A))

B. Background

DOE most recently amended its dishwasher test procedures in a final rule published October 31, 2012 that established a new test procedure at appendix C1. 77 FR 65942 (“October 2012 final rule”). (For additional information on the history of test procedure rulemaking for dishwashers, please see the October 2012 final rule.) Appendix C1 follows the same general procedures as those included in the previously established appendix (*i.e.*, “appendix C”), with updates to: (1) revise the provisions for measuring energy consumption in standby mode or off mode; (2) add requirements for dishwashers

³ IEC 62301, *Household electrical appliances—Measurement of standby power* (Edition 2.0, 2011-01).

⁴ IEC 62087, *Methods of measurement for the power consumption of audio, video, and related equipment* (Edition 3.0, 2011-04).

with water softeners to account for regeneration cycles; (3) require an additional preconditioning cycle; (4) include clarifications regarding certain definitions, test conditions, and test setup; and (5) replace obsolete test load items and soils. 77 FR 65942, 65982–65987. Appendix C1 is currently required to demonstrate compliance with DOE’s energy conservation standards for dishwashers at 10 CFR 430.32(f).

The current version of the DOE test procedure includes provisions for determining estimated annual energy use (“EAEU”) in kilowatt-hours per year (“kWh/year”), estimated annual operating cost (“EAOC”) in dollars per year, and water consumption in gallons per cycle (“gal/cycle”). (10 CFR 430.23(c)) On December 13, 2016, DOE published a final determination (“December 2016 Final Determination”) regarding the energy conservation standards for dishwashers in which DOE removed appendix C, which was applicable only to dishwashers manufactured before May 30, 2013. *See* 81 FR 90072, 90073.

On August 20, 2019, DOE published a request for information (“August 2019 RFI”) seeking comments on the existing test procedure for dishwashers. 84 FR 43071. In the August 2019 RFI, DOE requested comments, information, and data about a number of issues, including: cycle selections, cycle options, test load items, soils, annual number of cycles, loading pattern, detergent, rinse aid, water hardness, standby testing, room ambient conditions, incorporating requirements from existing waivers for testing dishwashers, repeatability and reproducibility of the test procedure, and efficiency metrics. *Id.*

DOE received comments in response to the August 2019 RFI from the interested parties listed in Table I-1.⁵

Table I-1 August 2019 RFI Written Comments

Commenter(s)	Reference in this NOPR	Commenter Type
Appliance Standards Awareness Project, American Council for an Energy-Efficient Economy, Alliance to Save Energy, and Natural Resources Defense Council, Northwest Energy Efficiency Alliance, Consumer Federation of America, National Consumer Law Center on behalf of its low-income clients	Joint Commenters	Efficiency Organizations
Association of Home Appliance Manufacturers ⁶	AHAM	Trade Association
California Energy Commission (“CEC”)	CEC	State Agency
GE Appliances, a Haier company (“GEA”)	GEA	Manufacturer
Pacific Gas and Electric Company (“PG&E”), San Diego Gas and Electric, and Southern California Edison	California Investor Owned Utilities (“CAIOUs”)	Utility Association
Samsung Electronics America	Samsung	Manufacturer
Whirlpool Corporation	Whirlpool	Manufacturer
Anonymous	Anonymous	Individual

On October 30, 2020, DOE published a final rule (“October 2020 Final Rule”) establishing a separate product class for standard size dishwashers with a cycle time for

⁵ The parenthetical reference provides a reference for information located in the docket of DOE’s rulemaking to develop test procedures for dishwashers (Docket NO. EERE-2016-BT-TP-0012, which is maintained at www.regulations.gov). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

⁶ DOE notes that AHAM submitted an additional comment following close of the comment period in which it encouraged DOE to adopt the updated AHAM test procedure for dishwashers. (AHAM, No. 11)

the “normal” cycle of less than one hour (*i.e.*, 60 minutes) from washing through drying. 85 FR 68723. The definition for the new product class of standard size dishwashers with a “normal” cycle time of 60 minutes or less defines “normal” cycle time by reference to Section 1.12 of appendix C1. 10 CFR 430.32(f)(1)(iii). On August 11, 2021, DOE published a NOPR (“August 2021 NOPR”) proposing to revoke the final rule that established the new product class for dishwashers. 86 FR 43970. The new product class definition, as well as the previously established definitions for standard size dishwasher and compact dishwasher, incorporate by reference American National Standards Institute (“ANSI”) ANSI/AHAM DW-1-2010 for specifying the place settings used to distinguish between “standard” and “compact.” 10 CFR 430.32(f)(1)(i)–(iii).

II. Synopsis of the Notice of Proposed Rulemaking

Currently, DOE incorporates by reference into 10 CFR part 430 the 2010 edition of AHAM DW-1, “Household Electric Dishwashers” (“ANSI/AHAM DW-1-2010”) and applies certain provisions of the standard to appendix C1. AHAM most recently updated AHAM DW-1 with the release of the 2020 edition and also renumbered the standard as AHAM DW-2 (“AHAM DW-2-2020”). AHAM also published the new standard AHAM DW-1-2020, “Uniform Test Method for Measuring the Energy Consumption of Dishwashers” (“AHAM DW-1-2020”), which is consistent with the existing DOE test procedure in appendix C1, including referencing AHAM DW-2-2020 for the provisions where appendix C1 currently references ANSI/AHAM DW-1-2010. Several provisions in AHAM DW-1-2020 provide updates and additions as compared to the existing requirements in appendix C1.

In this NOPR, DOE proposes to incorporate by reference into 10 CFR part 430 the new industry standard, AHAM DW-1-2020, and update the industry standard incorporated by reference in 10 CFR part 430 from ANSI/AHAM DW-1-2010 to AHAM DW-2-2020. Specifically, DOE proposes to:

- 1) Incorporate by reference AHAM DW-1-2020 into 10 CFR part 430 and apply certain provisions of the industry standards to appendix C1, including the following:
 - a. Add the water hardness specification in Section 2.11 of AHAM DW-1-2020;
 - b. Add the relative humidity specification in Section 2.5.1 of AHAM DW-1-2020 and the associated tolerance for the measurement instrument in Section 3.7 of AHAM DW-1-2020;
 - c. Update the active mode ambient temperature as specified in Section 2.5.1 of AHAM DW-1-2020;
 - d. Update the loading pattern requirement by applying the direction specified in Section 2.6 of AHAM DW-1-2020;
 - e. Update the specifications for detergent usage consistent with Section 2.10 of AHAM DW-1-2020. This includes changing the

type of detergent used, and the calculation of detergent dosage to be used for the pre-wash and main-wash cycles of dishwashers other than water re-use system dishwashers;

- f. Add specific dishwasher door configuration requirements during standby mode testing, by incorporating the specifications in Section 4.2 of AHAM DW-1-2020 and update the annual combined low-power mode hours based on cycle duration; and,
- g. Incorporate the requirements from AHAM DW-1-2020 for the test methods pertaining to two granted waivers for dishwashers with specific design features.

2) Establish new appendix C2, which would generally require testing as in appendix C1, with the following additional update:

- a. Updated number of annual cycles and low-power mode hours used for calculating the estimated annual energy use as specified in Section 5 of AHAM DW-1-2020.

For both appendix C1 and proposed new appendix C2, DOE additionally proposes to:

- 1) Specify provisions for scoring the test load and calculating a per-cycle cleaning index metric as specified in AHAM DW-2-2020 and establish a minimum cleaning index threshold of 65 as a condition for a test cycle to be valid.

- 2) Incorporate the test methods specified in a waiver for testing a basic model of dishwashers that does not hook up to a water supply line, but has a manually filled, built-in water tank. Additionally, incorporate the test methods specified in a waiver for basic models of dishwashers that are installed in-sink (as opposed to built-in to the cabinetry or placed on countertops).

DOE’s proposed actions are summarized in Table II-1 compared to the current test procedure, as well as the reason for the proposed change.

Table II-1 Summary of Changes in Proposed Test Procedure Relative to Current Test Procedure

Current DOE Test Procedure	Proposed Test Procedure	Applicable Test Procedure	Attribution
References provisions of ANSI/AHAM DW-1-2010 for some aspects of the test procedure.	References provisions of AHAM DW-1-2020 newly incorporated into 10 CFR part 430, with limited modifications.	Appendix C1 and appendix C2	Harmonize with industry standard and practice.
Does not specify a water hardness requirement.	Adds water hardness requirement to be consistent with AHAM DW-1-2020, which is 0 to 85 parts per million of calcium carbonate.	Appendix C1 and appendix C2	Harmonize with industry standard and practice.
Does not specify any range for relative humidity.	Specifies the relative humidity (“RH”) requirement from AHAM DW-1-2020,	Appendix C1 and appendix C2	Harmonize with industry standard and practice.

Current DOE Test Procedure	Proposed Test Procedure	Applicable Test Procedure	Attribution
	which is 35 percent $\pm$ 15 percent.		
Does not specify any instrumentation for measuring relative humidity.	References the instrumentation requirements for measuring relative humidity from AHAM DW-1-2020.	Appendix C1 and appendix C2	Harmonize with industry standard and practice.
Specifies that the ambient temperature must be maintained at 75° $\pm$ 5° F.	References the ambient temperature requirement from AHAM DW-1-2020, including maintaining it at a target temperature of 75° F.	Appendix C1 and appendix C2	Harmonize with industry standard and practice.
Does not specify a loading pattern.	References the loading pattern from AHAM DW-1-2020, which specifies the same loading requirements as the ENERGY STAR Cleaning Performance Test Method.	Appendix C1 and appendix C2	Harmonize with industry standard and practice.
References the detergent type and detergent dosing requirements from ANSI/AHAM DW-1-2010, which specifies Cascade with the Grease Fighting Power of Dawn as the detergent and dosing requirements based on water volumes in the prewash and main wash cycles.	References the detergent type and detergent dosing requirements from AHAM DW-1-2020, which specifies Cascade Complete Powder detergent and dosing requirements based on number of place settings.	Appendix C1 and appendix C2	Harmonize with industry standard and practice.
Uses 215 annual cycles for calculating annual energy use.	Reduces the annual number of cycles to 184 for calculating annual energy use.	Appendix C2	Harmonize with industry standard and practice.
Does not specify whether the dishwasher door should be open or closed during standby mode testing.	References the requirement from AHAM DW-1-2020, which specifies that the door must be opened at the end of an active cycle and closed immediately prior to standby power measurement.	Appendix C1 and appendix C2	Harmonize with industry standard and practice.
Uses 8,465 hours to calculate combined low-power mode energy consumption for dishwashers that do not have a fan-only mode.	References the requirement from AHAM DW-1-2020 to use the measured cycle duration to calculate	Appendix C2	Harmonize with industry standard and practice.

Current DOE Test Procedure	Proposed Test Procedure	Applicable Test Procedure	Attribution
	combined low-power mode hours.		
Does not include a method to test dishwashers operating on 208-volt power supply.	Includes a method to test dishwashers intended for a 208-volt power supply, which is also included in AHAM DW-1-2020.	Appendix C1 and appendix C2	Response to waiver and harmonize with industry standard and practice.
Does not include a method to test dishwashers with a water re-use system that uses water recovered from prior use.	Specifies the test method for dishwashers with a water re-use system from AHAM DW-1-2020.	Appendix C1 and appendix C2	Response to waiver and harmonize with industry standard and practice.
Specifies installation instructions and test provisions only for dishwashers that connect to a water supply line .	Specifies installation instructions and test provisions for dishwashers that do not connect to a water supply line but instead have a built-in water tank	Appendix C1 and appendix C2	Response to waiver.
Specifies installation instructions only for under-counter and under-sink dishwashers.	Specifies installation instructions for “in-sink” dishwashers.	Appendix C1 and appendix C2	Response to waiver.
Requires placing detergent within a main wash detergent compartment.	Specifies detergent placement instructions for dishwashers that do not have a main wash detergent compartment.	Appendix C1 and appendix C2	Response to waiver.
Does not specify measurement of the normal cycle time specifically for determining whether a standard size dishwasher has a normal cycle time of 60 minutes or less.	Specifies measurement of the duration of the “normal” cycle for the purpose of product class determination.	Appendix C1 and appendix C2	Update in response to new product class.
Does not specify a minimum cleaning index threshold to valid a test cycle.	References AHAM DW-2-2020 to specify measurement of a per-cycle cleaning index, with a threshold value of 65 as a condition for a test cycle to be valid.	Appendix C1 and appendix C2	Ensure the test procedure produces test results which measure energy and water use during a representative average use cycle.

DOE has tentatively determined that the proposed amendments to the test procedure described in Section III of this document for appendix C1 would not require DOE to amend the energy and water conservation standards for dishwashers.

The additional proposed amendments for the newly proposed appendix C2 would alter the reported energy and water consumption of dishwashers, as discussed in each relevant section of this NOPR. However, as proposed, testing in accordance with these specific proposed changes would not be required until such time as compliance is required with any amended energy conservation standards based on appendix C2.

Discussion of DOE's proposed actions are addressed in detail in Section III of this document.

III. Discussion

In the August 2019 RFI, DOE requested stakeholder feedback on several topics including test setup, dishwasher cycle-related specifications, potential inclusion of additional cycle features, representative test load with soiling levels, and whether further clarification is needed for the prescribed test procedure. 84 FR 43071.

While DOE received specific comments pertaining to each topic on which it requested comments, DOE also received some general comments in response to the August 2019 RFI. An anonymous commenter stated that the Federal government should refrain from rulemakings on products. (Anonymous, No. 3 at p. 1) AHAM stated that the current test procedure produces representative results, is not unduly burdensome, and is consistent with the DOE Appliance Standard Program's goals. However, AHAM commented that there is inherent variation for soil-sensing dishwashers that could not be eliminated during testing, and that the test procedure should provide additional clarity

and minimize variation, but there will always be some inconsistent soil responses in the test. (AHAM, No. 5 at pp. 2, 8) AHAM further stated that adding cycles or options, or changing the load or soils, would add significant test burden and decrease repeatability and reproducibility in some cases. However, AHAM stated, minor clarifications to the test procedure could improve it and suggested a number of clarifications in its comments, which DOE addresses in the relevant sections of this NOPR. (AHAM, No. 5 at p. 2) GEA and Whirlpool expressed support of AHAM's comments. (GEA, No. 10 at p. 1; Whirlpool, No. 4 at p. 1)

In the following sections, DOE addresses the topics on which it requested feedback in the August 2019 RFI, summarizes stakeholder comments received, responds to these comments, and proposes updates to the test procedure based on comments and DOE's analyses.

A. Scope of Applicability

This rulemaking applies to dishwashers, which are cabinet-like appliances which with the aid of water and detergent, wash, rinse, and dry (when a drying process is included) dishware, glassware, eating utensils, and most cooking utensils by chemical, mechanical and/or electrical means and discharge to the plumbing drainage system. 10 CFR 430.2. DOE is not proposing to amend the scope of the current dishwasher test procedure.

B. Updates to Industry Standards

The current dishwasher test procedure at appendix C1 references the AHAM industry standard, ANSI/AHAM DW-1-2010, for certain provisions of the DOE test procedure. In the August 2019 RFI, DOE requested comments in reference to this industry standard. 84 FR 43071, 43078. At the time of the August 2019 RFI, AHAM DW-1-2019, “Household Electric Dishwashers” (“AHAM DW-1-2019”) was the most recent version of the industry standard.

In response to the August 2019 RFI, stakeholders commented on the potential incorporation by reference of AHAM DW-1-2019, the then-current version of the industry standard. This NOPR refers to ANSI/AHAM DW-1-2010 and AHAM DW-1-2019, when discussing the August 2019 RFI and stakeholder comments, respectively.

Since the publication of the August 2019 RFI, AHAM published AHAM DW-1-2020 and AHAM DW-2-2020.

AHAM DW-1-2020 provides an industry test procedure for determining the energy and water consumption of dishwashers, updating the relevant test procedure provisions that were previously in ANSI/AHAM DW-1-2010.⁷ AHAM DW-1-2020 specifies definitions, testing conditions, instrumentation, test cycle and measurements, and calculations for energy and water consumption of dishwashers. AHAM DW-1-2020 also references the IEC Standard 62301, “Household electrical appliances—Measurement of standby power”, Edition 2.0, 2011-01 (“IEC 62301 Ed. 2.0”) for measuring standby

⁷ As noted previously, AHAM DW-1-2019 included the measurement of cleaning performance but not energy or water consumption.

mode and off mode power consumption. AHAM DW-1-2020 was developed by AHAM based upon the current appendix C1 and references, as applicable, AHAM DW-2-2020 in each instance where appendix C1 currently references ANSI/AHAM DW-1-2010.⁸ AHAM DW-1-2020 also includes updates that reflect AHAM's comments in response to the August 2019 RFI. Additionally, AHAM included requirements pertaining to the two dishwasher test procedure waivers that were in effect as of July 2020. DOE participated in the AHAM DW-1-2020 development process and provided feedback and comments for the task group's consideration on various topics.

AHAM DW-2-2020 supersedes the AHAM DW-1-2019 industry standard.⁹

AHAM included minor changes and illustrations to improve consistency throughout the document, to reflect the latest representative items used for testing, and to eliminate ambiguity in test preparation. DOE proposes to reference relevant sections of AHAM DW-2-2020, which includes setup, measurement, and calculation instructions for evaluating dishwasher cleaning performance, for its proposal to specify a per-cycle cleaning index threshold as a condition for a valid test cycle.

Because ANSI/AHAM DW-1-2010 and AHAM DW-1-2019 have been superseded, the updates proposed in this NOPR are consistent with AHAM DW-1-2020 and AHAM DW-2-2020, as appropriate. Where the requirements differ between

⁸ The current references to ANSI/AHAM DW-1-2010 specify place settings, serving pieces, soiling procedures, loading procedures, and detergent specifications—all of which are now specified in AHAM DW-2-2020.

⁹ AHAM updated its numbering scheme for dishwasher standards, wherein DW-2 measures cleaning performance, whereas DW-1 measures energy and water consumption.

succeeding documents, the implications of these differences are discussed in more detail in the respective sections of this NOPR.

DOE is proposing to incorporate by reference into 10 CFR part 430 the currently applicable industry test procedure for dishwashers, AHAM DW-1-2020. Simultaneously, DOE is also proposing to update the industry standard incorporated by reference in 10 CFR part 430 from ANSI/AHAM DW-1-2010 to AHAM DW-2-2020. In addition, DOE is proposing to reference in appendix C1 and newly proposed appendix C2 specific provisions of AHAM DW-1-2020 and AHAM DW-2-2020, with modifications, to clarify provisions where the applicable industry consensus standards would not produce test results that are representative of the energy and water use of certain products.

DOE requests comment on its proposal to incorporate by reference into 10 CFR part 430 the most recent version of the industry standard for dishwasher energy and water use measurement, AHAM DW-1-2020, as well as the industry performance standard, AHAM DW-2-2020, both with modifications. DOE seeks comment on its preliminary conclusion that the proposed modifications to the industry standards are necessary so that the DOE test method satisfies the requirements of EPCA.

C. Metrics

DOE's dishwasher test procedures in 10 CFR 430.23(c) and appendix C1 provide results for dishwasher energy consumption in kWh/year and water consumption in gal/cycle. In the August 2019 RFI, DOE requested feedback on an energy and water use metric on a per-place setting basis, including any data characterizing how the energy use

of dishwashers on the market in the United States could be impacted by it. 84 FR 43071, 43078.

DOE received comments regarding potential per-place setting energy and water use metrics. AHAM opposed such metrics and recommended that DOE maintain the number of place settings and metrics currently in appendix C1. AHAM stated that per-place setting energy and water use metrics could be confusing, whereas the current method is a less complex way to compare products. Also, AHAM expressed concern that a per-place setting metric would be too reliant on a claimed value of the number of place settings. (AHAM, No. 5 at p. 9) GEA expressed its support of AHAM's comments, stating that a per-place setting measurement would encourage manufacturers to increase the listed number of place settings to allow a higher maximum annual energy use, and that a uniform metric ensures appropriate comparison of ratings among models. (GEA, No. 10 at p. 2) The Joint Commenters also opposed the incorporation of per-place setting metrics for energy and water usage and provided data that they stated demonstrates that there is no correlation between place-setting capacity and energy or water use. (Joint Commenters, No. 8 at pp. 2–3) The CAIOUs also did not support per-place setting energy and water metrics, commenting that they have found no correlation between capacity and energy or water use, and that such metrics would cause confusion in the market. (CAIOUs, No. 7 at p. 3)

In this NOPR, DOE does not propose changing the efficiency metrics to a per-place setting basis. At this time, DOE does not have data to support the adoption of such a metric. The data submitted by the Joint Commenters demonstrates a wide range of

certified annual energy and per-cycle water use values among units available on the market listed in DOE's Compliance Certification Database.

DOE agrees with the Joint Commenters' assertion that currently available data demonstrates no consistent correlation between place-setting capacity and either energy or water use. Additionally, such a metric would also likely require development of an additional method to determine capacity based on place settings. At this time, DOE proposes to maintain the current efficiency metrics in appendix C1 and the new appendix C2.

D. Test Setup

1. Water Hardness

Appendix C1 does not currently specify any water hardness requirement for testing. In the August 2019 RFI, DOE requested information on how water hardness may impact consumer dishwasher energy and water performance, and on the burden associated with including a water hardness requirement in the DOE test procedure. 84 FR 43071, 43077. DOE also requested information on the hardness level of water used in current testing as compared to the water hardness level specified in ANSI/AHAM DW-1-2010, and the degree to which the water hardness level impacts whether the test procedure is reasonably designed to measure energy or water use during a representative use cycle or period of use. *Id.*

AHAM, GEA, Joint Commenters, CAIOUs, and CEC expressed concern over the potential variability caused by the lack of a water hardness condition and recommended

that DOE implement a water hardness requirement between 0 and 85 parts per million (“ppm”) of calcium carbonate (“CaCO₃”), consistent with ANSI/AHAM DW-1-2010. (AHAM, No. 5 at p. 7; GEA, No. 10 at p. 2; Joint Commenters, No. 8 at p. 1; CAIOUs, No. 7 at p. 2; CEC, No. 6 at p. 2) AHAM further stated that the water hardness specifications in AHAM DW-1-2019, which are the same as the water hardness specifications in ANSI/AHAM DW-1-2010, are consistent with laboratory practice. Further, AHAM expects that laboratories already have this capability and that including the requirement in DOE’s test procedure would not increase test burden and would add clarity to the test. (AHAM, No. 5 at p. 7)

These comments from interested parties suggest that varying levels of water hardness may impact measured energy and water usage during testing. To reduce potential variability across testing facilities and to support reproducibility of results, DOE proposes incorporating the water hardness requirements in Section 2.11 of AHAM DW-1-2020, which specifies a maximum water hardness of 85 ppm of CaCO₃. This water hardness specification is the same as the water hardness specification in ANSI/AHAM DW-1-2010, AHAM DW-1-2019, and AHAM DW-2-2020, indicating on-going industry practice. Additionally, in the October 2012 final rule, AHAM and Whirlpool commented that the American Water Works Association found a water hardness range of 0 to 85 ppm to be the normal range occurring in municipal water supplies, and Whirlpool stated that the water hardness specification was intended to reduce lab-to-lab test variation. 77 FR 65942, 65967. Although DOE did not adopt a water hardness specification in the October 2012 final rule due to a lack of data, it acknowledged that it had proposed to include such a water hardness requirement in the ENERGY STAR test method for

evaluating dishwasher cleaning performance that was under development at that time, and that DOE might consider the topic again in a future rulemaking if such data became available. *Id.* DOE finalized the ENERGY STAR “Test Method for Determining Residential Dishwasher Cleaning Performance” (“ENERGY STAR Cleaning Performance Test Method”) in 2014, which includes such a water hardness specification and which manufacturers have the option to use to report cleaning performance data. As such, certain manufacturers may already be testing their dishwashers according to these water hardness specifications. DOE notes that nine dishwasher brands are included in ENERGY STAR’s Most Efficient database,¹⁰ and that manufacturers of these models must report cleaning performance as measured by the ENERGY STAR Cleaning Performance Test Method. Furthermore, AHAM stated that it expects laboratories already have the capability to control water hardness to within these specifications. As such, DOE does not expect this proposal to be unduly burdensome or impact the rated energy and water use of dishwashers.

Additionally, as described further in Section III.G of this document, DOE is proposing to specify a minimum cleaning index threshold as a condition for a valid test cycle, which may also be impacted by water hardness.

DOE requests comment on its proposal to require use of the water hardness requirements from Section 2.11 of AHAM DW-1-2020.

¹⁰ ENERGY STAR Most Efficient database available at www.energystar.gov/most-efficient/me-certified-dishwashers. Last accessed October 23, 2020.

2. Relative Humidity

Currently, appendix C1 does not specify an ambient relative humidity for testing. In the August 2019 RFI, DOE requested comment on whether ambient relative humidity affects energy or water consumption, and whether test facilities already maintain an ambient relative humidity of 20 to 50 percent, as specified in ANSI/AHAM DW-1-2010. Additionally, DOE requested information on what, if any, test burden would result from a relative humidity specification and the extent of any such burden. 84 FR 43071, 43077.

AHAM supported amending appendix C1 to specify relative humidity test conditions, stating that relative humidity is a potential source of variation. AHAM recommended specifying relative humidity consistent with the requirements in AHAM DW-1-2019, which according to AHAM, would entail minimal test burden since testing facilities already have such capability. AHAM further commented that imposing a relative humidity requirement would add clarity to the test procedure and reduce variation among testing laboratories. (AHAM, No. 5 at p. 8) GEA also expressed support for establishing a relative humidity requirement consistent with AHAM DW-1-2019. (GEA, No. 10 at p. 2)

DOE proposes amending appendix C1 to include the relative humidity requirement of AHAM DW-1-2020, which specifies in Section 2.5.1 that an ambient relative humidity condition of 35 percent $\pm$ 15 percent must be maintained in the testing room throughout the soiling application and 2-hour air dry period. DOE also proposes to include this same requirement in the new appendix C2. The proposed ambient relative humidity level is the same requirement specified in ANSI/AHAM DW-1-2010, which

DOE referred to in its August 2019 RFI, and AHAM DW-1-2019, which stakeholders referenced in their comments.

DOE's testing experience suggests that ambient relative humidity could potentially impact the adherence of the applied soils to the test load during the 2-hour air-dry period specified in AHAM DW-2-2020 (which is the same as that specified in ANSI/AHAM DW-1-2010 and AHAM DW-1-2019). The adherence of the applied soil loads to the dishware could impact the amount of energy and water required to remove those soils for soil-sensing dishwashers, which constitute a significant percentage of dishwashers on the market. Further, adherence of the applied soil loads could impact cleaning performance, which in turn could impact the determination of the validity of each test cycle (see Section III.G of this document for more details). Establishing a relative humidity requirement would limit any such potential variation and increase repeatability and reproducibility of test results. As discussed, the proposed relative humidity requirement is the same as the requirement in AHAM dishwasher standards, indicating that this reflects current industry practice. Additionally, AHAM stated that it expects laboratories already have the capability to control relative humidity to within these specifications. As such, DOE does not expect this proposal to increase test burden as compared to current industry practice.

In conjunction with this proposed relative humidity test condition, DOE also proposes to include the relative humidity measuring device requirement specified in Section 3.7 of AHAM DW-1-2020, which states that relative humidity measurement equipment must have a resolution of at least 1 percent relative humidity, and an accuracy

of at least ± 6 percent relative humidity over the temperature range of 75 degrees Fahrenheit ($^{\circ}\text{F}$) ± 5 $^{\circ}\text{F}$.

DOE has compared this proposed requirement to the relative humidity measuring device requirements currently specified in other DOE test procedures. The Uniform Test Method for Measuring the Energy Consumption of Clothes Dryers at 10 CFR part 430, subpart B, appendix D1 and appendix D2; appendix E (Water Heaters); appendix H (Television Sets); appendix M and appendix M1 (Central Air Conditioners and Heat Pumps); appendix O (Vented Home Heating Equipment); appendix U (Ceiling Fans); appendix X1 (Dehumidifiers); and appendix AA (Furnace Fans) all require the use of a measuring device with a specified error tolerance to measure relative humidity. These appendices specify tolerances for the relative humidity measuring device ranging from 0.7 percent to 5 percent relative humidity. Therefore, DOE's proposal specifying a maximum error of no greater than ± 6 percent relative humidity to ensure accurate measurement of relative humidity while testing should not cause undue burden, since testing facilities that test other covered consumer products or equipment that require control of the ambient relative humidity already have the capability to meet the proposed requirement.

DOE requests comment on its proposal to reference AHAM DW-1-2020 for the relative humidity and associated instrumentation requirements, which specifies a relative humidity test condition of 35 percent ± 15 percent, and a resolution of at least 1 percent relative humidity and an accuracy of at least ± 6 percent relative humidity over the temperature range of 75 $^{\circ}\text{F}$ ± 5 $^{\circ}\text{F}$ for the relative humidity measuring device. To the

extent that stakeholder have additional information, DOE requests data regarding the impact of relative humidity on dishwasher energy and water usage.

3. Ambient Temperature

Section 2.5.1 of appendix C1 currently specifies an ambient temperature of 75 °F $\pm$ 5 °F for active mode testing. In the August 2019 RFI, DOE requested comment regarding the impacts of narrowing the allowable ambient temperature range on dishwasher energy and water consumption, and whether this change would represent a burden for test facilities. 84 FR 43071, 43077.

In response, AHAM requested that DOE maintain the same room ambient temperature range of 75 $\pm$ 5 °F, but that the test procedure should specify that 75 °F is the nominal target temperature. AHAM stated that the DOE clothes washer test procedure at 10 CFR part 430, subpart B, appendix J2 uses the same approach of establishing both a tolerance range and a target temperature. (AHAM, No. 5 at p. 8) GEA and Whirlpool additionally recommended specifying a target temperature of 75 °F in accordance with AHAM's suggestion. (GEA, No. 10 at p. 2; Whirlpool, No. 4 at p. 3) Whirlpool further stated that the temperature range is potentially a large source of variation in the test, and suggested reducing the allowable temperature tolerance from a range of 10 °F, providing confidential data to support its position. (Whirlpool, No. 4 at p. 3)

DOE notes that Section 2.5.1 of AHAM DW-1-2020 specifies an ambient temperature of 75 °F $\pm$ 5 °F and further specifies a target temperature of 75 °F. DOE is proposing to reference these ambient temperature requirements in AHAM DW-1-2020 in

appendix C1 and the new appendix C2. This proposed amendment would improve repeatability and reproducibility of results while minimizing additional test burden. As the proposed amendment is consistent with the industry standard, it reflects current industry practice. Additionally, as commented by AHAM, this amendment is consistent with the approach used to specify ambient temperature in the clothes washer test procedure at appendix J2.

DOE requests input on its proposal to specify a target nominal ambient temperature of 75 °F for active mode testing, as referenced from AHAM DW-1-2020.

4. 208-Volt Power

On April 10, 2017, DOE published a Decision and Order granting Miele, Inc. (“Miele”) a test procedure waiver (“Miele waiver”) for testing a specified basic model intended for a 208-volt power supply rather than the 115 volts or 240 volts specified in appendix C1. 82 FR 17227 (Case No. DW-12) ¹¹. Miele is required to test the basic model specified in the Miele waiver using appendix C1, except that it must maintain the electrical supply to the dishwasher at 208 volts ± 2 percent and within 1 percent of its nameplate frequency as specified by the manufacturer; and maintain a continuous electrical supply to the unit throughout testing, including the preconditioning cycles, specified in Section 2.9 of appendix C1, and in between all test cycles. 82 FR 17227, 17228–17229.

¹¹ All materials regarding the Miele waiver are available in docket EERE-2016-BT-WAV-0039 at www.regulations.gov.

In the August 2019 RFI, DOE requested feedback on whether the test procedure waiver provisions were generally appropriate for testing basic models with the same attributes as those subject to the Miele waiver. 84 FR 43071, 43078.

In response, both GEA and AHAM supported incorporating the provisions of the Miele waiver into appendix C1. (AHAM, No. 5 at p. 9; GE, No. 10 at p. 2) Subsequently, AHAM published the AHAM DW-1-2020 standard, which includes provisions in Section 2.2.2 for testing dishwashers that operate with an electrical supply of 208 volts.

As soon as practicable after the granting of any waiver, DOE is required to publish in the *Federal Register* a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. 10 CFR 430.27(l). As soon thereafter as practicable, DOE will publish in the *Federal Register* a final rule. *Id.* Since AHAM DW-1-2020 includes the language from the Miele waiver, DOE proposes to reference these requirements in appendix C1 and the new appendix C2 for dishwashers that operate at 208-volts.

DOE requests comment on its proposal to reference in appendix C1 and the new appendix C2 the testing provisions from AHAM DW-1-2020 to address the Miele waiver for dishwashers that operate at 208-volts.

5. Built-In Water Reservoir

DOE published a Decision and Order on December 9, 2020 (“December 2020 Decision and Order”), granting CNA International Inc. (“CNA”) a test procedure waiver (“CNA waiver”) for a basic model of a compact dishwasher that does not connect to a water supply line and instead has a built-in reservoir that must be manually filled with water. 85 FR 79171 (Case No. 2020-008)¹². This NOPR proposes amendments regarding the specific design characteristics addressed in the CNA waiver, generalized to be applicable to any future dishwasher models with this design characteristic, so as to eliminate any need for the continuation of this waiver.

On September 4, 2020, DOE published a notice that announced its receipt of the petition for waiver and granted CNA an interim waiver. 85 FR 55268 (“CNA Notice of Petition for Waiver”). In its petition for waiver and petition for interim waiver, CNA requested that DOE waive sections of the dishwasher test procedure requiring water inflow and water pressure criteria pertaining to a water hookup that allows automatic water inflow into the machine during the test cycle. 85 FR 55268, 55270 Instead, CNA suggested an alternate test procedure in which the water tank is manually filled before the test is run and water consumption is stipulated. (*Id.*) In the CNA Notice of Petition for Waiver, DOE granted CNA an interim waiver that specified an alternate test procedure that would be appropriate for testing the subject basic model and solicited comments from interested parties on all aspects of the petition and the specified alternate test

¹² All materials regarding the CNA waiver are available in docket EERE-2020-BT-WAV-0024 at www.regulations.gov.

procedure. *Id.* at 85 FR 55270–55271. DOE received two comments in response to the Notice of Petition for Waiver, and an additional comment response on behalf of CNA.

Based on review of these comments, DOE determined in the December 2020 Decision and Order that the alternate test procedure granted in the interim waiver, with additional clarifying modifications, will allow for the accurate measurement of the energy and water use of the product while alleviating the problems CNA identified regarding testing the specified basic model according to DOE's applicable dishwashers test procedure. 85 FR 79171, 79171. In particular, the alternate test procedure specified in the December 2020 Decision and Order included the following provisions:

(1) The water pressure, water meter, and water pressure gauge specifications do not apply because the water is added manually to the reservoir;

(2) Instructions to manually fill the built-in water reservoir to the full 5-liter reservoir capacity stated by the manufacturer;

(3) The water temperature is in accordance with Section 2.3.3 of appendix C1 (*i.e.*, $50^{\circ} \pm 2^{\circ} \text{F}$)

(3) Instructions regarding the required sequence of events as specified in the manufacturer instructions: power on the dishwasher, then manually fill the built-in water reservoir, then begin the test cycle within 2 minutes after powering on the dishwasher;

(4) For each preconditioning cycle, the built-in reservoir is manually filled before each cycle, and measurement of the prewash fill water volume (if any) and main wash fill water volume are not taken; instead, main wash fill water volume is specified as 0.396 gallons (1.5 liters);

(6) Water consumption measurements are not performed; instead, water consumption is specified as 4.8 liters.

85 FR 79171, 79174.

DOE proposes to incorporate each of these provisions into both appendix C1 and proposed new appendix C2, generalizing those provisions that were specific to the basic model subject to the CNA waiver to be applicable for a dishwasher of any capacity with a manually filled built-in water reservoir. Specifically:

- (1) Refer to the full reservoir capacity as reported by the manufacturer (rather than specifying the full capacity as 5 liters);
- (2) Require following any sequence of events specified in the manufacturer instructions (rather than specifying the particular sequence of events required for the basic model subject to the CNA waiver);
- (3) Use the prewash fill water volume (if any) and main wash water fill volume as reported by the manufacturer (rather than specifying a main wash fill water volume of 1.5 liters);
- (4) Water consumption for each test cycle is the value reported by the manufacturer (rather than specifying water consumption as 4.8 liters).

DOE requests comment on its proposal to incorporate the requirements of the CNA waiver for any dishwasher with a built-in reservoir. In particular, DOE requests stakeholder feedback on using the detergent dosage requirement based on number of place settings rather than main wash water volume in the new appendix C2, for dishwashers with built-in reservoirs.

6. In-Sink Installation

On October 15, 2020, FOTILE Kitchen Ware Co. Ltd. (“FOTILE”) filed a petition for waiver and interim waiver seeking a waiver from the installation requirements specified in appendix C1, which pertain to under-counter or under-sink dishwashers. 86 FR 26712, 26713.

In granting FOTILE an interim waiver on February 8, 2021, DOE noted that FOTILE's alternate test procedure specified a test enclosure that differed from the installation instructions provided in the operation manual. 86 FR 8548, 8549. Specifically, the alternate test procedure retained a requirement that the enclosure be brought into the closest contact with the appliance that the configuration of the dishwasher allows. In the case of FOTILE's basic models, this would include close contact between the bottom of the enclosure and the underside of the in-sink dishwasher. In the FOTILE interim waiver notice, DOE noted that because the height of the product is 2-15/16 inches (541 millimeters (mm)), placing the bottom part of the enclosure as close as possible to the bottom of the compact in-sink dishwasher would conflict with the installation instructions in the operation manual, which specify a minimum enclosure height of 35-7/16 inches (900 mm). *Id.* This may potentially result in differing heat

losses from the dishwasher that could impact energy consumption during the cycle. *Id.* In the interim waiver notice, DOE further noted that specifying the enclosure would be consistent with the manufacturer installation instructions and would provide results that are more representative of average use and requested comment on this topic. 86 FR 8548, 8551. DOE did not receive any comments in response to the FOTILE interim waiver.

On May 17, 2021, DOE published a Decision and Order granting FOTILE the waiver (“FOTILE waiver”). 86 FR 26712, 26715-26716 (Case No. 2020-020)¹³. Specifically, according to the published FOTILE waiver, FOTILE is required to test compact in-sink dishwashers using appendix C1 with modifications to install these dishwasher basic models from the top of a rectangular enclosure (as opposed to the front). 86 FR 26712, 26713. DOE also specified the use of the installation requirements that were proposed in the alternate test procedure in the FOTILE interim waiver, with modifications to the provisions pertaining to the enclosure in which the dishwasher is tested. 86 FR 26712, 26714–26715.

On July 22, 2021, DOE published a notification of extension of waiver granting a waiver to additional in-sink FOTILE basic model dishwashers. 86 FR 38700 (Case No. 2021-005).

¹³ All materials regarding the FOTILE waiver are available in docket EERE-2020-BT-WAV-0035 at www.regulations.gov.

DOE proposes to incorporate into appendix C1 and the new appendix C2 the alternate test procedures in the FOTILE waiver, such that the installation requirements would be applicable for any in-sink dishwasher. Specifically, DOE proposes that the requirements pertaining to the rectangular enclosure for under-counter or under-sink dishwashers that are specified in Section 2.1 of AHAM DW-1-2020 would not be applicable to in-sink dishwashers. For such dishwashers, DOE proposes that the rectangular enclosure must consist of a front, a back, two sides, and a bottom. The front, back, and sides of the enclosure must be brought into the closest contact with the appliance that the dishwasher configuration allows. DOE additionally proposes that the height of the enclosure must be as specified in the manufacturer's instructions for installation height. If no instructions are provided, DOE proposes that the enclosure height must be 36 inches, since this is the typical height of kitchen cabinetry with counters attached, which is where such a dishwasher would be installed. DOE also proposes that the dishwasher must be installed from the top and mounted to the edges of the enclosure.

DOE requests comment on its proposal to incorporate into appendix C1 and the new appendix C2 the installation requirements for in-sink dishwashers from the FOTILE waiver.

7. Absence of Main Detergent Compartment

In addition to seeking a waiver for the installation requirements for in-sink dishwashers, the basic models for which FOTILE sought a waiver do not have a main detergent compartment. 86 FR 26712, 26713. Specifically, according to the published

FOTILE waiver, FOTILE is required to test compact in-sink dishwashers placing the detergent directly into the washing chamber. 86 FR 26712, 26715.

In this NOPR, DOE proposes to incorporate the provisions for detergent placement specified in the FOTILE waiver into both appendix C1 and proposed new appendix C2, generalizing this provision such that it would be applicable to any dishwasher that does not have a detergent compartment.

DOE requests comment on its proposal that the detergent must be placed directly into the dishwasher chamber for any dishwasher that does not have a prewash or main wash detergent compartment.

E. Test Cycle Amendments

1. Cycle Selections

In the August 2019 RFI, DOE requested feedback on certain aspects regarding dishwasher testing cycle selection. DOE requested information on consumers' selection frequency of normal cycles and other cycle types, in addition to the data gathered in the U.S. Energy Information Agency's ("EIA") 2015 *Residential Energy Consumption Survey* ("RECS"). DOE also sought information on whether cycle selection varies based on a specific product's energy and water consumption; if additional cycle options are available with the normal cycle, including any temperature or drying options other than those recommended by the manufacturer, the means for consumers to select additional cycle options; and the frequency with which consumers select the options. 84 FR 43071, 43074.

AHAM commented that consumers still most frequently select the normal cycle, and when consumers decide on a cycle selection, they typically use it for most of their cycles. Therefore, AHAM opposed any changes to the currently tested normal cycle. (AHAM, No. 5 at p. 3) AHAM asserted that EPCA does not require every possible cycle, combination of options, or use pattern to be tested, as such testing would be unduly burdensome to conduct and not representative of an average use cycle or period of use. AHAM commented that all potential use conditions need not be tested for representative results. According to AHAM, to establish or amend representative average use cycles, DOE must demonstrate national, statistically average consumer behavior that would warrant changing the current test procedure, based on consumer usage data. AHAM concludes there is no basis for extrapolating regional consumer data. (AHAM, No. 5 at p. 2) AHAM opposed adding more cycle options to the test because it asserts that there are not sufficient data, and the test could be unduly burdensome to conduct. (AHAM, No. 5 at p. 3)

Conversely, CEC commented that although it does not have information indicating frequent selection of other cycle types in addition to the normal cycle, if DOE has information indicating frequent consumer selection of other cycle types, then DOE is obligated to include measurement of the energy consumption of those other cycle types in the test procedure. (CEC, No. 6 at pp. 1–2)

Both GEA and Whirlpool supported AHAM's comment that the normal cycle should remain the tested cycle. (GEA, No. 10 at p. 2; Whirlpool, No. 4 at p. 2) Both manufacturers submitted confidential data that supported the position that the

manufacturer-designated normal cycle still represents consumer preference regarding cycle selection. (GEA, No. 10 at p. 3; Whirlpool, No. 4 at p. 2)

Samsung supported DOE's initiatives to study consumer data on which cycle is most representative of consumer use. (Samsung, No. 9 at p. 2)

The CAIOUs referenced PG&E's *2016 Home Energy Use Survey* to support their claim that the tested normal cycle including any power-dry feature, in the current test procedure, is still the cycle most representative of how consumers operate dishwashers. The CAIOUs further stated that consumers would be less likely to switch from using the normal cycle if DOE were to incorporate cleaning performance in the test procedure, and recommended DOE investigate incorporating a cleaning performance test. (CAIOUs, No. 7 at pp. 1–2)

Absent data that reflects national use and frequency of use of other cycle types, DOE is not proposing changes to cycle selections for testing at this time. However, as discussed in more detail in Section III.G of this document, DOE is proposing a minimum cleaning index threshold for a test cycle to be considered valid. Under the proposal, if the normal cycle does not meet a specified threshold at any soil-load, DOE proposes that the most energy-intensive cycle be tested and used for certification purposes at that soil load. DOE believes this alternative approach would better represent an average use cycle by capturing those consumers that may select other cycles for washing dishes if the cleaning performance of the normal cycle does not meet their expectations, because higher energy

use provides increased thermal and mechanical action for removing soils, thus correlating generally with improved cleaning performance.

In response to the August 2019 RFI, Samsung also commented that DOE should specify that the manufacturer-recommended cycle for normal, regular, or typical use with the lowest energy efficiency should be selected as the test cycle if multiple cycle settings meet the definition of “normal cycle.” (Samsung, No. 9 at p. 2)

Regarding Samsung’s suggestion, DOE notes that the current test procedure at appendix C1 already defines a “normal cycle” in Section 1.12 as the manufacturer-recommended cycle for daily, regular, or typical use. Section 1.12 additionally specifies that if more than one cycle meets the definition of a normal cycle, the most energy-intensive cycle (*i.e.*, the cycle with the lowest energy efficiency) is considered the normal cycle. Section 1.12 of appendix C1. Therefore, the current test procedure already addresses Samsung’s suggestion.

Based on the information and comments received, DOE is not proposing any changes to the dishwasher test cycle selections, except with regard to validating the test cycle pursuant to the minimum cleaning index threshold that DOE proposes to include in appendix C1 and the new appendix C2. (See Section III.G of this document.) DOE is also not proposing to add any additional cycle options to the tested normal cycle.

2. Drying Energy Measurement

Section 5.3 of appendix C1 specifies a methodology for determining the “drying energy” consumption of a dishwasher. Dishwashers typically incorporate technologies to assist with drying the dishes after completion of the rinse portion of the cycle. Some dishwashers use an exposed resistance heater to heat the air inside the washing chamber after the final rinse to evaporate the water from the dishware. Other dishwasher models, however, do not use a resistance heater to heat the air, but instead achieve drying by raising the temperature of the final rinse water. The heated rinse water evaporates more quickly from the dishes after completion of the rinse portion of the cycle.

Section 1.14 of appendix C1 defines “power-dry feature” as the introduction of electrically-generated heat into the washing chamber for the purpose of improving the drying performance of the dishwasher. Further, the definition of “normal cycle” in Section 1.12 of appendix C1 specifically includes the power-dry feature as part of the normal cycle. Section 5.3 of appendix C1 specifies a methodology for calculating the energy consumed by the power-dry feature *after the termination of the last rinse option (emphasis added)*. Half of this drying energy is subtracted from the total dishwasher energy calculations of EAOC and EAEU at 10 CFR 430.23(c)(1) and (2), respectively.¹⁴

Because the application of Section 5.3 is limited to drying energy consumed only after the termination of the last rinse option, it would not be applicable to the drying energy use of a dishwasher that employs heated rinse technology, since such energy is consumed as part of the final rinse rather than after the final rinse. Rather, the energy use

¹⁴ This reflects consumer use of the power-dry feature for 50 percent (*i.e.*, half) of dishwasher cycles.

associated with the heated rinse would be captured as part of the normal cycle machine energy consumption. As a result, the energy use associated with heated rinse drying technology would be factored into EAOE and EAEU in its entirety, rather than only by half, as described for units with conventional power-dry technology that occurs after the final rinse.

DOE requested information and data on the extent to which manufacturers increase the temperature of the final rinse water to improve drying performance. 84 FR 43071, 43074. DOE further requested information on the extent to which manufacturers implement such a drying strategy as part of the normal cycle, and whether and to what extent such units provide an option to eliminate this drying function. *Id.* DOE also requested data and information on the energy use associated with increasing the temperature of the final rinse water as a means to improve drying performance, including any available options. *Id.*

AHAM opposed the addition of cycle options, including a power-dry option, to appendix C1. They claimed a lack of available data to suggest that consumers were selecting a power-dry feature at a frequency that would be considered representative of “average” consumer use. Therefore, requiring the selection of a power-dry option while testing would add unnecessary test burden. (AHAM, No. 5 at p. 3) GEA supported AHAM’s comments opposing the addition of cycle options stating that there is no justification for adding cycle options the test procedure, including the power dry feature. (GEA, No. 10 at p. 2)

In response to the comments from AHAM and GEA regarding the testing of a power-dry option, DOE notes that appendix C1 already requires testing of a power-dry cycle option, if available. Appendix C1 requires testing of dishwashers on the normal cycle, which is defined as the “cycle type, including washing and drying temperature options, recommended in the manufacturer’s instructions for daily, regular, or typical use to completely wash a full load of normally soiled dishes *including the power-dry feature*” (*emphasis added*). Section 1.12 of appendix C1. That is, the power-dry option is already selected during testing, if available.

At this time, DOE does not propose any changes to the measurement of drying energy to accommodate units that use heated rinse to achieve drying. The current measurement of drying energy consumption is dependent upon a clearly identifiable boundary between the conclusion of the final rinse and the activation of electrically-generated heat into the washing chamber. For units that use heated rinse to achieve drying, DOE initially determines that it would be burdensome to isolate the energy specifically attributable to raising the temperature of the final rinse, since such energy use would be embedded within the total energy use measured during that portion of the cycle; *i.e.*, it would not be possible to determine the “drying energy” without, for example, sub-metering the electrical energy use of the internal water heater. For these reasons, DOE is not proposing any changes to the existing requirements for measuring drying energy.

3. Annual Number of Cycles

Section 5.7 of appendix C1 calculates combined low-power mode energy consumption, which factors into the EAEU calculation, using 215 annual cycles. DOE

established the 215-cycle value in the August 2003 final rule, relying on data from several sources on consumer dishwasher usage behavior, including the 1997 version of RECS, several consumer dishwasher manufacturers, detergent manufacturers, energy and consumer interest groups, independent researchers, and government agencies. 68 FR 51887, 51889–51890. In the August 2019 RFI, DOE referenced an energy conservation standards NOPR published December 12, 2014 (79 FR 76142, “December 2014 NOPR”) and chapter 7 of its accompanying technical support document (“TSD”), which provided justification for using 215 cycles as the annual cycle estimate for EAEU calculations.¹⁵ 84 FR 43071, 43075. In the December 2014 NOPR, DOE considered survey data from the 2009 version of RECS—which suggested 171 average annual cycles—but determined that because RECS 2009 used a binning approach¹⁶ rather than providing point estimates of usage, and because of the large data set of consumers’ residential dishwasher usage habits used to develop the 215-cycle value, it would retain use of that value. 79 FR 76142, 76156. DOE also noted that 215 cycles per year is the number of cycles on which the EnergyGuide label administered by the Federal Trade Commission (“FTC”) is based. *Id.*

In the August 2019 RFI, DOE requested any additional information on annual consumer use of dishwashers, including on the appropriateness of the analysis that incorporates the 2009 RECS data and whether it results in a representative annual usage estimate. 84 FR 43071, 43075. DOE also sought feedback on the suitability of data from

¹⁵ December 2016 Final Determination technical support document available at www.regulations.gov/document?D=EERE-2014-BT-STD-0021-0029

¹⁶ Specifically, RECS 2009 provides data on the number of residential dishwasher cycles in the following bins: (1) Less than once per week, (2) once per week, (3) 2–3 times per week, (4) 4–6 times per week, (5) at least once per day.

the 2015 RECS, the survey for which directly asked for the typical number of dishwasher cycles per week rather than providing binned response options such as those included in the 2009 RECS. *Id.*

In response, AHAM and GEA recommended that DOE consider the latest (2015) RECS data in its analysis for the annual number of cycles used in the EAEU calculations. (AHAM, No. 5 at p. 4; GEA, No. 10 at p. 3) GEA stated that, based on the consumer data it collected, 50 percent of the time consumers run fewer than 148 cycles per year, and 66 percent of the time consumers run fewer than 188 cycles per year. (GEA, No. 10 at p. 3) AHAM stated that data collected from its members show a downward trend in the number of cycles per year, with a weighted average of 174 cycles per year. (AHAM, No. 5 at p. 4) Both GEA and AHAM recommended updating the annual number of cycles of dishwasher usage to 174 cycles per year, based on the 2015 RECS data and the data they presented, which was consistent with the trends of reduced dishwasher usage found in 2015 RECS data. (AHAM, No. 5 at p. 4; GEA, No. 10 at p. 3)

In this NOPR, DOE proposes to update the current annual cycles estimate to reflect more recent trends in dishwasher usage. DOE's analysis of 2015 RECS data indicates annual use of 185 cycles.¹⁷ While AHAM and GEA recommended 174 cycles per year, they also urged DOE to consider the 2015 RECS data in determining the number of annual cycles. Additionally, subsequent to submitting its initial comments to

¹⁷ In the 2015 RECS, EIA collected the number of times per week that households used their dishwasher as point values rather than ranges as EIA had done in previous surveys. For households using their dishwashers, multiplying weekly usage by number of weeks in the year results in annual usage rates. A weighted average of annual usage employs the household weight and produces a nationally weighted annual usage value.

DOE in response to the August 2019 RFI, AHAM released AHAM DW-1-2020, which specifies a value of 184 cycles per year in AHAM DW-1-2020 based on industry consensus. DOE thus proposes to amend the current annual number of cycles estimate from 215 to 184 cycles, through reference to AHAM DW-1-2020. The proposed value closely aligns with DOE's analysis of 2015 RECS data. DOE has initially determined that the 2015 RECS is a suitable source for updating the annual number of cycles estimate because (1) it is the most recent RECS edition available, (2) RECs is nationally representative for all U.S. households, and (3) it provides direct survey data on the typical number of dishwasher cycles run by consumers each week, rather than providing binned response options. Compared to the existing estimate of 215 annual cycles, the proposed estimate of 184 annual cycles is consistent with comments from AHAM and GEA as to the downward trend in dishwasher usage.

The proposal to update the annual cycle value for calculating EAEU, if finalized, would change the certified and reported EAEU values. DOE also notes that the existing energy conservation standards are based on the EAEU as determined under the current test procedure. As such, if this proposal were adopted, use of the 184 cycles-per-year value would be in conjunction with any future amended energy conservation standards for dishwashers that accounts for the updated annual cycle value. Accordingly, DOE proposes to specify this requirement in the new appendix C2. Manufacturers would be required to use the results of testing under the new appendix C2 to determine compliance with any future amended energy conservation standards.

DOE requests input on its proposal to update the estimated number of annual cycles from 215 to 184 cycles per year for future calculations of EAEU. DOE also requests comment on its approach to propose a new appendix C2 with the updated annual number of cycles, the use of which would be required for compliance with any amended energy conservation standards.

F. Energy and Water Consumption Test Methods

1. Test Load Items

The current test load and test load items are specified in Sections 2.6 and 2.7 of appendix C1. Non-soil-sensing dishwashers are tested with six serving pieces plus eight place settings, or six serving pieces plus the number of place settings equal to the capacity of the dishwasher if the latter is less than eight place settings. Soil-sensing compact and soil-sensing standard dishwashers are tested with four place settings and eight place settings, respectively, along with six serving pieces each.

In the August 2019 RFI, DOE requested information on the following topics regarding the current test load requirements: the typical number of place settings washed by consumers in each cycle; how the typical number of place settings relate to a dishwasher's overall capacity; whether the number of place settings affects energy and water consumption; whether introducing plastic items could have an impact on energy or water use; and typical composition of place setting items, serving pieces, and flatware that are washed in consumer dishwashers, including the types of items (*e.g.*, cups, bowls, and plates) and their characteristics (*e.g.*, size and material). 84 FR 43071, 43074–43075.

AHAM recommended the continuation of using eight place settings as the test load for testing standard dishwashers, stating that the eight place settings are representative of the thermal mass consumers place in the dishwasher. AHAM further stated that if DOE were to change the number of place settings, the standard would likely need to be adjusted as well. (AHAM, No. 5 at p. 4) GEA supported AHAM's comment and stated that there had not been any nationally relevant, statistically significant data justifying a change to the test load items, and therefore, GEA opposed changing the test load items. (GEA, No. 10 at p. 2) Whirlpool commented that its confidential data supported AHAM's position that eight place settings was representative. Furthermore, Whirlpool stated that changing the test load would unnecessarily add burden and/or increase variation in test results. (Whirlpool, No. 4 at pp. 1–2)

With regard to adding plastic test load items, AHAM commented that introducing these would not change water and energy use because these items do not add to the dishwasher's thermal mass. Furthermore, AHAM asserted that adding plastic into the energy test would likely increase variation and test burden with no added benefit. (AHAM, No. 5 at p. 4)

The comments summarized above generally support the continued use of eight place settings as representative of consumer use. DOE also notes that no data has been presented that would justify changing the test load items at this time. Although no data was presented regarding the use of plastic items, DOE recognizes that the minimal thermal mass of plastic test load items would likely result in little, if any, change to the energy and water consumption.

While not discussed in the August 2019 RFI or in comments submitted by stakeholders in response to the August 2019 RFI, DOE observes that some of the test load items specified in appendix C1 differ from the items specified in Section 3.4 of AHAM DW-2-2020, which is also referenced by Section 2.7.1 of AHAM DW-1-2020. The test load items as stated in appendix C1 and AHAM DW-2-2020 are shown in Table III-1 in this document below.

Table III-1 Test Load Items in Appendix C1 and AHAM DW-2-2020

Item	Appendix C1			AHAM DW-2-2020	
	Company/Designation	Description	Alternate	Company/Designation	Size
Dinner Plate	Corning Comcor®/Corelle® #6003893	10 inch Dinner Plate		Corelle® 5256294	10 inch (25.4cm)
Bread and Butter Plate	Corning Comcor®/Corelle® #6003887	6.75 inch Bread & Butter	Arzberg #8500217100 or 2000-00001-0217-1	Corelle® 5256286	6.7 inch (17.0cm)
Fruit Bowl	Corning Comcor®/Corelle® #6003899	10 oz. Dessert Bowl	Arzberg #3820513100	Corelle® 5256297	10 oz. (296mL)
Cup	Corning Comcor®/Corelle® #6014162	8 oz. Ceramic Cup	Arzberg #1382-00001-4732	Arzberg #1382-00001-4732	7 oz. (207mL)
Saucer	Corning Comcor®/Corelle® #6010972	6 inch Saucer	Arzberg #1382-00001-4731	Arzberg #1382-00001-4731	5.5 inch (14.0cm)
Serving Bowl	Corning Comcor®/Corelle® #6003911	1 qt. Serving Bowl		Corelle® #5256304	1 qt. (950mL)
Platter	Corning Comcor®/Corelle® #6011655	9.5 inch Oval Platter		Corelle® #6011655 OR ALTERNATE Corelle® #5256290	Oval - 9.5 inch by 7.5 inch (24.1cm by 19.1cm) Round – 8.5 in (21.6cm)
Glass – Iced Tea	Libbey #551HT			Libbey #551HT	12.5 oz.
Flatware – Knife	Oneida® — Accent 2619KPVF		WMF — Gastro 0800 12.0803.6047	WMF 12.0803.6047	

Flatware – Dinner Fork	Oneida® — Accent 2619FRSF		WMF — Signum 1900 12.1905.6040	WMF 12.1905.6040	
Flatware – Salad Fork	Oneida® — Accent 2619FSLF		WMF — Signum 1900 12.1964.6040	WMF 12.1964.6040	
Flatware – Teaspoon	Oneida® — Accent 2619STSF		WMF — Signum 1900 12.1910.6040	WMF 12.1910.6040	
Flatware – Serving Fork	Oneida® — Flight 2865FCM		WMF — Signum 1900 12.1902.6040	WMF 12.1902.6040	
Flatware – Serving Spoon	Oneida® — Accent 2619STBF		WMF — Signum 1900 12.1904.6040	WMF 12.1904.6040	

For the cup, saucer, and flatware items, the alternate options listed in appendix C1 are the primary options specified in AHAM DW-2-2020. The iced tea glass is the only item that is the same for both test procedures. The remaining items feature Corelle® as the manufacturer for both appendix C1 and AHAM DW-2-2020, but these items have new model numbers in AHAM DW-2-2020. DOE understands that the Corelle® model numbers listed in appendix C1 are no longer in production, and the model numbers listed in AHAM DW-2-2020 are the newer editions for these out of production items. Additionally, AHAM DW-2-2020 contains an alternative selection only for the serving platter. For the other test load items, AHAM DW-2-2020 provides instructions to contact AHAM for assistance to identify suitable alternatives.

As illustrated in Table III-1, AHAM DW-2-2020, which is referenced in AHAM DW-1-2020, includes newer model numbers of the test load items as compared to appendix C1. Therefore, DOE proposes to reference AHAM DW-1-2020, which specifies that the test load must be as stated in Section 3.4 of AHAM DW-2-2020 in

Section 2.7.1 of the standard. Specifically, DOE would apply the provisions of Section 3.4 of AHAM DW-2-2020 to appendices C1 and C2, excluding the Note accompanying Section 3.4 regarding AHAM assistance with determining alternatives.

However, DOE is also proposing to continue including the test load items currently specified in appendix C1 as alternate options, so that test laboratories can continue using the existing test load if they already have these items. This proposal would be applicable to both appendix C1 and the new appendix C2. Pursuant to EPCA requirements, this approach would not impose an undue burden, but rather minimize test burden as it would not require manufacturers and/or test laboratories to procure new items if they already have the existing test load items.

DOE requests comment on specifying that the test load items be as specified in AHAM DW-1-2020 (which references Section 3.4 of AHAM DW-2-2020), while additionally retaining, as an alternative, the current test load specifications in appendix C1 and the new appendix C2.

2. Soils

In the August 2019 RFI, DOE requested information on whether consumer soil loads have changed since DOE established the soil loads in the August 2003 final rule. 84 FR 43071, 43075. In particular, DOE requested any data regarding soiling conditions and the frequency of pre-rinsing by consumers. *Id.* DOE also sought information on whether the types of soil required in appendix C1 resulted in a test method that measured energy and water use during a representative use cycle or period of use. *Id.* In addition

to the representative quantity of soil and types of soil present for consumer use, DOE also requested information on the typical mix of soils consumers load into their dishwashers, on the appropriateness of the current composition of soil loads in appendix C1, and on whether the appendix C1 soil loads should be updated to incorporate different types of soils, including any additional fats or greases. 84 FR 43071, 43075–43076.

Samsung commented that DOE’s current soiling level reflects pre-rinsing performed by the consumer. Samsung added, however, that the report on which the soil levels in the current test procedure are based is 20 years old, and there has been consumer advocacy by dishwasher manufacturers, consumer advocates, and detergent manufacturers to educate consumers against pre-rinsing. Samsung suggested that DOE revise the test procedure to incorporate a larger soil load representing the soiling condition without pre-rinsing, and that the AHAM DW-1-2009¹⁸ soiling levels could be consistent with such soiling levels. (Samsung, No. 9 at pp. 2–3)

AHAM stated that no data suggest that consumers no longer pre-rinse their dishes. AHAM further stated that there is no need to change the soil types because the purpose of the soil composition is to activate the turbidity sensors only (for soil-sensing dishwashers), rather than to replicate the wide array of potential soils consumers might load into their dishwashers. According to AHAM, the current soil composition already achieves that goal of activating the turbidity sensors while being representative of average consumer use both in terms of composition and quantity. AHAM opposed

¹⁸ The AHAM DW-1-2009 standard is the same standard as ANSI/AHAM DW-1-2010 before it received the ANSI accreditation.

changing the distribution of soil loads and the soil composition for these reasons.

(AHAM, No. 5 at pp. 5–6) GEA supported AHAM’s comments, stating that there is no data available to justify a change to the test load soiling. (GEA, No. 10 at p. 2)

Samsung also recommended that DOE consider a field use factor for dishwashers with soil sensors. Samsung stated that dishwashers with soil sensors can adapt to a variety of soiling and loading conditions of consumer dishwasher usage, and thereby optimize energy and water use. Samsung suggested DOE consider developing a field use factor to credit soil-sensing dishwashers for such optimizations. Samsung stated that the clothes dryers test procedure at 10 CFR part 430, subpart B, appendix D1 uses a field use factor to recognize the energy benefits of dryers with automatic termination controls and requested DOE consider a similar factor for soil-sensing dishwashers. (Samsung No. 9 at p. 3)

The soil load specified in appendix C1 has been developed by DOE to produce a measure of energy and water use of soil-sensing dishwashers in a representative usage cycle. At this time, DOE does not have data on the operation of a soil-sensing function that would suggest that a field use factor to adjust testing results would be appropriate. Therefore, DOE is not proposing in this NOPR a field use factor for appendix C1 or the new appendix C2.

DOE did not receive any data regarding pre-rinsing by consumers. Although Samsung stated that there has been consumer advocacy to reduce pre-rinsing in recent years, no data have been presented to indicate whether or to what degree consumers have

changed pre-rinsing habits. Absent such data, DOE is not proposing any changes to the soil loads.

DOE continues to request feedback and data regarding soiling level and whether there have been changes to consumers' pre-rinsing behavior. DOE also seeks information regarding the impact of different soil levels on energy and water use in dishwashers currently on the market.

Section 2.7.4 of appendix C1 states that the soils shall be as specified in Section 5.4 of ANSI/AHAM DW-1-2010, except for the following substitutions:

- *Margarine*. The margarine shall be Fleischmann's Original stick margarine.
- *Coffee*. The coffee shall be Folgers Classic Decaf.

Additionally, Section 2.7.5 of appendix C1 states that soils shall be prepared according to Section 5.5 of ANSI/AHAM DW-1-2010, with the following additional specifications:

- *Milk*. The nonfat dry milk shall be reconstituted before mixing with the oatmeal and potatoes. It shall be reconstituted with water by mixing $\frac{2}{3}$ 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.
- *Instant mashed potatoes*. The potato mixture shall be applied within 30 minutes of preparation.

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

DOE notes that Table 3 in Section 5.4 of AHAM DW-2-2020 specifies Fleischmann's™ Original Stick margarine and Folgers™ Classic Decaf coffee, consistent with DOE's substitutions in Section 2.7.4 of appendix C1. These AHAM DW-2-2020 soiling specifications are also referenced in Section 2.7.4 of AHAM DW-1-2020. Therefore, DOE proposes to remove the substitution for margarine and coffee from regulatory text in appendix C1 and apply the soiling requirements in Section 2.7.4 of AHAM DW-1-2020 instead.

Additionally, Section 2.7.5 of AHAM DW-1-2020 includes the additional soil preparation requirements for milk, instant mashed potatoes, and ground beef, which are currently specified in appendix C1. Therefore, DOE proposes to remove the additional soil preparation specifications from Section 2.7.5 in appendix C1 and apply the requirements in Section 2.7.5 of AHAM DW-1-2020 instead.

DOE requests comment on its proposal to remove the soil substitution and soil preparation requirements from Sections 2.7.4 and 2.7.5 of appendix C1 and apply these same requirements from AHAM DW-1-2020 instead. DOE particularly requests data and information on how the proposed soil composition would affect energy and water use in current dishwashers.

3. Loading Pattern

Section 2.6 of appendix C1 references Section 5.8 of ANSI/AHAM DW-1-2010 for loading the dishwasher prior to running active mode tests, which requires loading in accordance with the manufacturer's recommendation. In the August 2019 RFI, DOE requested feedback on whether any additional instructions are needed beyond referencing a manufacturer's loading recommendation. 84 FR 43071, 43076. DOE also requested information on how consumers typically load dishwashers. *Id.* DOE stated that although manufacturer instructions may optimize loading patterns to maximize loading capacity and dishwasher performance, consumers may use other loading positions and alignment, leading to variability in dishwasher performance. *Id.*

AHAM stated that the lack of loading specificity in appendix C1 is a source of test procedure uncertainty. AHAM stated that the positioning of soiled items relative to unsoiled items may impact the rate at which soils are removed from the test load items, which may impact soil sensor responses. AHAM recommended that the test procedure establish the same loading instructions as Section 5.1(D) of the ENERGY STAR Cleaning Performance Test Method. AHAM added that the purpose of a specific loading pattern is to reduce variation in testing results, not necessarily to emulate consumer use. AHAM commented that consumer loading patterns are likely difficult to replicate in the test procedure. (AHAM, No. 5 at p. 6)

GEA also supported changing the loading pattern to conform with Section 5.1(D) of the ENERGY STAR Cleaning Performance Test Method. (GEA, No. 10 at p. 2) The Joint Commenters stated that they support additional specificity to the test procedure

regarding the loading pattern to improve reproducibility of test results among test laboratories. (Joint Commenters, No. 8 at p. 1)

As stated in the August 2019 RFI, DOE recognizes that the positioning of soiled test load items in relation to unsoiled ones could impact the rate at which soils are removed from the test load items, and therefore also impact soil sensor responses. 84 FR 43071, 43076. This could lead to variation in energy and water consumption. Specifying a loading pattern requirement would improve the repeatability of the testing procedure and reproducibility of results across both individual tests and testing facilities. Since submitting its comments, AHAM has included the loading pattern requirements specified in the ENERGY STAR Cleaning Performance Test Method in Section 2.6.3.4 of AHAM DW-1-2020. These requirements are applicable to soil-sensing dishwashers that are tested with both, clean and soiled place settings. DOE proposes to apply these AHAM DW-1-2020 loading requirements to appendix C1 and the new appendix C2 to reduce potential variation in the test procedure. Additionally, these loading requirements would apply to both soil-sensing and non-soil-sensing dishwashers as non-soil-sensing dishwashers would be required to use soil loads for testing under DOE's cleaning index threshold proposal discussed in Section III.G of this document.

DOE requests input on its proposal to use the loading requirements specified in Section 2.6.3.4 of AHAM DW-1-2020.

4. Preconditioning Cycles

Section 2.9 of appendix C1 requires manufacturers to precondition the dishwasher by running the normal cycle twice with no load after the testing conditions are established. The prewash fill water volume, if any, and the main wash fill water volume are measured during the second preconditioning cycle to calculate the detergent amounts to be used during the energy and water consumption tests. The prescribed procedure ensures an accurate calculation of detergent dosing, priming of the water lines and sump area of the pump, successful sensor calibration, and machine cleaning without adding significant test burdens. In the August 2019 RFI, DOE requested comment on whether two preconditioning cycles were adequate or more than is necessary to calibrate the soil sensors. DOE also requested comment on whether using the water volumes from the second preconditioning cycle continued to be appropriate for determining the detergent amounts if the sensors were still being calibrated during the second preconditioning cycle. 84 FR 43071, 43076.

AHAM commented that although sometimes unnecessary, two preconditioning cycles ensure that the dishwasher under test is properly calibrated, and manufacturers prefer to keep the existing two cycles for certainty in test results as well. (AHAM, No. 5 at p. 6) GEA supported AHAM's comment by reaffirming that two preconditioning cycles increased reliability and reproducibility in test results. (GEA, No. 10 at p. 2)

No commenter suggested the use of fewer or additional preconditioning cycles. Based on the above discussion, DOE is not proposing to modify the requirement for two

preconditioning cycles currently in appendix C1, and is proposing to apply this requirement to the new appendix C2.

5. Detergent

Section 2.10 of appendix C1 specifies using Cascade with the Grease Fighting Power of Dawn powder as the detergent formulation. This section also provides the method to calculate the detergent quantities to be added to the pre-wash (if available) and main-wash compartments, which is based on the pre-wash (if available) and main wash water volumes, respectively. In the August 2019 RFI, DOE requested information on whether the current powder detergent specified in appendix C1 results in a test procedure reasonably designed to measure energy and water use during a representative use cycle or period of use and requested comment on the use of a reference detergent. 84 FR 43071, 43076. DOE also requested comment on the method for calculating detergent dosing, including: whether to continue calculating the detergent dosing based on the measured water fill volumes in the second preconditioning cycle, or whether to specify a fixed amount of detergent; methods to differentiate between the different portions of a wash cycle and ways to appropriately calculate the corresponding detergent dosing; and reliance on manufacturer dosage recommendations. *Id.*

AHAM suggested that detergent dosing be evaluated, but advised DOE to maintain the existing powder detergent formulation, stating that this formulation was still representative of powder formulations on the market. AHAM also supported maintaining the current detergent dosage provisions. AHAM further stated that detergent impacts performance testing more than it impacts energy testing; thus, it did not need to be

changed for energy testing. AHAM also commented that it would discuss updates to detergent usage as part of its AHAM DW-1 process, but that more work is needed to understand the appropriate detergent and amounts to use, and how often formulations change. (AHAM, No. 5 at p. 7) GEA supported AHAM's comment and stated that there is insufficient data on the impact of detergents to the current test procedure or to other test procedures that may be run at the same time¹⁹ to make any change to detergents at this time. (GEA, No. 10 at pp. 1, 2) Whirlpool also agreed with AHAM and commented that the current powder detergent referenced in appendix C1 is representative of powder detergents on the market. Whirlpool further commented that, although single dose detergents are the most commonly used detergent type, given the recent rising popularity of single dose detergents, their formulations are not stable because detergent manufacturers make frequent changes and improvements. Whirlpool also suggested that further evaluation was needed to assess the impact of single dose detergents on energy use. (Whirlpool, No. 4 at p. 3) Since publication of the August 2019 RFI and the subsequent end of the comment period, AHAM informed DOE, during the task group's meetings to establish AHAM DW-1-2020, that the powder detergent currently specified in appendix C1—Cascade with the Grease Fighting Power of Dawn—is no longer commercially available. Instead, a new powder detergent, Cascade Complete Powder, which has a slightly different formulation²⁰ from Cascade with the Grease Fighting Power of Dawn, is now available on the market. AHAM has updated AHAM DW-2-

¹⁹ GEA did not specify which other test procedures it was referring to that may be run at the same time as the DOE test procedure.

²⁰ Stakeholders mentioned during the AHAM task group calls that they were informed by the detergent manufacturer that the only difference between Cascade with the Grease Fighting Power of Dawn and Cascade Complete Powder is related to the enzymes used in the detergent. DOE was not able to verify this information independently because the ingredient list for Cascade with the Grease Fighting Power of Dawn is not available on product packaging (or online).

2020 to reference this new detergent for testing purposes. AHAM DW-1-2020 references AHAM DW-2-2020, both for detergent formulation as well as dosage.

In addition to a change in the detergent to be used for testing, both AHAM DW-1-2020 and AHAM DW-2-2020 also specify new dosage requirements in comparison to the current requirements of appendix C1.²¹ Section 4.1 of AHAM DW-2-2020 specifies the detergent dosage as 1.8 grams per place setting in the main compartment of the detergent dispenser and 1.8 grams per place setting in the prewash compartment of the detergent dispenser or other location. Section 2.10.1 of AHAM DW-1-2020 further specifies to use half the quantity of detergent that is specified in Section 4.1 of AHAM DW-2-2020 for both prewash and main-wash detergent for the energy and water consumption tests. Prewash detergent is specified only for those units if it is recommended by the manufacturer's instructions for conditions that are consistent with the test procedure. This includes, but is not limited to, manufacturer instructions that recommend the use of prewash detergent for the normal cycle, normally soiled loads, or for water hardness between 0 and 85 ppm. Additionally, if manufacturer instructions lead to the use of the prewash detergent requirements, the prewash detergent is placed as instructed by the manufacturer or, if no instructions are provided, the prewash detergent is placed on the inner door near the detergent cup.

DOE performed preliminary investigative testing on four standard dishwashers to compare the energy and water consumption results when using (1) the current

²¹ As discussed, the detergent dosage for appendix C1 is based on measurements of the prewash fill water volume, if any, and the main wash fill water volume measured during the second preconditioning cycle.

detergent (Cascade with the Grease Fighting Power of Dawn) with the current dosage method; (2) the new detergent (Cascade Complete Powder) with the current dosage method; and (3) the new detergent with the new dosage method. Table III-2 presents the detergent quantities for each of the three investigative tests for the four units. Table III-3 presents the measured water consumption and estimated annual energy use for these four units when tested according to the three scenarios.

Table III-2 Detergent Dosage (in grams) for Each Investigative Test

Test Unit	Appendix C1		New Detergent with Current Dosage		New Detergent with New Dosage	
	Prewash Detergent (g)	Main wash Detergent (g)	Prewash Detergent (g)	Main wash Detergent (g)	Prewash Detergent (g)	Main wash Detergent (g)
1	0	10.5	0	10.5	7.2	7.2
2	0	12.5	0	13	0	7.2
3	0	105	0	11	0	7.2
4	11	11	11	11	7.2	7.2

Table III-3 Measured Water Consumption and Estimated Annual Energy Use for Each Investigative Test

Test Unit	Appendix C1		New Detergent with Current Dosage		New Detergent with New Dosage	
	Water (gal/cycle)	EAEU (kWh/year)	Water (gal/cycle)	EAEU (kWh/year)	Water (gal/cycle)	EAEU (kWh/year)
1	2.3	211	2.4	204	2.5	204
2	3.1	257	3.3	256	3.3	261
3	3.2	269	3.2	265	3.1	274
4	3.4	273	5.9	357	3.9	301

Table III-3 indicates that for test units 1, 2, and 3, the water consumption among the three tests varied within a range of 0.1 – 0.2 gal/cycle. For unit 4, the “Appendix C1” test and the “New Detergent with New Dosage” test yielded equivalent water

consumption values; however, the water consumption of the “New Detergent with Current Dosage” test was 2.5 gal/cycle higher, an increase of 73 percent over the other two tests. Similar percentage differences were observed for EAEU among the three tests. Given the small sample size of only 4 test units, DOE believes that additional testing would be required to determine whether the observed variation in results is due to the change in detergent and dosage, or whether it could be attributed to unrelated differences in the sensor response of these soil-sensing dishwashers, or other factors.

Given the uncertainty about whether the new detergent and dosing requirements would impact the energy and water consumption of dishwashers, DOE proposes that both the current detergent and dosage requirement as well as the new detergent and new dosage requirement would be allowable to use for testing according to appendix C1. By maintaining the use of the current detergent and dosing requirements, manufacturers would not be required to re-test currently certified dishwashers. Because DOE is proposing the detergent type and dosage specifications in AHAM DW-1-2020 in addition to the current requirements, this proposal would not require the re-rating or re-certification of dishwashers currently on the market. Additionally, permitting the optional use of the detergent and dosing specifications in AHAM DW-1-2020 would avoid the need for manufacturers to request test procedure waivers should the currently required detergent become unavailable and would harmonize with current industry practice.

For the new appendix C2, which would be required at the time compliance is required with updated energy and water conservation standards, DOE proposes to specify only the new detergent and dosage requirements from AHAM DW-1-2020.

The current dosage requirements specify detergent dosage based on water volume, which requires distinguishing the water used in the pre-wash from the water used in the main wash. DOE has observed, and stakeholders have also expressed, that uncertainty in differentiating the pre-wash and main wash cycles to estimate detergent dosage could be a potential source of test variation. As stated, the new detergent dosage is based on the number of place settings rather than measurement of pre-wash and main wash water volumes, potentially providing more consistent dosing. More consistent dosing would improve the repeatability and reproducibility of the results. Additionally, the new dosage would reduce test burden since it would eliminate the need to identify, isolate, and calculate the pre-wash and main wash water volumes.

DOE requests comment on its proposal to adopt in appendix C1 the new detergent and new dosage requirements as specified in AHAM DW-1-2020, while also retaining the current detergent and dosage requirements in appendix C1. The use of either set of detergent requirements would be allowable for testing under appendix C1. DOE also requests comment on the detergent currently being used by manufacturers and test laboratories for testing and certification of dishwashers.

If stakeholder comments indicate that the currently specified detergent, Cascade with the Grease Fighting Power of Dawn, is no longer being used by manufacturers, DOE

may instead consider including only the new detergent, Cascade Complete Powder, and dosage requirements from AHAM DW-1-2020 in appendix C1, rather than allowing both the current and new detergent and dosage requirements.

DOE also welcomes comments and data on the impact of the new detergent and dosage on energy and water use.

6. Rinse Aid

Section 2.1 of appendix C1 currently requires that testing be conducted without the use of rinse aid, and that any rinse aid reservoirs remain empty for testing.

In the August 2019 RFI, DOE noted that a standard from IEC, IEC 60436: “Electric Dishwashers for Household Use – Methods for Measuring the Performance” (“IEC 60436”) specifies the use of rinse aid during testing. 84 FR 43071, 43077. IEC 60436 requires the use of a standard rinse aid formulation rather than a commercially marketed brand. DOE sought information from stakeholders on consumer use of rinse aid, and on whether the use of rinse aid had any effect on measured energy and water consumption. *Id.*

AHAM commented that rinse aid does not impact energy and water use. AHAM further commented that IEC 60436 specifies use of rinse aid because there is a performance element to that test. As such, AHAM did not support a proposal to add a rinse aid requirement or a need to collect consumer data on rinse aid usage. (AHAM, No. 5 at p. 7)

Based on these comments, and the lack of data regarding the effect of rinse aid on measured energy and water usage and consumer usage of it, DOE maintains its conclusions from past rulemakings that the test procedure should preclude the use of rinse aid, and that the rinse aid container should remain empty during testing. 68 FR 51887, 51891. Adding a rinse aid requirement would increase test burden without information indicating that it would improve the representativeness of the test results, and it could potentially cause variation in test results. For these reasons, DOE is not proposing a rinse aid requirement in appendix C1 or the new appendix C2, which is consistent with the specifications in AHAM DW-1-2020 that DOE proposes to reference in this NOPR.

7. Water Softener Regeneration Cycles

In the October 2012 final rule, DOE adopted a method for measuring the energy consumed during regeneration cycles for water softeners built into certain residential dishwashers. 77 FR 65942, 65960. The adopted approach relies on manufacturer-reported values for the energy and water use for each regeneration cycle and the number of annual regeneration cycles. *Id.* The current calculations for water softener regeneration cycles are provided in Sections 5.1.3, 5.4.3, 5.5.1.2, 5.5.2.2, 5.6.1.2, and 5.6.2.2 of appendix C1. In the August 2019 RFI, DOE requested comment on whether any dishwasher had a water softener regeneration cycle at every or nearly every cycle, and if any additional instructions should be specified in appendix C1 to avoid repeatedly accounting for the water and energy use during water softener regeneration. 84 FR 43071, 43077.

DOE did not receive any comment regarding the energy and water use during water softener regeneration cycles, and thus does not propose any changes in this NOPR with regards to water softener regeneration cycles, aside from maintaining the associated definitions and calculations specified in AHAM DW-1-2020.

8. Water Re-Use System

On November 1, 2013, DOE published a Decision and Order (“November 2013 Decision and Order”) granting Whirlpool a test procedure waiver (“Whirlpool waiver”) for testing specified basic models equipped with a “water use system,” in which water from the final rinse cycle is stored for use in the subsequent cycle, with periodic draining (“drain out”) and cleaning (“clean out”) events. 78 FR 65629 (Case No. DW-11)²². Whirlpool is required to test the basic model specified in the November 2013 Decision and Order using appendix C1, with the following modifications:

- (1) “Water use system” water and energy consumption shall be accounted for during dishwasher water and energy measurement and reporting, subject to the following:
- (2) For “drain out” events, constant values of 0.072 gallons per cycle and 2.6 kWh/year shall be added to values measured by appendix C1.

²² All materials regarding the Whirlpool waiver are available in docket EERE-2013-BT-WAV-0042 at www.regulations.gov.

- (3) For “clean out” events, constant values of 0.071 gallons per cycle and 10.3 kWh/year shall also be added to values measured by appendix C1.
- (4) To calculate the detergent quantity for testing, a constant value of 0.91 gallons for the water fill amount shall be used, representing both saved water fill and house supply water fill.
- (5) If a “drain out” or “clean out” event occurs during testing, any results from that use of the test procedure shall be disregarded. Disconnect and reconnect power to the dishwasher, then restart the test procedure.
- (6) To detect a “drain out” event, measure the water volume supplied during the first fill. A cycle shall be considered to have a “drain out” event if the first fill uses approximately 1 gallon from the water supply. Without a “drain out” event, the first fill would use approximately 0.11 gallons from the water supply.
- (7) To detect a “clean out” event, monitor the temperature of the sump water using an additional temperature measuring device. The device shall be placed inside the sump in an area such that the device will always be submerged in water and will not interfere with the operation of the dishwasher. A cycle shall be considered to have a “clean out” event if the temperature of the sump water during wash and rinse portions of the cycle reaches 150 °F. Without a

“clean out” event, the highest sump water temperatures would reach approximately 140 °F.

78 FR 65629, 65631.

In the August 2019 RFI, DOE requested feedback on whether the test procedure waiver provisions were generally appropriate for testing basic models with the same attributes as those subject to the November 2013 Decision and Order. 84 FR 43071, 43078.

In response, both GEA and AHAM supported incorporating the provisions of the Whirlpool waiver into appendix C1. (AHAM, No. 5 at p. 9; GE, No. 10 at p. 2) Subsequently, AHAM published the AHAM DW-1-2020 standard, which includes provisions for testing water re-use system dishwashers. Specifically, Sections 1.3, 1.9, and 1.29 of AHAM DW-1-2020 include definitions for a clean out event, drain out event, and water re-use system dishwasher, respectively. These definitions are consistent with those specified in the November 2013 Decision and Order granted in November 2013. AHAM DW-1-2020 also specifies the detergent dosing requirements, methods to measure the energy and water consumption of water re-use system dishwashers, including detection of drain out and clean out events, and calculations for energy and water consumption. Sections 2.10.2, 4.1.3, 5.1.4, 5.15, 5.4.4, 5.4.5, 5.5.1.3, 5.5.1.4, 5.5.2.3, 5.5.2.4, 5.6.1.3, 5.6.1.4, 5.6.2.3, and 5.6.2.4 of AHAM DW-1-2020. All of these requirements are consistent with the alternate test procedure specified in the November 2013 Decision and Order granting the waiver to Whirlpool for water re-use systems,

except for the specified water energy consumption equations in Sections 5.6.1.3, 5.6.1.4, 5.6.2.3, and 5.6.2.4, which use an incorrect constant.²³

As soon as practicable after the granting of any waiver, DOE is required to publish in the *Federal Register* a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. 10 CFR 430.27(l). As soon thereafter as practicable, DOE will publish in the *Federal Register* a final rule. *Id.* Since AHAM DW-1-2020 includes the language from the Whirlpool waiver, DOE proposes to reference these requirements in appendix C1 and the new appendix C2, with added modifications to the equations in Sections 5.6.1.3, 5.6.1.4, 5.6.2.3, and 5.6.2.4 of AHAM DW-1-2020.

DOE requests comment on its proposal to reference in appendix C1 and the new appendix C2 the testing provisions from AHAM DW-1-2020 to address the Whirlpool waiver for water re-use system dishwashers.

G. Cleaning Performance

EPCA requires DOE to establish test procedures that are reasonably designed to produce test results that measure energy efficiency, energy use, water use (for certain products), or estimated annual operating cost of a covered product during a representative average use cycle or period of use, as determined by the Secretary, and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) DOE's test procedure for

²³ The equations in the noted sections improperly use the constant K = specified heat of water in kWh per gal per °F, instead of C / e , where C = specific heat of water in Btu's per gal per °F, and e = nominal gas or oil water heater recovery efficiency.

dishwashers identifies the “normal cycle” as the cycle representative of consumer use, defines the term “normal cycle,” requires testing using the “normal cycle,” and compliance with the applicable standards is determined based on the measured energy and water use of the “normal cycle.” 10 CFR 430.23(c) and 10 CFR 430 subpart B appendix C1. The “normal cycle” is defined as the cycle type, including washing and drying temperature options, recommended in the manufacturer’s instructions for daily, regular, or typical use to completely wash a full load of normally soiled dishes including the power-dry feature. If no cycle or more than one cycle is recommended in the manufacturer’s instructions for daily, regular, or typical use to completely wash a full load of normally soiled dishes, the most energy-intensive of these cycles shall be considered the normal cycle. In the absence of a manufacturer recommendation on washing and drying temperature options, the highest energy consumption options must be selected. Section 1.12 of appendix C1. As such, the existing test procedure does not define what constitutes “completely wash[ing]” a full load of normally soiled dishes (*i.e.*, the cleaning performance).

For dishwashers, the cleaning performance at the completion of a cycle influences how a consumer uses the product. If the cleanliness of the dishware after completion of a cleaning cycle does not meet consumer expectations, consumers may alter their use of the dishwasher. For example, consumers may alter the use of the product by selecting a cycle that consumes more energy and water to provide a higher level of cleaning, operating the selected cycle multiple times, or pre-washing the dishware before loading into the dishwasher to achieve an acceptable level of cleaning. DOE received comment from Samsung expressing concern in response to the August 2019 RFI, in which

Samsung stated that consumers unsatisfied with the cleaning performance of the normal cycle may opt to select a different mode that could result in increased energy consumption. (Samsung, No. 9 at p. 3) Thus, it is possible that dishwashers exist on the market that are currently tested by manufacturers using a “normal cycle” that does not “completely wash” dishes.

In general, a consumer-acceptable level of cleaning performance (*i.e.*, a representative average use cycle) can be easier to achieve through the use of higher amounts of energy and water use during the dishwasher cycle.²⁴ Conversely, maintaining acceptable cleaning performance can be more difficult as energy and water levels are reduced.²⁵ Improving one aspect of dishwasher performance, such as reducing energy and/or water use as a result of energy conservation standards, may require a trade-off with one or more other aspects of performance, such as cleaning performance. DOE expects, however, that consumers maintain the same expectations of cleaning performance regardless of the efficiency of the dishwasher. As the dishwasher market continuously evolves to higher levels of efficiency—either as a result of mandatory minimum standards or in response to voluntary programs such as ENERGY STAR—it becomes increasingly more important that DOE ensures that its test procedure continues

²⁴Higher energy use may provide increased thermal and mechanical action for removing soils. Similarly, higher water use may provide better rinsing performance by reducing the amount of soil re-deposition on the dishware.

²⁵ In the December 2014 NOPR that proposed amended energy and water use standards for dishwashers, DOE noted that cleaning performance could be maintained up to Efficiency Level 3, which was defined as 234 kWh/yr and 3.1 gal/cycle. 79 FR 76141, 76165. In the December 2016 Final Determination, DOE additionally noted that manufacturers generally indicated that by using all available design options to improve efficiency, they would likely be able to maintain performance with a maximum energy consumption between 250 and 260 kWh/year and water consumption at 3.1 gal/cycle. 81 FR 90072, 90082.

to reflect representative use. As such, the normal cycle that is used to test the dishwasher for energy and water performance must be one that provides a consumer-acceptable level of cleaning performance, even as efficiency increases.

In order for DOE's test procedure to more accurately and fully test dishwashers during a representative average use cycle, DOE believes that amending the test procedure to define what constitutes completely washing a full load of normally soiled dishes (*i.e.*, the cleaning performance) will better represent consumer use of the product. As such, DOE proposes additional direction for selecting the appropriate test cycle, *i.e.*, for determining whether the cycle "can completely wash a full load of normally soiled dishes." DOE is proposing to include a cleaning index methodology and minimum threshold to validate the selection of the test cycle in appendix C1 and the newly proposed appendix C2.²⁶ This proposal is discussed in detail in the following sections.

This proposal is in line with comments DOE received in response to the August 2019 RFI regarding the adoption of cleaning performance into the test procedure. Samsung commented that the tested cycle (*i.e.*, the normal cycle) should perform at or above a minimum level of acceptable functionality because some consumers may select test cycles other than the default mode that perform better without recognizing the resulting increase in the energy consumption of the dishwasher. (Samsung, No. 9 at p. 3) The CAIOUs commented that, while the test procedure is representative of current

²⁶ This approach is analogous to the one used for clothes dryers, in which the DOE test procedure at appendix D2 defines a threshold dryness level for automatic cycle termination clothes dryers as a condition for the test cycle to be valid. Specifically, Section 3.3.2 of appendix D2 specifies that if the final moisture content after completion of the drying cycle is greater than 2 percent, the test shall be invalid and a new run shall be conducted using the highest dryness level setting.

energy and water consumption, they believe there is merit in investigating a dishwasher cleaning performance test method to ensure future consumer benefit. (CAIOUs, No. 7 at p. 2)

1. Cleaning Performance Test Method

DOE is proposing to adopt a cleaning performance test method that will help determine if a dishwasher when tested according to the DOE test procedure “completely washes a normally soiled load of dishes,” according to the representative consumer use. Specifically, DOE proposes to include the cleaning performance evaluation setup, procedures, and calculations that are specified in the ENERGY STAR Cleaning Performance Test Method, which references ANSI/AHAM DW-1-2010, in appendix C1 and newly proposed appendix C2.

In response to the August 2019 RFI, Samsung recommended that DOE incorporate by reference the ENERGY STAR Cleaning Performance Test Method in the dishwasher test procedure and adopt the minimum cleaning index, as established for the ENERGY STAR Most-Efficient Program. (Samsung, No. 9 at p. 3)

The ENERGY STAR Cleaning Performance Test Method specifies a procedure to determine cleaning performance at the same test loads described in the DOE test method. For soil-sensing dishwashers, cleaning performance is evaluated on the same cycles that are used to determine energy and water consumption (*i.e.*, the heavy, medium, and light soil loads). (ENERGY STAR Cleaning Performance Test Method Section 5.1.B) For

non-soil-sensing dishwashers, cleaning performance is evaluated on three additional cycles at the heavy, medium, and light soil loads that are run immediately after the clean-load cycle that is used to determine energy and water consumption. (ENERGY STAR Cleaning Performance Test Method Section 5.1.C) Each test load item is quantitatively evaluated for cleanliness under prescribed lighting conditions referenced from ANSI/AHAM DW-1-2010. (ENERGY STAR Cleaning Performance Test Method Section 4.B) Additionally, Section 5.2 of the ENERGY STAR Test Method specifies the criteria to grade the load; it references Section 5.10 of ANSI/AHAM DW-1-2010, which specifies the following requirements: Each test load item receives a score based on the number and size of soil particles that remain on the item following the termination of a test cycle. Glassware items are additionally evaluated for the number and size of remaining spots, streaks, and rack contact marks. A score of 0 indicates a completely clean test load item, and a single test load item cannot exceed a cumulative score of 9. The number of test items that receive each score is counted (*i.e.*, number of items in the test load that receive a score of 0, 1, 2, ..., 9) and the weighted average of these counts is subtracted from 100 to produce a final cleaning index for the test cycle. A score of 100 indicates perfect cleaning performance.

Accordingly, DOE proposes to include the requirements specified in Sections 4(B), 5.2, and 5.3, of the ENERGY STAR Cleaning Performance Test Method, as follows:

Section 4(B) of the ENERGY STAR Cleaning Performance Test Method establishes the lighting requirements for the evaluation room for scoring the test load, as

specified in ANSI/AHAM DW-1-2010. These same lighting requirements are also specified in Section 5.10 of AHAM DW-2-2020; therefore, DOE proposes to reference Section 5.10 of AHAM DW-2-2020 to specify the lighting requirements for the evaluation room.

Section 5.2 of the ENERGY STAR Cleaning Performance Test Method establishes the scoring procedure to evaluate each dishware item in the test load after completion of the test cycle, as specified in ANSI/AHAM DW-1-2010. The scoring method is also specified in Section 5.10.1 of AHAM DW-2-2020; therefore, DOE proposes to reference the scoring requirements specified in AHAM DW-2-2020.

Section 5.3 of the ENERGY STAR Cleaning Performance Test Method specifies the equation for calculating a cleaning index for each test cycle, which is also specified in Section 5.12.3.2 of AHAM DW-2-2020; therefore, DOE proposes to reference the calculation of cleaning index for each test cycle from AHAM DW-2-2020.

DOE notes that the calculation to determine per-cycle cleaning index is based on the individual score of each item such that dishware and flatware are scored based on soil particles, while glassware are scored based on soil particles as well as spots, streaks, and rack contact marks. DOE further notes that AHAM DW-2-2020 provides two separate equations for calculating the total cleaning index for one test run. The equation in Section 5.12.3.1 of AHAM DW-2-2020 specifies a soil-only cleaning index, which is calculated using the scores of each test load item (including glassware) based only on soil particles. Section 5.12.3.2 of AHAM DW-2-2020 uses the same equation as that in the ENERGY

STAR Cleaning Performance Test Method (and ANSI/AHAM DW-1-2010), and defines the total cleaning index calculation using the scores of dishware and flatware cleaning performance based on soil particles and glassware based on soil particles as well as spots, streaks, and rack contact marks. DOE is proposing to reference Section 5.12.3.2 of AHAM DW-2-2020 to calculate the total cleaning index of a cycle because DOE expects that consumers would evaluate the cleanliness of their load items at the completion of a cycle . DOE requests feedback on whether it should consider referencing Section 5.12.3.1 of AHAM DW-2-2020 instead, which would calculate the cleaning index based on soil particles only. If DOE were to calculate the cleaning index using soil particles only, it would reevaluate the per-cycle cleaning index threshold value (discussed further in Section III.G.2 of this document) to reflect this change. DOE requests stakeholder feedback on an appropriate threshold to consider.

DOE requests feedback on the proposed methodology to test, score, and calculate a cleaning index to validate the tested cycle and seeks comment if other methodologies should be considered for validating the cleaning performance of the tested cycle.

DOE requests feedback on whether it should consider referencing Section 5.12.3.1 of AHAM DW-2-2020 to measure cleaning performance, which would calculate the cleaning index based on soil particles only. DOE notes that if it were to calculate cleaning index using soil particles only, it would reevaluate the per-cycle cleaning index threshold value to reflect this change.

2. Cleaning Index Threshold

In response to the August 2019 RFI, Samsung commented that DOE should use the ENERGY STAR Most-Efficient cleaning index threshold when establishing the standard for dishwashers in the future standards rulemaking. (Samsung, No. 9 at p. 3)

In this NOPR, DOE proposes to provide direction in the test procedure as to what constitutes whether a cycle under test can completely wash a full load of normally soiled dishes, by establishing a minimum cleaning index threshold as a condition for each individual test cycle to be valid. The threshold is intended to represent a level of cleaning such that if the dishwasher did not meet this threshold after operating in the “normal cycle,” the consumer would be expected to operate the dishwasher using a more energy-intensive cycle than the “normal cycle.” Specifically, DOE proposes that if the normal cycle at a particular soil level (*i.e.*, heavy, medium, or light) does not achieve the defined cleaning index threshold, that soil level (*i.e.*, heavy, medium, or light) would need to be re-tested using the most energy-intensive cycle (to be determined using the proposed methodology discussed in Section III.G.4 of this document) that achieves the defined cleaning index threshold. The data from the most energy-intensive cycle would be used to represent that soil level in the downstream calculations.

To determine an appropriate threshold value, DOE aggregated confidential consumer cycle selection data provided by industry for this NOPR, and considered past consumer comments and test data collected in support of the October 2020 Final Rule.²⁷

²⁷ See Dishwasher NODA Test Data (5-21-20), available at: www.regulations.gov/document/EERE-2018-BT-STD-0005-3213

DOE understands general consumer satisfaction as a fundamental characteristic of a functioning market, and that consumers are largely satisfied with the performance of dishwashers currently on the market. However, based on Samsung's comments discussed in Section III.G of this document as well as qualitative comments that DOE received during the rulemaking that culminated in the October 2020 Final Rule, DOE recognizes that the cleaning performance of the normal cycle may not always meet consumer expectations of cleaning performance. (See for example: Toronto, EERE-2018-BT-STD-0005, No. 2304 at p. 1; Carley, EERE-2018-BT-STD-0005, No. 2950 at p. 1; Bruggeman, EERE-2018-BT-STD-0005, No. 3038 at p. 1; *etc.*) Further, confidential data submitted by manufacturers indicate, in the aggregate, that roughly 25–45 percent of all dishwasher cycles are conducted on a cycle other than the normal cycle. DOE recognizes that among these other selected cycles, some would be expected to be less energy intensive than the normal cycle (*e.g.*, a glassware cycle), while others would be expected to be more energy intensive than the normal cycle (*e.g.*, a pots and pans cycle). The data provided by manufacturers do not indicate which types of cycles comprise the percentage of cycles not conducted on the normal cycle. In lieu of additional details regarding the dataset, DOE has proceeded under the assumption that either option (selecting a more energy-intensive or less energy-intensive alternate cycle) is equally as likely. Accordingly, DOE estimates that one-half (*i.e.*, 12 to 23 percent) of cycles not conducted on the normal cycle are instead conducted on a cycle that is more energy intensive than the normal cycle.

Since DOE expects that consumers unsatisfied with the cleaning performance of the normal cycle would select alternate cycles that are more energy-intensive to achieve

better cleaning results, the cycle selection data serves as a reasonable proxy for consumer acceptance of the cleaning performance of the normal cycle. To identify an appropriate cleaning index threshold, DOE sought to select a cleaning index value that aligned with the cycle selection data. That is, DOE sought to identify the cleaning index value that was achieved between 77 to 88 percent of the time when a dishwasher was operated on the normal cycle, indicating that the remaining 12 to 23 percent of the time the cleaning performance on the normal cycle would be worse and thus would result in consumers selecting more energy-intensive cycles. DOE evaluated the cleaning indices measured for the heavy, medium, and light soil load cycles as defined in the DOE dishwasher test procedure, using the market-representative dishwasher test sample from the October 2020 Final Rule.²⁸ Using these data, DOE plotted the rate at which test cycles would achieve each potential cleaning index threshold level (in increments of 5 on the Cleaning Index scale). Figure III.1 shows the percentage of each of the soil test cycles that meet the threshold at each potential threshold level among all the units in the test sample. The proposed threshold level of 65 is indicated by the dashed line and is described further as follows.

²⁸ The test sample consisted of 31 units spanning 13 brands. The units selected for testing represented over 95 percent of dishwasher manufacturers and were broadly representative of the current dishwasher market. 85 FR 68723, 68724.

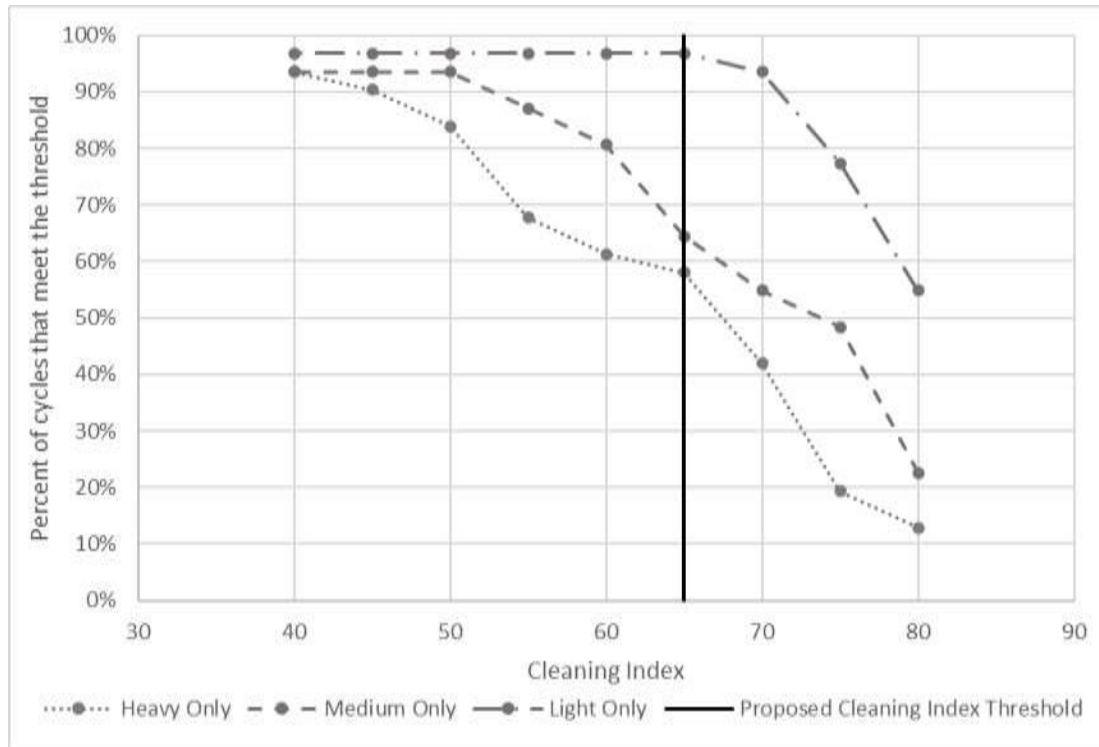


Figure III.1 Percent of Heavy, Medium, and Light Soil Test Cycles that Meet Potential Cleaning Index Thresholds

In determining a threshold, DOE seeks to establish a level that ensures the tested cycle produces test results, which measure energy use and water use of the dishwasher during a representative average use cycle. Establishing a threshold level that is “too high” would indicate that a substantial number of dishwasher cycles performed by consumers do not meet consumer expectations for cleaning performance on the normal cycle, which would not appropriately reflect general consumer usage of the normal cycle. Whereas, establishing a threshold that is “too low” would not appropriately reflect the percentage of cycles for which consumers are likely to select a more energy-intensive cycle to achieve better cleaning performance than can be achieved on the normal cycle.

DOE used the data presented in Figure III.1 and the consumer usage weighting factors specified in appendix C1 (and proposed to be retained in appendix C1 and the newly proposed appendix C2) for the heavy (0.05), medium (0.33), and light (0.62) soil loads to calculate the percentage of cycles that would need to be tested at a more energy-intensive cycle than the normal cycle (*i.e.*, the percentage of cycles that would not meet the threshold at each point).²⁹ The percentage of cycles that would need to be tested at a more energy-intensive cycle than the normal cycle is shown in Figure III.2, along with the range for the percentage of cycles that would operate on a more energy-intensive cycle than the normal cycle as estimated from industry data.

²⁹ Percent of cycles likely to be operated on a more energy-intensive cycle than the normal cycle calculated as (100 percent - percentage of cycles meeting the threshold level at each point).

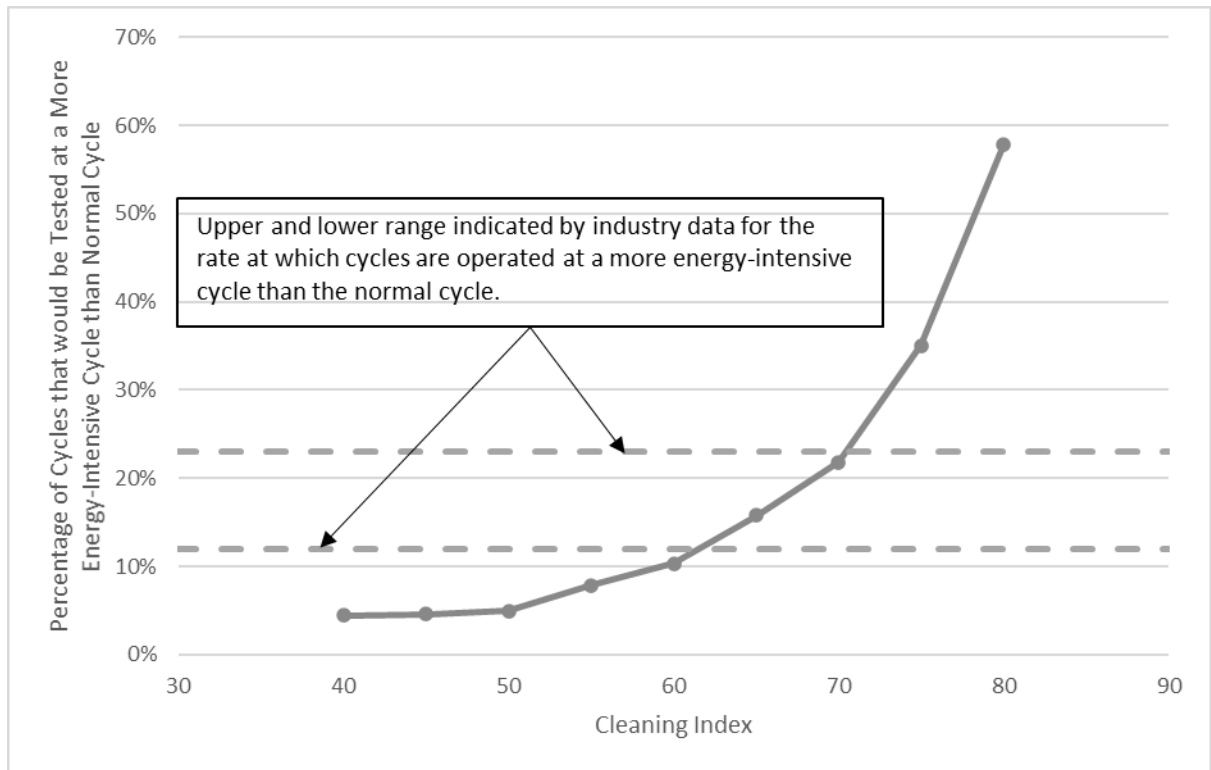


Figure III.2 Percentage of Cycles that Would Be Tested at a More Energy-Intensive Cycle than the Normal Cycle at each Cleaning Index Threshold

Based on the results in Figure III.1 and Figure III.2, DOE proposes establishing a minimum cleaning index of 65 as the threshold level for a test cycle to be valid. At a cleaning index of 65, the percentage of test cycles at each soil level that would achieve the minimum cleaning index threshold is 97 percent for lightly soiled loads, 65 percent for medium soiled loads, and 58 percent for heavily soiled loads. On a weighted-average basis, the measured normal test cycles would reach the threshold cleaning index of 65 approximately 84 percent of the time (*i.e.*, 16 percent of cycles would not meet the

threshold, as shown in Figure III.2).³⁰ The 16-percent rate—representing the overall percentage of cycles that would need to be tested using the most energy-intensive cycle—would align with DOE’s estimate of roughly 12 to 23 percent of cycles being operated using a more energy-intensive cycle than the normal cycle.

DOE also considered other cleaning index threshold values, such as 70, which would align with the ENERGY STAR Most-Efficient criteria, and values below 65. However, for a cleaning index threshold of 70, 22 percent of the cycles would need to be tested at the most energy-intensive cycle, which is close to the upper bound of DOE’s estimated threshold (*i.e.*, 23 percent) for the percentage of cycles that would likely be tested at a more energy-intensive cycle compared to the normal cycle. At a cleaning index threshold of 60, only 10 percent of cycles would need to be tested at the most energy-intensive cycle, which is outside the representative range estimated by DOE from industry-supplied data. While the percentage of cycles estimated to operate at the most energy-intensive cycle to meet a cleaning index threshold of 70 is within the range of cycles that DOE estimates are conducted on a more energy-intensive cycle than the normal cycle, DOE is proposing a cleaning index threshold of 65 because it is closer to the mid-point of the range of 12 to 23 percent of cycles that are likely to be tested on a more energy-intensive cycle compared to the normal cycle. However, if stakeholder feedback indicates that a cleaning index threshold of 70 is appropriate, DOE will consider

³⁰ DOE estimates the overall rate as a weighted average of the rate at each soil load times the frequency of consumer usage of each soil load; *i.e.*, (97 percent lightly soiled × 0.62) + (65 percent × 0.33) + (58 percent × 0.05) = 84 percent overall rate that meets a threshold of 65. Therefore, 16 percent of cycles would not meet the threshold of 65.

establishing 70 as the cleaning index threshold value for a test cycle to be considered valid.

DOE proposes to specify the same cleaning index threshold value for all tested soil loads because it does not have information to suggest that consumer expectations for the cleaning performance of the load at the end of the cycle differ based on the initial soil load of the dishware.

DOE requests feedback on the proposed cleaning index threshold value of 65 for each test cycle or whether it should consider a threshold value of 70 instead.

DOE requests additional data on consumer dishwasher cycle selections. In particular, DOE requests data indicating the frequency with which consumers select the normal cycle; and, for cycles not conducted on the normal cycle, the frequency with which a more energy-intensive cycle is selected.

DOE also requests additional data on how frequently consumers are dissatisfied with the cleaning performance of the normal cycle as well as the actions, and the frequency of each action, that consumers would take if the load is not satisfactorily clean.

3. Validation of the Test Cycle

Similar to the ENERGY STAR Cleaning Performance Test Method, DOE proposes that the cleaning index of the test cycles be determined for the same test cycles required for the energy and water tests for both soil-sensing and non-soil-sensing

dishwashers. The following paragraphs discuss specific details regarding implementation of this proposal for soil-sensing and non-soil-sensing dishwashers, respectively.

For soil-sensing dishwashers, Section 2.6.3 of appendix C1 specifies that the normal cycle shall be tested first for the sensor heavy response, then for the sensor medium response, and finally for the sensor light response, using a defined combination of soiled and clean test load items for each test cycle. DOE proposes maintaining this test sequence, which is also specified in Section 2.6.3 of AHAM DW-1-2020. As discussed, DOE proposes that each of the sensor heavy, medium, and light response test cycles would be required to achieve a cleaning index of 65 or greater to constitute a valid cycle. If a test cycle at a particular soil level does not achieve the defined cleaning index threshold, that soil level would need to be re-tested using the most energy-intensive cycle (to be determined using the proposed methodology discussed in Section III.G.4 of this document) that achieves a cleaning index threshold of 65 or greater. For the soil level under consideration, the test results from the most energy-intensive valid cycle that achieves a cleaning index threshold of 65 or greater would be used in the calculation of EAOE, EAEU, and per-cycle water consumption.

In the event that a test cycle at a particular soil level does not achieve the defined cleaning index threshold, DOE proposes that the filter should be cleaned prior to testing the soil level at the most energy-intensive cycle that achieves a cleaning index of 65 or greater. Cleaning the filter before transitioning from the normal cycle to the specified most energy-intensive cycle at a given soil load would ensure that residual particles from the normal cycle test run do not impact the cleaning performance evaluation for that most

energy-intensive cycle. It would also promote repeatability and reproducibility of the test results when testing according to the proposed amendments (in which the sequence of test cycles may require switching from the normal cycle to a different program cycle).

Non-soil-sensing dishwashers are currently tested with a clean (*i.e.*, unsoiled) test load. Under the proposal that a test cycle would be considered valid if its cleaning index threshold is 65 or greater, DOE proposes that non-soil-sensing dishwashers must be tested instead with a soiled load. Specifically, for non-soil-sensing dishwashers, DOE proposes incorporating the same procedure for evaluating the validity of the normal cycle and, if necessary, testing the most energy-intensive cycle that achieves a cleaning index threshold of 65 or greater, as proposed for soil-sensing dishwashers. The same equations specified for soil-sensing dishwashers in Section 5 of appendix C1 and newly proposed appendix C2, Calculations of Derived Results from Test Measurements, would apply to non-soil-sensing dishwashers. The proposed test procedure would specify testing the heavy, medium, and light soil levels, in that sequence.

Since non-soil-sensing dishwashers consume a fixed amount of water and energy independent of the amount of soil present in the test load, it is assumed that if the normal cycle obtains a cleaning index of 65 or greater at a given soil load (*e.g.*, for the sensor heavy response test), that the normal cycle would also achieve the cleaning index threshold for any lesser soil loads (*e.g.*, the sensor medium and sensor light response tests). Therefore, if a tested soil load for a non-soil-sensing dishwasher meets the defined threshold criteria when tested on the normal cycle, no additional testing would be required of cycles with lesser soil loads. If a non-soil-sensing dishwasher is not tested at

a certain soil load because the preceding heavier soil load(s) meets the cleaning index threshold on the normal cycle, the energy and water consumption values of the preceding soil load would be used to calculate the weighted-average energy and water consumption values. For example, if the sensor medium response and sensor light response tests on the normal cycle are not conducted, the values of the sensor heavy response test on the normal cycle would be used for all three soil loads; whereas, if only the sensor light response test is not conducted, the values of the sensor medium response test on the normal cycle would be used for the sensor medium and the sensor light response tests.

DOE could also consider other potential methods to validate that the measured energy and water consumption of dishwashers is representative of consumer use. For example, the test procedure could define an energy “add” or multiplicative factor that would be applied to the energy and water consumption values for any test cycle that does not meet the defined cleaning index threshold (*e.g.*, DOE could specify a constant adder that could be included to the measured energy consumption of a cycle that does not meet the cleaning index threshold). Such adder or multiplicative factor would compensate for the additional energy and water needed to achieve a consumer-accepted level of cleaning. This example approach would eliminate the need to run additional test cycles, thereby mitigating test burden.

As discussed at the beginning of Section III.G of this document, the representative average use of a dishwasher is represented in DOE’s test procedure by the normal cycle. The normal cycle definition includes the phrase “completely wash a full load of normally soiled dishes.” See 10 CFR part 430 subpart B appendix C1. The discussion in Sections

III.G.1 – 3 of this document illustrates that it is likely that dishwashers exist that are testing using the “normal cycle,” but are not “completely washing” dishes, leading consumers to pre-rinse and use additional cycles, *etc.* Thus, the testing of those dishwashers is not representative of energy use, energy efficiency, and water use during a representative average use cycle. In order to ensure that the testing of all dishwashers more accurately measures energy and water use during representative consumer use (*i.e.*, completely washing a normally soiled load of dishes), DOE is proposing to adopt a cleaning performance threshold.

Further, under 42 U.S.C. 6293(e)(1), DOE is required to determine whether an amended test procedure will alter the measured energy use of any covered product. If an amended test procedure does alter measured energy use, DOE is required to make a corresponding adjustment to the applicable energy conservation standard to ensure that minimally-compliant covered products remain compliant. (42 U.S.C. 6293(e)(2)) The measured energy use of certain dishwashers could change if a more-energy intensive cycle is required to verify that a dishwasher model completely washes a normally soiled load of dishes (*i.e.*, dishwashers for which the cycle recommended in the manufacturer's instructions for daily, regular, or typical use to completely wash a full load of normally soiled dishes does not completely wash a full load of normally soiled dishes). However, DOE does not expect that this proposal would impact the measured energy of dishwasher models for which the normal cycle completely washes a full load of normally soiled dishes as required by the current DOE test procedure. Further, DOE does not expect that this proposal would impact minimally compliant models. As discussed in the December 2016 Final Determination, DOE relied on cleaning performance data from the ENERGY

STAR Cleaning Performance Test Method, which showed that cleaning performance began to drop off at energy and water consumptions below Efficiency Level 3 (255kWh/year and 3.1 gal/cycle). 81 FR 90072, 90082. Additionally, testing conducted in support of the October 2020 Final Rule included two minimally-compliant units, both of which exceeded the proposed cleaning index threshold of 65 at each of the three soil loads on the normal cycle. As such, DOE expects that manufacturers would likely be able to maintain cleaning performance, up to a score of 70, with a maximum energy consumption between 250 and 260 kWh/year and water consumption at 3.1 gal/cycle. DOE has tentatively determined that this proposal would not require an adjustment to the energy conservation standard for dishwashers to ensure that minimally-compliant dishwashers remain compliant.

DOE requests feedback on its proposed approach to ensure that the test procedure produces test results which measure energy use and water use during a representative average use cycle.

DOE requests comment on its proposal that, if a test cycle at a particular soil level is re-tested using the most energy-intensive cycle, the filter should be cleaned prior to testing the soil level at the most energy-intensive cycle.

DOE requests feedback on its proposal to require testing non-soil-sensing dishwashers using a soiled load for the purpose of being able to evaluate the cleaning index of each tested cycle.

DOE requests comment on its proposed approach for non-soil-sensing dishwashers; particularly that if a tested soil load meets the defined threshold criteria when tested on the normal cycle, no additional testing is required of cycles with lesser soil loads.

DOE requests comment and data on the test cycles currently selected by manufacturers for rating the energy and water use of dishwashers compared to the test cycles that would be selected under the proposed cleaning index threshold of 65 as a condition for a valid test cycle. In particular, DOE requests data on the extent to which manufacturers would need to test a more-energy intensive cycle, or redefine the normal cycle, to meet the proposed cleaning index threshold of 65.

DOE requests information on other potential methods to validate that the measured energy and water consumption of dishwashers is representative of consumer use, such as the example approaches of applying an “adder” or multiplicative factor to the energy and water consumption values for any test cycles that do not achieve the defined cleaning index threshold. If stakeholders recommend such an approach, DOE requests data and information that could be used to determine this factor.

DOE requests comment and related supporting data on whether this proposal would result in an altered measured energy use for dishwashers that are currently minimally-compliant with the existing energy conservation standards for dishwashers.

DOE notes that compact dishwashers that are non-soil-sensing are currently tested at the manufacturer-stated capacity, if the capacity of the dishwasher is less than eight place settings. Section 2.6.2 of appendix C1. Under the proposal to test non-soil-sensing dishwashers with a soiled load, the instructions specify that compact dishwashers must be tested using four place settings plus six serving pieces, and that some of the place settings are soiled for the different soiled loads. However, DOE is aware that the rated capacity of some compact, non-soil-sensing dishwashers is less than four place settings (*e.g.*, the basic models for which CNA and FOTILE submitted waiver petitions and discussed in Sections III.D.5 and III.D.6, respectively, of this document). For such dishwashers, as well as any soil-sensing compact dishwashers that have a rated capacity of less than four place settings, DOE proposes the following requirements for soiling the test load:

- Heavy soil load: soil two-thirds of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is greater;
- Medium soil load: soil one-quarter of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is smaller;
- Light soil load: soil one-quarter of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is smaller, using half the quantity of soils specified for one place setting.

DOE requests comment on whether the soil loads proposed for compact dishwashers that have a capacity of less than four place settings is appropriate. If stakeholders recommend different quantity of soils for such dishwashers, DOE requests feedback on the soil level that should be used for such small capacity dishwashers.

4. Determining the Most Energy-Intensive Cycle

To determine the most energy-intensive cycle that achieves a cleaning index of 65 or greater for a given soil load, if the normal cycle does not achieve this threshold level, DOE proposes a new Section 4.1.1 in appendix C1 and newly proposed appendix C2 to provide instructions for determining the most energy-intensive cycle type, to be conducted only if required for this purpose. DOE proposes that the most energy-intensive cycle would be determined by conducting a single test cycle with a clean test load for each available cycle (*e.g.*, Normal, Heavy Duty, Pots and Pans, *etc.*).

DOE also considered that the most energy-intensive cycle be determined for each sensor response test cycle using the respective soil load (*i.e.*, the most energy-intensive sensor heavy response test cycle would require testing each available cycle type with the heavy soil load; the most energy-intensive sensor medium response and sensor light response test cycles would be determined similarly). However, DOE is not proposing this approach due to the significant burden associated with soiling the load and running the cycle for each available cycle type at each potential soil level. If stakeholder comments indicate that such an approach would be more representative to determine the most energy-intensive cycle, DOE would consider it.

DOE also proposes that prior to running the clean load test to determine the most energy-intensive cycle, the dishwasher filter should be cleaned so that soil particles from any previous tests does not affect the determination of the most energy-intensive cycle.

DOE requests feedback on its proposed methodology for determining the most energy-intensive cycle. DOE also requests feedback on whether it should consider determination of the most energy-intensive cycle for sensor response test cycle using the respective soil load.

DOE requests feedback on its proposal to require cleaning of the dishwasher filter prior to running the clean load test to determine the most energy-intensive test cycle.

H. Standby Mode Test Method

1. Standby Power Measurement

Section 4.2 of appendix C1 provides instructions for measuring standby mode and off mode power. These instructions do not currently specify if the dishwasher door is to be open or closed when testing in standby mode and off mode. In the August 2019 RFI, DOE requested comment on whether testing with the door closed is representative of energy use in standby mode or off mode during a representative average use cycle or period of use (*i.e.*, the door is closed when the dishwasher is not in active mode). 84 FR 43071, 43077. Additionally, DOE requested feedback on whether energy is consumed when the door is open, and if so, whether the energy consumption with the door open is significantly different from the energy consumed with the door closed. *Id.*

AHAM commented that it was further investigating the inquiry about whether standby testing with the door closed is representative of energy use in standby mode and whether energy consumed with the door open is significantly different than when the door is closed. (AHAM, No. 5 at p. 7) The Joint Commenters recommended that the test procedure specify that the door remain closed during standby and off mode power testing. (Joint Commenters, No. 8 at p. 2) Both CEC and the CAIOUs stated that DOE should specify that standby testing be conducted with the door closed. (CEC, No. 6 at p. 2; CAIOUs, No. 7 at p. 3) CEC further stated that, “intuitively, most consumers will keep the dishwasher door closed to prevent disruption of foot traffic patterns in their kitchen.” (CEC, No. 6 at p. 2) CEC reiterated that DOE should fully specify the conditions under which measurements are to be made to improve repeatability. (CEC, No. 6 at p. 2)

DOE reviewed recent models from different manufacturers and observed that some newer models have LED lights inside the dishwasher tub as well as other indicators either on the door or on the electronic control panel that illuminate when the dishwasher door is open. Additional energy use by any such lights and/or indicators could affect the standby power consumption and the resulting EAEU measurement; for example, a 1-watt increase in the standby power consumption could impact the EAEU by up to 5 percent, *i.e.*, conducting standby mode testing with the dishwasher door open as compared to testing with the door closed could result impact test results for EAEU by up to 5 percent if the lights consumed an additional 1 watt of power.

Section 4.2 of the new AHAM DW-1-2020 standard also includes specific instructions for the door orientation during standby mode testing. It specifies that the

standby mode test must be conducted after completing the last active mode test as part of the energy test sequence. Thereafter, the dishwasher door must be opened and immediately closed without changing the control panel settings used for the active mode wash cycle and without disconnecting the electrical supply to the dishwasher. Once the door is closed, the standby mode and off mode measurements should begin.

DOE proposes to reference this requirement from AHAM DW-1-2020 regarding opening and closing the door prior to starting the standby mode and off mode tests. DOE has initially concluded that performing standby mode and off mode testing with the door closed is likely to be most representative of average consumer use while also providing a representative measurement, in particular noting CEC's comment that most consumers will keep the dishwasher door closed to prevent disruption of foot traffic patterns in their kitchen.

Based on DOE's interactions with test laboratories, dishwashers are already tested with the door closed in standby mode. Therefore, DOE does not expect any increase in costs to manufacturers from this proposed update were it made final.

DOE requests input on its proposal to apply the standby mode and off mode test requirements from Section 4.2 of AHAM DW-1-2020 to appendix C1 and proposed new appendix C2.

2. Annual Combined Low-Power Mode Energy Consumption Calculation

Section 5.7 of appendix C1 specifies the method to calculate the annual combined low-power mode energy consumption. The combined low-power mode energy consumption includes the power consumption in inactive mode³¹ and off mode,³² depending on whether a unit can enter both of these modes or only one of these modes. To calculate the annual low-power mode energy consumption, Section 5.7 of appendix C1 currently assigns 8,465 hours annually to low-power modes for units that do not have a fan-only mode. For units that have a fan-only mode, the annual hours assigned to low-power modes are calculated for each individual unit based on the tested duration in active mode and fan-only mode. Section 5.7 of appendix C1. That is, the combined low-power annual hours for all available modes other than active mode, S_{LP} , is calculated as:

$S_{LP} = [H - \{N \times (L + L_F)\}]$ for dishwashers capable of operating in fan-only mode; otherwise, $S_{LP} = 8,465$

Where,

H = the total number of hours per year = 8,766 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

³¹ *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. Section 1.10 of appendix C1.

³² *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. Section 1.15 of appendix C1.

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, and

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. Section 5.7, appendix C1.

Section 5.7 of AHAM DW-1-2020 updated this calculation such that the combined low-power annual hours, S_{LP} , is a calculated value for all units. That is, dishwashers that do not have a fan-only mode would use the same equation to calculate S_{LP} as dishwashers that do have a fan-only mode. The only difference in calculation of S_{LP} for units without a fan-only mode is that L_F would be equal to 0 for such units.

DOE proposes to reference the annual low-power mode energy consumption calculation specified in Section 5.7 of AHAM DW-1-2020, which would also include the updated calculation method for combined low-power annual hours, S_{LP} . This approach would change the hours assigned to low-power mode from 8,465 hours for dishwashers that do not have a fan-only mode to a value that is dependent on the duration of the normal cycle. Calculating the annual low-power mode energy consumption utilizing the measured active mode duration for each individual unit rather than assigning a constant value across all units would provide a more representative result.

The proposed change to the combined low-power annual hours would potentially impact the measured EAEU. DOE also notes that the current energy conservation standard was developed using the method for determining the combined low-power annual hours specified in appendix C1. As such, DOE proposes that, if this proposal were adopted, this change would go into effect in conjunction with any amended energy conservation standards for dishwashers. Accordingly, DOE is proposing that the updated calculation of annual low-power mode energy consumption be included only in the new appendix C2. Appendix C1 would continue using the current method for calculating the annual low-power mode energy consumption

DOE requests comment on its proposal to use the updated combined low-power annual hours, specified in Section 5.7 of AHAM DW-1-2020, for the calculation of annual combined low-power mode energy consumption in the proposed new appendix C2.

I. Network Mode

Appendix C1 currently does not address “network mode” power consumption. DOE received two comments that recommended incorporating a network mode power consumption test method into appendix C1. Specifically, the Joint Commenters stated that DOE should consider incorporating a network mode power consumption measurement in the test procedure for "connected" dishwashers so consumers can have a better understanding of the energy associated with connected functionality, adding that as of September 2019, there were 11 ENERGY STAR-qualified connected models on the market. (Joint Commenters, No. 8 at p. 2) Additionally, the CAIOUs recommended that

DOE define a "network mode" for smart dishwashers and implement a method to measure power consumption in network mode so that consumers have a better understanding of the power usage for connected units. (CAIOUs, No. 7 at p. 3)

DOE is aware of dishwashers with network capabilities that are currently on the market. However, DOE does not have sufficient data at this time regarding the energy use and consumer use patterns associated with such capabilities to evaluate potential test procedure provisions related to network capabilities. Therefore, DOE is proposing that all network functions must be disabled during testing. Specifically, DOE proposes to include a requirement in appendix C1 and the proposed new appendix C2 that for dishwashers which can communicate through a network (*e.g.*, Bluetooth® or internet connection), all network functions must be disabled, if it is possible to disable it by means provided in the manufacturer's user manual, for the duration of testing. If the manufacturer instructions provided in the user manual do not provide for disabling a connected function, the standby power test procedure is conducted with the connected function in the "as-shipped" condition. DOE seeks comment on its proposal to require the disablement of all network functions throughout the duration of testing.

DOE seeks the following information regarding connected dishwashers that could inform future test procedure considerations:

DOE requests feedback on connected dishwashers currently on the market. Specifically, DOE requests input on the types of features or functionality enabled by connected dishwashers that exist on the market or that are under development.

DOE requests data on the percentage of users purchasing connected dishwashers, and, for those users, the percentage of the time when the connected functionality of the dishwashers is used.

DOE requests data on the amount of additional or reduced energy use of connected dishwashers.

DOE requests data on the pattern of additional or reduced energy use of connected dishwashers; for example, whether it is constant, periodic, or triggered by the user.

DOE requests information on any existing testing protocols that account for connected features of dishwashers, as well as any testing protocols that may be under development within the industry.

J. Test Cycle Duration

As stated, DOE established a separate product class for standard size dishwashers with a cycle time for the normal cycle of less than one hour from washing through drying. 10 CFR 430.32(f)(1)(iii). *See also* 85 FR 68723. The definition for the new product class of standard size dishwashers with a “normal” cycle time of 60 minutes or less defines “normal” cycle time by reference to Section 1.12 of appendix C1. 10 CFR 430.32(f)(1)(iii). The new product class definition, as well as the previously established definitions for standard size dishwasher and compact size dishwasher, reference

ANSI/AHAM DW-1-2010 for specifying the place settings used to distinguish between “standard” and “compact.” 10 CFR 430.32(f)(1)(i)–(iii).

On December 29, 2020, the National Resources Defense Council (“NRDC”), Sierra Club, Consumer Federation of America, and Massachusetts Union of Public Housing Tenants petitioned the U.S. Court of Appeals for the Second Circuit to review and set aside the October 2020 Final Rule. *Natural Resources Defense Council v. U.S. Dep’t of Energy*, No. 20-4256 (2d Cir.). On the same day, the States of California, Connecticut, Illinois, Maine, Michigan, Minnesota, New Jersey, New Mexico, New York, Nevada, Oregon, Vermont, and Washington, the Commonwealth of Massachusetts, the District of Columbia, and the City of New York filed a separate petition for review of the October 2020 Final Rule in the U.S. Court of Appeals for the Second Circuit. *California v. U.S. Dep’t of Energy*, No. 20-4285 (2d Cir.). These two cases have been consolidated in the Second Circuit and have been placed in abeyance pending DOE’s review of the October 2020 Final Rule in compliance with Executive Order 13990.

Further, on March 1, 2021, AHAM petitioned DOE to reconsider the October 2020 Final Rule that established and amended standards for short-cycle residential dishwashers (Docket EERE-2021-BT-STD-0002, No. 001 at p. 2).³³ On April 28, 2021, the NRDC, Sierra Club, the Consumer Federation of America, and the Massachusetts

³³ AHAM submitted its petition pursuant to the Administrative Procedure Act (“APA”), 5 U.S.C. 551 *et seq.*, which provides among other things, that “[e]ach agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule.” (5 U.S.C. 553(e)) The AHAM petition is available in the docket to this rulemaking, EERE-2021-BT-STD-0002, at www.regulations.gov.

Union of Public Housing Tenants (“NRDC, et al.”) also submitted a petition for DOE to repeal the same October 2020 Final Rule (“NRDC petition for reconsideration”).³⁴

On August 11, 2021, DOE published a NOPR (“August 2021 NOPR”) stating that the October 2020 Final Rule resulted in amended energy conservation standards for the new product class without properly determining whether the relevant statutory criteria for amending standards were met. 86 FR 43970. As a result, DOE proposed to revoke the October 2020 Final Rule establishing the new short cycle product class. *Id.*

As stated, DOE is proposing to incorporate by reference AHAM DW-1-2020 in its entirety into 10 CFR part 430, and amend the dishwasher test procedure to reference specified provisions of the standard. Specifically, DOE is proposing to amend 10 CFR 430.32(f)(1)(iii) to remove the existing reference to appendix C1, and instead reference AHAM DW-1-2020 for the definition of “normal cycle.” DOE is also proposing to specify the method for determining cycle duration in Section 5.3 of appendix C1 and the proposed new appendix C2. DOE proposes the test duration is the weighted average of the sensor heavy response, sensor medium response, and sensor light response tests for all dishwashers (*i.e.*, both soil-sensing and non-soil-sensing dishwashers). Additionally, DOE is proposing to update the references to AHAM DW-1 in the standard size dishwasher and compact size dishwasher descriptions in 10 CFR 430.32. In light of the

³⁴ NRDC also submitted its petition pursuant to the APA, 5 U.S.C. 553(e), to repeal the final rule. The NRDC petition is available in the docket to this rulemaking, EERE-2021-BT-STD-0002, at www.regulations.gov.

August 2021 NOPR, DOE is not proposing at this time to require reporting of the test duration.

DOE requests comment on the proposal to update the standard size dishwasher, compact size dishwasher, and standard size dishwasher with a “normal” cycle time of 60 minutes or less descriptions at 10 CFR 430.32(f)(1)(i)–(iii). DOE also requests comment on the proposal to explicitly provide the method for determining cycle duration in appendices C1 and C2.

K. Test Procedure Costs and Harmonization

1. Test Procedure Costs and Impact

In this NOPR, DOE proposes to amend the existing test procedure for dishwashers at appendix C1 and adopt a new test procedure at appendix C2. The proposed amendments to appendix C1 would establish requirements for water hardness, relative humidity, and loading pattern; update requirements for ambient temperature, detergent dosage, and standby power measurement; include testing approaches from published waivers for dishwashers; and include provisions for evaluating cleaning performance and establishing a minimum per-cycle cleaning index threshold as a condition for a valid test. The newly proposed appendix C2 would additionally include an updated annual number of cycles and low-power mode hours for the calculation of energy consumption.

The proposed amendments to appendix C1 would establish new requirements for water hardness and relative humidity and would update the requirements for ambient

temperature. DOE does not expect these proposals to increase test burden as compared to current industry practice because it expects that laboratories already control water hardness, relative humidity, and ambient temperature to within the proposed specifications, as indicated by manufacturer comments supporting these proposals, as well as general industry acceptance for these requirements as they pertain to dishwashers and other appliances.

DOE also proposes to establish in appendix C1 a new requirement for loading soiled dishes. DOE does not expect this proposal to change the rated energy and water use because the thermal mass inside the dishwasher chamber would be the same, regardless of how the dishes are loaded in the unit. DOE also does not expect this proposal to increase the cost of conducting the test procedure as compared to the current test procedure based on the large number of brands currently participating in the ENERGY STAR qualification and Most Efficient programs (which requires the loading pattern proposed in this NOPR) and based on AHAM's statements expressing support on behalf of the industry.

Further, DOE is also proposing a new detergent type and approach for calculating the detergent dosage in appendix C1. However, DOE is also proposing to retain the current detergent type and dosing requirement. As such, DOE does not expect this proposal to increase test burden as compared to current industry practice.

DOE is further proposing in appendix C1 that standby mode power consumption be measured with the door closed. Based on DOE's interactions with test laboratories,

dishwashers are already tested with the door closed in standby mode. Therefore, DOE does not expect any increase in costs to manufacturers from this proposed update if it were made final.

Finally, DOE is proposing the evaluation of cleaning performance in appendix C1. Specifically, DOE is proposing that each tested soil load must meet a minimum per-cycle cleaning index threshold of 65 for a test cycle to be considered valid. As discussed, DOE understands the market to reflect general consumer satisfaction with the cleaning performance of currently available dishwashers, and the proposed test cycle validation index would reflect that consumer acceptance.

Were a currently certified dishwasher model to require retesting, or new models be tested for certification under the proposed amendments to appendix C1, if made final, DOE estimated the cost to test a dishwasher basic model according to the proposed appendix C1. DOE estimates the costs to test a soil-sensing dishwasher to be approximately \$2,330 per basic model and that for a non-soil-sensing dishwasher to be approximately \$790 per basic model. These costs were estimated as follows.

Based on its experience conducting dishwasher testing, DOE estimates the total duration to test dishwashers currently, according to appendix C1, to be 25 hours for a soil-sensing dishwasher and 6 hours for a non-soil-sensing dishwasher. The additional time required to score a load at the end of cycle and calculate the cleaning index is estimated to be 1 hour per soil load. Therefore, DOE estimates the test duration under the

proposed updates to appendix C1 to be 28 hours for soil-sensing dishwashers (25 hours currently + 1 hour per soil load to score the load and calculate cleaning index).

For non-soil-sensing dishwashers, DOE's proposal requires testing on the heavy soil load. This would increase testing time by approximately 2.5 hours (in addition to the 1 hour associated with scoring and calculating cleaning index) due to the additional time associated with preparing the soils, soiling the load, allowing the soils to dry, and loading the soiled dishes. To mitigate burden, DOE's proposal additionally specifies that non-soil-sensing dishwashers are required to test the medium and light soil loads only if the next-greater soil load requires the use of the most energy-intensive cycle. To estimate the testing burden associated with this proposal, DOE estimates that most non-soil-sensing dishwashers would only be tested at the heavy soil load. Therefore, DOE estimates the total testing duration for non-soil sensing dishwashers under the proposed appendix C1 to be 9.5 hours (2.5 hours to soil the load + 1 hour to score the load and calculate cleaning index).

Based on data from the Bureau of Labor Statistics' ("BLS's") Occupational Employment and Wage Statistics, the mean hourly wage for electrical and electronic engineering technologist and technician is \$29.27.³⁵ Additionally, DOE used data from BLS's Employer Costs for Employee Compensation to estimate the percent that wages comprise the total compensation for an employee. DOE estimates that wages make up

³⁵ DOE used the mean hourly wage of the "17-3027 Mechanical Engineering Technologists and Technicians" from the most recent BLS Occupational Employment and Wage Statistics (May 2020) to estimate the hourly wage rate of a technician assumed to perform this testing. See www.bls.gov/oes/current/oes173027.htm. Last accessed on July 26, 2021.

70.4 percent of the total compensation for private industry employees.³⁶ Therefore, DOE estimated that the total hourly compensation (including all fringe benefits) of a technician performing these tests is approximately \$41.58.³⁷ Using these labor rates and time estimates, DOE estimated that it would cost dishwasher manufacturers approximately \$1,165 to conduct a single test on a soil-sensing dishwasher unit and approximately \$395 to conduct a single test on a non-soil-sensing dishwasher unit.³⁸

DOE requires at least two units to be tested for each basic model prior to certifying a rating with DOE. Therefore, DOE estimates that manufacturers would incur testing costs of approximately \$2,330 per soil-sensing dishwasher basic model and approximately \$790 per non-soil-sensing dishwasher basic model. The incremental increase in testing costs under the proposed updates to appendix C1 compared to the current appendix C1 would be approximately \$250 per soil-sensing dishwasher basic model and approximately \$290 per non-soil-sensing dishwasher basic model.

DOE requests comment on its initial determination as to the impacts from the proposed amendments to appendix C1 related to the rated energy and water use of currently certified dishwashers. DOE also requests comment on the potential impact to manufacturers from the updates proposed to appendix C1. Finally, DOE requests

³⁶ DOE used the March 2021 “Employer Costs for Employee Compensation” to estimate that for “Private Industry Workers,” “Wages and Salaries” are 70.4 percent of the total employee compensation. See www.bls.gov/news.release/archives/ecec_06172021.pdf. Last accessed on July 26, 2021.

³⁷ $\$29.27 \div 0.704 = \41.58 .

³⁸ Soil-sensing dishwasher: $\$41.58 \times 28 \text{ hours} = \$1,164.24$ (rounded to \$1,165)
Non-soil-sensing dishwasher: $\$41.58 \times 9.5 \text{ hours} = \395.01 (rounded to \$395).

comment on its estimated costs for testing soil-sensing and non-soil-sensing dishwashers according to the proposed appendix C1.

In addition to the proposed amendments to appendix C1, DOE is also proposing a new appendix C2. As proposed, use of appendix C2 would be required in conjunction with the compliance date of future amendments to the energy conservation standards for dishwashers, should such amendments be adopted. The proposed change to the annual number of cycles and low-power mode hours, both of which are used for the calculation of energy consumption, would change certain inputs to the calculation, but would not impact the burden as compared to conducting the calculation under the current test procedure.

Another proposed update in the proposed appendix C2 would require the use of a new detergent type and method to calculate the detergent dosage. Based on testing that DOE conducted in support of the October 2020 Final Rule, DOE estimates that the updated detergent dosage methodology would reduce testing time by about 1 hour because the new methodology estimates detergent dosage based on the number of place settings as opposed to the prewash and main wash fill water volumes as required under the current (and proposed) appendix C1 test procedure. Determination of the prewash and main wash fill water volumes requires about 1 hour to identify the prewash and main wash phases of a test cycle, isolating the water consumed during these specific portions of the cycle, and then calculating the quantity of detergent required.

Based on these estimates DOE anticipates the total duration to test soil-sensing dishwashers according to the newly proposed appendix C2 would be 27 hours. Similarly, DOE's estimate of the total duration to test non-soil-sensing dishwashers according to proposed appendix C1 would be 9.5 hours. Therefore, the total duration to test non-soil-sensing dishwashers according to the newly proposed appendix C2 would be 8.5 hours. Using the same labor rates as those used to estimate the testing costs for the updates proposed to appendix C1, DOE estimated that it would cost dishwasher manufacturers approximately \$2,246 per soil-sensing dishwasher basic model and approximately \$705 per non-soil-sensing dishwasher basic model.³⁹

These costs would be for testing pursuant to newly proposed appendix C2, and as proposed, testing pursuant to new appendix C2 would only be required at such time as compliance is required with amended energy conservation standards for dishwashers, should such amendments be adopted. DOE will address the expected costs to industry if and when DOE establishes energy conservation standards for dishwashers.

DOE requests comment on the potential impact to manufacturers from the updates proposed to the newly proposed appendix C2. Specifically, DOE requests comment on the per basic model test costs associated with testing soil-sensing and non-soil-sensing dishwashers.

2. Harmonization with Industry Standards

³⁹ 27 hours testing time per soil-sensing unit × \$41.58 per hour × 2 units per basic model = \$2,245.32 (rounded to \$2,245) and 8.5 hours test time per non-soil-sensing unit × \$41.58 per hour × 2 units per basic model = \$706.86 (rounded to \$705)

DOE's established practice is to adopt industry test standards as DOE test procedures for covered products and equipment, unless such methodology would be unduly burdensome to conduct or would not produce test results that reflect the energy efficiency, energy use, water use (as specified in EPCA) or estimated operating costs of that equipment during a representative average use cycle. Section 8(c) of 10 CFR part 430 subpart C appendix A. In cases where the industry standard does not meet EPCA statutory criteria for test procedures, DOE will make modifications through the rulemaking process to these standards as the DOE test procedure.

The current test procedure for dishwashers at appendix C1 references ANSI/AHAM DW-1-2010 in definitions and for testing conditions, and IEC 62301 Ed. 2.0 for test conditions, equipment, and standby mode power consumption measurement. The industry standards DOE proposes to reference via amendments described in this notice are discussed in further detail in Section III.B and Section IV.M of this document. DOE requests comments on the benefits and burdens of the proposed updates and additions to industry standards referenced in the test procedure for dishwashers.

DOE notes that certain of its proposed modifications would not require retesting and recertification of dishwasher basic models as compared to adopting AHAM DW-1-2020 and AHAM DW-2-2020 without modification, while maintaining the representativeness of the DOE test procedure. DOE is proposing to maintain the list of test load items currently in appendix C1 as an alternative to the test load items specified

in AHAM DW-1-2020, so test laboratories that currently have the test load items are not required to purchase new items. The proposal to maintain the current detergent and dosage requirements as alternatives to the detergent and dosage requirements specified in AHAM DW-1-2020 would allow manufacturers to continue to rely on existing test data and would not require re-testing or re-certification of dishwashers on the market.

Additionally, DOE is proposing to maintain the annual number of cycles and low-power mode hours currently specified in appendix C1 because these values can impact the EAEU, which provides the basis for the existing energy conservation standards. DOE proposes to adopt the annual number of cycles and low-power mode hours from AHAM DW-1-2020 for the newly proposed appendix C2, which would be applicable upon the compliance date of any future amended energy conservation standards for dishwashers. DOE is also proposing to adopt the test procedure waiver provisions applicable to dishwashers for which water is supplied through a manually filled attached tank and for in-sink dishwashers without a main detergent compartment. AHAM DW-1-2020 does not have comparable provisions. The DOE proposal would eliminate the need of manufacturers of such products from having to seek waivers and thereby reduce compliance burden. These modifications would ensure, as required by EPCA, that the DOE test procedure is not unduly burdensome to conduct.

Additionally, AHAM DW-1-2020 references the relevant sections of AHAM DW-2-2020 and IEC 62301 Ed. 2.0 for the requirements where appendix C1 currently references ANSI/AHAM DW-1-2010 and IEC 62301 Ed. 2.0, respectively. Further, DOE's proposal to incorporate a methodology for measuring cleaning performance and including a consumer-representative minimum cleaning performance threshold as a

condition for a cycle to be valid is to be referenced from the relevant sections of AHAM DW-2-2020.

L. Compliance Date and Waivers

EPCA prescribes that, if DOE amends a test procedure, all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with that amended test procedure, beginning 180 days after publication of such a test procedure final rule in the *Federal Register*. (42 U.S.C. 6293(c)(2))

If DOE were to publish an amended test procedure, EPCA provides an allowance for individual manufacturers to petition DOE for an extension of the 180-day period if the manufacturer may experience undue hardship in meeting the deadline. (42 U.S.C. 6293(c)(3)) To receive such an extension, petitions must be filed with DOE no later than 60 days before the end of the 180-day period and must detail how the manufacturer will experience undue hardship. (*Id.*)

Upon the compliance date of an amended test procedure, should DOE issue such an amendment, any waivers that had been previously issued and are in effect that pertain to issues addressed by the amended test procedure are terminated. 10 CFR 430.27(h)(3). Recipients of any such waivers would be required to test the products subject to the waiver according to the amended test procedure as of the compliance date of the amended test procedure. The amendments proposed in this NOPR pertain to issues addressed by waivers granted to Whirlpool, Case No. DW-011, Miele, Case No. DW-012, CNA, Case

No. 2020-008, and FOTILE, Case No. 2020-020. 78 FR 65629, 82 FR 17227, 85 FR 79171, and 86 FR 26712, respectively.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (“OMB”) has determined that this test procedure does not constitute a “significant regulatory action” under Section 3(f) of Executive Order (“E.O.”) 12866, Regulatory Planning and Review, 58 FR 51735 (Oct. 4, 1993). Accordingly, this action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs (“OIRA”) in OMB.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis (“IRFA”) 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 (Aug. 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.energy.gov/gc/office-general-counsel.

DOE reviewed this proposed rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE certifies that the proposed rule, if adopted, would not have significant economic impact on a substantial number of small entities. The factual basis of this certification is set forth in the following paragraphs.

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

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including dishwashers, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A))

In addition, EPCA requires that DOE amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption. (42 U.S.C. 6295(gg)(2)(A)) Standby mode and off mode energy consumption must be

incorporated into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product unless the current test procedures already account for and incorporate standby and off mode energy consumption or such integration is technically infeasible. If an integrated test procedure is technically infeasible, DOE must prescribe a separate standby mode and off mode energy use test procedure for the covered product, if technically feasible. (42 U.S.C. 6295(gg)(2)(A)(ii)) Any such amendment must consider the most current versions of the IEC Standard 62301 and IEC Standard 62087 as applicable. (42 U.S.C. 6295(gg)(2)(A))

DOE is proposing amendments to the test procedure for dishwashers in satisfaction of its statutory obligations under EPCA.

In this NOPR, DOE proposes to incorporate by reference into 10 CFR part 430 the new industry standard, AHAM DW-1-2020, and update the industry standard incorporated by reference in 10 CFR part 430 from ANSI/AHAM DW-1-2010 to AHAM DW-2-2020. Specifically, DOE proposes to:

- 1) Incorporate by reference AHAM DW-1-2020 into 10 CFR part 430 and apply certain provisions of the industry standards to appendix C1, including the following:
 - a. Add the water hardness specification in Section 2.11 of AHAM DW-1-2020;

- b. Add the relative humidity specification in Section 2.5.1 of AHAM DW-1-2020 and the associated tolerance for the measurement instrument in Section 3.7 of AHAM DW-1-2020;
- c. Update the active mode ambient temperature as specified in Section 2.5.1 of AHAM DW-1-2020;
- d. Update the loading pattern requirement by applying the direction specified in Section 2.6 of AHAM DW-1-2020;
- e. Update the specifications for detergent usage consistent with Section 2.10 of AHAM DW-1-2020. This includes changing the type of detergent used, and the calculation of detergent dosage to be used for the pre-wash and main-wash cycles of dishwashers other than water re-use system dishwashers;
- f. Add specific dishwasher door configuration requirements during standby mode testing, by incorporating the specifications in Section 4.2 of AHAM DW-1-2020 and update the annual combined low-power mode hours based on cycle duration; and,
- g. Incorporate the requirements from AHAM DW-1-2020 for the test methods pertaining to two granted waivers for dishwashers with specific design features.

2) Establish new appendix C2, which would generally require testing as in appendix C1, with the following additional update:

- a. Updated number of annual cycles and low-power mode hours used for calculating the estimated annual energy use as specified in Section 5 of AHAM DW-1-2020.

For both, appendices C1 and C2, DOE additionally proposes to:

- 1) Specify provisions for scoring the test load and calculating a per-cycle cleaning index metric as specified in AHAM DW-2-2020 and establish a minimum cleaning index threshold of 65 as a condition for a test cycle to be valid.
- 2) Incorporate the test methods specified in a waiver for testing a basic model of dishwashers that does not hook up to a water supply line but has a manually filled, built-in water tank. Additionally, incorporate the test methods specified in a waiver for basic models of dishwashers that are installed in-sink (as opposed to built-in to the cabinetry or placed on countertops).

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. DOE used SBA’s small business size standards to

determine whether any small entities would be subject to the requirements of the rule. These size standards and codes are established by the North American Industry Classification System (“NAICS”) and are available at www.sba.gov/document/support-table-size-standards. Dishwashers are classified under NAICS 335220, “Major Household Appliance Manufacturing.” The SBA sets a threshold of 1,500 employees or fewer for an entity to be considered as a small business for this category.

DOE used DOE’s Compliance Certification Database⁴⁰ and California Energy Commission’s Modernized Appliance Efficiency Database System (“MAEDbS”)⁴¹ to create a list of companies that sell dishwashers covered by this rulemaking in the United States. DOE consulted publicly available data to identify original equipment manufacturers (“OEMs”). DOE relied on public data and subscription-based business information tools to determine company location, headcount, and annual revenue.

DOE identified 14 companies that are OEMs of dishwashers. In reviewing the 14 OEMs, DOE did not identify any domestic companies that met the SBA criteria for a small entity. Given the lack of small entities with a direct compliance burden, DOE concludes that the impacts of the proposed test procedure amendments outlined in this NOPR would not have a “significant economic impact on a substantial number of small entities.” DOE will transmit the certification and supporting statement of factual basis to

⁴⁰ www.regulations.doe.gov/certification-data. Last accessed April 22, 2021.

⁴¹ cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx. Last accessed April 22, 2021.

the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

DOE seeks comment on its findings that there are no small businesses that are OEMs of dishwashers in the United States. DOE also seeks comment on its conclusion that the proposed test procedure amendments would not have significant impacts on a substantial number of small manufacturers.

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of dishwashers must certify to DOE that their products comply with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including dishwashers. (*See generally* 10 CFR part 429.) The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (“PRA”). This requirement has been approved by OMB under OMB control number 1910-1400. Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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

D. Review Under the National Environmental Policy Act

In this proposed rule, DOE proposes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for dishwashers. DOE has determined that this proposed rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, DOE has determined that adopting test procedures for measuring energy efficiency of consumer products and industrial equipment is consistent with activities identified in 10 CFR part 1021, appendix A to subpart D, A5 and A6. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

E.O. 13132, "Federalism," 64 FR 43255 (Aug. 4, 1999) imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The E.O. requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The E.O. also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory

policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE has examined this proposed rule and has determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this proposed rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by E.O. 13132.

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, Section 3(a) of E.O. 12988, “Civil Justice Reform,” 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity, (2) write regulations to minimize litigation, (3) provide a clear legal standard for affected conduct rather than a general standard, and (4) promote simplification and burden reduction. Section 3(b) of E.O. 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation (1) clearly specifies the preemptive effect, if any, (2) clearly specifies any effect on existing Federal law or regulation, (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction, (4) specifies the retroactive effect, if any, (5) adequately defines key terms, and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines

issued by the Attorney General. Section 3(c) of E.O. 12988 requires executive agencies to review regulations in light of applicable standards in Sections 3(a) and 3(b) to determine whether they are met, or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, the proposed rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (“UMRA”) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of \$100 million or more in any one year (adjusted annually for inflation), Section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed “significant intergovernmental mandate,” and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at energy.gov/gc/office-general-counsel. DOE examined this proposed rule according to UMRA and its statement of policy and determined that the rule contains neither an

intergovernmental mandate, nor a mandate that may result in the expenditure of \$100 million or more in any year, so these requirements do not apply.

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

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

I. Review Under Executive Order 12630

DOE has determined, under E.O. 12630, “Governmental Actions and Interference with Constitutionally Protected Property Rights” 53 FR 8859 (March 18, 1988), that this proposed regulation would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

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

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB’s guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE’s guidelines were published at 67 FR 62446 (Oct. 7, 2002). Pursuant to OMB Memorandum M-19-15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at

www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf. DOE has reviewed this proposed rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

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

The proposed regulatory action to amend the test procedure for measuring the energy efficiency of dishwashers is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by

the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

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

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

The proposed modifications to the test procedure for dishwashers would incorporate testing methods contained in certain sections of the following commercial standards: AHAM DW-1-2020, AHAM DW-2-2020, and IEC 62301 Ed. 2.0. DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of Section 32(b) of the FEAA (*i.e.*, whether it was developed in a manner that fully provides for public participation, comment, and review.) DOE will consult with both the Attorney General and the Chairman of the FTC concerning the impact of these test procedures on competition, prior to prescribing a final rule.

M. Description of Materials Incorporated by Reference

In this NOPR, DOE proposes to incorporate by reference into 10 CFR part 430 the test standard published by AHAM, titled “Uniform Test Method for Measuring the Energy Consumption of Dishwashers,” AHAM DW-1-2020, and the test standard published by IEC, titled “Household electrical appliances—Measurement of standby power,” IEC 62301 Ed. 2.0 for both, appendix C1 and the new appendix C2. Additionally, DOE proposes to update the industry standard incorporated by reference in 10 CFR part 430 from ANSI/AHAM DW-1-2010 to AHAM DW-2-2020.

AHAM DW-1-2020 is a voluntary industry-accepted test procedure that measures the energy and water consumption of household electric dishwashers. The test procedure amendments proposed in this NOPR generally reference AHAM DW-1-2020 including provisions to address: water hardness, relative humidity, ambient temperature, test load items, loading pattern, detergent, standby power measurement, dishwashers with 208 V power source, and water re-use system dishwashers. Additionally, this NOPR proposes to incorporate by reference AHAM DW-1-2020 in its entirety in the new appendix C2. In addition to the updates proposed to appendix C1, the new appendix C2 would include updated requirements for the annual number of cycles and calculation of low-power mode energy consumption.

DOE also proposes to incorporate by reference into 10 CFR part 430 AHAM DW-2-2020, “Household Electric Dishwashers,” which is a standard to determine the cleaning performance of dishwashers. For some of the provisions that DOE is proposing to reference from AHAM DW-1-2020, the standard references AHAM DW-2-2020; these include certain definitions and requirements for test cycle and load, soils, and

detergent. Additionally, DOE's proposed requirements for evaluating cleaning performance in appendix C1 and the new appendix C2 would also be referenced from the relevant sections of AHAM DW-2-2020.

DOE also proposes to apply specified provisions of the IEC Standard, IEC 62301 Ed. 2.0, to the new appendix C2. IEC 62301 Ed. 2.0, already incorporated by reference into 10 CFR part 430 for application to appendix C1, is an international standard that specifies methods of measurement of electrical power consumption of household appliances in standby mode(s) and other low power modes, as applicable. The proposed new appendix C2 would include references to IEC 62301 Ed. 2.0 for the measurement of dishwasher standby power consumption.

Copies of AHAM DW-1-2020 and AHAM DW-2-2020 may be purchased from AHAM at 1111 19th Street NW, Suite 402, Washington, DC 20036; or by going to AHAM's online store at www.aham.org/AHAM/AuxStore.

Copies of IEC 62301 Ed. 2.0 can be obtained from – 3, rue de Varembe, P.O. Box 131, CH - 1211 Geneva 20 - Switzerland, or by visiting www.iec.ch. Copies of the IEC standards are also available at American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, (212) 642-4936, or by visiting webstore.ansi.org.

V. Public Participation

A. Participation in the Webinar

The time and date of the webinar are listed in the **DATES** section at the beginning of this document. If no participants register for the webinar, it will be cancelled.

Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website:

www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=38&action=viewlive. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has an interest in the topics addressed in this proposed rulemaking, or who is representative of a group or class of persons that has an interest in these issues, may request an opportunity to make an oral presentation at the webinar.

Such persons may submit requests to speak by email to:

ApplianceStandardsQuestions@ee.doe.gov. Persons who wish to speak should include with their request a computer file in WordPerfect, Microsoft Word, PDF, or text (ASCII) file format that briefly describes the nature of their interest in this rulemaking and the topics they wish to discuss. Such persons should also provide a daytime telephone number where they can be reached.

Persons requesting to speak should briefly describe the nature of their interest in this rulemaking and provide a telephone number for contact. DOE requests persons selected to make an oral presentation to submit an advance copy of their statements at least two weeks before the webinar. At its discretion, DOE may permit persons who cannot supply an advance copy of their statement to participate, if those persons have made advance

alternative arrangements with the Building Technologies Office. As necessary, requests to give an oral presentation should ask for such alternative arrangements.

C. Conduct of the Webinar

DOE will designate a DOE official to preside at the webinar and may also use a professional facilitator to aid discussion. The meeting will not be a judicial or evidentiary-type public hearing, but DOE will conduct it in accordance with Section 336 of EPCA (42 U.S.C. 6306). A court reporter will be present to record the proceedings and prepare a transcript. DOE reserves the right to schedule the order of presentations and to establish the procedures governing the conduct of the webinar. There shall not be discussion of proprietary information, costs or prices, market share, or other commercial matters regulated by U.S. anti-trust laws. After the webinar and until the end of the comment period, interested parties may submit further comments on the proceedings and any aspect of the rulemaking.

The webinar will be conducted in an informal, conference style. DOE will present summaries of comments received before the webinar, allow time for prepared general statements by participants, and encourage all interested parties to share their views on issues affecting this rulemaking. Each participant will be allowed to make a general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will allow, as time permits, other participants to comment briefly on any general statements.

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly and comment on statements made by others. Participants should be prepared to answer questions by DOE and by other participants concerning these issues. DOE representatives may also ask questions of participants concerning other matters relevant to this rulemaking. The official conducting the webinar will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the above procedures that may be needed for the proper conduct of the webinar.

A transcript of the webinar will be included in the docket, which can be viewed as described in the *Docket* section at the beginning of this document and will be accessible on the DOE website. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule no later than the date provided in the **DATES** section at the beginning of this proposed rule.⁴² Interested parties may submit comments using any of the methods described in the **ADDRESSES** section at the beginning of this NOPR.

⁴² DOE has historically provided a 75-day comment period for test procedure NOPRs pursuant to the North American Free Trade Agreement, U.S.-Canada-Mexico (“NAFTA”), Dec. 17, 1992, 32 I.L.M. 289 (1993); the North American Free Trade Agreement Implementation Act, Pub. L. 103-182, 107 Stat. 2057 (1993) (codified as amended at 10 U.S.C.A. 2576) (1993) (“NAFTA Implementation Act”); and Executive Order 12889, “Implementation of the North American Free Trade Agreement,” 58 FR 69681 (Dec. 30, 1993). However, on July 1, 2020, the Agreement between the United States of America, the United

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

Mexican States, and the United Canadian States (“USMCA”), Nov. 30, 2018, 134 Stat. 11 (*i.e.*, the successor to NAFTA), went into effect, and Congress’s action in replacing NAFTA through the USMCA Implementation Act, 19 U.S.C. 4501 *et seq.* (2020), implies the repeal of E.O. 12889 and its 75-day comment period requirement for technical regulations. Thus, the controlling laws are EPCA and the USMCA Implementation Act. Consistent with EPCA’s public comment period requirements for consumer products, the USMCA only requires a minimum comment period of 60 days. Consequently, DOE now provides a 60-day public comment period for test procedure NOPRs.

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. Comments and documents submitted via email 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. Following these instructions, the cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. No telefacsimiles (faxes) will be accepted.

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

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

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

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that they believe to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked non-confidential with the information believed to be confidential deleted. Submit these documents via email to *ResDishwasher2016TP0012@ee.doe.gov* or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

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

E. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

- 1) DOE requests comment on its proposal to incorporate by reference into 10 CFR part 430 the most recent version of the industry standard for dishwasher energy and water use measurement, AHAM DW-1-2020, as well as the industry performance standard, AHAM DW-2-2020, both with modifications. DOE seeks comment on its preliminary conclusion that the proposed modifications to the industry standards are necessary so that the DOE test method satisfies the requirements of EPCA.
- 2) DOE requests comment on its proposal to require use of the water hardness requirements from Section 2.11 of AHAM DW-1-2020.
- 3) DOE requests comment on its proposal to reference AHAM DW-1-2020 for the relative humidity and associated instrumentation requirements, which specifies a relative humidity test condition of 35 percent $\pm$ 15 percent, and a resolution of at least 1 percent relative humidity and an accuracy of at least $\pm$ 6 percent relative humidity over the temperature range of 75 °F $\pm$ 5 °F for the relative humidity measuring device. To the extent that stakeholder have additional information, DOE requests data regarding the impact of relative humidity on dishwasher energy and water usage.
- 4) DOE requests input on its proposal to specify a target nominal ambient temperature of 75 °F for active mode testing, as referenced from AHAM DW-1-2020.

- 5) DOE requests comment on its proposal to reference in appendix C1 and the new appendix C2 the testing provisions from AHAM DW-1-2020 to address the Miele waiver for dishwashers that operate at 208-volts.
- 6) DOE requests comment on its proposal to incorporate the requirements of the CNA waiver for any dishwasher with a built-in reservoir. In particular, DOE requests stakeholder feedback on using the detergent dosage requirement based on number of place settings rather than main wash water volume in the new appendix C2, for dishwashers with built-in reservoirs.
- 7) DOE requests comment on its proposal to incorporate into appendix C1 and the new appendix C2 the installation requirements for in-sink dishwashers from the FOTILE waiver.
- 8) DOE requests comment on its proposal that the detergent must be placed directly into the dishwasher chamber for any dishwasher that does not have a prewash or main wash detergent compartment.
- 9) DOE requests input on its proposal to update the estimated number of annual cycles from 215 to 184 cycles per year for future calculations of EAEU. DOE also requests comment on its approach to propose a new appendix C2 with the updated annual number of cycles, the use of which would be required for compliance with any amended energy conservation standards.
- 10) DOE requests comment on specifying that the test load items be as specified in AHAM DW-1-2020 (which references Section 3.4 of AHAM DW-2-2020), while additionally retaining, as an alternative, the current test load specifications in appendix C1 and the new appendix C2.

- 11) DOE continues to request feedback and data regarding soiling level and whether there have been changes to consumers' pre-rinsing behavior. DOE also seeks information regarding the impact of different soil levels on energy and water use in dishwashers currently on the market.
- 12) DOE requests comment on its proposal to remove the soil substitution and soil preparation requirements from Sections 2.7.4 and 2.7.5 of appendix C1 and apply these same requirements from AHAM DW-1-2020 instead. DOE particularly requests data and information on how the proposed soil composition would affect energy and water use in current dishwashers.
- 13) DOE requests input on its proposal to use the loading requirements specified in Section 2.6.3.4 of AHAM DW-1-2020.
- 14) DOE requests comment on its proposal to adopt in appendix C1 the new detergent and new dosage requirements as specified in AHAM DW-1-2020, while also retaining the current detergent and dosage requirements in appendix C1. The use of either set of detergent requirements would be allowable for testing under appendix C1. DOE also requests comment on the detergent currently being used by manufacturers and test laboratories for testing and certification of dishwashers.
- 15) DOE also welcomes comments and data on the impact of the new detergent and dosage on energy and water use.
- 16) DOE requests comment on its proposal to reference in appendix C1 and the new appendix C2 the testing provisions from AHAM DW-1-2020 to address the Whirlpool waiver for water re-use system dishwashers.

- 17) DOE requests feedback on the proposed methodology to test, score, and calculate a cleaning index to validate the tested cycle and seeks comment if other methodologies should be considered for validating the cleaning performance of the tested cycle.
- 18) DOE requests feedback on whether it should consider referencing Section 5.12.3.1 of AHAM DW-2-2020 to measure cleaning performance, which would calculate the cleaning index based on soil particles only. DOE notes that if it were to calculate cleaning index using soil particles only, it would reevaluate the per-cycle cleaning index threshold value to reflect this change.
- 19) DOE requests feedback on the proposed cleaning index threshold value of 65 for each test cycle or whether it should consider a threshold value of 70 instead.
- 20) DOE requests additional data on consumer dishwasher cycle selections. In particular, DOE requests data indicating the frequency with which consumers select the normal cycle; and, for cycles not conducted on the normal cycle, the frequency with which a more energy-intensive cycle is selected.
- 21) DOE also requests additional data on how frequently consumers are dissatisfied with the cleaning performance of the normal cycle as well as the actions, and the frequency of each action, that consumers would take if the load is not satisfactorily clean.
- 22) DOE requests feedback on its proposed approach to ensure that the test procedure produces test results which measure energy use and water use during a representative average use cycle.

- 23) DOE requests comment on its proposal that, if a test cycle at a particular soil level is re-tested using the most energy-intensive cycle, the filter should be cleaned prior to testing the soil level at the most energy-intensive cycle.
- 24) DOE requests feedback on its proposal to require testing non-soil-sensing dishwashers using a soiled load for the purpose of being able to evaluate the cleaning index of each tested cycle.
- 25) DOE requests comment on its proposed approach for non-soil-sensing dishwashers; particularly that if a tested soil load meets the defined threshold criteria when tested on the normal cycle, no additional testing is required of cycles with lesser soil loads.
- 26) DOE requests comment and data on the test cycles currently selected by manufacturers for rating the energy and water use of dishwashers compared to the test cycles that would be selected under the proposed cleaning index threshold of 65 as a condition for a valid test cycle. In particular, DOE requests data on the extent to which manufacturers would need to test a more-energy intensive cycle, or redefine the normal cycle, to meet the proposed cleaning index threshold of 65.
- 27) DOE requests information on other potential methods to validate that the measured energy and water consumption of dishwashers is representative of consumer use, such as the example approaches of applying an “adder” or multiplicative factor to the energy and water consumption values for any test cycles that do not achieve the defined cleaning index threshold. If

stakeholders recommend such an approach, DOE requests data and information that could be used to determine this factor.

- 28) DOE requests comment and related supporting data on whether this proposal would result in an altered measured energy use for dishwashers that are currently minimally-compliant with the existing energy conservation standards for dishwashers.
- 29) DOE requests comment on whether the soil loads proposed for compact dishwashers that have a capacity of less than four place settings is appropriate. If stakeholders recommend different quantity of soils for such dishwashers, DOE requests feedback on the soil level that should be used for such small capacity dishwashers.
- 30) DOE requests feedback on its proposed methodology for determining the most energy-intensive cycle. DOE also requests feedback on whether it should consider determination of the most energy-intensive cycle for sensor response test cycle using the respective soil load.
- 31) DOE requests feedback on its proposal to require cleaning of the dishwasher filter prior to running the clean load test to determine the most energy-intensive test cycle.
- 32) DOE requests input on its proposal to apply the standby mode and off mode test requirements from Section 4.2 of AHAM DW-1-2020 to appendix C1 and proposed new appendix C2.
- 33) DOE requests comment on its proposal to use the updated combined low-power annual hours, specified in Section 5.7 of AHAM DW-1-2020, for the

calculation of annual combined low-power mode energy consumption in the proposed new appendix C2.

34) DOE requests feedback on connected dishwashers currently on the market.

Specifically, DOE requests input on the types of features or functionality enabled by connected dishwashers that exist on the market or that are under development.

35) DOE requests data on the percentage of users purchasing connected dishwashers, and, for those users, the percentage of the time when the connected functionality of the dishwashers is used.

36) DOE requests data on the amount of additional or reduced energy use of connected dishwashers.

37) DOE requests data on the pattern of additional or reduced energy use of connected dishwashers; for example, whether it is constant, periodic, or triggered by the user.

38) DOE requests information on any existing testing protocols that account for connected features of dishwashers, as well as any testing protocols that may be under development within the industry.

39) DOE requests comment on the proposal to update the standard size dishwasher, compact size dishwasher, and standard size dishwasher with a “normal” cycle time of 60 minutes or less descriptions at 10 CFR 430.32(f)(1)(i)–(iii). DOE also requests comment on the proposal to explicitly provide the method for determining cycle duration in appendices C1 and C2.

- 40) DOE requests comment on its initial determination as to the impacts from the proposed amendments to appendix C1 related to the rated energy and water use of currently certified dishwashers. DOE also requests comment on the potential impact to manufacturers from the updates proposed to appendix C1. Finally, DOE requests comment on its estimated costs for testing soil-sensing and non-soil-sensing dishwashers according to the proposed appendix C1.
- 41) DOE requests comment on the potential impact to manufacturers from the updates proposed to the newly proposed appendix C2. Specifically, DOE requests comment on the per basic model test costs associated with testing soil-sensing and non-soil-sensing dishwashers.
- 42) DOE seeks comment on its findings that there are no small businesses that are OEMs of dishwashers in the United States. DOE also seeks comment on its conclusion that the proposed test procedure amendments would not have significant impacts on a substantial number of small manufacturers.

VI. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this notice of proposed rulemaking and request for comment.

List of Subjects in

10 CFR Part 430

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

Signing Authority

This document of the Department of Energy was signed on December 3, 2021, by Kelly J. Speakes-Backman, Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on December 3, 2021

 Kelly Speakes-Backman Digitally signed by Kelly Speakes-Backman
Date: 2021.12.03 18:20:04 -05'00'

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

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

PART 430 -- ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

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

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

2. Section 430.3 is amended by:
 - a. Redesignating paragraphs (i)(2) through (6) as (i)(3) through (7);
 - b. Adding a new paragraph (i)(2); and
 - c. Revising newly redesignated paragraphs (i)(3); and
 - d. Revising paragraph (o)(6). The addition and revisions read as follows:

§ 430.3 Materials incorporated by reference.

* * * * *

(i) * * *

(2) ANSI/AHAM DW-1-2020, (“AHAM DW-1-2020”), Uniform Test Method for Measuring the Energy Consumption of Dishwashers, (approved October 2020), IBR approved for §430.32 and appendices C1 and C2 to subpart B.

(3) ANSI/AHAM DW-2-2020, (“AHAM DW-2-2020”), Household Electric

Dishwashers, (approved 2020), IBR approved for appendices C1 and C2 to subpart B.

* * * * *

(o) * * *

(6) IEC 62301 (“IEC 62301”), Household electrical appliances—Measurement of standby power, (Edition 2.0, 2011-01), IBR approved for appendices C1, C2, D1, D2, F, G, H, I, J2, N, O, P, Q, X, X1, Y, Z, BB, and CC to subpart B.

* * * * *

3. Section 430.23 is amended by revising paragraph (c) 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,

$$\text{EAOC} = (\text{De} \times \text{ETLP}) + (\text{De} \times \text{N} \times (\text{M} + \text{MWS} + \text{MDO} + \text{MCO} + \text{EF} - (\text{ED}/2))).$$

Where,

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

E_{TLP} = the annual combined low-power mode energy consumption in kilowatt-hours per year and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable,

N = the representative average dishwasher use of 215 cycles per year when EAOE is determined pursuant to appendix C1 to this subpart, and 184 cycles per year when EAOE is determined pursuant to appendix C2 to this subpart,

M = the machine energy consumption per cycle, in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable,

M_{WS} = the machine energy consumption per cycle for water softener regeneration, in kilowatt-hours and determined pursuant to section 5 of appendix C1 or appendix C2 to this subpart, as applicable,

M_{DO} = for water re-use system dishwashers, the machine energy consumption per cycle during a drain out event in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable,

M_{CO} = for water re-use system dishwashers, the machine energy consumption per cycle during a clean out event, in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable,

E_F = the fan-only mode energy consumption per cycle, in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable, and

E_D = the drying energy consumption, in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable.

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

$$E_{AOC} = (D_e \times E_{TLP}) + (D_e \times N \times (M + M_{WS} + M_{DO} + M_{CO} + E_F - (E_D/2))) + (D_e \times N \times (W + W_{WS} + W_{DO} + W_{CO})).$$

Where,

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

W = the water energy consumption per cycle, in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable,

W_{ws} = the water softener regeneration water energy consumption per cycle in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable,

W_{DO} = The drain out event water energy consumption per cycle in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable, and

W_{CO} = The clean out event water energy consumption per cycle in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable.

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

$$EAO C_g = (D_e \times E_{TLP}) + (D_e \times N \times (M + M_{WS} + M_{DO} + M_{CO} + E_F - (E_D/2))) + (D_g \times N \times (W_g + W_{WSg} + W_{DOg} + W_{COg})).$$

Where,

D_e , E_{TLP} , N , M , M_{WS} , M_{DO} , M_{CO} , 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, in Btus and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable.

W_{WSg} = the water softener regeneration energy consumption per cycle in Btu per cycle and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable,

W_{DOg} = the drain out water energy consumption per cycle in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable, and

W_{COg} = the clean out water energy consumption per cycle in kilowatt-hours and determined according to section 5 of appendix C1 or appendix C2 to this subpart, as applicable.

(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:

$$EAEU = (M + M_{WS} + M_{DO} + M_{CO} + E_F - (E_D/2) + W + W_{WS} + W_{DO} + W_{CO}) \times N + E_{TLP}$$

Where,

M , M_{WS} , M_{DO} , M_{CO} , E_F , E_D , E_{TLP} are all defined in paragraph (c)(1)(i) and W ,

W_{WS} , W_{DO} , W_{CO} are defined in paragraph (c)(1)(ii) of this section.

(3) The sum of the water consumption, V , the water consumption during water softener regeneration, V_{WS} , the water consumption during drain out events for dishwashers equipped with a water re-use system, V_{DO} , and the water consumption during clean out events for dishwashers equipped with a water re-use system, V_{CO} , expressed in gallons per cycle and defined pursuant to section 5 of appendix C1 or appendix C2 to this subpart, as applicable, must be rounded to one decimal place.

(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 C1 to this subpart or appendix C2 to this subpart, as applicable.

* * * * *

4. Appendix C1 to subpart B of part 430 is revised to read as follows:

**Appendix C1 to Subpart B of Part 430—Uniform Test Method for
Measuring the Energy Consumption of Dishwashers**

NOTE: Manufacturers must use the results of testing under this appendix (published on [*Insert Date of Publication*]) to determine compliance with the relevant standard from §430.32(f)(1) as it appeared in the January 1, 2021 edition of 10 CFR parts 200-499. For any amended standards for dishwashers published after January 1, 2021, manufacturers must use the results of testing under appendix C2 to determine compliance. Representations related to energy or water consumption must be made in accordance with the appropriate appendix that applies (i.e., appendix C1 or appendix C2) when determining compliance with the relevant standard. Manufacturers may also use appendix C2 to certify compliance with any amended standards prior to the applicable compliance date for those standards.

0. Incorporation by Reference

DOE incorporated by reference in §430.3, AHAM DW-1-2020, AHAM DW-2-2020, and IEC 62301:2011 (IEC 62301) in their entirety. The following enumerated provisions of AHAM DW-1-2020, AHAM DW-2-2020, and IEC 62301 are applicable to this appendix, as follows:

- (1) AHAM DW-1-2020: Uniform Test Method for Measuring the Energy
Consumption of Dishwashers

- (i) Sections 1.1 through 1.30 as referenced in section 1 of this appendix;
 - (ii) Section 2.1 as referenced in sections 2 and 2.1 of this appendix;
 - (iii) Sections 2.2 through 2.3.3, sections 2.5 and 2.7, sections 2.7.2 through 2.8, and section 2.11, as referenced in section 2 of this appendix;
 - (iv) Section 2.4 as referenced in sections 2 and 2.2 of this appendix;
 - (v) Section 2.6.3 as referenced in sections 2 and 2.3 of this appendix;
 - (vi) Section 2.7.1 as referenced in sections 2 and 2.4 of this appendix;
 - (vii) Section 2.9 as referenced in sections 2 and 2.5 of this appendix;
 - (viii) Section 2.10 as referenced in sections 2 and 2.6 of this appendix;
 - (ix) Sections 3.1 through 3.2 and sections 3.5 through 3.7 as referenced in section 3 of this appendix;
 - (x) Section 3.3 as referenced in sections 3 and 3.1 of this appendix;
 - (xi) Section 3.4 as referenced in sections 3 and 3.2 of this appendix;
 - (xii) Sections 4.1 as referenced in sections 4 and 4.1 of this appendix;
 - (xiii) Section 4.1.4 as referenced in sections 4 and 4.1.2 of this appendix;
- and

- (xiv) Section 5 as referenced in section 5 of this appendix.(2)

AHAM DW-2-2020: Household Electric Dishwashers

- (i) Section 5.10 as referenced in sections 2 and 2.8 of this appendix;
- (ii) Sections 5.10.1 as referenced in sections 4 and 4.2 of this appendix;
and
- (iii) Section 5.12.3.2 as referenced in sections 5 and 5.1 of this appendix.

(3) IEC 62301: Household Electrical Appliances - Measurement of Standby Power

- (i) Sections 4.2, 4.3.2, and 5.2 as referenced in section 2 of this appendix; and
- (ii) Sections 5.1, note 1, and 5.3.2 as referenced in section 4 of this appendix.

1. Definitions

The definitions in Section 1.1 through 1.30 of AHAM DW-1-2020 apply to this test procedure, including the applicable provisions of AHAM DW-2-2020 as referenced in Sections 1.5, 1.18, 1.19, 1.20, and 1.22 of AHAM DW-1-2020.

2. Testing Conditions

The testing conditions in Sections 2.1 through 2.11 of AHAM DW-1-2020, except Sections 2.6.1 and 2.6.2, and the testing conditions in Section 5.10 of AHAM DW-2-2020 apply to this test procedure, including the following provisions of:

(1) Sections 4.2, 4.3.2, and 5.2 of IEC 62301 as referenced in Sections 2.1, 2.2.4, and 2.5.2 of AHAM DW-1-2020, respectively, and

(2) Sections 5.3 through 5.8 of AHAM DW-2-2020 as referenced in Sections 2.6.3.1, 2.6.3.2, and 2.6.3.3; section 3.4 of AHAM DW-2-2020, excluding the accompanying Note, as referenced in Section 2.7.1 of AHAM DW-1-2020; Section 5.4 of AHAM DW-2-2020 as referenced in Section 2.7.4 of AHAM DW-1-2020; Section 5.5 of AHAM DW-2-2020 as referenced in Section 2.7.5 of AHAM DW-1-2020, and Section 4.1 of AHAM DW-2-2020 as referenced in Section 2.10.1 of AHAM DW-1-2020. Additionally, the following requirements are also applicable.

2.1 Installation Requirements.

The installation requirements described in Section 2.1 of AHAM DW-1-2020 are applicable to all dishwashers, with the following additions:

2.1.1 In-Sink Dishwashers.

For in-sink dishwashers, the requirements pertaining to the rectangular enclosure for under-counter or under-sink dishwashers are not applicable. For such dishwashers, the rectangular enclosure must consist of a front, a back, two sides, and a bottom. The front,

back, and sides of the enclosure must be brought into the closest contact with the appliance that the configuration of the dishwasher will allow. The height of the enclosure shall be as specified in the manufacturer's instructions for installation height. If no instructions are provided, the enclosure height shall be 36 inches. The dishwasher must be installed from the top and mounted to the edges of the enclosure.

2.1.2 Dishwashers without a Direct Water Line.

Manually fill the built-in water reservoir to the full capacity reported by the manufacturer, using water at a temperature in accordance with Section 2.3 of AHAM DW-1-2020.

2.2 Water pressure.

The water pressure requirements described in Section 2.4 of AHAM DW-1-2020 are applicable to all dishwashers except dishwashers that do not have a direct water line.

2.3 Non-soil-sensing and soil-sensing dishwashers to be tested at a nominal inlet temperature of 50 °F, 120 °F, or 140 °F.

The test load and soiling requirements for all non-soil-sensing and soil-sensing dishwashers shall be the same as those requirements specified in Section 2.6.3 of AHAM DW-1-2020 for soil-sensing dishwashers. Additionally, both non-soil-sensing and soil-sensing compact dishwashers that have a capacity of less than four place settings shall be tested at the rated capacity of the dishwasher and the test load shall be soiled as follows at each soil load:

- a. Heavy soil load: soil two-thirds of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is greater;
- b. Medium soil load: soil one-quarter of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is smaller;
- c. Light soil load: soil one-quarter of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is smaller, using half the quantity of soils specified for one place setting.

2.4. Test load items.

The test load items described in Section 2.7.1 of AHAM DW-1-2020 apply to this test procedure, including the applicable provisions of AHAM DW-2-2020 , as referenced in Section 2.7.1 of AHAM DW-1-2020. The following test load items may be used in the alternative.

Dishware/glassware/ flatware item	Primary source	Description	Primary No.	Alternate source	Alternate source No.
Dinner Plate	Corning Comcor [®] /Corelle [®]	10 inch Dinner Plate	6003893		
Bread and Butter Plate	Corning Comcor [®] /Corelle [®]	6.75 inch Bread & Butter	6003887	Arzberg	8500217100 or 2000- 00001-0217- 1

Fruit Bowl	Corning Comcor®/Corelle®	10 oz. Dessert Bowl	6003899	Arzberg	3820513100
Cup	Corning Comcor®/Corelle®	8 oz. Ceramic Cup	6014162	Arzberg	1382-00001-4732
Saucer	Corning Comcor®/Corelle®	6 inch Saucer	6010972	Arzberg	1382-00001-4731
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		2619KPV F	WMF—Gastro 0800	12.0803.6047
Flatware—Dinner Fork	Oneida®—Accent		2619FRS F	WMF—Signum 1900	12.1905.6040
Flatware—Salad Fork	Oneida®—Accent		2619FSL F	WMF—Signum 1900	12.1964.6040
Flatware—Teaspoon	Oneida®—Accent		2619STS F	WMF—Signum 1900	12.1910.6040
Flatware—Serving Fork	Oneida®—Flight		2865FC M	WMF—Signum 1900	12.1902.6040
Flatware—Serving Spoon	Oneida®—Accent		2619STB F	WMF—Signum 1900	12.1904.6040

2.5 Preconditioning requirements.

The preconditioning requirements described in Section 2.9 of AHAM DW-1-2020 are applicable to all dishwashers. For dishwashers that do not have a direct water line,

measurement of the prewash fill water volume, V_{pw} , if any, and measurement of the main wash fill water volume, V_{mw} , are not taken.

2.6 Detergent.

The detergent requirements described in Section 2.10 of AHAM DW-1-2020 are applicable to all dishwashers. For any dishwasher that does not have a detergent compartment, determine the amount of main wash detergent (in grams) according to Section 2.10 of AHAM DW-1-2020, or as specified below, and place the detergent directly into the dishwasher chamber.

Additionally, the following detergent and dosage may also be used for all dishwashers. Note that if the detergent specified in Section 2.10 of AHAM DW-1-2020 is used, then the dosage requirements specified in Section 2.10 of AHAM DW-1-2020 must be used. Alternately, if the detergent specified below is used, the dosage requirements specified below must be used.

Use Cascade with the Grease Fighting Power of Dawn powder as the detergent formulation. For all dishwashers other than water re-use system dishwashers 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 2.6.1 and 2.6.2 of this appendix.

2.6.1 Detergent Dosing for Dishwashers other than Water Re-use System Dishwashers.

2.6.1.1 *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.

2.6.1.2 *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 2.5.1.1 of this appendix.

For dishwashers that do not have a direct water line, the V_{mw} is equal to the manufacturer reported water capacity used in the main wash stage of the test cycle.

2.6.2 Detergent Dosing for Water Re-use System Dishwashers. Use the same detergent dosing requirement as specified in Section 2.10.2 of AHAM DW-1-2020.

2.7 Connected functionality.

For dishwashers that can communicate through a network (*e.g.*, Bluetooth® or internet connection), disable all network functions that can be disabled by means provided in the manufacturer's user manual, for the duration of testing. If network functions cannot be disabled by means provided in the manufacturer's user manual, conduct the standby power test with network function in the "as-shipped" condition.

2.8 Evaluation Room Lighting Conditions.

The lighting setup in the evaluation room where the test load is scored shall be according to the requirements specified in Section 5.10 of AHAM DW-2-2020.

3. Instrumentation

For this test procedure, the test instruments are to be calibrated annually according to the specifications in Sections 3.1 through 3.7 of AHAM DW-1-2020, including the applicable provisions of IEC 62301 as referenced in Section 3.6 of AHAM DW-1-2020 . Additionally, the following requirements are also applicable.

3.1 Water meter.

The water meter requirements described in Section 3.3 of AHAM DW-1-2020 are applicable to all dishwashers except dishwashers that do not have a direct water line. For such dishwashers these water meter conditions do not apply and water is added manually pursuant to Section 2.1.1 of this appendix.

3.2 Water pressure gauge.

The water pressure gauge requirements described in Section 3.4 of AHAM DW-1-2020 are applicable to all dishwashers except dishwashers that do not have a direct water line. For such dishwashers these water pressure gauge conditions do not apply and water is added manually pursuant to Section 2.1.1 of this appendix.

4. Test Cycle and Measurements

The test cycle and measurement specifications in Sections 4.1 through 4.2 of AHAM DW-1-2020 and the scoring specifications in Section 5.10.1 of AHAM DW-2-2020 apply to this test procedure, including Section 5.1, note 1, and Section 5.3.2 of IEC 62301 as referenced in Section 4.2 of AHAM DW-1-2020. Additionally, the following requirements are also applicable.

4.1 Active mode cycle.

The active mode energy consumption measurement requirements described in Section 4.1 of AHAM DW-1-2020 are applicable to all dishwashers. Additionally, the following requirements are also applicable:

- a. After the completion of each test cycle (sensor heavy response, sensor medium response, and sensor light response), the test load shall be scored according to Section 4.2 of this appendix and its cleaning index calculated according to Section 5.1 of this appendix.
- b. A test cycle is considered valid if its cleaning index is 65 or higher; otherwise, the test cycle is invalid and the data from that test run is discarded.
- c. For soil-sensing dishwashers, if the test cycle at any soil load is invalid, clean the dishwasher filter according to manufacturer's instructions and repeat the test at that soil load on the most energy-intensive cycle (determined as provided in Section 4.1.1 of this appendix) that achieves a cleaning index of 65 or higher.
- d. For non-soil-sensing dishwashers, perform testing as described in Sections 4.1.a through 4.1.c of this appendix, except that, if a test cycle at a given soil load meets the cleaning index threshold criteria of 65 when tested on the normal cycle, no further testing is required for test cycles at lesser soil loads.

4.1.1 Determination of most energy-intensive cycle.

To determine the most energy-intensive cycle, ensure the filter is cleaned as specified in the manufacturer's instructions and test each available cycle type, selecting the default cycle options for that cycle type. In the absence of manufacturer recommendations on washing and drying temperature options, the highest energy consumption options must be selected. Following the completion of each test cycle, the

machine electrical energy consumption and water consumption shall be measured according to Section 4.1.1 and 4.1.4 of AHAM DW-1-2020, respectively. The total cycle energy consumption, E_{MEI} , of each tested cycle type shall be calculated according to Section 5.2 of this appendix. The most energy-intensive cycle is the cycle type with the highest value of E_{MEI} .

For standard dishwashers, test each cycle with a clean load of eight place settings plus six serving pieces, as specified in Section 2.7 of AHAM DW-1-2020. For compact dishwashers, test each cycle with a clean load of four place settings plus six serving pieces, as specified in Section 2.7 of AHAM DW-1-2020. If the capacity of the dishwasher, as stated by the manufacturer, is less than four place settings, then the test load must be the stated capacity.

4.1.2 Water consumption.

The water consumption requirements described in Section 4.1.4 of AHAM DW-1-2020 are applicable to all dishwashers except dishwashers that do not have a direct water line. For such dishwashers these water consumption measurement requirements do not apply and water consumption, V , is the value reported by the manufacturer.

4.2 Scoring

Following the termination of an active mode test, each item in the test load shall be scored on a scale from 0 to 9 according to the instructions in Section 5.10.1 of AHAM DW-2-2020.

5. Calculation of Derived Results from Test Measurements

The calculations in Section 5.1 through 5.7 of AHAM DW-1-2020 and Section 5.12.3.2 of AHAM DW-2-2020 apply to this test procedure. The following additional requirements are also applicable:

- a. In Sections 5.1.3, 5.1.4, 5.1.5, 5.4.3, 5.4.4, 5.4.5, and 5.7 of AHAM DW-1-2020, use $N = 215$ cycles/year in place of $N = 184$ cycles/year.
- b. In Section 5.7 of AHAM DW-1-2020, use $S_{LP} = 8,465$ for dishwashers that are not capable of operating in fan-only mode.
- c. For both soil-sensing and non-soil-sensing dishwashers, use the equations specified for soil-sensing dishwashers.
- d. If a non-soil-sensing dishwasher is not tested at a certain soil load as specified in Section 4.1.d of this appendix, use the energy and water consumption values of the preceding soil load when calculating the weighted average energy and water consumption values (i.e., if the sensor medium response and sensor light response tests on the normal cycle are not conducted, use the values of the sensor heavy response test for all three soil loads; if only the sensor light response test is not conducted, use the values of the sensor medium response test for the sensor light response test).
- e. For dishwashers that do not have a direct water line, water consumption is equal to the volume of water use in the test cycle, as specified by the manufacturer.

- f. In Sections 5.6.1.3, 5.6.1.4, 5.6.2.3, and 5.6.2.4 of AHAM DW-1-2020, use (C/e) in place of K.

5.1 Cleaning Index.

Determine the per-cycle cleaning index for each test cycle using the equation in Section 5.12.3.2 of AHAM DW-2-2020.

5.2 Calculation for determination of the most energy-intensive cycle type.

The total cycle energy consumption for the determination of the most energy-intensive cycle specified in Section 4.1.1 of this appendix is calculated for each tested cycle type as:

$$E_{MEI} = M + E_F - (E_D/2) + W$$

where,

M = per-cycle machine electrical energy consumption, expressed in kilowatt hours per cycle,

E_F = fan-only mode electrical energy consumption, if available on the tested cycle type, expressed in kilowatt hours per cycle,

E_D = drying energy consumed using the power-dry feature after the termination of the last rinse option of the tested cycle type, if available on the tested cycle type, expressed in kilowatt hours per cycle, and

W = water energy consumption and is defined as:

$V \times T \times K$, for dishwashers using electrically heated water, and

$V \times T \times C/e$, for dishwashers using gas-heated or oil-heated water.

Additionally,

V = water consumption in gallons per cycle,

T = nominal water heater temperature rise and is equal to 90 °F for dishwashers that operate with a nominal 140 °F inlet water temperature, and 70 °F for dishwashers that operate with a nominal 120 °F inlet water temperature,

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

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.

5.3 Calculation of cycle duration.

The cycle duration, t, expressed in hours, is calculated as:

$$t = (t_{hr} \times F_{hr}) + (t_{mr} \times F_{mr}) + (t_{lr} \times F_{lr})$$

where,

t_{hr} = the duration of the sensor heavy response cycle including the power-dry feature,

t_{mr} = the duration of the sensor medium response cycle including the power-dry feature,

t_{lr} = the duration of the sensor light response cycle including the power-dry feature,

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. Appendix C2 to subpart B of part 430 is added to read as follows:

**Appendix C2 to Subpart B of Part 430—Uniform Test Method for
Measuring the Energy Consumption of Dishwashers**

NOTE: Manufacturers must use the results of testing under this appendix C2 to determine compliance with any standards for dishwashers provided in §430.32(f)(1) that are published after January 1, 2021. Representations related to energy or water consumption must be made in accordance with the appropriate appendix that applies (i.e., appendix C1 or appendix C2) when determining compliance with the relevant standard. Manufacturers may also use appendix C2 to certify compliance with any amended standards prior to the applicable compliance date for those standards.

0. Incorporation by Reference

DOE incorporated by reference in §430.3, AHAM DW-1-2020, AHAM DW-2-2020, and IEC 62301:2011 (IEC 62301) in their entirety. The following enumerated provisions of AHAM DW-1-2020, AHAM DW-2-2020, and IEC 62301 are applicable to this appendix, as follows:

(1) AHAM DW-1-2020: Uniform Test Method for Measuring the Energy
Consumption of Dishwashers

- (i) Sections 1.1 through 1.30 as referenced in section 1 of this appendix;
- (ii) Section 2.1 as referenced in sections 2 and 2.1 of this appendix;
- (iii) Sections 2.2 through 2.3.3, sections 2.5 and 2.7, sections 2.7.2 through 2.8, and section 2.11, as referenced in section 2 of this appendix;
- (iv) Section 2.4 as referenced in sections 2 and 2.2 of this appendix;
- (v) Section 2.6.3 as referenced in sections 2 and 2.3 of this appendix;
- (vi) Section 2.7.1 as referenced in sections 2 and 2.4 of this appendix;
- (vii) Section 2.9 as referenced in sections 2 and 2.5 of this appendix;
- (viii) Section 2.10 as referenced in sections 2 and 2.6 of this appendix;

- (ix) Sections 3.1 through 3.2 and sections 3.5 through 3.7 as referenced in section 3 of this appendix;
- (x) Section 3.3 as referenced in sections 3 and 3.1 of this appendix;
- (xi) Section 3.4 as referenced in sections 3 and 3.2 of this appendix;
- (xii) Section 4.1 as referenced in sections 4 and 4.1 of this appendix;
- (xiii) Section 4.1.4 as referenced in sections 4 and 4.1.2 of this appendix;
and
- (xiv) Section 5 as referenced in section 5 of this appendix.

(2) AHAM DW-2-2020: Household Electric Dishwashers

- (i) Section 5.10 as referenced in sections 2 and 2.8 of this appendix;
- (ii) Sections 5.10.1 as referenced in sections 4 and 4.2 of this appendix;
and
- (iii) Section 5.12.3.2 as referenced in sections 5 and 5.1 of this appendix.

(3) IEC 62301: Household Electrical Appliances - Measurement of Standby Power

- (i) Sections 4.2, 4.3.2, and 5.2 as referenced in section 2 of this appendix; and
- (ii) Sections 5.1, note 1, and 5.3.2 as referenced in section 4 of this appendix.

1. Definitions

The definitions in Sections 1.1 through 1.30 of AHAM DW-1-2020 apply to this test procedure, including the applicable provisions of AHAM DW-2-2020 as referenced in Sections 1.5, 1.18, 1.19, 1.20, and 1.22 of AHAM DW-1-2020.

2. Testing Conditions

The testing conditions in Section 2.1 through 2.11 of AHAM DW-1-2020, except Sections 2.6.1 and 2.6.2, and the testing conditions in Section 5.10 of AHAM DW-2-2020 apply to this test procedure, including the following provisions of:

(1) Sections 4.2, 4.3.2, and 5.2 of IEC 62301 as referenced in Sections 2.1, 2.2.4, and 2.5.2 of AHAM DW-1-2020, respectively, and

(2) Sections 5.3 through 5.8 of AHAM DW-2-2020 as referenced in Sections 2.6.3.1, 2.6.3.2, and 2.6.3.3; Section 3.4 of AHAM DW-2-2020, excluding the accompanying Note, as referenced in Section 2.7.1 of AHAM DW-1-2020; Section 5.4 of AHAM DW-2-2020 as referenced in Section 2.7.4 of AHAM DW-1-2020; Section 5.5 of AHAM DW-2-2020 as referenced in Section 2.7.5 of AHAM DW-1-2020, and Section 4.1 of AHAM DW-2-2020 as referenced in Section 2.10.1 of AHAM DW-1-2020.

Additionally, the following requirements are also applicable.

2.1 Installation Requirements.

The installation requirements described in Section 2.1 of AHAM DW-1-2020 are applicable to all dishwashers, with the following additions:

2.1.1 In-Sink Dishwashers.

For in-sink dishwashers, the requirements pertaining to the rectangular enclosure for under-counter or under-sink dishwashers are not applicable. For such dishwashers, the rectangular enclosure must consist of a front, a back, two sides, and a bottom. The front, back, and sides of the enclosure must be brought into the closest contact with the appliance that the configuration of the dishwasher will allow. The height of the enclosure shall be as specified in the manufacturer's instructions for installation height. If no instructions are provided, the enclosure height shall be 36 inches. The dishwasher must be installed from the top and mounted to the edges of the enclosure.

2.1.2 Dishwashers without a Direct Water Line.

Manually fill the built-in water reservoir to the full capacity reported by the manufacturer, using water at a temperature in accordance with Section 2.3 of AHAM DW-1-2020.

2.2 Water pressure.

The water pressure requirements described in Section 2.4 of AHAM DW-1-2020 are applicable to all dishwashers except dishwashers that do not have a direct water line.

2.3 Non-soil-sensing and soil-sensing dishwashers to be tested at a nominal inlet temperature of 50 °F, 120 °F, or 140 °F.

The test load and soiling requirements for all non-soil-sensing and soil-sensing dishwashers shall be the same as those requirements specified in Section 2.6.3 of AHAM DW-1-2020 for soil-sensing dishwashers. Additionally, both non-soil-sensing and soil-sensing compact dishwashers that have a capacity of less than four place settings shall be tested at the rated capacity of the dishwasher and the test load shall be soiled as follows at each soil load:

- a. Heavy soil load: soil two-thirds of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is greater;
- b. Medium soil load: soil one-quarter of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is smaller;
- c. Light soil load: soil one-quarter of the place settings, excluding flatware and serving pieces (rounded up to the nearest integer) or one place setting, whichever is smaller, using half the quantity of soils specified for one place setting.

2.4 Test load items.

The test load items described in Section 2.7.1 of AHAM DW-1-2020 apply to this test procedure, including the applicable provisions of AHAM DW-2-2020 , as referenced

in Section 2.7.1 of AHAM DW-1-2020. The following test load items may be used in the alternative.

Dishware/glassware/ flatware item	Primary source	Description	Primary No.	Alternate source	Alternate source No.
Dinner Plate	Corning Comcor®/Corelle®	10 inch Dinner Plate	6003893		
Bread and Butter Plate	Corning Comcor®/Corelle®	6.75 inch Bread & Butter	6003887	Arzberg	8500217100 or 2000- 00001-0217- 1
Fruit Bowl	Corning Comcor®/Corelle®	10 oz. Dessert Bowl	6003899	Arzberg	3820513100
Cup	Corning Comcor®/Corelle®	8 oz. Ceramic Cup	6014162	Arzberg	1382-00001- 4732
Saucer	Corning Comcor®/Corelle®	6 inch Saucer	6010972	Arzberg	1382-00001- 4731
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		2619KPV F	WMF— Gastro 0800	12.0803.6047
Flatware—Dinner Fork	Oneida®—Accent		2619FRS F	WMF— Signum 1900	12.1905.6040
Flatware—Salad Fork	Oneida®—Accent		2619FSL F	WMF— Signum 1900	12.1964.6040
Flatware—Teaspoon	Oneida®—Accent		2619STS F	WMF— Signum 1900	12.1910.6040

Flatware—Serving Fork	Oneida®—Flight		2865FC M	WMF— Signum 1900	12.1902.6040
Flatware—Serving Spoon	Oneida®—Accent		2619STB F	WMF— Signum 1900	12.1904.6040

2.5 Preconditioning requirements

The preconditioning requirements described in Section 2.9 of AHAM DW-1-2020 are applicable to all dishwashers except the measurement of the prewash fill water volume, V_{pw} , if any, and measurement of the main wash fill water volume, V_{mw} , are not required.

2.6 Detergent.

The detergent requirements described in Section 2.10 of AHAM DW-1-2020 are applicable to all dishwashers. For any dishwasher that does not have a detergent compartment, place the detergent directly into the dishwasher chamber.

2.7 Connected functionality.

For dishwashers that can communicate through a network (*e.g.*, Bluetooth® or internet connection), disable all network functions that can be disabled by means provided in the manufacturer’s user manual, for the duration of testing. If network functions cannot be disabled by means provided in the manufacturer’s user manual, conduct the standby power test with network function in the “as-shipped” condition.

2.8 Evaluation Room Lighting Conditions.

The lighting setup in the evaluation room where the test load is scored shall be according to the requirements specified in Section 5.10 of AHAM DW-2-2020.

3. Instrumentation

For this test procedure, the test instruments are to be calibrated annually according to the specifications in Section 3.1 through 3.7 of AHAM DW-1-2020, including the applicable provisions of IEC as referenced in Section 3.6 of AHAM DW-1-2020. Additionally, the following requirements are also applicable.

3.1 Water meter.

The water meter requirements described in Section 3.3 of AHAM DW-1-2020 are applicable to all dishwashers except dishwashers that do not have a direct water line. For such dishwashers these water meter conditions do not apply and water is added manually pursuant to Section 2.1.1 of this appendix.

3.2 Water pressure gauge.

The water pressure gauge requirements described in Section 3.4 of AHAM DW-1-2020 are applicable to all dishwashers except dishwashers that do not have a direct water line. For such dishwashers these water pressure gauge conditions do not apply and water is added manually pursuant to Section 2.1.1 of this appendix.

4. Test Cycle and Measurements

The test cycle and measurement specifications in Sections 4.1 through 4.2 of AHAM DW-1-2020 and the scoring specifications in Section 5.10.1 of AHAM DW-2-2020 apply to this test procedure, including Section 5.1, note 1, and Section 5.3.2 of IEC 62301 as referenced in Section 4.2 of AHAM DW-1-2020. Additionally, the following requirements are also applicable.

4.2 Active mode cycle.

The active mode energy consumption measurement requirements described in Section 4.1 of AHAM DW-1-2020 are applicable to all dishwashers. Additionally, the following requirements are also applicable:

- a. After the completion of each test cycle (sensor heavy response, sensor medium response, and sensor light response), the test load shall be scored according to Section 4.2 of this appendix and its cleaning index calculated according to Section 5.1 of this appendix.
- b. A test cycle is considered valid if its cleaning index is 65 or higher; otherwise, the test cycle is invalid and the data from that test run is discarded.
- c. For soil-sensing dishwashers, if the test cycle at any soil load is invalid, clean the dishwasher filter according to manufacturer's instructions and repeat the test at that soil load on the most energy-intensive cycle (determined as provided in Section 4.1.1 of this appendix) that achieves a cleaning index of 65 or higher.

- d. For non-soil-sensing dishwashers, perform testing as described in Section 4.1.a through 4.1.c of this appendix, except that, if a test cycle at a given soil load meets the cleaning index threshold criteria of 65 when tested on the normal cycle, no further testing is required for test cycles at lesser soil loads.

4.1.1 Determination of most energy-intensive cycle.

To determine the most energy-intensive cycle, ensure the filter is cleaned as specified in the manufacturer's instructions and test each available cycle type, selecting the default cycle options for that cycle type. In the absence of manufacturer recommendations on washing and drying temperature options, the highest energy consumption options must be selected. Following the completion of each test cycle, the machine electrical energy consumption and water consumption shall be measured according to Sections 4.1.1 and 4.1.4 of AHAM DW-1-2020, respectively. The total cycle energy consumption, E_{MEI} , of each tested cycle type shall be calculated according to Section 5.2 of this appendix. The most energy-intensive cycle is the cycle type with the highest value of E_{MEI} .

For standard dishwashers, test each cycle with a clean load of eight place settings plus six serving pieces, as specified in Section 2.7 of AHAM DW-1-2020. For compact dishwashers, test each cycle with a clean load of four place settings plus six serving pieces, as specified in Section 2.7 of AHAM DW-1-2020. If the capacity of the dishwasher, as stated by the manufacturer, is less than four place settings, then the test load must be the stated capacity.

4.1.2 Water consumption.

The water consumption requirements described in Section 4.1.4 of AHAM DW-1-2020 are applicable to all dishwashers except dishwashers that do not have a direct water line. For such dishwashers these water consumption measurement requirements do not apply and water consumption, V , is the value reported by the manufacturer.

4.2 Scoring.

Following the termination of an active mode test, each item in the test load shall be scored on a scale from 0 to 9 according to the instructions in Section 5.10.1 of AHAM DW-2-2020.

5. Calculation of Derived Results from Test Measurements

The calculations in Sections 5.1 through 5.7 of AHAM DW-1-2020 and Section 5.12.3.2 of AHAM DW-2-2020 apply to this test procedure. The following additional requirements are also applicable:

- a. For both soil-sensing and non-soil-sensing dishwashers, use the equations specified for soil-sensing dishwashers.
- b. If a non-soil-sensing dishwasher is not tested at a certain soil load as specified in Section 4.1.d of this appendix, use the energy and water consumption values of the preceding soil load when calculating the weighted average energy and water consumption values (i.e., if the sensor medium

response and sensor light response tests on the normal cycle are not conducted, use the values of the sensor heavy response test for all three soil loads; if only the sensor light response test is not conducted, use the values of the sensor medium response test for the sensor light response test).

- c. For dishwashers that do not have a direct water line, water consumption is equal to the volume of water use in the test cycle, as specified by the manufacturer.
- d. In Sections 5.6.1.3, 5.6.1.4, 5.6.2.3, and 5.6.2.4 of AHAM DW-1-2020, use (C/e) in place of K.

5.1 Cleaning Index.

Determine the per-cycle cleaning index for each test cycle using the equation in Section 5.12.3.2 of AHAM DW-2-2020.

5.2 Calculation for determination of the most energy-intensive cycle type.

The total cycle energy consumption for the determination of the most energy-intensive cycle specified in Section 4.1.1 of this appendix is calculated for each tested cycle type as:

$$E_{MEI} = M + E_F - (E_D/2) + W$$

where,

M = per-cycle machine electrical energy consumption, expressed in kilowatt hours per cycle,

E_F = fan-only mode electrical energy consumption, if available on the tested cycle type, expressed in kilowatt hours per cycle,

E_D = drying energy consumed using the power-dry feature after the termination of the last rinse option of the tested cycle type, if available on the tested cycle type, expressed in kilowatt hours per cycle, and

W = water energy consumption and is defined as:

$V \times T \times K$, for dishwashers using electrically heated water, and

$V \times T \times C/e$, for dishwashers using gas-heated or oil-heated water.

Additionally,

V = water consumption in gallons per cycle,

T = nominal water heater temperature rise and is equal to 90 °F for dishwashers that operate with a nominal 140 °F inlet water temperature, and 70 °F for dishwashers that operate with a nominal 120 °F inlet water temperature,

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

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.

5.3 Calculation of cycle duration.

The cycle duration, t , expressed in hours, is calculated as:

$$t = (t_{hr} \times F_{hr}) + (t_{mr} \times F_{mr}) + (t_{lr} \times F_{lr})$$

where,

t_{hr} = the duration of the sensor heavy response cycle including the power-dry feature,

t_{mr} = the duration of the sensor medium response cycle including the power-dry feature,

t_{lr} = the duration of the sensor light response cycle including the power-dry feature,

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.

6. Section 430.32 is amended by revising paragraph (f)(1) to read as follows:

§ 430.32 Energy and water conservation standards and their compliance dates.

* * * * *

(f) *Dishwashers*. (1) All dishwashers manufactured on or after May 30, 2013, shall meet the following standard—

(i) Standard size dishwashers shall not exceed 307 kwh/year and 5.0 gallons per cycle. Standard size dishwashers have a capacity equal to or greater than eight place

settings plus six serving pieces as specified in AHAM DW-1-2020 (incorporated by reference, see § 430.3) using the test load specified in section 2.4 of appendix C1 or appendix C2 in subpart B of this part, as applicable.

(ii) Compact size dishwashers shall not exceed 222 kwh/year and 3.5 gallons per cycle. Compact size dishwashers have a capacity less than eight place settings plus six serving pieces as specified in AHAM DW-1-2020 using the test load specified in section 2.4 of appendix C1 or appendix C2 in subpart B of this part, as applicable.

(iii) Standard size dishwashers with a “normal cycle”, as defined in AHAM DW-1-2020, of 60 minutes or less are not currently subject to energy or water conservation standards. Standard size dishwashers have a capacity equal to or greater than eight place settings plus six serving pieces as specified in AHAM DW-1-2020 using the test load specified in section 2.4 of appendix C1 or appendix C2 in subpart B of this part, as applicable. “Normal cycle” duration is determined according to section 5.3 of appendix C1 or appendix C2 in subpart B of this part, as applicable.

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