DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[EERE–2017–BT–TP–0004]

RIN 1904–AD84

Energy Conservation Program: Test Procedures for Refrigeration Products

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

ACTION: Final rule.

SUMMARY: On December 23, 2019, the U.S. Department of Energy (''DOE'') published a notice of proposed rulemaking (''NOPR'') to amend the test procedures for refrigerators, refrigerator-freezers, and freezers, and miscellaneous refrigeration products (collectively ''refrigeration products''). That proposed rulemaking serves as the basis for this final rule. Specifically, the test procedure amendments adopted in this final rule incorporates by reference the most recent version of the referenced industry standard, provide additional specifications regarding test setup and test conduct, and make additional corrections to the test procedures. The amendments also adjust the energy conservation standards for these products to ensure that the change in test methodology does not: Require manufacturers to increase the efficiency of already compliant products in order to meet the current energy conservation standard; or enable products that would not be compliant with the current energy conservation standards to meet the adjusted energy conservation standards.

DATES: The effective date of this rule is November 12, 2021. The final rule changes will be mandatory for product testing starting April 11, 2022. The incorporation by reference of certain material listed in this rule is approved by the Director of the Federal Register on November 12, 2021. The incorporation by reference of other material listed in this rule was approved by the Director of the Federal Register on May 21, 2014.

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

A link to the docket web page can be found at *https://www.regulations.gov/docket?D=EERE-2017-BT-TP-0004.* The docket web page contains instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket contact the Appliance and Equipment Standards Program staff at (202) 287–1445 or by email: *ApplianceStandardsQuestions@ee.doe.gov.*

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SUPPLEMENTARY INFORMATION: DOE maintains a previously approved incorporation by reference and incorporates by reference the following industry standard into 10 CFR part 430:

AHAM HRF–1–2019, (''HRF–1–2019''), Energy and Internal Volume of Consumer Refrigeration Products, Copyright © 2019.

Copies of HRF–1–2019 can be obtained from the Association of Home Appliance Manufacturers, 1111 19th Street NW, Suite 402, Washington, DC 20036, (202) 872–5955, or go to *https://www.AHAM.org.*

AS/NZS 4474.1:2007, (''AS/NZS 4474.1:2007''), Performance of Household Electrical Appliances—Refrigerating Appliances; Part 1: Energy Consumption and Performance, Second Edition, published August 15, 2007.

Copies of AS/NZS 4474.1:2007 can be obtained from the GPO Box 476, Sydney NSW 2001, (02) 9237–6000 or (12) 0065–4646, or go to *www.standards.org.au/Standards New Zealand,* Level 10 Radio New Zealand House 144 The Terrace Wellington 6001 (Private Bag 2439 Wellington 6020), (04) 498–5990 or (04) 498–5991, or go to *www.standards.co.nz.*

For a further discussion of this standard, see section IV.N.

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I. Authority and Background

Refrigerators, refrigerator-freezers, and freezers 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)(1)) Additionally, under 42 U.S.C. 6292(a)(20), DOE may extend coverage over a particular type of consumer product provided that DOE determines

that classifying products of such type as covered products is necessary or appropriate to carry out the purposes of EPCA, and specified requirements are met. (See 42 U.S.C. 6292(b)(1) and 6295(l)(1)) Consistent with its statutory obligations, DOE established regulatory coverage over miscellaneous refrigeration products (''MREFs'').[1] 81 FR 46768 (July 18, 2016).

DOE's energy conservation standards and test procedures for refrigerators, refrigerator-freezers, freezers, and MREFs are currently prescribed at 10 CFR 430.23(a) and part 430, subpart B, appendix A (''Appendix A'') for refrigerators and refrigerator-freezers; 10 CFR 430.23(b) and 10 CFR part 430, subpart B, appendix B (''Appendix B'') for freezers; and 10 CFR 430.23(ff) and appendix A for MREFs.

The following sections discuss DOE's authority to establish test procedures for refrigerators, refrigerator-freezers, freezers, and MREFs (collectively, ''refrigeration products''), and relevant background information regarding DOE's consideration of test procedures for these products.

A. Authority

The Energy Policy and Conservation Act, as amended (''EPCA''),[2] 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 B [3] 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 refrigerators, refrigerator-freezers, and freezers, the subject of this document. (42 U.S.C. 6292(a)(1))

The energy conservation program under EPCA consists essentially of four parts: (1) Testing, (2) labeling, (3) federal energy conservation standards, and (4) certification 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 testing requirements consist of test procedures that manufacturers of covered products must use as the basis for (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA (42 U.S.C. 6295(s)), and (2) making representations about the efficiency of those products (42 U.S.C. 6293(c)). Similarly, DOE must use these test procedures to determine whether the products comply with any 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 shall be reasonably designed to produce test results which measure energy efficiency, energy use or estimated annual operating cost of a covered product during a representative average use cycle (as determined by the Secretary) or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

Further, when amending a test procedure, DOE must determine the extent to which, if any, the proposal would alter the measured energy use of a given product as determined under the existing test procedure. (42 U.S.C. 6293(e)(1)) If DOE determines that the amended test procedure would alter the measured energy use of a covered product, DOE must also amend the applicable energy conservation standard during the rulemaking carried out with respect to such test procedure. (42 U.S.C. 6293(e)(2)) In determining the amended energy conservation standard, the Secretary shall measure, pursuant to the amended test procedure, the energy efficiency, energy use, or water use of a representative sample of covered products that minimally comply with the existing standard. The average of such energy efficiency, energy use, or water use levels determined under the amended test procedure shall constitute the amended energy conservation standard for the applicable covered products. *Id.*

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 into the overall energy efficiency, energy consumption, or other energy descriptor, unless the current test procedure already incorporates the standby mode and off mode energy consumption, or if such integration is technically infeasible. (42 U.S.C. 6295(gg)(2)(A)) If an integrated test procedure is technically infeasible, DOE must prescribe separate standby mode and off mode energy use test procedures for the covered product, if a separate test is technically feasible. (*Id.*) Any such amendment must consider the most current versions of the International Electrotechnical Commission (''IEC'') Standard 62301 [4] and IEC Standard 62087 [5] as applicable. (42 U.S.C. 6295(gg)(2)(A))

If DOE determines that a test procedure amendment is warranted, it must publish a proposed test procedure and offer the public an opportunity to present oral and written comments on it. (42 U.S.C. 6293(b)(2))

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including refrigeration products, 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 their 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

[1] A miscellaneous refrigeration product is defined as a consumer refrigeration product other than a refrigerator, refrigerator-freezer, or freezer, which includes coolers and combination cooler refrigeration products. 10 CFR 430.2.

[2] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Public Law 116–260 (Dec. 27, 2020).

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

[4] IEC 62301, *Household electrical appliances—Measurement of standby power* (Edition 2.0, 2011–01).

[5] IEC 62087, *Methods of measurement for the power consumption of audio, video, and related equipment* (Edition 3.0, 2011–04).

determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. DOE is publishing this final rule in satisfaction of the 7-year review requirement specified in EPCA. (42 U.S.C. 6293(b)(1)(A))

B. Background

As described, DOE's existing test procedure for refrigerators, refrigerator-freezers, and MREFs appears at Appendix A (''Uniform Test Method for Measuring the Energy Consumption of Refrigerators, Refrigerator-Freezers, and Miscellaneous Refrigeration Products''). DOE's existing test procedure for freezers appears at Appendix B (''Uniform Test Method for Measuring the Energy Consumption of Freezers''). These test procedures are the result of numerous evaluations and updates that have occurred since DOE initially established its test procedures for these products in a final rule published in the **Federal Register** on September 14, 1977 (42 FR 46140).[6]

DOE most recently amended the test procedures for refrigerators, refrigerator-freezers, and freezers in a final rule published on April 21, 2014 (the ''April 2014 Final Rule''). 79 FR 22320. The amendments enacted by the April 2014 Final Rule addressed products with multiple compressors and established an alternative method for measuring and calculating energy consumption for refrigerator-freezers and refrigerators with freezer compartments. *Id.* The April 2014 Final Rule also amended certain aspects of the test procedures to improve test accuracy and repeatability. *Id.* To allow additional time to review comments and data received during the comment period extension, DOE did not address automatic icemaking energy use or built-in testing configuration in the April 2014 Final Rule. *Id.*

On July 18, 2016, DOE published a final rule (the ''July 2016 Final Rule'') that established coverage and test procedures for MREFs.[7] 81 FR 46768. Included within this product category are refrigeration products that include one or more compartments that maintain higher temperatures than typical refrigerator compartments, such as wine chillers and beverage coolers. Additionally, the July 2016 Final Rule amended appendices A and B to include provisions for testing MREFs and to improve the clarity of certain existing test requirements, which would apply to all refrigeration products. *Id.*

On June 30, 2017, DOE published a request for information (the ''June 2017 RFI'') to initiate a data collection process to inform DOE's decision on whether to amend its test procedures in Appendices A and B. 82 FR 29780. After reviewing comments received in response to the June 2017 RFI, DOE published a NOPR on December 23, 2019 (the ''December 2019 NOPR''), in which DOE proposed amendments to its test procedures and corresponding amendments to the energy conservation standards for refrigeration products to account for the proposed test procedure amendments. 84 FR 70842. DOE held a public meeting related to this NOPR on January 9, 2020 (the ''December 2019 NOPR public meeting'').

DOE received written comments in response to the December 2019 NOPR and oral comments at the December 2019 NOPR public meeting from the interested parties listed in Table I.1.

TABLE I.1—COMMENTS RECEIVED IN RESPONSE TO DECEMBER 2019 NOPR

Commenter(s)	Reference in this NOPR	Commenter type
California Energy Commission	CEC	Regulatory Agency.
Appliance Standards Awareness Project, American Council for an Energy-Efficient Economy, Consumer Federation of America, National Consumer Law Center, National Resources Defense Council.	Joint Commenters	Efficiency Organizations & Consumer Advocates.
Northwest Energy Efficiency Alliance	NEEA	Efficiency Organization.
California Investor-Owned Utilities (Pacific Gas and Electric Company,[8] San Diego Gas and Electric, Southern California Edison).	CA IOUs	Utilities.
Association of Home Appliance Manufacturers	AHAM	Trade Association.
Felix Storch, Inc	FSI	Manufacturer.
GE Appliances, a Haier Company	GEA	Manufacturer.
Liebherr Canada, Ltd	Liebherr	Manufacturer.
Samsung Electronics America	Samsung	Manufacturer.
Sub Zero Group, Inc	Sub Zero	Manufacturer.
Whirlpool Corporation	Whirlpool	Manufacturer.

Note: Comments received not related to the proposals in the December 2019 NOPR will be considered and addressed as appropriate should DOE undertake additional rulemakings.

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[9]

II. Synopsis of the Final Rule

In this final rule, DOE amends appendices A and B, and corresponding sections in 10 CFR part 429, and in 10 CFR 430.23 as follows:

- Incorporates by reference the current revision to the applicable industry standard, AHAM HRF–1–2019, ''Energy and Internal Volume of Consumer Refrigeration Products,'' which includes updates to methods for

[6] A more detailed history of the test procedures is provided at 84 FR 70842, 70844–70845 (December 23, 2019).

[7] As part of the rulemaking process to establish the scope of coverage, definitions, test procedures, and corresponding energy conservation standards for MREFs, DOE established an Appliance Standards and Rulemaking Federal Advisory Committee negotiated rulemaking working group. (*See* 80 FR 17355 (April 1, 2015))

[8] Pacific Gas and Electric Company separately submitted comments (See docket ID number EERE–2017–BT–TP–0004–25) that are identical to those submitted by the CA IOUs (See docket ID number EERE–2017–BT–TP–0004–23). This final rule references only the CA IOUs comment when addressing the comments provided in both documents.

[9] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop test procedures for consumer refrigeration products. (Docket No. EERE–2017–BT–TP–0004, which is maintained at *https://www.regulations.gov*). The references are arranged as follows: (Commenter name, docket ID number, page of that document). The December 2019 NOPR Public Meeting Transcript is referenced for comments provided during the December 2019 NOPR public meeting.

test setup, sampling intervals, test conditions, and energy consumption calculations;

• Specifies how to determine the top of the unit for the purpose of temperature measurement location;

• Clarifies ambient temperature and gradient requirements;

• Provides additional context regarding product coverage and situations requiring test procedure waivers;

• Reinstates previously omitted optional test method for products with multiple temperature compartments; and

• Updates the references in 10 CFR part 429 and 10 CFR 430.23 to refer to the amended appendices A and B.

The adopted amendments are summarized in Table II.1 compared to the current test procedure as well as the reason for the adopted change.

TABLE II.1—SUMMARY OF CHANGES IN THE AMENDED TEST PROCEDURE

Current DOE test procedure	Amended test procedure	Attribution
Incorporates by reference (''IBR'') AHAM HRF–1–2008.	Updates IBR to AHAM HRF–1–2019	Industry test method update.
Variation between definitions and corresponding test procedure provisions in industry standard.	Definitions amended and established consistent with test procedure provisions in HRF-1-2019.	IBR of HRF-1-2019.
Variation between testing provisions for testing anti-sweat heaters and equations to calculate annual energy use.	Requires only the tests used for calculating annual energy use to be conducted.	IBR of HRF-1-2019.
Specifies a temperature measurement interval of 4 minutes or less for most products.	Specifies that the temperature and power supply measurement intervals shall not exceed 1 minute.	IBR of HRF-1-2019; improves representativeness, repeatability, and reproducibility.
Does not define the terms ''compartment'' or ''sub-compartment''.	Defines terms consistent with HRF–1–2019	IBR of HRF-1-2019.
Does not explicitly specify thermocouple placement in certain product configurations.	Provides additional thermocouple placement specifications.	IBR of HRF-1-2019; improves representativeness, repeatability, and reproducibility.
Does not explicitly specify the setup for test chamber floors that have vents for airflow.	Provides consistent specifications for test platform and floor requirements.	IBR of HRF-1-2019.
Does not explicitly specify timing of required temperature range conditions.	Specifies that conditions must be maintained for stabilization and test periods.	Improves representativeness, repeatability, and reproducibility.
Requires a separate stabilization period and test period when conducting all energy tests.	Allows test period to serve as stabilization period when conducting certain energy tests.	IBR of HRF-1-2019.
Stabilization requirements may not be achievable by certain products with irregular compressor cycling or multiple compressors.	Allows measuring average temperatures over multiple compressor cycles or for a given time period to determine stable operation.	IBR of HRF-1-2019; addresses current waiver.
Includes energy use adder for automatic icemakers of 84 kWh/yr.	Updates energy use adder for automatic icemakers to 28 kWh/yr.	IBR of HRF-1-2019.
Tests connected features the same as certain other customer-accessible features, *i.e.,* set at the lowest energy usage position, except for demand response devices in the as-shipped position.	Tests any connected products with the communication module on but not connected to a network.	IBR of HRF-1-2019.
Inadvertently omits optional method for calculating average per-cycle energy consumption of refrigerators and refrigerator-freezers.	Reinstates optional method and makes other non-substantive corrections.	Correction.

Section III of this document describes the amendments to the current test procedures for Refrigeration products. DOE has determined that the amendment to the icemaking energy use adder would alter the measured efficiency of Refrigeration products and require re-certification solely as a result of DOE's adoption of the amendments to the test procedures. After reviewing comments received in response to the December 2019 NOPR, DOE is not requiring calculations in accordance with this test procedure amendment until the compliance dates of any amended energy conservation standards for these products, which would incorporate the amended automatic icemaker energy consumption. Accordingly, in this final rule DOE is not amending the energy conservation standards for these products based on this test procedure amendment. This amendment is discussed in section III.G of this document.

Additionally, while the amendment to test connected products with the communication module on but not connected to any network could affect the measured energy consumption for certain products, DOE expects that this amendment would typically result in no change to measured energy use ratings. Therefore, DOE is not amending the energy conservation standards for these products based on this test procedure amendment as discussed in section III.H.2 of this document.

Similarly, the amendment revising the ambient temperature measurement locations for products measuring less than 36 inches in height is not expected to result in a change to measured energy use ratings. Therefore, DOE is not amending the energy conservation standards for these products based on this test procedure amendment as discussed in section III.D.5 of this document.

The effective date for the amended test procedures adopted in this final rule is 30 days after publication of this document in the **Federal Register**. Representations of energy use or energy efficiency must be based on testing in accordance with the amended test procedures beginning 180 days after the publication of this final rule.

III. Discussion

A. Scope of Applicability

The amendments in this final rule apply to products that meet the definition for ''refrigeration product,'' as codified in 10 CFR 430.2. Refrigeration products include refrigerators, refrigerator-freezers, freezers, and MREFs. Refrigeration products generally refer to cabinets used with one or more doors that are capable of maintaining

temperatures colder than the ambient temperature. While these products are typically used for the storage and freezing of food or beverages, the definitions do not require that the products be designed or marketed for that purpose. The definitions require only that the product be capable of maintaining compartment temperatures within certain ranges, regardless of use. (10 CFR 430.2)

As stated, the test procedure for refrigerators, refrigerator-freezers, and MREFs is included in appendix A. The test procedure for consumer freezers is included in appendix B. The amendments in this final rule do not change the scope of applicability of the test procedures for refrigeration products.

B. Relevant Industry Test Standards

DOE's test procedures for refrigeration products in Appendices A and B currently incorporate by reference the Association of Home Appliance Manufacturers (''AHAM'') industry standard HRF–1, ''Energy and Internal Volume of Refrigerating Appliances'' (''HRF–1–2008''). DOE references HRF–1–2008 for definitions, installation and operating conditions, temperature measurements, and volume measurements. In August 2016, AHAM released an updated version of the HRF–1 standard, HRF–1–2016.

In the June 2017 RFI, DOE stated that, based on review of HRF–1–2016, the majority of the updates from the 2008 standard were clarifications or other revisions to harmonize with DOE's test procedures. 82 FR 29780, 29785. In the December 2019 NOPR, DOE proposed to incorporate by reference HRF–1–2016 into 10 CFR part 430, subpart A, and reference certain sections of the 2016 standard in appendix A and appendix B. DOE noted that updating the references to HRF–1–2016 would not substantively affect the existing test procedures in appendix A and appendix B. 84 FR 70842, 70847–70848. DOE also noted that AHAM had released a draft of an updated HRF–1 for public review and provided a link to the draft revision. 84 FR 70842, 70847. DOE requested feedback on its proposal and on whether DOE should incorporate an updated version of HRF–1 instead, should one become publicly available. 84 FR 70842, 70848.

In response to the December 2019 NOPR, AHAM supported incorporation by reference in its entirety of the new version of HRF–1, HRF–1–2019, stating that DOE had participated in the development of the standard and that the standard was also available for public review, allowing other stakeholders to provide feedback as well. (AHAM, No. 18, p. 2)

Whirlpool and Liebherr also recommended the incorporation of HRF–1–2019. (Whirlpool, No. 19, p. 1; Liebherr, No. 16, p. 1) Sub Zero commented that HRF–1–2019 is the most up-to-date and effective energy test procedure for household refrigeration equipment and recommended that it be adopted by reference by DOE. (Sub Zero, No. 17, p. 1–2)

DOE is also aware of another international test standard: International Electrotechnical Commission (''IEC'') Standard 62552, ''Household refrigerating appliances—Characteristics and test methods'' (''IEC 62552''). The latest publication of this test standard is IEC 62552:2015, which was published in three parts (IEC 62552–1:2015, IEC 62552–2:2015, and IEC 62552–3:2015) on February 13, 2015.[10] On November 30, 2020 IEC issued an amendment to this test standard, IEC 62552:2015/AMD1:2020.[11]

CEC encouraged DOE to incorporate by reference the three parts of IEC 62552, stating that the standard addresses all types of refrigerators, including those not driven by compressors, and that harmonizing with the international test procedure would reduce net test burden. (CEC, No. 20, p. 4)

Samsung recommended that DOE generally consider adopting global IEC test procedures in residential appliance test procedures in order to reduce regulatory burdens. Samsung referenced what it described as significant progress toward international modernization and harmonization of standards and test procedures in many industries, leading to improvements in efficiency. According to Samsung, DOE's adoption of IEC test procedures would allow companies to design international platforms and configurations for global markets, which Samsung asserted would reduce cost for manufacturers in design and testing and would result in improved efficiencies and broader consumer choices. (Samsung, No. 24, p. 3) The Joint Commenters referenced similar comments that Samsung provided in the December 2019 NOPR Public Meeting and also recommended that DOE evaluate the relevant IEC test procedures. (Joint Commenters, No. 22, p. 2) NEEA also recommended that DOE adopt a version of the IEC test procedure to harmonize refrigerator test procedures worldwide, which NEEA stated would reduce overall test burden on manufacturers. NEEA added that such harmonization would eliminate the need for manufacturers to optimize refrigerator performance to multiple test procedures. (NEEA, No. 26, p. 5)

In response to CEC's comment regarding applicability of IEC 62552 to non-compressor products, DOE's existing test procedure for MREFs in 10 CFR 430.23(ff) and appendix A already accounts for testing non-compressor products. (See 10 CFR 430.23(ff)(8)) Additionally, while HRF–1–2016 specifically limited scope to compressor-driven refrigerators, refrigerator-freezers, wine chillers, and freezers (See section 2 of HRF–1–2016), HRF–1–2019 does not limit scope to compressor products.

DOE recognizes that there may be a potential benefit to harmonizing among international test standards and regulations, including the potential for reduced burden on manufacturers. In the present case, the existing DOE test procedure, which uses an approach consistent with that in HRF–1–2019, has a long history of use in the United States market, is generally understood by industry, and the results are generally understood by consumers. The existing test procedure is also used as the basis for the Environmental Protection Agency's ENERGY STAR eligibility criteria for refrigerators, refrigerator-freezers, and freezers[12] and the Federal Trade Commission's (''FTC'') EnergyGuide labels[13] for these products. DOE also notes that the current approach to the test procedure was generally supported for use by commenters representing manufacturers. (AHAM, No. 18, p. 2; Liebherr, No. 16, p. 1; Sub Zero, No. 17, pp. 1–2; Whirlpool, No. 19, p. 1)

For these reasons, DOE is generally maintaining the existing test approach in this final rule. As discussed in the following sections of this final rule, the test procedure amendments established in this final rule do not represent a significant change from the current test approach and, therefore, result in little or no additional burden on manufacturers. Additionally, DOE has determined that the existing test approach, including the amendments as discussed in this final rule, results in representative measures of energy use and is not unduly burdensome to conduct, as required under EPCA. (42 U.S.C. 6293(b)(3))

[10] Available online from IEC at *https://webstore.iec.ch/.*

[11] Available online from IEC at *https://webstore.iec.ch/.*

[12] See ENERGY STAR's Eligibility Criteria Version 5.0, available at *https://www.energystar.gov/ia/partners/product_specs/program_reqs/Refrigerators_and_Freezers_Program_Requirements_V5.0.pdf.*

[13] See 16 CFR 305.8.

In addition to the comments described earlier in this section, many of the commenters supporting use of the IEC 62552 test method referred to the ambient conditions required in that test standard, including the requirement for testing at two ambient temperatures. As discussed in section III.B.1 of this document, DOE considered harmonizing with IEC 62552's ambient test conditions, including as part of an optional second ambient test condition; however, DOE concluded that the current single-ambient test approach is appropriate for determining representative energy consumption for refrigeration products.

DOE also reviewed the updates included in the latest HRF–1–2019 standard, as discussed in section III.B.2 of this document. Compared to the draft available for public review and referenced in the December 2019 NOPR, the published version of HRF–1–2019 includes only one substantive update, as discussed in section III.F of this final rule. After considering these updates, DOE is incorporating by reference HRF–1–2019 with additional changes as discussed further in this final rule.

1. Ambient Test Conditions

The DOE test procedures in appendices A and B simulate typical room conditions (72 °F (22.2 °C)) with door openings, by testing at 90 °F (32.2 °C) without door openings. 10 CFR 430.23(a)(7), 10 CFR 430.23(b)(7), and 10 CFR 430.23(ff)(7). The test procedures directly measure the energy consumed during steady-state operation and defrosts, if applicable. The additional thermal load and additional energy consumption of the refrigeration system at the elevated ambient temperature, compared to typical operating ambient conditions, represents the increase in energy consumption caused by thermal loads introduced during normal consumer use—*e.g.,* from door openings and the loading of warm items into the refrigerated space. Additionally, the current test procedures incorporate usage adjustment factors to account for differences in these user-related thermal loads for different types of refrigeration products (*i.e.,* chest freezers and MREFs are typically used less frequently than a primary refrigerator-freezer in a household).

DOE has provided principles of interpretation for its test procedures in 10 CFR 430.23(a)(7), 10 CFR 430.23(b)(7), and 10 CFR 430.23(ff)(7) to describe the intent of the test procedures and the requirements regarding component operation in the test condition versus typical room temperature operation. For example, energy consuming components that operate in typical room conditions (including as a result of door openings, or a function of humidity), and that are not excluded by the test procedure, must operate in an equivalent manner during energy testing under the test procedure, or be accounted for by all calculations as provided for in the test procedure. (*See,* for example, 10 CFR 430.23(a)(7)(i))

DOE first adopted the 90 °F ambient test condition in 1977 after conducting a public notice and comment proceeding to discuss the merits of a proposed test procedure that included the possibility of adopting the 90 °F ambient temperature condition or a higher one at 104 °F. (*See* 42 FR 46140, 46142 (September 14, 1977) (rejecting adoption of the 104 °F ambient test condition in favor of 90 °F)) DOE explained the basis for selecting this temperature condition in its proposal leading to that final rule by noting in part that the selected temperature is designed to compensate for door openings when they occur and a correction factor can be applied ''when appropriate.'' 42 FR 21584, 21586 (April 27, 1977). Further, industry's more recent efforts at revising and updating the test procedures for refrigeration have continued to consistently apply the 90 °F ambient condition. The currently incorporated by reference HRF–1–2008, the more recent HRF–1–2016, and most recent HRF–1–2019 all maintain the approach of a 90 °F ambient temperature.

In response to the December 2019 NOPR, DOE received a variety of comments regarding the test method set forth in IEC 62552, in particular with regard to the specification of two ambient test conditions (at approximately 90 °F and 60 °F) [14] by IEC 62552. The IEC 62552 method requires testing at these two ambient conditions with optional additional load processing efficiency tests (to account for a door opening and warm item insertion) and other auxiliary component efficiency tests.[15] The total energy consumption of a product is determined by a regional interpolation function of the 90 °F and 60 °F test results, load processing efficiency results, and auxiliary component efficiency results. The regional interpolation functions are not defined by IEC 62552—individual jurisdictions may adapt these interpolation weighting factors to result in representative household conditions for the specific jurisdiction.

In response to the December 2019 NOPR, AHAM opposed adopting the test method of IEC 62552 in the current DOE test procedure rulemaking. AHAM cited a study conducted in 1991 by Lawrence Berkeley National Laboratory that found agreement between the 90 °F test method required by the DOE test procedure and field use energy consumption.[16] AHAM stated that any effort to consider or adopt IEC 62552, specifically, the two ambient test conditions, would require extensive testing and take time to evaluate, which would be inappropriate at this time given DOE's statutory obligations to publish an amended test procedure. AHAM stated that it continues its efforts to harmonize HRF–1 with IEC 62552 and the DOE test procedures and commented that its task force will consider if any of the elements of the IEC 62552 test method should eventually be incorporated into HRF–1. AHAM supported an incorporation by reference of HRF–1–2019, which AHAM asserted balances representativeness with test burden, while also retaining high repeatability and reproducibility with the single 90 °F closed-door test point. (AHAM, No. 18, pp. 3–4) Sub Zero supported AHAM's comments and added that IEC 62552 over time has adopted more and more of the methods prescribed in HRF–1, and in the future, these test standards may become even more similar. (Sub Zero, No. 17, p. 2) Sub Zero additionally stated that the elevated-ambient, closed-door energy test prescribed in HRF–1–2019 has been shown to be an excellent proxy for determining actual field energy use while providing repeatability and reproducibility without imposing an unreasonable burden to conduct. (Sub Zero, No. 17, p. 1–2)

At the December 2019 NOPR Public Meeting, GEA stated that the 60 °F ambient test point used in IEC 62552 was developed specifically for products which, in low-temperature climates, would activate a heater in order to maintain refrigeration capacity, and that

[14] IEC 62552 specifically requires testing at 16 °C and 32 °C, which correspond to 60.8 °F and 89.6 °F.

[15] IEC 62552–3:2015 specifies closed-door testing at 16 °C and 32 °C and a load processing efficiency test in Annex G to account for door openings and warm item loading, which is also conducted at two ambient conditions. The load processing efficiency test quantifies the additional energy consumed by the product to remove a known amount of energy which is contained in warm water, which is placed into refrigerated compartments in a defined way (with one door opening). Test methods for accounting for the energy use of other auxiliary components (ambient-controlled anti-sweat heaters and tank-type automatic icemakers) are found in Annex F.

[16] Alan Meier and Richard Jansky, Lawrence Berkeley National Laboratory, *Field Performance of Residential Refrigerators: A Comparison with the Laboratory Test* (May 1991).

the 60 °F test is not needed to measure the average energy usage at 72 °F with door openings. GEA stated that applying an additional test point at 60 °F would not only double the testing time, but also would not be as repeatable or reproducible as the single ambient method in HRF–1. GEA further commented that single speed compressors and variable speed compressors alike would benefit from the lower ambient temperature. (GEA, Public Meeting Transcript, No. 11, pp. 54–57)

Several commenters recommended that DOE consider alignment with IEC 62552, stating that there are potential benefits associated with multiple ambient condition tests. The CA IOUs, CEC, NEEA, and the Joint Commenters commented that testing at a single ambient test point cannot differentiate energy-saving design options (*e.g.,* variable speed compressors) present in refrigeration products currently on the market. (CA IOUs, No. 23, p. 1; CEC, No. 20, p. 3; NEEA, No. 26, p. 2; Joint Commenters, No. 22, p. 1) The CA IOUs and CEC also stated that the single condition leads to a focus on insulation rather than refrigeration efficiency. (CA IOUs, No. 23, p. 2; CEC, No. 20, p. 4) The CA IOUs, CEC, NEEA, and the Joint Commenters argued that the elevated ambient temperature does not represent normal use conditions. (CA IOUs, No. 23, p. 2; CEC, No. 20, p. 3; NEEA, No. 26, p. 2; Joint Commenters, No. 22, p. 1) The CA IOUs and CEC raised concerns regarding susceptibility to circumvention, stating that multiple test points discourage test circumvention strategies. (CA IOUs, No. 23, p. 2; CEC, No. 20, p. 4) The CA IOUs and CEC also argued that there is a high testing burden for manufacturers who supply products to international markets if individual jurisdictions each have different single-ambient test points. (CA IOUs, No. 23, p. 2; CEC, No. 20, p. 3) Specifically, the CA IOUs, NEEA, and the Joint Commenters commented that IEC 62552 allows jurisdictions to use the two ambient test points to interpolate to the appropriate regional ambient temperature, thus reducing overall test burden across jurisdictions with different climates. (CA IOUs, No. 23, p. 2; NEEA, No. 26, p. 2; Joint Commenters, No. 22, p. 2)

The Joint Commenters further commented and referred to previous comments on a request for information DOE published regarding the representativeness of DOE's test procedures and average use cycles of covered products.[17] The Joint Commenters stated that some variation in efficiency performance among models would be expected at more representative test conditions. The Joint Commenters stated that because most refrigerators and freezers are not placed in 90 °F rooms, the single elevated ambient test point may not be providing an accurate relative ranking of model efficiencies. Specifically, the Joint Commenters were concerned that two models that have the same energy consumption as measured by the current test procedure could potentially perform significantly differently at more representative conditions, and furthermore, that the current test procedure does not adequately reflect the benefits of variable speed compressors. The Joint Commenters commented that a refrigerator's compressor would cycle more often at an ambient temperature of 72 °F than at 90 °F and therefore, the benefits of variable speed compressors, which can reduce speed to cycle less frequently, would be greater at 72 °F. The Joint Commenters stated that a test procedure that relied on an ambient condition more representative of field conditions would provide more incentive for optimizing designs at these conditions and would supply better information to consumers. The Joint Commenters also mentioned that the load processing efficiency test in IEC 62552, which measures a unit's response to a single door opening and insertion of warm water bottles, can increase representativeness. (Joint Commenters, No. 22, pp. 1–2)

NEEA stated that test data of 100 refrigerators evaluated as part of the IEC 62552 development demonstrates that the ambient temperature has the greatest impact on refrigerator energy consumption, and technologies such as variable speed compressors have an energy savings potential of 10–30% for refrigerator-freezers due to reduced cycling losses from load-matching (*i.e.,* responding to door openings and warm item insertion). NEEA commented that without the addition of a second ambient temperature test in DOE's test procedure, the reduced energy use associated with such energy saving technologies will not be recognized. NEEA stated that the current test procedure may even penalize the rated performance of energy efficient refrigerators in some cases due to rating equipment at near full compressor speed. NEEA also stated that testing at a single elevated ambient temperature with no user interaction does not reflect normal use and does not encourage manufacturers to optimize the performance of their products for a normal use condition. (NEEA, No. 26, p. 2)

NEEA presented data from testing six refrigerators using both the DOE (*i.e.,* high ambient temperature) and IEC 62552 low-temperature ambient conditions. NEEA asserted that the data shows that refrigerators with variable speed compressors showed a relatively smaller increase in energy consumption from the low-temperature test to the high-temperature test. This data is reproduced in Table III.1. Based on this data, NEEA stated that DOE's single ambient test temperature obscures the energy saving benefit of variable speed technologies that would be of most benefit during normal use. (NEEA, No. 26, pp. 1–3)

NEEA referred to the Australian/New Zealand regulatory requirements for refrigerators and freezers (AS/NZS 4474:2018), which incorporate IEC 62552 without modifications but adapt the weighting factors for the 90 °F test result and the 60 °F test result for the purpose of providing a representative local energy use. NEEA stated that the IEC test method is specifically constructed in a manner to allow different countries and regions to add the different components together in a manner and weighting that best reflects local conditions while using only a single suite of test elements that remain harmonized throughout the world, and that weighting factors can be adapted for the typical conditions in the United States. (NEEA, No. 26, pp. 1–4)

Samsung commented in support of a test method with multiple ambient test conditions, specifically IEC 62552, stating that such a method would be more representative in capturing the energy savings benefits of innovative technologies such as variable speed compressors. Samsung stated that the current test procedure, with a single 90 °F ambient test point, was adequate at a time when most of the refrigerators in the market used single speed compressors, but that in the last ten years, variable speed compressors and adaptive control algorithms have allowed compressors to optimize performance for different load conditions as well as minimize temperature fluctuations for better food preservation. Samsung stated that the energy savings of such technologies would be realized under real-world variable-load conditions due to door openings, introduction of large food

[17] On March 18, 2019 DOE issued a notice of request for information on the measurement of average use cycles or periods of use in DOE test procedures. 84 FR 9721 (March 18, 2019).

loads, seasonal temperature changes, and consumer day/night routines. (Samsung, No. 24, pp. 2–3)

Samsung acknowledged that testing in two ambient test conditions would result in an increase in the test burden, but Samsung stated that such burden is justified by the need for representativeness in order to accurately measure the efficiency benefits of new technologies. Samsung recommended that DOE could limit test burden by developing an optional single ambient test condition approach, as DOE has similarly done for the optional measurement or calculation of motor performance in the 2016 test procedure final rule for pumps.[18] (Samsung, No. 24, p. 3)

NEEA also commented in support of an approach in which manufacturers could elect to perform an optional second ambient condition test, noting that this approach would be an incremental approach to incentivize more efficient technologies while not increasing burden for those manufacturers choosing not to run the additional test. (NEEA, No. 26, p. 4)

At the December 2019 NOPR Public Meeting, ASAP commented that IEC 62552 has a strong international pedigree and recommended that DOE perform a side-by-side comparison of the IEC 62552 and the DOE test procedure. (ASAP, Public Meeting Transcript, No. 11, pp. 89–91) The CA IOUs also recommended that DOE conduct such a comparison to determine the representativeness of the single ambient test condition, and stated that the DOE test procedure should provide adequate differentiation of part-load compressor technologies. (CA IOUs, Public Meeting Transcript, No. 11, pp. 91–92)

DOE appreciates the comprehensive feedback from commenters regarding the ambient test condition issue. The primary concerns with the existing single ambient test condition approach were regarding representativeness (specifically for variable speed compressor products) and the potential for circumvention.

DOE recognizes the concern of using a single test condition to measure energy consumption of models with variable speed compressors. While variable speed compressors and single speed compressors may have similar performance at full-load conditions (*i.e.,* full speed and compressor always on), variable speed compressors typically perform more efficiently than single speed compressors when operating at part-load conditions. Variable speed compressors may match the lower cooling demand by reducing speed rather than by cycling on and off, thereby avoiding losses that occur when the system cycles on and off. On March 29, 2021, DOE published a final rule to amend the test procedure for room air conditioners to, in part, provide for the testing of variable speed compressor products to better reflect their relative efficiency gains at lower outdoor temperatures compared to single speed compressor products (the ''March 2021 Room AC Final Rule''). 86 FR 16446 (March 29, 2021). In the March 2021 Room AC Final Rule, DOE explained that the previous test procedure for room air conditioners measured performance while operating at full-load conditions (*i.e.,* the compressor is operated continuously on), and as a result, the existing DOE test procedure for room air conditioners did not capture any inefficiencies due to cycling losses. *Id* at 86 FR 16452. DOE included a methodology for determining and applying a ''performance adjustment factor'' for variable speed room air conditioners to reflect the avoidance of cycling losses that would be experienced in a representative consumer installation (*i.e.,* at part load conditions). 86 FR 16446, 16455–16460. However, the same is not true for the existing test procedures for refrigeration products: the existing 90 °F ambient test point does not impose a full-load test condition for all refrigeration products. As discussed previously in this section, the 90 °F test condition represents typical room conditions (72 °F (22.2 °C)) with door openings (*i.e.,* typical operation rather than maximum thermal load operation). At the ambient test condition temperature of 90 °F, many refrigeration products exhibit compressor cycling, and thus the 90 °F condition typically already represents part-load conditions for single speed compressor products and variable speed compressor products alike. This is further supported by the existence of multiple provisions in HRF–1–2019 and IEC 62552 regarding cycling compressor systems (*e.g.,* stabilization requirements and test period selection requirements). Given that most refrigeration products have compressors that cycle at this test condition, the single elevated ambient test method already captures inefficiencies due to cycling losses (and correspondingly, efficiencies for variable speed compressors avoiding cycling losses) for refrigeration products, which generally addresses the primary concerns that commenters raised regarding the test procedure not adequately capturing efficiency benefits of variable speed compressors.

As discussed, NEEA presented data from testing six refrigerators using two ambient test points of 32 °F and 16 °F (as set forth in IEC 62552), and this data is reproduced in Table III.1. Because the existing DOE test procedures use an ambient test condition of 90 °F (approximately 32 °C), DOE has calculated the performance differentials for these six refrigerators in terms of a percent decrease in energy use from 32 °C to 16 °C.

TABLE III.1—NEEA AMBIENT TEST CONDITION COMPARISON

Unit	Compressor type	32 °C annual energy consumption (kWh/yr)	16 °C annual energy consumption (kWh/yr)	Percent decrease in energy use from 32 °C to 16 °C
B	Single Speed	536.50	243.43	55
C	Single Speed	607.19	281.61	54
F	Single Speed	563.55	291.21	48
Single Speed Mean				*52*
A	Variable Speed	625.41	327.61	48
D	Variable Speed	467.05	231.36	50
E	Variable Speed	451.43	229.32	49
Variable Speed Mean				*49*

Note: 16 °C is approximately equal to 60 °F and 32 °C is approximately equal to 90 °F.

[18] On January 25, 2016, DOE published a final rule establishing a new test procedure for pumps with calculation methods applicable for certain types of pumps. 81 FR 4085, 4140.

NEEA's data indicate that the variable speed units exhibited a smaller decrease in energy use than single speed units when testing at 16 °C compared to 32 °C. Specifically, the average percent decrease in energy use (from 32 °C to 16 °C) was 52% for single speed compressor products but only 49% for variable speed compressor products in NEEA's dataset. This indicates that, on average, variable speed compressor products did not exhibit additional savings over single speed compressor products at lower ambient conditions.

In response to comments suggesting that DOE conduct additional investigative testing on a larger sample of single speed compressor products and similar variable speed compressor products, DOE tested 16 additional products using appendices A and B test procedures at ambient conditions of 90 °F and 60 °F to compare the resulting impacts on variable speed and single speed compressor products. DOE's investigative testing results are shown in Table III.2.

TABLE III.2—DOE AMBIENT TEST CONDITION COMPARISON

Unit	Product class	Compressor type	Total adjusted volume (ft^3)	90 °F annual energy consumption (kWh/yr)	60 °F annual energy consumption (kWh/yr)	Percent decrease in energy use from 90 °F to 60 °F
G	13A	Single Speed	4.4	229	76	67
H	3	Single Speed	11.9	312	152	51
I	3	Single Speed	21.9	392	189	52
J	3A	Single Speed	17.6	266	82	69
K	5A	Single Speed	27.7	682	402	41
L	5A	Single Speed	34.7	750	404	46
M	9	Single Speed	35.2	486	288	41
Single Speed Mean						*52*
N	13A	Variable Speed	5.2	239	63	74
O	3	Variable Speed	24.4	388	161	59
P	5	Variable Speed	13.2	306	157	49
Q	5A	Variable Speed	27.5	508	309	39
R	5A	Variable Speed	28.7	748	432	42
S	5A	Variable Speed	39.2	764	541	29
T	5A	Variable Speed	39.3	645	418	35
U	5A	Variable Speed	40.1	782	480	39
V	5–BI	Variable Speed	11.9	442	152	66
Variable Speed Mean						*48*
Standard Deviation for all Samples (G through V).						*13*

Note: Test results for product class 5A utilize an automatic icemaker energy adder of 84 kWh per year.

Similar to the test results from NEEA, DOE's test results showed no clear performance improvement for variable speed compressor products relative to single speed compressor products at the 60 °F test condition. Specifically, the average percent decrease in energy use (from 90 °F to 60 °F) was 52% for single speed compressor products but only 48% for variable speed compressor products in DOE's dataset, which closely matches the results from NEEA's dataset. This suggests that given the current state of compressor technology, introducing a second low temperature ambient test would have no significant impact on the relative measured energy use of variable speed compressor products compared to single speed compressor products. Therefore, adding a lower ambient temperature test for the purpose of differentiating the performance of variable speed compressors is not justified at this time.

In response to comments indicating that a single ambient test condition introduces the potential for circumvention, DOE provides principles of interpretation for its test procedures in 10 CFR 430.23(a)(7), 10 CFR 430.23(b)(7) and 10 CFR 430.23(ff)(7) to describe the intent of the test procedures and the requirements regarding component operation in the test condition versus typical room temperature operation. For example, energy consuming components that operate in typical room conditions (including as a result of door openings, or a function of humidity), and that are not excluded by the test procedure, must operate in an equivalent manner during energy testing under the test procedure, or be accounted for by all calculations as provided for in the test procedure. 10 CFR 430.23(a)(7)(i). Further, commenters did not provide an explanation for why a test conducted at the high temperature test condition (*i.e.,* 90 °F) and a second low temperature condition (*i.e.,* 60 °F) would be any more robust in preventing circumvention attempts.

On December 8, 2020 DOE published an early assessment review and request for information regarding energy conservation standards for miscellaneous refrigeration products (the ''December 2020 MREFs RFI''). 85 FR 78964 (December 8, 2020). In response to the December 2020 MREFs RFI, the CA IOUs raised concerns about the appropriateness of the 90 °F ambient test condition for MREFs that utilize thermoelectric cooling rather than compressor cooling. The CA IOUs commented that, compared to other refrigeration products, MREFs have a lower cooling load and less frequent door openings. The CA IOUs suggested that alternative testing approaches would be more representative of an average use cycle for MREFs than the load factor adjustment in DOE's current test procedure, and these could also lead to more appropriately engineered solution so that consumers may realize improved real-world benefits. Specifically, the CA IOUs indicated that the adjustment factor of 0.55 in Appendix A may be appropriate for MREFs with compressor cooling, but that there was insufficient evidence presented by DOE that this same factor would be appropriate for MREFs with thermoelectric cooling. The CA IOUs noted that this could misrepresent and

potentially limit the use of non-compressor cooling technologies (such as thermoelectric or magnetocaloric systems), which are capable of operating more efficiently at lower temperature differences between the cabinet interior and the ambient condition. The CA IOUs referenced data for coolers provided during the development of DOE's test procedure for MREFs.[19] (CA IOUs, December 2020 MREFs RFI, No. 5, pp. 3–4)[20]

In the development of the July 2016 Final Rule, DOE considered the data referenced in the CA IOUs comment and determined that one set of test requirements was appropriate for testing coolers in appendix A, regardless of refrigeration technology. 81 FR 46767, 46781–46782. DOE included the 90 °F ambient test temperature and 0.55 usage factor, as initially proposed for vapor-compression coolers, to establish consistent test requirements across all coolers, as this would ensure that all products offering the same consumer utility and function are rated on a consistent basis, thus providing consumers with a meaningful basis on which to compare product energy consumptions. 81 FR 46767, 46782. DOE also stated that manufacturers of products which are unable to maintain the standard 55 °F cooler compartment temperature when subject to a 90 °F ambient condition would be required to pursue a test procedure waiver to determine an appropriate energy use rating for these products that reflects actual energy use under normal consumer use. 81 FR 46767, 46781. As of this final rule, DOE has not received any petitions for waiver regarding non-compressor MREFs.

As such, the 0.55 usage factor applied to calculate energy consumption for MREFs accounts for the reduced cooling load and less frequent door openings for cooler compartments, which is a consistent reduction regardless of refrigeration technology. Furthermore, DOE notes that these provisions have not precluded the availability of thermoelectric coolers on the market and certified to DOE. In this final rule, DOE will maintain the existing approach for testing MREFs, including instructions for pursuing a test procedure waiver when appropriate.

For the aforementioned reasons, DOE is maintaining the single ambient test condition approach by incorporating by reference the most recent industry test procedure, HRF–1–2019.

2. Updates to AHAM HRF–1–2019

As discussed earlier in section III.B of this document, multiple commenters recommended that DOE incorporate by reference HRF–1–2019 because it is the latest industry test procedure. (AHAM, No. 18 at p. 2; Whirlpool, No. 19, p. 1; Liebherr, No. 16, p. 1; Sub Zero, No. 17, p. 1–2)

In the December 2019 NOPR, DOE noted that HRF–1–2019 was not yet final and provided a link to the public review draft. 84 FR 70842, 70847. Because HRF–1–2019 was not yet available at that time, DOE proposed incorporating the latest industry standard available at that time, HRF–1–2016, with additional proposed amendments in Appendices A and B. 84 FR 70842, 70847–70848. DOE also stated that it would consider incorporating by reference HRF–1–2019 in its entirety when made available for public distribution. 84 FR 70842, 70848.

In response to the December 2019 NOPR, AHAM commented that since posting the draft for public review, AHAM made one non-editorial change incorporated in the published HRF–1–2019 standard related to the two-part equation used to account for defrost energy consumption. (AHAM, No. 18 at pp. 2–3)

For this final rule, DOE reviewed HRF–1–2019 to determine whether it would be an appropriate reference for the DOE test procedures. Consistent with AHAM's comment, DOE observed only editorial changes in HRF–1–2019 compared to the public review draft referenced in the December 2019 NOPR, except for the two-part calculation updates. These calculation updates are discussed further in section III.F of this final rule. Compared to HRF–1–2016, the updates in HRF–1–2019 generally harmonize with DOE's existing requirements for refrigeration products, incorporate the proposals made by DOE in the December 2019 NOPR, or otherwise improve clarity of the industry test method. Other than the updates discussed in this section and the following sections of this final rule, the relevant sections of HRF–1–2019 are substantively consistent with the test procedure proposed in the December 2019 NOPR, which proposed to incorporate by reference certain sections of HRF–1–2016 (*i.e.,* except as discussed in this final rule, any minor changes to terminology, organization, or wording in HRF–1–2019 relative to the December 2019 NOPR would not change the required testing or calculations). Accordingly, DOE is incorporating by reference HRF–1–2019 for its test procedures in appendices A and B.

The following discussion addresses updates resulting from adoption of HRF–1–2019, generally. Following that discussion, DOE presents the topics highlighted in the December 2019 NOPR, and provides separate discussion sections to discuss its proposals, comments received in response to the December 2019 NOPR, and determinations made for this final rule (including incorporation by reference of HRF–1–2019 and any adjustments to the industry standard, as applicable).

Purpose and Scope

Sections 1 and 2 of HRF–1–2019 specify the purpose and scope of the industry test standard. These sections generally harmonize with DOE's existing test requirements and scope of coverage in its regulations in 10 CFR 430.2, 10 CFR 430.23, and Appendices A and B, but include several minor differences. While DOE is incorporating by reference HRF–1–2019 in its entirety, DOE is not referring to section 1 or 2 for testing to avoid potential conflicts with the scope and requirements of DOE's regulations. DOE also states in section 1 of appendices A and B that DOE's regulations take priority in the case of any conflict with HRF–1–2019.

Definitions

DOE provides a number of relevant definitions in 10 CFR 430.2 and in appendices A and B. Additionally, appendices A and B currently reference Section 3, ''Definitions'', of HRF–1–2008. Section 3 of HRF–1–2019 includes updates that generally harmonize with the requirements of the existing DOE test procedures; however, DOE identified certain substantive definition updates or terms that require further clarification, and which are addressed in the following paragraphs.

Section 1 of appendices A and B both include definitions for the term ''through-the-door ice/water dispenser.'' HRF–1–2019 refers to this term but does not include a definition. Because this term is likely well understood in the context of conducting testing per HRF–1–2019, DOE is maintaining the definition for ''through-the-door ice/water dispenser'' in both appendices A and B. Including this definition will additionally provide context for differentiating between refrigeration product classes with and without ''through-the-door ice service'' as specified in 10 CFR 430.32(a).

[19] DOE presented laboratory test data for vapor compression and thermoelectric wine chillers in a notice of proposed rulemaking regarding test procedures for MREFs. 79 FR 74893, 74910–74912 (December 16, 2014).

[20] The December 2020 MREFs RFI and corresponding comments are located in the docket of DOE's rulemaking to consider amended energy conservation standards for MREFs. (Docket No. EERE–2020–BT–STD–0039, which is maintained at *https://www.regulations.gov/*).

HRF–1–2019 includes definitions for many terms that DOE defines in 10 CFR 430.2. For example, HRF–1–2019 defines ''refrigerator,'' ''refrigerator-freezer,'' ''freezer,'' and ''miscellaneous refrigeration product.'' The definitions in HRF–1–2019 are generally consistent with DOE's definitions in 10 CFR 430.2, but with minor differences. DOE is including a statement in section 3 of appendices A and B that in case of conflicting terms between DOE's regulations and HRF–1–2019, DOE's definitions take priority.

Compared to the HRF–1–2008 standard, HRF–1–2019 includes a definition for the term ''compartment,'' as discussed in section III.C of this final rule. HRF–1–2019 also provides specific definitions for cooler compartment, freezer compartment, and fresh food compartment. The current test procedure includes definitions for fresh food compartment and freezer compartment by reference to HRF–1–2008. The fresh food compartment and freezer compartment definitions in HRF–1–2019 include updates to harmonize the definitions with the testing requirements. For example, HRF–1–2008 defined freezer compartment in a combination refrigerator-freezer as the compartment(s) designed for storage of foods at temperatures of 8 °F average or lower, but appendix A requires testing freezer compartments to a standardized compartment temperature of 0 °F. (See section 3.2 of appendix A) HRF–1–2019, by contrast, defines freezer compartment in a refrigerator-freezer as a compartment capable of maintaining temperatures colder than 0 °F, which is consistent with the existing test procedure (and HRF–1–2019) requirement to test freezer compartments in refrigerator-freezers to a standardized compartment temperature of 0 °F. With this change, a freezer compartment in a refrigerator-freezer not capable of maintaining a temperature of 0 °F would not be required to be tested at the 0 °F temperature requirement. DOE is not aware of any products that would be affected by this definition change in HRF–1–2019. Because the updated HRF–1–2019 definition better harmonizes with the existing test requirement, DOE is incorporating it in its test procedure by way of incorporation by reference to Section 3, *Definitions,* of HRF–1–2019.

HRF–1–2019's definitions for fresh food compartment and freezer compartment also remove reference to the design intent of the compartments included in the HRF–1–2008 definitions. For example, HRF–1–2008 specifies that the fresh food compartment be designed for the refrigerated storage of food while HRF–1–2019 refers only to the capability of compartments to maintain temperatures as specified in the definitions. This is consistent with the approach DOE uses to define refrigeration products in 10 CFR 430.2. For example, DOE defines freezer as a product capable of maintaining compartment temperatures of 0 °F (as determined per the test procedure), without referencing whether the product is designed for the storage of food. (10 CFR 430.2)

Section 1 of appendix A defines ''cooler compartment'' as a refrigerated compartment designed exclusively for wine or other beverages within a refrigeration product that is capable of maintaining compartment temperatures either (a) no lower than 39 °F (3.9 °C), or (b) in a range that extends no lower than 37 °F (2.8 °C) but at least as high as 60 °F (15.6 °C). HRF–1–2019 also provides a definition for ''cooler compartment'' that specifies the same temperature operating range as the definition in appendix A but removes the provision that the compartment be designed exclusively for wine or other beverages. This update is consistent with the definitions for fresh food compartment, freezer compartments, and DOE's product definitions in 10 CFR 430.2, which all refer to the capability of products to maintain certain compartment temperatures rather than design intent. To ensure consistency among definitions and to avoid reliance on design intent, DOE is adopting the definition for ''cooler compartment'' included in HRF–1–2019 by way of incorporation by reference of Section 3, *Definitions,* of HRF–1–2019. DOE does not expect that this update to the cooler compartment definition would change how products are currently classified or tested. The ''cooler'' definition in 10 CFR 430.2 includes no such reference to storage of wine or other beverages, so this update only applies to cooler compartments in combination cooler refrigeration products. DOE is only aware of combination cooler refrigeration products with cooler compartments designed for refrigerating wine or other beverages, and therefore this amendment would not affect how these products are currently classified or tested.

DOE has determined that the updated definitions in HRF–1–2019 better harmonize the test standard definitions with the test requirements as established in this final rule, improve clarity of the test procedure, and do not substantively change the test requirements compared to the existing approach, except as noted in this final rule.

Anti-Sweat Heater Switches

Section 2.3 of appendices A and B provides instructions regarding anti-sweat heater settings, stating that the anti-sweat heater switch is to be on during one test and off during a second test (except for units equipped with variable anti-sweat heater control). For units shipped with the anti-sweat heater switch in the highest energy use position, the test instructions in section 2.3 of appendix A require an additional test beyond what is required to calculate annual energy use, as described in the following paragraphs.

DOE provides annual energy use calculations for refrigerators and refrigerator-freezers in 10 CFR 430.23(a)(5); freezers in 10 CFR 430.23(b)(5); and miscellaneous refrigeration products in 10 CFR 430.23(ff)(5). These sections refer to per-cycle energy consumption (*i.e.,* the energy use per day), as determined in either appendices A or B, multiplied by 365 days per year to determine annual energy use. For units with anti-sweat heater switches, the annual energy use calculations are based on the average of the per-cycle energy consumption for the standard cycle (*i.e.,* with the anti-sweat heater switch in the highest energy use position) and the per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just before shipping. (10 CFR 430.23(a)(5)(ii), 10 CFR 430.23(b)(5)(ii), and 10 CFR 430.23(ff)(5)(ii)) Accordingly, for units with the anti-sweat heater switch shipped in the highest energy position, only the standard cycle is required for testing since the as-shipped position represents the highest energy use position required for the standard cycle. Therefore, for such units, the requirement in section 2.3 of appendices A and B to conduct testing with the anti-sweat heater off is unnecessary for determining annual energy use since only the test with the anti-sweat heater on (*i.e.,* the highest energy use setting) would be used to calculate annual energy use per the calculations in 10 CFR 430.23.

The updated language in HRF–1–2019 harmonizes the test procedure with the annual energy use calculations. Specifically, section 5.5.2(x) of HRF–1–2019 specifies testing anti-sweat heater switches in the highest and lowest energy use positions for each temperature control setting if the product is shipped with the switch in the lowest energy use position (*e.g.,* the

off position); otherwise, it shall be run only in the highest energy use position for each temperature control setting. Conceptually, this requirement in HRF–1–2019 could represent a change from the current testing approach for models in which the as-shipped anti-sweat heater setting is not at either the highest or lowest energy use position (*i.e.,* shipped with the anti-sweat heater at an intermediate setting); however, DOE is not aware of any models with anti-sweat heater control switches offering intermediate settings. Therefore, DOE does not expect this update to require re-testing or re-certification for any existing models.

In summary, the updates included in HRF–1–2019 would avoid the potential for running unnecessary tests that would not be used in calculating annual energy use. For this reason, DOE is incorporating the HRF–1–2019 instructions for anti-sweat heater switch settings with no modification.

Test Conditions and Setup

Section 2.2 of appendices A and B incorporates by reference HRF–1–2008 sections 5.3.2 through 5.5.5.5 (excluding section 5.5.5.4) for certain test setup and operational conditions. These sections provide requirements for certain test conditions (relative humidity, air circulation, and radiation), instruments (temperature, electrical, time, relative humidity, and weight), and general test requirements (power supply, test setup, including unit settings, loading, and internal temperature measurements). Section 2 of appendices A and B otherwise provides additional test condition requirements, including ambient temperature conditions, anti-sweat heater instructions as discussed in the previous section, and additional test setup instructions.

In the December 2019 NOPR, DOE proposed to incorporate by reference sections 5.3.2 through 5.5.6.4 of HRF–1–2016, which specify test setup and operational conditions that are generally the same as those currently specified in the HRF–1–2008 incorporation by reference, in appendices A and B. 84 FR 70842, 70869, 70874. Section 5.5.6.5 of HRF–1–2016, which was not proposed for incorporation by reference in the December 2019 NOPR, includes instructions for placing a thermocouple in any ice storage compartment. Section 5.5.6.5 of HRF–1–2019 includes this same setup requirement. Given that this temperature measurement is not used elsewhere in the standard, and to avoid unnecessary test setup requirements, DOE is not referencing this section of HRF–1–2019 for its test procedures. DOE is otherwise incorporating by reference section 5 of HRF–1–2019, except as noted in this final rule, which generally maintains the existing test procedure setup and operational condition requirements.

At the end of section 2.6 in appendix A and 2.4 in appendix B, DOE specifies that for cases in which setup is not clearly defined by the test procedure, manufacturers must submit a petition for a waiver. HRF–1–2019 does not include this instruction, as it is specific to DOE's requirements. To ensure that models are tested and rated correctly under DOE's regulations, DOE is maintaining this instruction regarding test setups requiring petitions for waiver.

Test Measurements

Section 5.1 of appendices A and B provides instructions regarding temperature measurements. Section 5.1(b) of appendices A and B specify the recording requirements when the interior temperature sensor arrangement does not conform to the setups specified in HRF–1–2008 and specify that the certification report must indicate that non-standard sensor locations were used. HRF–1–2019 generally includes this same recording requirement as in sections 5.1(b) of appendices A and B (See, for example, sections 5.5.6.1, 5.5.6.2, 5.5.6.4, and 5.8.1). However, DOE is maintaining the existing language from sections 5.1(b) of appendices A and B, with updated references to HRF–1–2019, to ensure that the test procedure explicitly specifies DOE's record keeping and reporting requirements. DOE is also amending the corresponding certification requirements in 10 CFR 429.14 (for refrigerators, refrigerator-freezers, and freezers) and 429.61 (for miscellaneous refrigeration products) to update references to appendices A and B as amended in this final rule.

Section 2.9 of appendix A, section 2.7 of Appendix B, and section 5.1.1 of both appendices A and B refer to temperature measurement intervals of 4 minutes or less. Section 5.1.1 of appendix A also specifies that the measurement intervals for multiple refrigeration system products shall not exceed one minute. Sections 3.28, 5.5.6.1, 5.5.6.2, 5.5.6.4, and 5.8.1.1 of HRF–1–2019 refer to temperature measurement intervals not to exceed one minute. Based on DOE's testing of refrigeration products, the existing one-minute requirement for multiple refrigeration system products, and the presence of the one-minute interval requirement in HRF–1–2016, DOE has determined that test laboratories already have the capability to record data at one-minute intervals using automated data acquisition systems, and manufacturers likely already record data at one-minute (or shorter) intervals. Accordingly, DOE is incorporating by reference this updated requirement in HRF–1–2019. DOE does not expect that this update will require re-testing (or re-certification) of products already certified as complying with the current energy conservation standards when tested to the existing DOE test procedure, as manufacturers likely already test in accordance with the updated requirements specified in HRF–1–2019. In the event manufacturers do not already record data at one-minute intervals for existing models, DOE expects that any impact of this amendment on measured energy use would be *de minimis,* and manufacturers will not be required to re-test or re-certify performance of the existing models.

DOE's current test procedures incorporate by reference section 5.5.1 of HRF–1–2008 regarding power supply requirements, stating that, unless otherwise specified, the electrical power supply shall be 115 ± 1 V, 60 Hz at the product service connection and the actual voltage shall be recorded as measured at the product service connection with the compressor motor operating. Section 5.5.1 in HRF–1–2016 and HRF–1–2019 similarly specify that power supply be maintained at 115 ± 1 V, 60 Hz at the product service connection, and that the actual voltage shall be maintained and recorded throughout the test, excluding instantaneous voltage fluctuations caused by the turning on or off of electrical components. The updated language in the more recent versions of HRF–1 is generally consistent with the existing test approach, with additional clarification to limit the potential for test variability. DOE does not expect the updated language to affect current model classifications or energy use ratings. DOE notes that HRF–1–2019 does not specify the required data recording intervals for power supply measurements. For consistency with the temperature measurement intervals and with how DOE expects manufacturers are currently testing refrigeration products, DOE is specifying in appendices A and B that the power supply requirements referenced in HRF–1–2019 section 5.5.1 be determined based on measurement intervals not to exceed one minute. DOE does not expect that this update will require re-testing or re-certification of any models, as manufacturers likely already test in accordance with this requirement, similar to the temperature

recording requirements discussed in this section.

Test Conduct

Section 3.2 of both appendices A and B specifies which compartment temperatures are used to compare to the standardized compartment temperatures to determine appropriate temperature settings for testing, as specified in the existing Table 1 in both appendices A and B. HRF–1–2019 generally includes the same test instructions regarding temperature settings but does not include the specification at the end of section 3.2 in both appendices A and B regarding what compartment temperatures should be compared to standardized compartment temperatures to determine appropriate temperature settings for testing. DOE is maintaining the provisions regarding compartment temperatures, with updated references to HRF–1–2019, to ensure that the test procedure maintains the existing temperature setting instructions.

In the December 2019 NOPR, DOE proposed to update the formatting of Table 1 in both appendices A and B and to provide instructions regarding coverage and test procedure waivers. 84 FR 70842, 70857–70858. Table 5–1 in HRF–1–2019 includes test instructions that are generally consistent with DOE's requirements. However, DOE expects that the amended Table 1 as proposed in the December 2019 NOPR improves clarity of the test requirements and the potential need for test procedure waivers by improving the table formatting (*i.e.,* merging cells to show applicability of settings and results) and referring to the test procedure waiver provisions rather than a ''no energy use rating'' outcome from testing. The updated text in Table 5–1 of HRF–1–2019 improves clarity regarding test results by referring to tested compartment temperatures relative to standardized compartment temperatures. Accordingly, DOE is providing an alternate table to be used in place of Table 5–1 of HRF–1–2019, consistent with the December 2019 NOPR proposal, but including the improved wording from Table 5–1 of HRF–1–2019.

Additionally, section 7 of appendices A and B provides general instructions regarding the applicability and requirements for test procedure waivers, while HRF–1–2019 includes no such reference. Therefore, DOE is maintaining the test procedure waiver instructions as currently specified in section 7 of appendices A and B.

Section 3.3 of appendix A provides an optional test for models with two compartments and user-operable controls, which allows for the use of three tests as specified in Australian/New Zealand Standard 4474.1:2007, ''Performance of household electrical appliances—Refrigerating appliances, Part 1: Energy consumption and performance'' (''AS/NZS 4474.1:2007''). This optional approach incorporates a three-test triangulation method to calculate performance at the standardized compartment temperatures rather than the two-test interpolation approach otherwise generally applied in appendix A. HRF–1–2019 includes the same reference to the AS/NZS 4474.1:2007 optional approach as in section 3.3 of appendix A; however, the instructions for that approach are included in section 5.6.3(6), within the section for ''Temperature Settings for Convertible Compartments.'' To ensure proper application of the optional test method, DOE is providing separate instructions in appendix A to clarify the use of section 5.6.3(6) of HRF–1–2019 (*i.e.,* as an optional alternative test independent from the ''Temperature Settings for Convertible Compartments'' section in HRF–1–2019).

Additionally, DOE is providing a reference for ''AS/NZS 4474.1:2007'' in appendix A to clarify its use throughout the test procedure. HRF–1–2019 refers to this test standard, as described in the previous paragraph, but does not include a full reference.

Calculations

In the December 2019 NOPR, DOE proposed to correct an omission regarding the calculations for the optional AS/NZS 4474.1:2007 test approach described in the previous section. 84 FR 70842, 70857. The energy use calculations associated with the optional test method are not currently included in appendix A; accordingly, DOE proposed to reinstate the calculations as previously established for refrigerator-freezers prior to the inadvertent omission from appendix A. *Id.* HRF–1–2019 does not include the energy use calculations associated with the optional AS/NZS 4474.1:2007 test approach; therefore, DOE is providing the calculations associated with that test in appendix A, as proposed in the December 2019 NOPR. Because the AS/NZS 4474.1:2007 approach is applicable to products with multiple temperature compartments, the approach is also applicable to combination cooler refrigeration products (*i.e.,* not only to refrigerator-freezers). Therefore, DOE is also including energy use calculations for the AS/NZS 4474.1:2007 optional test approach as applied to combination cooler refrigeration products.

Section 5.10 of HRF–1–2019 provides annual energy consumption calculations. As discussed earlier in this section of this final rule, DOE currently provides annual energy use calculations as part of its test procedures in 10 CFR 430.23(a)(5), 10 CFR 430.23(b)(5), and 10 CFR 430.23(ff)(5). The calculations in section 5.10 of HRF–1–2019 are consistent with DOE's current calculations. To avoid duplicate calculation requirements, DOE is updating 10 CFR 430.23(a)(5), 10 CFR 430.23(b)(5), and 10 CFR 430.23(ff)(5) to remove calculation instructions and to instead reference appendices A or B, as appropriate, which in turn reference section 5.10 of HRF–1–2019, for determinations of annual energy use.

Specific Amendments Addressed by DOE

The following sections discuss other specific amendments to the test procedures for refrigeration products, typically made by reference to HRF–1–2019. These amendments relate to compartment definitions, test setup requirements, ambient temperature requirements, stabilization requirements, defrost energy consumption, icemaking energy consumption, and other refrigeration product features.

C. Compartment Definitions and Clarifications

Although the term ''compartment'' is used throughout the current DOE test procedures in appendices A and B, the term is not defined. The DOE test procedures use the term to refer to both individual enclosed spaces within a product (*e.g.,* referring to a specific freezer compartment), as well as all enclosed spaces within a product that meet the same temperature criteria (*e.g.,* referring to the freezer compartment temperature—a volume-weighted average temperature for all individual freezer compartments within a product).

In the December 2019 NOPR, DOE proposed to include a definition for ''compartment'' consistent with AS/NZS 4474.1:2007 but adapted to use the appropriate DOE terminology for certain terms within the definition. 84 FR 70842, 70847. Specifically, DOE proposed to define a ''compartment'' as an enclosed space within a refrigeration product that is directly accessible through one or more external doors and may be divided into sub-compartments. *Id.* DOE stated that the proposal would not affect how compartments would be classified or treated under the test procedure and, accordingly, DOE did not expect that the proposed definition

would impact measured energy consumption. *Id.*

To provide further detail, DOE proposed to define ''sub-compartment'' as an enclosed space within a compartment that may have a different operating temperature from the compartment within which it is located. *Id.* DOE stated that this definition, coupled with the proposed definition for ''compartment,'' would remove the need to separately define ''separate auxiliary compartment'' and ''special compartment'' because these terms would be redundant with the proposed compartment definitions; therefore, DOE proposed to remove the terms ''separate auxiliary compartment'' and ''special compartment'' from appendices A and B and replace them with ''compartment'' or ''sub-compartment'' as appropriate. *Id.*

In response to the December 2019 NOPR, AHAM commented that HRF–1–2019 includes definitions for ''compartment'' and ''sub-compartment'' consistent with the December 2019 NOPR proposals. (AHAM, No. 18, pp. 7–8) DOE did not receive any comments in objection to the proposals for compartment definitions.

For the discussed reasons, DOE is adopting the definitions for ''compartment'' and ''sub-compartment'' through incorporation of section 3.8 of HRF–1–2019.

Section 5.5.2(s) of HRF–1–2019 includes instructions for testing products with convertible compartments consistent with DOE's existing test procedure in appendix A, section 2.7. However, these instructions specifically pertain to individual compartments within a product that may operate as fresh food, freezer, or cooler compartments without affecting the overall product's classification (*e.g.,* as a ''refrigerator'' or ''freezer''). For example, the current instruction regarding convertible compartments is included in appendix A. If a model consisting of a single convertible compartment were to be tested as a freezer compartment, appendix B rather than appendix A would be the applicable test procedure.

In the April 2014 Final Rule, DOE separately addressed convertible products, such as those that can switch from ''refrigerator'' to ''freezer'' and for which more than one product class may apply. DOE stated that, ''in the case of a product for which the convertible compartment is the only compartment (*i.e.,* the entire product is convertible), the product effectively meets the definitions of two different covered products'' and that ''DOE is requiring that convertible products be tested and certified as both refrigerators and freezers if the products meet the applicable definition(s).'' 79 FR 22319, 22343.

DOE is aware of products currently available on the market that indicate capability to be converted between refrigerator operation and freezer operation, and that are only certified to DOE's Compliance Certification Management System (''CCMS'') database as freezers.

Hence, DOE is reiterating its position regarding treatment of convertible products from the April 2014 Final Rule:

DOE will require that manufacturers certify each individual model as complying with the energy conservation standard applicable to all product classes identified in § 430.32(a) into which the individual model falls if the individual model is distributed in commerce as a model within that product class. The manufacturer must assign a different basic model number to the units in each product class even if a manufacturer uses the same individual model number to identify the product. As an example, if a single individual model were distributed in commerce as an automatic defrost all-refrigerator (product class 3A) and as an automatic defrost upright freezer (product class 9), the manufacturer could use the same individual model number but would be required to test the model according to the test procedure applicable to each corresponding product class (*i.e.,* appendix A for class 3A and appendix B for class 9). The manufacturer would also need to certify each basic model separately (*i.e.,* in product class 3A and in product class 9) using a different basic model number for the two product classes. 79 FR 22319, 22343.

D. Test Setup

In the December 2019 NOPR, DOE discussed multiple aspects of the test procedure setup requirements, specifically with regard to built-in products, freezer drawers, test platforms, products with separate external temperature controls, and vertical ambient temperature measurement locations. 84 FR 70842, 70852–70854. The following sections discuss these test setup topics, including the resulting amendments established in this final rule.

1. Built-In Test Configuration

Built-in refrigeration products generally are products that (1) have unfinished sides that are not intended to be viewable after installation; (2) are designed exclusively to be installed totally encased by cabinetry, fastened to the adjoining cabinetry, walls, or floor; and (3) are either equipped with a factory-finished face or accept a custom front panel. (10 CFR 430.2) In the development of the existing test procedures for refrigeration products, DOE presented data indicating that performing testing in a built-in enclosure (*i.e.,* enclosing the units in simulated cabinetry) may affect measured energy consumption for certain configurations of built-in products. 78 FR 41610, 41649–41650 (July 10, 2013). Those products that reject condenser heat at the back of the unit showed a potential increase in energy use when tested in an enclosure. However, data supplied by Liebherr [21] indicated no significant impact on measured energy consumption when rear-condenser built-in units were tested in an enclosure consistent with manufacturer recommendations. 78 FR 41610, 41650.

In the June 2017 RFI, DOE requested further information on appropriate testing for built-in products, including energy impacts of testing in an enclosure, representativeness of test results compared to actual consumer use, test burden, and any potential alternative test approaches. 82 FR 29780, 29783–29784. Based on available test data and stakeholder comments received in response to the June 2017 RFI, in the December 2019 NOPR, DOE tentatively determined that testing built-in units in enclosures consistent with the manufacturer installation instructions would result in no significant difference in measured energy use compared to testing in a freestanding configuration, and therefore, DOE did not propose to amend the current requirement that all units be tested in the freestanding configuration. 84 FR 70842, 70851–70852.

In response to the December 2019 NOPR, AHAM, FSI, and Sub Zero commented that requiring enclosures for built-in testing would be unduly burdensome without a corresponding benefit to the representativeness or accuracy of the test procedure. (AHAM, No. 18, p. 7; FSI, No. 21, p. 2; Sub Zero, No. 17, p. 2)

Based on the information gathered throughout the rulemaking process and consideration of the comments received,

[21] Liebherr provided data as part of the previous test procedure rulemaking. These documents and corresponding comments are located in the docket of DOE's previous rulemaking to develop test procedures for refrigerators, refrigerator-freezers, and freezers. (Docket No. EERE–2012–BT–TP–0016, which is maintained at *https://www.regulations.gov/*) (See Document No. EERE–2012–BT–TP–0016–0034).

DOE is maintaining the existing test approach for built-in products by adopting the test method in HRF–1–2019, which does not require that built-in products be tested in an enclosure.

2. Thermocouple Configuration for Freezer Drawers

As discussed in section III.B of this document, the current test procedures for refrigeration products incorporate by reference portions of HRF–1–2008 for testing requirements. Section 5.5.5.5 of HRF–1–2008 includes figures specifying thermocouple placement for several example fresh food and freezer compartment configurations. HRF–1–2008 also provides that in situations where the interior of a cabinet does not conform to the configurations shown in the example figures, measurements must be taken at locations chosen to represent approximately the entire cabinet.

In the December 2019 NOPR, DOE proposed to incorporate by reference HRF–1–2016 and the relevant errata, including a clarification to Figure 5–2. 84 FR 70842, 70852–70853. DOE also proposed to amend appendices A and B to explicitly specify that for freezer drawers, the thermocouple setup for drawer-type freezer compartments must follow sensor layout type 6 specified in HRF–1–2016, as the configurations in Figure 5–2 of HRF–1–2016 (as well as HRF–1–2008) do not specify their applicability to drawer compartments. *Id.*

In response to this proposal in the December 2019 NOPR, AHAM commented that DOE should instead incorporate by reference the provisions in HRF–1–2019, which are identical to those in HRF–1–2016 but also include the aforementioned errata. (AHAM, No. 18, p. 8)

HRF–1–2019 explicitly indicates in the notes to Figure 5–2 that freezer compartments less than 2 cubic feet in volume should be tested with one thermocouple located in the geometric center of the compartment. HRF–1–2019 also states that the type 5 and type 6 freezer thermocouple configurations in Figure 5–2 apply to vertical freezers and freezer compartments with either doors or drawers, addressing the clarification that DOE had proposed in the December 2019 NOPR.

Based on its review of HRF–1–2019, DOE has determined that the test requirements in HRF–1–2019 are consistent with the December 2019 NOPR proposal. Therefore, DOE is adopting these provisions by incorporating by reference HRF–1–2019.

3. Test Platform Requirements

Section 2.1.3 in both appendices A and B requires that a test platform be used if the test chamber floor temperature is not within 3 °F of the measured ambient temperature. If a platform is used, it must have a solid top with all sides open for air circulation underneath, and its top shall extend at least 1 foot beyond each side and front of the unit under test and extend to the wall in the rear. DOE included this requirement in its test procedures to limit the variability of airflow near the unit during testing. Airflow directly at the base of the unit may increase heat transfer from the condenser and compressor compartment, resulting in better measured energy performance compared to a unit with no airflow at the base of the unit.

As discussed in the December 2019 NOPR, the text of section 2.1.3 in appendices A and B does not explicitly address the setup for a test chamber floor that has vents for airflow. 84 FR 70842, 70853. DOE stated that such a test chamber floor is analogous to a ''platform'' because the floor is elevated above an airflow pathway, and therefore, testing should follow the same procedure required for a test platform. *Id.* DOE proposed to specify that for a test chamber floor that allows for airflow (*e.g.,* through a vent or holes), any airflow pathways through the floor must be located at least 1 foot away from all sides of the unit. *Id.* DOE also stated that, based on experience with third-party laboratories, the proposal is consistent with current industry practice and therefore would not impact measured energy use. *Id.*

In response to the December 2019 NOPR, AHAM supported DOE's proposal to specify that airflow pathways through the test floor must be located at least one foot away from all sides of the unit, indicating that this is consistent with the revised test procedure in HRF–1–2019. (AHAM, No. 18, p. 8)

Based on the foregoing discussion, DOE is adopting these test platform requirements through incorporation by reference of section 5.3.1 of HRF–1–2019.

4. Separate External Temperature Controls

In 2014, DOE granted a waiver to Liebherr to allow for testing a refrigerator intended to be connected to a separate freezer that houses the controls for both the refrigerator and freezer cabinets. 79 FR 19886 (April 10, 2014; case no. RF–035). Under the waiver approach, Liebherr must test the subject refrigerator according to appendix A with the additional requirement that the freezer cabinet (with controls for both the refrigerator and freezer) be close enough to allow for the electrical connection to the refrigerator, but far enough away to avoid interfering with ambient airflow or other test conditions. The freezer must be set to the ''off'' position for testing. 79 FR 19886, 19887–19888.

In the December 2019 NOPR, DOE stated that it is not aware of any other products for which the cabinet controls are housed in a separate product; however, DOE proposed to amend appendices A and B to address such products to eliminate the potential need for additional test procedure waivers. 84 FR 70842, 70853. DOE proposed to follow the approach specified in the Liebherr waiver, but with revisions to be applicable to different cabinet configurations. *Id.*

In response to this proposal, Liebherr commented that Liebherr's products requiring the test procedure waiver for separate external temperature controls have been discontinued and Liebherr is likewise not aware of other such products. (Liebherr, No. 16, p. 1) AHAM provided a similar comment, and both commenters suggested there is no longer a need for such an amendment to the DOE test procedures. (Liebherr, No. 16, p. 1; AHAM, No. 18, pp. 8–9)

HRF–1–2019 does not include the additional instructions that DOE proposed in the December 2019 NOPR regarding products with external controls. Based on DOE's review of the market and on the comments from Liebherr and AHAM indicating that products requiring such instructions are no longer available, DOE is not amending the test procedure to include instructions specific for refrigerators intended to be connected to a separate freezer that houses the controls for both the refrigerator and freezer cabinets models. The publication of this final rule terminates the existing Liebherr waiver consistent with 10 CFR 430.27(h)(3) and 10 CFR 430.27(l).

5. Ambient Temperature Measurement Locations

Section 2.1.2 of both appendices A and B requires that a test room vertical ambient temperature gradient of no more than 0.5 °F per foot (0.9 °C per meter) must be maintained during testing. To demonstrate that this requirement has been met, test data must include measurements taken using temperature sensors at locations 10 inches from the center of the two sides of the unit under test at heights of 2

inches and 36 inches above the floor or supporting platform and at a height of 1 foot above the unit under test. The requirement to measure temperature 1 foot above the unit under test does not explicitly address products with components that extend above the top of the refrigerated storage cabinet (*e.g.,* beer dispensers or ''keg refrigerators'' with taps on top of the cabinet).

In the December 2019 NOPR, DOE proposed that when measuring the ambient temperature 1 foot above the unit, the top of the unit should be determined by the refrigerated cabinet height, excluding any accessories or protruding components on the top of the unit (*e.g.,* taps or dispensers). 84 FR 70842, 70854. DOE stated that this proposal would reduce the potential for testing variability and not impact measured energy use. *Id.*

AHAM commented in response to the December 2019 NOPR that DOE's proposal is consistent with the updates to HRF–1–2019 section 5.3.1. (AHAM, No. 18, p. 9)

Section 5.3.1 of HRF–1–2019 includes instructions that are consistent with the previous ambient temperature measurement locations but does not explicitly clarify that the top of the unit should be determined by the refrigerated cabinet height, excluding any accessories or protruding components on the top of the unit, as DOE had proposed in the December 2019 NOPR. In this final rule, DOE is incorporating that specification in section 5.1(a) of both appendices A and B to supplement the reference to HRF–1–2019.

Additionally, HRF–1–2019 includes new provisions for the ambient temperature measurement locations for units 36 inches or less in height. Specifically, section 5.3.1 of HRF–1–2019 states that for a product height of 36 inches (91.5 cm) or less, the ambient temperature shall be recorded at points located at a distance of the product height divided by two above the floor or platform and 10 inches (25.4 cm) from the center of the two sides of the unit under test. This is in contrast to the provision for products greater than 36 inches in height (and consistent with the current DOE test procedures), for which HRF–1–2019 states that the ambient temperature be measured at locations 36 inches above the floor or platform and 10 inches (25.4 cm) from the center of the two sides of the unit under test, consistent with the existing requirement for testing all products.

After considering the new provisions for products 36 inches or less in height, DOE acknowledges that maintaining ambient temperature around the actual product dimensions rather than above units with height less than 36 inches would ensure the most repeatable and reproducible testing. Therefore, DOE is adopting these provisions by incorporating by reference HRF–1–2019. DOE expects that this update would not affect measured energy use compared to the existing approach (*i.e.,* with ambient thermocouples 36 inches above the test floor). Section 2.1.2 of Appendices A and B requires a maximum vertical ambient temperature gradient of 0.5 °F per foot, thereby limiting the variability of the ambient temperature as measured at different heights around the unit under test. Given that the test procedure amendment is not expected to change measured energy use, DOE does not expect the amendment to require re-testing or impact compliance of the affected products.

E. Test Conditions

1. Ambient Temperature and Vertical Ambient Gradient

Section 2.1.2 of both appendices A and B, which, as discussed in the previous section, addresses the vertical ambient temperature gradient, does not specify the period during which the vertical ambient temperature gradient must be maintained. Section 2.1.1 of both appendices specifies that the ambient temperature shall be maintained during both the stabilization period and test period. DOE stated in the December 2019 NOPR that the vertical ambient temperature gradient should be maintained during both the stabilization period and test period to ensure consistent ambient conditions throughout both periods. 84 FR 70842, 70853–70854. Thus, DOE proposed to specify that the vertical ambient temperature gradient be maintained during both the stabilization period and test period. *Id.*

AHAM indicated that this proposal is consistent with the updates to HRF–1–2019 section 5.3.1. (AHAM, No. 18, p. 9)

Section 5.3.1 of HRF–1–2019 does not explicitly provide that the vertical ambient temperature gradient should be maintained during both the stabilization period and test period to ensure consistent ambient conditions throughout both periods, as DOE had proposed. Additionally, section 5.3.1 of HRF–1–2019 specifies the ambient temperature requirement (90.0 ± 1.0 °F) must be maintained during the test period. This omits the current DOE requirement in section 2.1.1 of appendices A and B that the ambient temperature shall be maintained during both the stabilization period and test period.

To ensure that appropriate ambient conditions are maintained throughout testing, including both the stabilization and test periods, the amendments in this final rule incorporate by reference HRF–1–2019 and additionally provide that both the ambient temperature and vertical ambient temperature gradient must be maintained during both the stabilization period and test period.

2. Stabilization

This final rule establishes several amendments to stabilization criteria included in the test procedures for refrigeration products. These amendments adopt the relevant provisions in HRF–1–2019, which DOE is incorporating by reference, and are consistent with the amendments DOE proposed in the December 2019 NOPR. DOE addresses the specific topics and amendments regarding the stabilization amendments in the following sections.

Elapsed Time Between Measurement Periods

Section 2.9 in appendix A and section 2.7 in appendix B provide two options for determining whether steady-state conditions exist based on a maximum rate of change of average compartment temperatures for a unit under test. The first option (''part A stability'') specifies determining the rate of change of compartment temperatures by comparing temperature measurements recorded during a period of at least 2 hours to the measurements recorded over an equivalent time period, with 3 hours elapsing between the two measurement periods. If this first option cannot be used, a second option (''part B stability'') specifies that the average of the measurements during a number of complete repetitive compressor cycles occurring through a period of no less than 2 hours and including the last complete cycle before a defrost period (or if no cycling occurs, the average of the measurements during the last 2 hours before a defrost period) are compared to the same averaging period before the following defrost period.

For test units with cycling compressors, it may not be possible to measure temperatures over complete compressor cycles while allowing exactly 3 hours to elapse between the measurement periods, as required for part A stability. However, as DOE stated in the development of the April 2014 Final Rule, DOE considers the 3-hour period to represent a minimum elapsed time between temperature checkpoint periods. 78 FR 41610, 41651 (July 10, 2013). Accordingly, in the December

2019 NOPR, DOE proposed to clarify that the time elapsed between measurement periods must be at least 3 hours for the stability check. 84 FR 70842, 70845.

Section 3.28(a) of HRF–1–2019 specifies that 3 hours is the minimum time that must elapse between measurement periods using this option to verify steady-state conditions; hence, DOE is adopting this provision through incorporation by reference of HRF–1–2019.

Use of Stabilization Data for Steady-State Test Period

In response to the June 2017 RFI, multiple interested parties suggested that for certain products, data recorded during the stabilization period could be considered part of the test period data. (AHAM, No. 5 at p. 8; BSH Home Appliances Corporation (''BSH''), No. 2 at p. 2; Sub Zero, No. 4 at p. 2) DOE tentatively agreed that the stabilization period and part one of a two-part energy test capture essentially the same unit operation, and in the December 2019 NOPR proposed to amend the test period requirements in appendices A and B to provide that, if the part A stabilization criteria is used, that same period be used for steady-state test period data, where appropriate (*i.e.,* for the test periods that do not capture defrosts). 84 FR 70842, 70854.

In response to the December 2019 NOPR, AHAM again supported a change that would allow full stability data to be used for the first part of the test instead of requiring a separate test part one test.[22] (AHAM, No. 18, pp. 9–10) AHAM reiterated at the December 2019 NOPR Public Meeting that using a proven period of stability for both stabilization and part one test periods is possible now and was not implemented in earlier versions of HRF–1 because newer data acquisition technologies allow labs to view and assess data in real time. (AHAM, Public Meeting Transcript, No. 11, p. 67) AHAM also recommended that DOE adopt the provisions in HRF–1–2019 to address this issue. (*Id.*)

The CA IOUs and CEC expressed concern that data from when the unit under test is achieving steady state operation should not be used for test period data. (CA IOUs, No. 23, p. 4; CEC, No. 20, pp. 4–5) These commenters stated that because the stabilization period is the timeframe the system takes to achieve steady state, any data collected during this period is ill-suited for product efficiency ratings. The CA IOUs and CEC also asked whether there is any precedent for such an approach and whether there are independent data and analysis that can validate the data quality of the stabilization period. (*Id.*)

Section 3.28 of HRF–1–2019 specifies criteria to confirm that the test unit has achieved stable operation. The reference to stabilization and steady state periods refer to units that are already in stable operation rather than units achieving stability. Thus, the use of a steady state period as the test period ensures that data representing stable operation is used for the test period.

Data used to confirm stable conditions is used as part of the test data only in specific circumstances. Section 5.7 of HRF–1–2019 provides that the data used to confirm steady state conditions is used as data for part one of the variable defrost control test or as the non-automatic defrost test period. Section 5.7.2.1.1 also provides that the steady state data may be used for part one of the long-time automatic defrost control test if a two-part test period is conducted. In each of these circumstances, the data confirming steady state conditions captures the same type of unit operation as the data required for certain test periods under the existing test procedure approach (*i.e.,* normal compressor operation and no operation associated with a defrost). The approach established in this final rule, by reference to HRF–1–2019, avoids the requirement for multiple data acquisition periods capturing the same types of unit operation. Further, the updated approach specifically requires that steady state conditions be confirmed on the test period data, whereas the existing approach requires confirming steady state prior to a test period.

Through incorporation by reference, DOE is adopting the provisions in section 3.28, section 5.7.1, and section 5.7.2.1.1 of HRF–1–2019, which use verified stabilization data as the steady-state test periods for certain product types. These requirements are consistent with DOE's proposal in the December 2019 NOPR.

Irregular Compressor Cycling

Stabilization determinations may be difficult for products with multiple compressors or irregular compressor cycling. For these products, the average compartment temperatures over one complete compressor cycle may not be representative of the average compartment temperatures over a longer period of operation with multiple compressor cycles. For example, a product with a combination of long and short compressor on cycles during normal operation would likely have either higher or lower average compartment temperatures over an individual compressor on/off cycle, when compared to the average compartment temperatures over a longer period of operation with multiple compressor cycles.

Figure 1 in appendix A shows the requirements for selecting the defrost portion of the test for a two-part test, including that the compressor cycles immediately preceding (*i.e.,* cycle A) and following (*i.e.,* cycle B) the defrost portion of the test must be within 0.5 °F of the non-defrost part of the test. As discussed in the December 2019 NOPR, products with irregular compressor cycling may not be able to meet the requirements for determining the start and end points for the defrost portion of the test when using the two-part test as provided in section 4.2.1.1 in appendices A and B (and 4.2.3.4.2 in appendix A for multiple-compressor products) because the average temperature of an individual compressor cycle may never match the average temperature over a longer period of operation that includes many compressor cycles. 84 FR 70842, 70854–70855. For example, a product with a combination of long and short compressor on cycles during normal operation would likely have either higher or lower average compartment temperatures over an individual compressor on/off cycle, when compared to the average compartment temperatures over a longer period of operation with multiple compressor cycles. *Id.* For cases of irregular compressor cycling using the two-part test method, DOE proposed to include an alternate determination of when to start and end the defrost test period. *Id.* DOE proposed that the beginning of the period be determined based on the average compartment temperatures over one or more complete compressor cycles before a defrost, that the average temperatures over the multiple complete compressor cycles must be within 0.5 °F of the average determined over the first part of the test (''part one'', the steady-state test period), and that all cycles included in the averaging period would be included within the defrost test period (''part two''). *Id.* Similarly, the test period would end with a period of complete compressor cycles after a defrost with the average compartment temperatures over that period within

[22] DOE notes that the terms ''part one test'' and ''first part of the test'' refer to steady-state test periods which do not capture defrost energy use. ''Part two'' of a two-part test period captures the energy consumption associated with defrosting operation. The selection of this data period is described further in a subsequent subsection of this document.

0.5 °F of the average determined over the first part of the test, with all compressor cycles included in the averaging period included in the defrost test period. *Id.*

AHAM expressed general support for this proposal and suggested that the updates in HRF–1–2019 would address such issues. (AHAM, No. 18, pp. 9–10)

Compared to DOE's proposed approach in the December 2019 NOPR, HRF–1–2019 has a similar method for determining the defrost test period. Section 5.7.2.1.4 of HRF–1–2019 addresses systems with irregular cycling compressors, stating that when using a compressor cycle pattern to establish cycle A, cycle B, and the first part of the test, the compressor cycle pattern shall be the same for all. This is depicted in Figure 5–4 of HRF–1–2019. The method in section 5.7.2.1.4 of HRF–1–2019 allows for the use of a consistent pattern of irregular compressor cycles to be used in place of single, regular compressor cycles. Additionally, whereas the method proposed by DOE would require that all compressor cycles included in the averaging period be included in the defrost test period, the method in section 5.7.2.1.4 of HRF–1–2019 is consistent with the method currently used in section 4.2.1.1 of appendices A and B, and would exclude cycle A and cycle B (which themselves may be cycle patterns) from the defrost part of the test period.

DOE agrees that the method in section 5.7.2.1.4 of HRF–1–2019 is consistent with the intent of the current test procedures in appendices A and B and expects that it will improve representativeness, reproducibility, and repeatability of test results for products with irregular compressor cycling by ensuring consistent selection of cycle A and cycle B used to define the defrost portion of the test for these products. Additionally, the approach in HRF–1–2019 treats regular repeating sequences of compressor operation as normal compressor cycles, which ensures that units with regular and irregular compressor cycling operation are tested in a consistent manner. While the HRF–1–2019 approach represents a minor change from the method proposed in the December 2019 NOPR (although it is consistent with the method included in the draft of HRF–1–2019 for public review, as referenced in the December 2019 NOPR), it accomplishes the same goal (*i.e.,* ensuring the part two test period captures all operation associated with a defrost). Therefore, DOE is adopting this method through incorporation by reference of HRF–1–2019.

Multiple Compressor Products

For products with multiple compressors, the asynchronous cycling of the different compressors may make it more difficult to determine whether average compartment temperatures are within 0.5 °F of the average temperatures for the first part of the test (the cycle A and cycle B requirements discussed in the previous section). To address this issue, DOE proposed in the December 2019 NOPR that if a multiple compressor product cannot meet the 0.5 °F criteria, the test period shall include precool, defrost, and recovery time for the defrosted compartment, as well as sufficient dual compressor cycles to allow the length of the test period to be at least 24 hours, unless a second defrost occurs prior to completion of 24 hours, in which case the second part of the test shall include a whole number of complete primary compressor cycles comprising at least 18 hours. 84 FR 70842, 70855. Under the proposed approach, the test period would start at the end of a regular freezer compressor on-cycle after the previous defrost occurrence (refrigerator or freezer). *Id.* The test period would also include the target defrost and following freezer compressor cycles, ending at the end of a freezer compressor on-cycle before the next defrost occurrence (in either the refrigerator or freezer). *Id.* This proposed approach is consistent with an existing waiver test method for a multiple compressor product.[23] *Id.*

The updates in HRF–1–2019 incorporate methods for verifying steady state conditions for multiple compressor products. Section 3.28(c) of HRF–1–2019 instructs for multiple compressor products that the test shall start after a minimum 24-hour stabilization run for each temperature control setting or when the conditions of section 3.28(a) (''part A stability'') are met. This is consistent with the existing DOE steady-state condition requirement for multiple compressor products, as specified in appendix A, section 4.2.3.2.

Section 5.7.2.4 of HRF–1–2019 provides test period selection instructions for multiple compressor products in a manner consistent with the proposed approach in the December 2019 NOPR. Section 5.7.2.4 specifies that a two-part test period shall be used for multiple compressor products with automatic defrost; and for cycling compressor systems, each part shall comprise at least 24 hours, unless a defrost occurs prior to completion of 24 hours, in which case the test shall comprise at least 18 hours. Additionally, section 5.7.2.4 of HRF–1–2019 clarifies that if at least one compressor cycles on and off, test periods shall be based on compressor cycles associated with the primary compressor system (these are referred to as ''primary compressor cycles''), and if the freezer compressor cycles on and off, it shall be the primary compressor system.

AHAM encouraged DOE to adopt the provisions in HRF–1–2019 in order to improve the clarity of the testing instruction for multiple compressor products. (AHAM, No. 18, pp. 9–10)

The new sections in HRF–1–2019 are generally consistent with DOE's existing approach and the provisions included in an existing waiver.

In the December 2019 NOPR, DOE had also proposed regulatory text that would allow for considering multiple compressor cycles if individual cycles never meet the existing temperature criteria for test period part two, similar to the approach described in the previous irregular compressor cycling section. *See* 84 FR 70842, 70871. However, the irregular compressor cycling issue is addressed by the existing test procedure waiver provisions, which are incorporated into HRF–1–2019, and does not require separate consideration in the test period instructions.

Accordingly, DOE is adopting the multiple compressor test period and stability provisions through incorporation by reference of HRF–1–2019.

F. Defrost Energy Consumption

In addition to the changes discussed in section III.B.2 of this final rule, HRF–1–2019 also includes a substantial revision to the two-part energy use equations currently used to account for defrost energy consumption for long-time automatic defrost control, variable defrost control, and multiple defrost types in sections 5.8.2.1.2, 5.8.2.1.3, and 5.8.2.1.6, respectively of HRF–1–2019. As stated in AHAM's comments in response to the December 2019 NOPR, this change to the two-part energy use equations is the one non-editorial change incorporated in the published HRF–1–2019 compared to the public draft for review as referenced in the December 2019 NOPR. (AHAM, No. 18 at pp. 2–3)

[23] In the notice granting the waiver, DOE determined that the specified multiple-compressor models would not be able to reach the temperature stability conditions specified in Appendix A. 80 FR 7851, 7853. (See case number RF–042) On November 18, 2020, DOE extended the waiver to another GEA multiple-compressor combination cooler refrigeration product basic model to address the same issue of determining stability. 85 FR 73466. (*See* case number 2020–007).

The updated two-part equation determines the defrost energy consumption based on the compressor run-time between defrost periods and the compressor run-time ratio as measured during testing. The methodology currently in appendices A and B assumes a compressor run-time ratio of 50 percent, or, 12 hours per day.

In response to the December 2019 NOPR, AHAM stated that using the actual measured compressor run-time ratio in the equation improves the reproducibility of the energy test procedure by harmonizing the two methods (defrost-to-defrost method and two-part method) for testing long time automatic defrost models. AHAM commented that this is a significant improvement on the current DOE equation without introducing additional test burden, as it only changes the way the data collected under the current method is used. (AHAM, No. 18, pp. 2–3)

AHAM acknowledged that this change would result in increased energy use ratings for certain products. AHAM collected data from manufacturers to estimate the impact of this change on the energy use measurement for models in product classes 3, 4, 5, 7, and 9, and suggested corresponding changes to DOE's energy conservation standards for these product classes. AHAM noted that its recommendations were based on data from both minimally compliant and ENERGY STAR rated products, as well as both variable speed compressor models and single speed compressor models. AHAM indicated that the change in the equation impacts ratings for variable speed compressor models and single speed compressor models differently. (AHAM, No. 28, p. 1–4) A part of AHAM's data summary and recommendation for adjustment of the standards is reproduced in Table III.3.

TABLE III.3—SUMMARY OF AHAM ENERGY USE IMPACTS BASED ON TWO-PART EQUATION UPDATE

	Impact on annual energy usage rating			
	Top-mount refrigerator-freezers (product class 3) (%)	Bottom-mount refrigerator-freezers (product class 5) (%)	Side-mount refrigerator-freezers (product classes 4 & 7) (%)	Upright freezers (product class 9) (%)
Minimum	−1.04	−1.37	−0.33	0.00
Maximum	1.59	5.38	3.27	3.79
Mean	0.34	0.76	1.19	1.83
AHAM Recommendation for Adjustment to Energy Conservation Standards	0.00	2.50	1.50	2.50

Samsung requested that DOE maintain the reference to the equation in AHAM HRF–1–2016, as proposed in the December 2019 NOPR, and not update it with the equation in AHAM HRF–1–2019. Samsung commented that it had informed AHAM of its findings that the updated energy consumption equation for variable defrost systems in HRF–1–2019 is technically incorrect and fails to accurately measure the defrost energy consumption of refrigerators with variable defrost systems, which in turn would result in higher defrost energy estimates for refrigerators that have variable speed compressors and lower defrost energy estimates for defrost systems using single speed compressors. (Samsung, No. 24, pp. 3–4)

Samsung asserted that the equation in HRF–1–2019 is technically incorrect because, unlike long-time automatic defrost control algorithms, variable defrost control algorithms utilize a variety of parameters in order to determine the timing of the next defrost sequence, including: Compressor run time, number of door openings, previous defrost length, room humidity, *etc.* Samsung stated that a long-time automatic defrost control algorithm determines the timing of the next defrost sequence simply based on the compressor time elapsed, so it is appropriate to use an observed compressor run-time to predict the number of defrosts per day if this is the control algorithm. Samsung stated that the new HRF–1–2019 equation assumes that the number of defrosts per day using a variable defrost control algorithm is similarly dependent upon only the compressor time elapsed, which Samsung claims is not true for most variable defrost control algorithms. Samsung additionally showed that this calculation method benefits cycling single-speed compressor systems over variable-speed compressor systems. (Samsung, No. 24, pp. 4–8)

DOE agrees that the premise of the updated equation, which would rely on test data rather than an assumption, would appear to improve representativeness of the test procedure. However, DOE also acknowledges Samsung's concern that variable defrost frequency is determined not only by compressor run-time, and thus the updated equation may not be representative for such products.

Furthermore, DOE notes that section 5.8.2.1.5 of HRF–1–2019, which details the two-part energy use calculation for multiple-compressor products with automatic defrost, still maintains an assumption of 50 percent run-time ratio.

Thus, using the HRF–1–2019 updated equation for single-compressor products would cause a discrepancy between the calculations for single-compressor and multiple-compressor products.

As stated in AHAM's comments, the average overall impact of the calculation update included in HRF–1–2019 is expected to be small (2.5% or less for the impacted product classes). Given the small expected impact on measured energy use but significant questions regarding representativeness, as indicated in Samsung's comments, DOE is not incorporating this calculation update in this final rule. DOE is specifying in section 5.3 of both appendices A and B that the existing calculations be used in place of the equations in sections 5.8.2.1.2 through 5.8.2.1.6 of HRF–1–2019. Maintaining the existing calculations is consistent with the approach as proposed in the December 2019 NOPR. The current DOE test procedures do not include provisions for calculating the two-part energy use for freezers with multiple compressors or for freezers with multiple defrost cycle types, and DOE is not aware of any such freezer products available on the market at this time. Therefore, DOE is maintaining the existing approach and not including provisions for multiple compressors or multiple defrost cycle types in its amendments to appendix B (consistent with the approach as proposed in the December 2019 NOPR).

HRF–1–2019 additionally includes updated provisions for the valid range of CT_L and CT_M values (as described in the following paragraph), which are used for the calculation of CT, the compressor-on time between defrosts.

In both appendices A and B, the CT_L value is designated as the shortest compressor run-time between defrosts

used in the variable defrost control algorithm (greater than or equal to 6 but less than or equal to 12 hours), or the shortest compressor run time between defrosts observed for the test (if it is shorter than the shortest run time used in the control algorithm and is greater than 6 hours), or 6 hours (if the shortest observed run time is less than 6 hours). (See section 5.2.1.3 of appendix A and section 5.2.1.3 of appendix B) In the same section of both appendices, the CT_M value is designated as the maximum compressor run-time between defrosts in hours (greater than CT_L but not more than 96 hours). (*Id.*) Hence, the current test procedures require that $6 < CT_L < 12$ and $CT_L < CT_M \leq 96$, in hours.

By contrast, section 5.8.2.1.3 of HRF–1–2019 provides that $0 < CT_L < CT_M \leq 96$, in hours. DOE notes that this allows CT_L values less than 6 hours, potentially resulting in adjustments to the CT values currently used in the energy use equations for current products. For example, if the shortest compressor run-time between defrosts observed for the test is 4 hours, the CT_L value used in the current DOE test procedure would be 6 hours, whereas the CT_L value used in HRF–1–2019 would be 4 hours. Such a change would typically increase the rated annual energy use of the product by increasing the estimated defrost energy use contribution in overall energy use.

At this time, DOE does not have information to indicate to what extent manufacturer variable defrost control algorithms incorporate CT_L parameters less than 6 hours. As a result, DOE cannot estimate to what extent current products would be affected by this change. Also, absent information as to whether manufacturer defrost control algorithms incorporate CT_L parameters less than 6 hours, DOE cannot determine whether the current approach is less representative than the approach taken in HRF–1–2019. Given the lack of information on the extent to which the industry update impacts product ratings and test procedure representativeness, DOE is not adopting the new provisions for CT_L and CT_M in HRF–1–2019. Instead, DOE is maintaining the current provisions, which specify that $6 < CT_L < 12$ and $CT_L < CT_M \leq 96$, in hours, consistent with the approach as proposed in the December 2019 NOPR.

G. Icemaking Energy Consumption

The current DOE test procedures for refrigeration products utilize a standardized energy adder of 84 kWh per year to account for the energy consumption of automatic icemakers. This adder approach was originally proposed in 2010 based on data available at that time and is based on data from AHAM [24] suggesting an icemaking efficiency of 0.128 kWh/lb [25] and an assumed ice consumption (*i.e.* icemaking demand) of 1.8 lbs/day (0.128 kWh/lb × 1.8 lbs/day × 365 days/yr = 84 kWh/yr). 75 FR 29824 (May 27, 2010). As discussed in the December 2019 NOPR, since the establishment of the 84 kWh per year adder, DOE has received information indicating that the actual icemaking demand is considerably lower than the 1.8 lbs/day assumed as the basis for the 84 kWh per year adder. 84 FR 70842, 70848. DOE has also considered incorporation of a test method to directly measure the icemaking energy consumption. 79 FR 22319, 22341–22342.

In the June 2017 RFI, DOE presented the history of the icemaking energy use adder, including all data gathered to that point and the potential consideration of an active icemaking energy use test procedure, and again requested comment on how its test procedures should account for automatic icemaking energy consumption and on the availability of any additional consumer use data. 82 FR 29780, 29782–29783.

Based on comments received in response to the June 2017 RFI, DOE proposed in the December 2019 NOPR that the icemaker energy use adder be based on a lower value of daily ice consumption as identified through data submitted by commenters. 84 FR 70842, 70849. Specifically, DOE proposed an amended icemaking energy use adder of 28 kWh per year based on an ice consumption value of 0.59 lbs/day, which represented the median ice consumption from the provided data. *Id.* DOE also initially determined that based on the reduced daily ice consumption, the benefits of any laboratory-based test procedure to measure icemaking energy use would likely not outweigh the burdens associated with this testing (an estimated 50 percent increase in total testing time). *Id.* DOE also proposed that the same fixed adder would apply for any products with automatic icemaking, regardless of the number of icemakers in the product. 84 FR 70842, 70850.

1. Icemaking Energy Use Adder

In response to the December 2019 NOPR, DOE received multiple comments on the appropriateness of the proposals, which are addressed in the following discussion.

NEEA, the CA IOUs, and CEC did not support DOE's proposed reduction to 28 kWh per year, asserting that the median ice usage of 0.59 lbs/day is too low to use for the icemaker adder. (NEEA, No. 26, pp. 5–6; CA IOUs, No. 23, p. 2; CEC, No. 20, p. 2) Instead, NEEA and the CA IOUs recommended that DOE account for the higher-volume ice users found in the study by using the mean ice usage of 0.83 lbs/day. (CA IOUs, No. 23, p. 2; NEEA, No. 26, pp. 5–6) CEC additionally commented that DOE's proposal does not differentiate between through-the-door and in-freezer icemaker models, and CEC stated that studies showed differences in rates of ice use. (CEC, No. 20, p. 2)

At the December 2019 NOPR Public Meeting, GEA stated that the median value of 0.59 lbs/day assumed by DOE is based on a sample of over 5,000 data points from across the 48 contiguous states, and that this value was representative because the distribution of icemaking values was skewed towards a larger population of lower values. GEA also stated that its results were consistent with the studies by NEEA. (GEA, Public Meeting Transcript, No. 11, p. 35) AHAM reiterated its comments on the previous rulemaking and supported DOE's proposal to amend the adder to 28 kWh per year. Similar to the comment by GEA, AHAM commented that the data from the NEEA and AHAM field use studies show that about 60–70% of users use less ice than the average, and that therefore the median ice usage rate is a better value to use for the adder. (AHAM, No. 18, p. 5)

AHAM also stated that it has no indication that consumer ice consumption rates have changed since 2014, so the previous field use studies still support a lower adder. AHAM also agreed with DOE's proposal to use the same fixed icemaker adder for all products with icemakers regardless of the number of icemakers. AHAM stated its understanding that consumer ice consumption rates do not change based on the number of automatic icemakers their product has. (AHAM, No. 18, p. 6)

The comments received in response to the December 2019 NOPR refer to the same data regarding ice consumption that DOE used to develop its initial determination in the December 2019 NOPR. Absent any new data, DOE is maintaining its preliminary conclusion from the December 2019 NOPR that the median ice consumption rate, 0.59 lbs/day, is appropriate for the calculation of the icemaking energy use adder because of the prevalence of lower ice consumption rates found in field use studies (*i.e.,* the median provides a more

[24] The AHAM data consisted of 51 samples from a variety of product classes and icemaker configurations.

[25] The average icemaking efficiency was originally reported as 128 Wh per lb of ice produced.

representative value of consumer use than the mean).

In addition to discussing the representative daily ice use rate, commenters also discussed icemaking efficiency and other factors that may influence the corresponding energy use of an automatic icemaker.

The CA IOUs and CEC both stated that the current ice maker energy use adder assumed a relatively high efficiency ice maker based on a 2011 study by the National Institute of Standards and Technology (''NIST'') that showed a range of efficiencies in measured icemakers, including units using over twice as much energy as assumed in DOE's adder. (CA IOUs, No. 23, pp. 2–3; CEC, No. 20, p. 2) The CA IOUs commented that should DOE decide to keep a no-test adder, they would support an adder in the range of 43 to 50 kWh per year, based on the average ice making consumption of 0.83 lbs/day with an ice making efficiency of 0.142 to 0.165 kWh per lb of ice, which CA IOUs characterized as being in alignment with the ice making efficiencies found in the NOPR published on July 10, 2013 (See 78 FR 41610). (CA IOUs, No. 23, pp. 2–3) NEEA supported an adder of 55 kWh per year based on 0.83 lbs/day, but provided additional test data for six products for which the average energy consumption was 35.53 kWh per year based on the existing assumption of an icemaking rate of 0.59 lbs/day. (NEEA, No. 26, pp. 5–6)

AHAM, Sub Zero, and FSI recommended DOE incorporate the 28 kWh per year adder as specified in HRF–1–2019. (Sub Zero, No. 17, p. 2; AHAM, No. 18, p. 4–5; FSI, No. 21, p.1)

DOE revisited the icemaker energy use data provided by AHAM,[26] applying an updated assumption of daily ice consumption of 0.59 lbs/day (in place of AHAM's original assumption of 1.8 lbs/day), which produced a revised estimate of annual energy use of 27.6 kWh/year (0.128 kWh/lb × 0.59 lbs/day × 365 days/yr = 27.6 kWh/yr). As noted, the AHAM data consisted of 51 data samples from a variety of product classes and icemaker configurations. Combining this revised estimate based on AHAM's 51 data points with the 6 additional sample points provided by NEEA results in an average energy use of 28.4 kWh/year across all 57 data points (using the current estimated icemaking rate of 0.59 lbs/day). This combined set of available data supports the 28 kWh per year adder as proposed in the December 2019 NOPR.

Based on DOE's consideration of the data submitted by stakeholders and for the reasons discussed, DOE is adopting an icemaker adder value of 28 kWh per year by referencing HRF–1–2019.

2. Icemaking Energy Test Method Impacts

Certain commenters urged DOE to consider using a test to directly determine the icemaking energy use instead of using a fixed energy adder.

CEC opposed reducing the adder based on human behavior rather than testing the efficiency of the ice maker. CEC claimed that by lowering the icemaking energy use adder, DOE is artificially lowering the efficiency of the entire refrigerator, which will negatively impact consumers' ability to choose efficient refrigeration products. (CEC, No. 20, p. 2)

NEEA, the CA IOUs, and CEC all commented that a no-test adder will limit innovation in efficient automatic ice making techniques and may lead to less efficient operating units. These parties recommended that DOE reconsider a test method to directly measure the energy consumption associated with automatic icemaking rather than permanently use an energy adder. (NEEA, No. 26, p. 6; CA IOUs, No. 23, p. 3; CEC, No. 20, pp. 2–3) The CA IOUs reiterated that the fixed adder was not intended to be a permanent measure, and the original product testing did not constitute a representative sample of products that would justify a permanent simplification to persist in the test procedure. (CA IOUs, No. 23, p. 3)

AHAM commented that because ice consumption is so low, there is limited opportunity for energy savings, and the icemaker energy use is a small percent (2.5–4.5%) of the rated energy use of typical refrigeration products. Furthermore, AHAM stated that much of the energy use associated with icemaking comes from the thermodynamic energy required for freezing 90 °F water. According to AHAM, there are limited icemaker technologies that could be employed to improve icemaker energy use, and some could sacrifice consumer utility (*e.g.* speed of ice production) in order to improve efficiency. AHAM stated that manufacturers are not likely to make a trade-off compromising consumer utility (and, under EPCA, must not be required to) in pursuit of energy efficiency. (AHAM, No. 18, p. 5)

NEEA also commented that the energy used by the ice maker appears to be determined by the time required to produce the ice, and that faster production requires a lower freezer compartment temperature and corresponding increase in compressor operation time or speed. (NEEA, No. 26, p. 5)

In addition to these potential efficiency impacts, commenters also discussed costs directly associated with a potential test method for measuring ice maker energy use.

CEC recommended that DOE incorporate the icemaker energy test included in IEC 62552, indicating that manufacturers have not found the costs of this test to be unduly burdensome. CEC asserted that the explicit instructions for automatic ice makers in IEC 62552 would guarantee repeatability of the test, and manufacturers would not incur an additional burden to separately test the efficiency of the automatic ice maker when present. According to CEC, the IEC 62552 test provides a better representation of real-world conditions, lowers the testing burden on manufacturers, and is more likely to lead to a measurement of a representative average use cycle. (CEC, No. 20, pp. 3–4)

NEEA commented that a test to measure the energy use of an icemaker should be optional. NEEA suggested that DOE provide the option of allowing manufacturers to test an ice maker to the NIST test procedure in place of the default value of the icemaker adder.[27] (NEEA, No. 26, p. 6)

AHAM commented that the burden of testing icemaker energy use is high, resulting in a 50% increase in test time and a subsequent 25% decrease in test capacity. AHAM stated that depending on the test facility, the increased test time may also require the addition of test rooms in order to recoup that lost capacity. AHAM asserted that this was not cost-effective, specifying that the cost to operate an icemaker for a year is low, about $2.92 per year based on a rate of 10.65¢ per kWh. (AHAM, No. 18, pp. 4–6) Sub Zero similarly commented that an icemaker energy test was not justified for such a low contribution to overall product energy use, and Sub

[26] As part of the development of the April 2014 Final Rule, AHAM presented data derived from three consumer surveys and three separate field tests which indicated a representative icemaking energy use adder of 84 kWh per year based on a production rate of 1.8 lbs/day. This data summary, ''AHAM Update to DOE on Status of Ice Maker Energy Test Procedure—November 19, 2009'' is filed under Docket No. EERE–2012–BT–TP–0016 and can be found online at *https://www.regulations.gov/docket/EERE-2012-BT-TP-0016/document.*

[27] NEEA did not specify the NIST test procedure referenced in its comments. DOE is aware of a 2012 publication from NIST titled *Development of a Method to Measure the Energy Consumption of Automatic Icemakers in Domestic Refrigerators with Single Speed Compressors,* as discussed further in this section.

Zero supported the amended value of the adder, stating that it is representative of field use data. (Sub Zero, No. 17, p. 2) FSI strongly supported the continuation of using an adder instead of requiring testing, stating that many smaller businesses do not have the means to fix water temperature and pressure for consistent icemaker energy test results and would have to outsource these tests at great cost. (FSI, No. 21, p. 1)

DOE generally maintains its preliminary determination made in the December 2019 NOPR that, based on more recent and complete data suggesting a lower rate of daily ice consumption than had been previously assumed, the benefits of any laboratory-based test procedure to measure icemaking energy use would not outweigh the burdens associated with this testing (an estimated 50 percent increase in total testing time).

In its review of the IEC 62552 test method for measuring the energy used to make ice, DOE notes that Annex F.3 of IEC 62552–3:2015 specifies: (1) The test is usually undertaken adjacent to (following or prior to) a normal energy consumption test, and (2) the test is conducted at ambient temperatures of 16 °C and 32 °C. Conducting an icemaker test at two ambient temperatures would result in a significant increase in test time in comparison to the current DOE test procedure.

Furthermore, DOE found the IEC 62552 method to be limited in its applicability to refrigeration products. The method in Annex F.3 of IEC 62552–3:2015 is specifically applicable only to tank-type automatic icemakers, in which fresh water is used from an internal tank that is manually filled by the user. IEC 62552:2015 does not provide a test procedure for products that are connected to a mains water supply for automatic icemaking, which represents nearly all automatic icemaking models available on the market.

The NIST method,[28] which is similar to that used by AHAM to collect data on icemaker energy use, relies upon additional measurements of ice production rates and covers products that connect to a mains water supply. However, this test would represent an estimated 50% increase in test duration for products with automatic icemakers.

DOE appreciates the comprehensive information provided by interested parties on this topic. DOE has reviewed the additional test method options but has concluded that the adoption of a 28 kWh per year adder through the incorporation by reference of HRF–1–2019 is justified. DOE has determined that based on the currently established methods for measuring icemaking energy consumption, adopting a test method to determine icemaking energy use would significantly increase test burden with little potential to improve representativeness of measured energy use. Thus, DOE concludes that a test procedure incorporating the fixed energy use adder of 28 kWh per year results in a measure of annual energy consumption that is representative of actual consumer use while not being unduly burdensome to conduct.

For the aforementioned reasons, in this final rule, DOE is adopting the 28 kWh per year icemaker adder through incorporation by reference of HRF–1–2019, which includes in section 5.9 a constant adder of 0.0767 kWh per cycle (*i.e.,* per day) for products with automatic icemakers.

3. Amended Energy Conservation Standards

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)) In the December 2019 NOPR, DOE stated that because the energy adder for automatic icemakers would be reduced by 56 kWh per year (the difference between the current value of 84 kWh per year and the proposed value of 28 kWh per year), the measured energy use of minimally-compliant products with automatic icemakers would also decrease by 56 kWh per year. 84 FR 70842, 70850. As a result, DOE proposed in the December 2019 NOPR to amend the energy conservation standards for refrigeration products with automatic icemakers to reflect a reduction of 56 kWh per year in the equations for maximum energy use. 84 FR 70842, 70850–70851. DOE also proposed a one-year lead-time period for the required use of the revised icemaker energy use adder and corresponding amended energy conservation standards to reduce the burden on manufacturers of re-certifying and re-labeling their products. 84 FR 70842, 70850–70851.

In response to the December 2019 NOPR, AHAM opposed a one-year lead time to implement the change to the icemaker adder, stating that it could lead to stranded investments and additional costs for manufacturers to re-certify products and change EnergyGuide labels. AHAM recommended that DOE not require compliance until the compliance date of the next amended standards. AHAM asserted that this would be consistent with DOE's previous rulemaking approach and makes sense to address any impacts on measured energy. (AHAM, No. 18, p. 6–7) Sub Zero stated that the amended icemaking energy use adder would be best implemented on the effective date of the next standard. (Sub Zero, No. 17, p. 2) Whirlpool commented that any modifications to the icemaker energy fixed adder should not be adopted before the compliance date for the next amended energy conservation standard. (Whirlpool, No. 19, p. 1)

In response to the December 2019 NOPR, FSI encouraged DOE to make no administrative changes that do not directly benefit the environment or energy consumption. FSI asserted that changing the energy use adder for icemakers in DOE's energy conservation standards would require companies to spend time making changes to certifications for no real change or benefit. FSI suggested that amendments of this nature could be deferred until after recovery from the COVID–19 crisis. (FSI, No. 21, p. 1)

DOE recognizes the concerns raised by the commenters that the proposal would create burden associated with this updated calculation, including costs to re-certify products, re-label products, and update marketing materials. In consideration of these comments, DOE will not require testing with the amended icemaking energy use adder until the compliance dates of the next amended energy conservation standards for refrigeration products.[29] Newly amended section 5.3 of both appendices A and B specifies an exception to the application of Section 5.8.2, *Energy Consumption,* of HRF–1–

[28] DOE reviewed the publication *Development of a Method to Measure the Energy Consumption of Automatic Icemakers in Domestic Refrigerators with Single Speed Compressors,* by David A. Yashar (September 18, 2012). Available online at *https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.1759.pdf.*

[29] DOE is addressing Energy Conservation Standards for Consumer Refrigerators, Refrigerator-Freezers, and Freezers in Docket No. EERE–2017–BT–STD–0003 (maintained at *https://www.regulations.gov/docket/EERE-2017-BT-STD-0003*). DOE is separately addressing Energy Conservation Standards for Miscellaneous Refrigeration Products in Docket No. EERE–2020–BT–STD–0039 (maintained at *https://www.regulations.gov/docket/EERE-2020-BT-STD-0039*).

2019 to substitute an icemaking energy use adder of 0.23 kWh/cycle (*i.e.,* 84 kWh/year) to demonstrate compliance with the existing energy conservation standards for refrigeration products at 10 CFR 430.32(a) and (aa). As such, DOE is not amending energy conservation standards in this final rule, and manufacturers will not be required to update certification and labeling of products with automatic icemakers as a result of this final rule.

H. Features Not Directly Addressed in Appendix A or Appendix B

The current test procedures in appendices A and B do not include provisions specific to products with door-in-door designs (or other features that reduce the thermal load on the product by limiting the need for door openings) and smart functions such as display screens and network-connected functionality.[30] The following sections discuss these features.

1. Door-in-Door Designs

As discussed in section III.B of this final rule, the current DOE test procedures for refrigeration products represent operation in typical room conditions with door openings by testing at an elevated ambient temperature with no door openings. (10 CFR 430.23(a)(7)) The increased thermal load from the elevated ambient temperature represents the thermal load associated with door openings—as warmer ambient air mixes with the refrigerated air inside the cabinet—as well as the loading of warmer items in the cabinet. This approach is maintained in the updated industry test procedure, HRF–1–2019, which DOE is incorporating by reference in this final rule.

As discussed in the June 2017 RFI, DOE is aware of certain products available on the market that incorporate a door-in-door design, which could reduce energy consumption during actual use by minimizing the amount of cool cabinet air escaping to the room and being replaced by warmer ambient air during door openings. 82 FR 29780, 29782.

In the December 2019 NOPR, DOE noted that door-in-door features, and other systems such as camera display systems (which show the user the interior of the cabinet without needing to open the door), have some potential to reduce energy consumption associated with door openings for these products. 84 FR 70842, 70855–70856. However, DOE initially determined that there was not sufficient data regarding consumer usage patterns of these features to warrant revisions to the test procedures and did not propose amendments to address their use in the December 2019 NOPR. *Id.*

In response to the December 2019 NOPR, Samsung commented that more consumer use data must be collected to fully understand user behavior before considering such changes in the test procedures. Samsung recommended that separate product classes and energy conservation standard levels be considered based on additional door designs. (Samsung, No. 24, p. 4) AHAM agreed with DOE's proposed approach not to amend the test procedure to account for newly developing features such as door-in-door designs, display screens, and connected functions without national, statistically significant, field use data on consumer use. AHAM commented that these features are still developing, as are consumers' use and understanding of them. (AHAM, No. 18, p. 10)

Specifically, AHAM indicated that it does not currently have data regarding consumer use of the door-in-door feature or corresponding energy impacts of different types of door openings; and that guesses, estimations, or unsupported assumptions are not enough to justify test procedure amendments as per the Data Quality Act.[31] AHAM reiterated that it would oppose any proposed change that would alter the closed-door test, which it stated is based on data regarding ambient conditions and door openings, and because door openings are difficult to control and introduce significant variation. AHAM commented that when statistically significant consumer data from field studies are available, DOE should evaluate possible calculation or other approaches that do not add test burden or change the representativeness, repeatability, or reproducibility of the test. (AHAM, No. 18, p. 10)

AHAM and Sub Zero also stated that regulating such features now would likely stifle innovation and could in some cases prevent manufacturers from including such features. (AHAM, No. 18, p. 10; Sub Zero, No. 17, p. 2) Sub Zero commented that these features may offer a consumer utility, and there is no data at present to determine if there is an appreciable energy impact. Sub Zero suggested that DOE may want to revisit this issue when data is available in the future, but HRF–1–2019 currently provides appropriate instruction on how these features are to be tested. (Sub Zero, No. 17, p. 2)

DOE does not currently have consumer usage data to support amendments to the test procedures for refrigeration products with door-in-door or camera display designs, which may reduce door openings. In order to limit testing burden and avoid affecting the representativeness, repeatability, or reproducibility of the test procedure, DOE is maintaining the closed-door methodology as specified in HRF–1–2019 and consistent with the approach proposed in the December 2019 NOPR. DOE would consider whether separate product classes and energy conservation standards would be appropriate for products with special door designs as part of an energy conservation standards rulemaking.

2. Display Screens, Connected Functions, and Demand Response

Refrigeration products that include user control panels or displays located on the front of the product are currently available on the market. Many products incorporating these more advanced user interfaces also include internet connections to allow for additional functions, which can control the product's operation and provide additional attributes, such as television or internet access. These attributes can operate with many different control schemes, including activation by proximity sensors.

The current DOE test procedures require that refrigeration products with a communication module for demand-response functions be tested with the communication module in the ''as shipped'' configuration. Section 2.10 of appendix A and section 2.8 of appendix B. Additionally, the current DOE test procedures, through reference to HRF–1–2008, require testing with customer-accessible features not required for normal operation and which are electrically powered, manually

[30] The current DOE test procedures require that consumer refrigeration products that have a communication module specifically for demand-response functions be tested with the communication module in the ''as shipped'' configuration. Section 2.10 of appendix A and section 2.8 of appendix B. Section 5.5.2(g) of HRF–1–2008, which is incorporated by reference into the existing DOE test procedures, requires testing with customer-accessible features not required for normal operation and which are electrically powered, manually initiated, and manually terminated—which typically includes any connected functions other than demand response—set at their lowest energy usage positions when adjustment is provided (*i.e.,* typically the off position).

[31] DOE understands AHAM's reference to the ''Data Quality Act'' to refer to section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554, 114 Stat. 2763) and the associated implementing guidelines. DOE's implementing guidelines are available at *https://www.energy.gov/cio/downloads/2019-final-updated-version-doe-information-quality-guidelines.*

initiated, and manually terminated, set at their lowest energy usage positions when adjustment is provided.

In the December 2019 NOPR, DOE acknowledged that some consumers will use connected functions if offered on a product; however, connected products are in the early stages of development and meaningful data on consumer use for connected functions or display screens are currently unavailable. 84 FR 70842, 70856. DOE stated that it does not want to limit innovation or hinder manufacturers from offering these functions to consumers or impede the ability to provide potential utility that these functions may offer. *Id.* Additionally, DOE noted that connected functions vary by model, and that further specifying a test to reflect the energy consumption of the various connected functions would likely introduce test variability and increase test burden. *Id.* For these reasons, DOE did not propose any amendments to the existing test procedure approach to address connected functions. *Id.*

In the December 2019 NOPR, DOE did propose to remove sections 2.10 of Appendix A and 2.8 of Appendix B, which state that products ''that have a communication module for demand response functions that is located within the cabinet shall be tested with the communication module in the configuration set at the factory just before shipping,'' which would result in such communication modules being set to their lowest energy usage positions (off). 84 FR 70842, 70856–70857. This proposal was intended to maintain consistency between the specifications for demand response functions and other features not required for maintaining compartment temperatures per AHAM HRF–1–2016. *Id.*

In response to the December 2019 NOPR, the Joint Commenters encouraged DOE to investigate the energy consumption of display screens and connected functions and how consumers use these functions so that they can be captured in the test procedure in the future. The Joint Commenters stated that DOE should maintain the existing approach of testing demand-response function communication modules in the as-shipped configuration and adopt a similar approach for other consumer-accessible functions. The Joint Commenters claimed that with the amendment proposed in the December 2019 NOPR, manufacturers may ship products with demand-response function communication modules in a position other than off, and yet that energy use would not be captured in the product's rating. The Joint Commenters stated that consumers could unknowingly end up paying more to operate the product without receiving any benefit from the added functionality (*e.g.,* if the consumer's electric utility does not offer any demand response program). The Joint Commenters added that by encouraging (but not requiring) manufacturers to ship modules in the off position, the existing approach does not impede innovation, and that the same would apply for other consumer-accessible functions such as display screens. (Joint Commenters, No. 22, p. 2–3)

NEEA recommended that DOE include network power consumption and connected function modes in the test procedures by connecting the appliance to a network for testing as recommended for normal use by the supplier where such smart functions are provided. According to NEEA, network connected devices with display panels are increasing in usage. Data presented by NEEA showed that 75% of the ENERGY STAR refrigerator sales from 2015 to 2019 are bottom-mount and 9.9% of those have connected capability. NEEA stated that connected appliances offer energy savings opportunities and opportunities for grid interaction to reduce the demand on the grid. (NEEA, No. 26, p. 6)

The CA IOUs opposed DOE's proposal to set connected functionality to the ''off'' position during testing and instead recommended a method of incorporating the energy usage into the test procedures because the active-mode power mode of smart functions may meaningfully add to the unit's overall electrical load. The CA IOUs did not agree that that measurement and disclosure of smart devices could limit innovation. The CA IOUs referred to BSH's comment on the June 2017 RFI [32] as evidence that a method could be developed with low test burden and thus encouraged DOE to reconsider incorporating a method to measure networked functionality and, at the very least, test products in their ''as-shipped'' mode. (CA IOUs, No. 23, p. 3)

CEC supported the comments from the CA IOUs and recommended that standby mode and off mode of connected devices be measured, stating that such measurements are required under EPCA. According to the CA IOUs, DOE provided insufficient rationale excluding the measurement of energy consumption associated with connected functions in the test procedures. (CEC, No. 20, p. 4) The CA IOUs supported alignment with the California Energy Commission's Low Power Modes Roadmap, based on IEC Standard 62301:2011, which identifies data collection procedures for standby power draw of several products. The CA IOUs recommended that DOE should: (1) Collect data on power draw of smart functions in all operational modes, (2) isolate the power required for network connectivity in various covered smart appliances, (3) incorporate standby and off-mode energy usage into the standard metrics. The CA IOUs predicted that growth will not only occur among smart device functions for higher end products where they currently exist, but across the market, pushed in part by California Senate Bill No. 49: Clean Power, Smart Power. (CA IOUs, No. 23, pp. 3–4)

At the December 2019 NOPR Public Meeting, NRDC stated that testing connected functions in the off position—and assuming their component energy consumption is 0 kWh/yr—is not representative of actual consumer usage, and thus opposed DOE's proposed amendment. (NRDC, Public Meeting Transcript, No. 11, pp. 78 & 89)

AHAM commented that it is too soon to address display screens and connected functions given the currently limited market penetration. AHAM supported DOE's proposal to have these functions tested in their lowest energy use positions to avoid stifling innovation and reduce cumulative regulatory burden. AHAM also suggested that DOE could incorporate by reference HRF–1–2019, which requires that devices with communication modules be tested with the device on but not connected to any communication network. AHAM asserted that this approach would not impact measured energy use. (AHAM, No. 18, pp. 10–11) Whirlpool agreed that the test procedure should not be amended for features like door-in-door designs, display screens, and connected features at this time. (Whirlpool, No. 19, p. 1) Both Whirlpool and Sub Zero supported AHAM's recommendation to incorporate by reference HRF–1–2019.

[32] In response to the June 2017 RFI, BSH commented that display screens consume energy in normal use and that energy is not captured during the existing test procedure. BSH supported including some portion of the energy consumed by these features in the energy test, if they do not add burden to the test procedure. BSH noted that Appendix A refers to products with demand-response capability and recommends that the test procedure instead refer to all connected products. BSH stated that connected communication modules consume a small amount of energy and can be easily captured during the energy test. BSH recommended testing with the communication module in the on position but not connected, consistent with the European energy test. (BSH, No. 2 at p. 2)

(Whirlpool, No. 19, p. 1; Sub Zero, No. 17, p. 2)

Based on consideration of the industry test standard HRF–1–2019 and of comments received in response to the December 2019 NOPR, DOE is incorporating by reference section 5.5.2(r) of HRF–1–2019, which specifies testing units with communication modules with the communication modules on but not connected to any communication network. DOE has determined that the adopted approach provides a representative measure of the energy use during an average period of use. DOE acknowledges that manufacturers market connected functions available on refrigeration products and consumers purchasing such products will likely use the connected functions to some extent. However, the range of functions available varies by model and DOE lacks information on how consumers use such functions (*e.g.,* which connected functions consumers choose to use, how frequently consumers access such functions, *etc.*). Accordingly, DOE has determined that measuring energy consumed by the communication module rather than any specific connected function provides a representative, repeatable, and reproducible test procedure for these products. Additionally, this approach reflects current industry practice—as it is the approach specified in the industry test procedure—and therefore does not add an undue burden.

In response to AHAM's concern, the adopted procedure for testing communication modules measures energy consumed by the communication module while not connected to a network rather than the energy consumed while the unit is performing any connected functions. Therefore, the test procedure would not introduce any additional burden associated with testing multiple connected functions or modes that manufacturers may choose to introduce in products with communication modules.

With regard to comments suggesting that DOE incorporate standby and off-mode energy use into the standard metrics for refrigerators, as discussed, EPCA requires that DOE amend its test procedures for refrigeration products to integrate measures of standby mode and off mode energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor, unless the current test procedure already incorporates the standby mode and off mode energy consumption, or if such integration is technically infeasible. (42 U.S.C. 6295(gg)(2)(A)) If an integrated test procedure is technically infeasible, DOE must prescribe separate standby mode and off mode energy use test procedures for the covered product, if a separate test is technically feasible. (*Id.*) 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))

As described in the April 2014 Final Rule, the DOE test procedures for refrigeration products measure the energy use of these products during extended time periods that include periods when the compressor and other key components are cycled off. All of the energy these products use during the ''off cycles'' is already included in the measurements. 79 FR 22320, 22345. The approach of testing with connected functions on but not connected to a network accounts for energy consumption of such functions as part of active mode testing, and as a result, this method provides consumers with representative estimates of energy consumption. DOE reiterates its conclusion from the April 2014 Final Rule that by measuring the energy use during ''off cycles,'' the current test procedures already address EPCA's requirement to include standby mode and off mode energy consumption in the overall energy descriptor for refrigeration products. *Id.*

Through incorporation by reference of HRF–1–2019, DOE is adopting the provision in section 5.5.2(r) of HRF–1–2019, which states that units shipped with communication devices shall be tested with the communication device on but not connected to any communication network. This approach also requires testing communication modules for demand-response functions on but not connected to a network, amending the current requirements in sections 2.10 of appendix A and 2.8 of appendix B that such communication modules be tested in the as-shipped position.

DOE does not currently have test data as to the extent of energy use of connected functions. DOE did not receive such data from stakeholders. DOE is adopting the amended approach in HRF–1–2019 as it is reflective of the industry consensus for testing refrigeration products with communication modules. Absent data which would suggest otherwise, DOE agrees with AHAM's comment indicating that the HRF–1–2019 approach is not expected to impact measured energy use and thus would not impact compliance of these products. Hence DOE has also concluded that an amendment to the energy conservation standards with respect to this amendment is not necessary.

I. Corrections

In the December 2019 NOPR, DOE proposed several corrections to the test procedures in appendices A and B, which included amendments to improve clarity and consistency with the industry test procedure proposed to be incorporated by reference (*i.e.,* AHAM HRF–1–2016). 84 FR 70842, 70857–70858.

The inadvertent omission of calculations associated with the optional test for models with two compartments and user-operable controls according to AS/NZS 4474.1:2007 is discussed in section III.B.2 of this final rule. Similarly, the updates to Table 1 in appendices A and B, as proposed in the December 2019 NOPR, are discussed in section III.B.2 of this final rule.

In this final rule, DOE is incorporating by reference HRF–1–2019, which resolves the need to issue separate corrections regarding other issues identified in the December 2019 NOPR. Re-ordering of definitions in Appendix A is no longer necessary given the updated incorporation by reference of HRF–1–2019. Similarly, updating appendix B, as proposed, to ensure consistent terminology and instructions as appendix A is no longer necessary given that the volume instructions for both Appendices are now included by reference to HRF–1–2019. Additionally, HRF–1–2019 includes the proposed clarification to the instructions in section 3.2.1 of appendices A and B, which would have clarified the instructions regarding electronic control settings for the median test.

DOE identified one additional error, which is corrected in this final rule. In 10 CFR 429.14(d)(1), the instructions regarding compartment volumes used to determine product category refer to 10 CFR 429.72(d) rather than (c). 10 CFR 429.72(d) provides the alternative method for determining volume in miscellaneous refrigeration products. 10 CFR 429.72(c) provides this method for refrigerators, refrigerator-freezers, and freezers. DOE is amending 10 CFR 429.14(d)(1) to correctly refer to 10 CFR 429.72(c).

J. Effective Date, Compliance Date, and Waivers

The effective date for the adopted test procedure amendments will be 30 days after publication of this final rule in the **Federal Register**. EPCA prescribes that all representations of energy efficiency and energy use, including those made on marketing materials and product

labels, must be made in accordance with an amended test procedure, beginning 180 days after publication of the final rule in the **Federal Register**. (42 U.S.C. 6293(c)(2)) 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.*)

As discussed in section III.G.3, compliance with the amended icemaking energy use adder for products with one or more automatic icemakers will be required for representations of energy use on or after the compliance date of any amended energy conservation standards for refrigeration products.

Upon the compliance date of test procedure provisions in this final rule, any waivers that had been previously issued and are in effect that pertain to issues addressed by such provisions are terminated. (10 CFR 430.27(h)(3)) Recipients of any such waivers are 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 adopted in this document pertain to issues addressed by a waiver granted to GEA (case nos. RF–042 and 2020–007). Per 10 CFR 430.27(l), the publication of this final rule eliminates the need for the continuation of granted waivers. As discussed previously, DOE is not amending the test procedure to address the waiver granted to Liebherr (case no. RF–035), as the products for which the waiver was required are no longer available and the waiver is no longer necessary. The publication of this final rule terminates this waiver consistent with 10 CFR 430.27(h)(3) and 10 CFR 430.27(l). Under 10 CFR 430.27(h)(3), the waiver automatically terminates on the date on which use of the test procedure is required to demonstrate compliance.

K. Test Procedure Costs

In this document, DOE amends the existing test procedures for refrigeration products by incorporating by reference the current version of an industry standard, with minor modifications as discussed in the previous sections of this final rule. This updated reference results in the following substantive changes compared to the existing test approach: (1) Clarifying test setup provisions; (2) specifying certain test condition measurements and applicability to data recording periods; (3) allowing for stabilization data to also serve as test data for certain product types; (4) specifying stabilization requirements for products not able to meet the existing requirements; (5) revising the automatic icemaking energy consumption adder; and (6) requiring connected function communication modules to be on, but not connected to a network, for testing.

DOE's analysis of these amendments indicates a resulting net cost savings to manufacturers. Further discussion of the cost impacts of the test procedure amendments are presented in the following paragraphs.

1. Amendment Regarding the Stabilization and Test Periods

DOE is adopting the provisions in HRF–1–2019 to combine the stabilization period with the test period for certain models of refrigeration products. This would decrease test burden by shortening the test duration for any model with stabilization currently determined according to sections 2.9(a) of appendix A or 2.7(a) of appendix B and with non-automatic defrost, or that would be tested to using the two-part test period. This amendment would apply to all refrigeration products.

Based on review of the CCMS, DOE has identified 3,618 models of refrigerators, refrigerator-freezers, and freezers, and 583 models of MREFs that would be impacted by this amendment.

DOE expects that this amendment would decrease test duration by at least 6 hours for these models (reflecting the 3-hour minimum test period duration at two temperature settings) and up to 48 hours (reflecting 24-hour test periods at each setting). Based on an estimated decreased test duration of at least 6 hours (*i.e.,* a decrease in test time of greater than ten percent), DOE assumed a cost savings of approximately ten percent (*i.e.,* $500 per test).[33] Additionally, based on data from DOE's Compliance Certification Database, DOE anticipates that manufacturers would replace or modify existing models every 3.5 years. Therefore, on average, refrigerator, refrigerator-freezer, and freezer and MREF manufacturers would introduce approximately 1,200 new or modified covered models each year that would use these shorter overall testing periods. Because DOE requires manufacturers to test at least two units per model, manufacturers would on average conduct 2,400 tests annually using these shorter overall testing periods. Using these estimates, DOE anticipates industry cost savings of approximately $1,200,000 per year for refrigeration product manufacturers.

DOE expects that the amendment would not impact the representations of energy efficiency or energy use for refrigeration products currently on the market. Manufacturers would be able to rely on data generated under the current test procedure. As such, manufacturers would not be required to retest refrigeration products as a result of DOE's adoption of the amendment to the test procedure stabilization period.

2. Amendment Regarding Energy Use Associated With Automatic Icemaking

DOE is amending the automatic icemaker energy use adder in the test procedures for refrigeration products with automatic icemakers (these amendments would reflect an energy use reduction of 56 kWh per year). As discussed in section III.G.3 of this document, DOE is not requiring use of the amended automatic icemaker energy use adder until the compliance dates of any amended energy conservation standards for refrigeration products that account for the amended energy use value. Therefore, manufacturers will not be required to re-certify or re-label products with automatic icemakers as a result of the amended automatic icemaker energy use adder adopted in this final rule and will incur no corresponding costs.

3. Impact of the Other Amendments

DOE anticipates that the remainder of the amendments would not impact manufacturers' test or certification costs. Most of the amendments provide additional specificity to the applicability and conduct of the test procedures. These amendments include: (1) Clarifying test setup provisions; (2) specifying certain test condition measurements and applicability to data recording periods; (3) specifying stabilization requirements for products not able to meet the existing requirements; and (4) requiring connected function communication modules to be on, but not connected to a network, for testing.

While these amendments are not expected to impact measured energy use compared to the existing test procedure, manufacturers may opt to re-test models according to the amended test procedure. Because DOE requires

[33] DOE expects that costs would decrease by a smaller percentage than the total reduction in test time due to fixed overhead and labor requirements for testing (*i.e.,* test set up and data analysis would be unchanged). The total cost per test is based on FSI's comment stating between $4,500 and $5,000 per refrigerator test conducted at outside laboratories. (FSI, No. 6 at p. 1)

manufacturers to test at least two units per model to determine ratings, DOE estimates this optional re-testing cost would be $9,000 per re-tested model.[34]

DOE has determined that these other amendments would not require changes to the designs of refrigeration products, and that the amendments would not impact the utility or availability of these products. The other amendments would not impact the representations of energy efficiency or energy use of refrigeration products. As a result, manufacturers would be able to rely on data generated under the current test procedure. Manufacturers would not be required to re-test refrigeration products as a result of DOE's adoption of the other amendments to the test procedure.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (''OMB'') has determined this test procedure rulemaking does not constitute ''significant regulatory actions'' 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 a final regulatory flexibility analysis (FRFA) for any final rule where the agency was first required by law to publish a proposed rule for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003 to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website: *https://energy.gov/gc/office-general-counsel.*

DOE reviewed this adopted rule to amend the test procedures for refrigeration products under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. This final rule amends DOE's refrigeration products test procedures to incorporate by reference AHAM HRF–1–2019, which includes the following substantive changes compared to the existing test procedures: (1) Clarifying test setup provisions; (2) specifying certain test condition measurements and applicability to data recording periods; (3) allowing for stabilization data to also serve as test data for certain product types; (4) specifying stabilization requirements for products not able to meet the existing requirements; (5) revising the automatic icemaking energy consumption adder; and (6) requiring connected function communication modules to be on, but not connected to a network, for testing. DOE concludes that this final rule will not have a significant impact on a substantial number of small entities, and the factual basis for this certification is set forth in the following paragraphs.

DOE uses the Small Business Administration's (''SBA'') small business size standards to determine whether manufacturers qualify as small businesses, which are listed by the North American Industry Classification System (''NAICS'').[35] The SBA considers a business entity to be a small business, if, together with its affiliates, it employs less than a threshold number of workers specified in 13 CFR part 121. The 2017 NAICS code for refrigeration products is 335220, major household appliance manufacturing.[36] The threshold number for NAICS code 335220 is 1,500 employees. This employee threshold includes all employees in a business's parent company and any other subsidiaries.

Most of the manufacturers supplying refrigeration products are large multinational corporations. DOE conducted a focused inquiry into small business manufacturers of products covered by this rulemaking. DOE used the CCMS Database [37] for miscellaneous refrigeration products and for refrigerators, refrigerator-freezers, and freezers to create a list of companies that sell refrigeration products covered by this rulemaking in the United States. DOE identified a total of 42 original equipment manufacturers that sell refrigeration products in the United States market.

DOE then reviewed these companies to determine whether the entities met the SBA's definition of ''small business'' and screened out any companies that do not offer products covered by this rulemaking, do not meet the definition of a ''small business,'' or are foreign-owned and operated. Based on this review, DOE has identified five domestic manufacturers of refrigeration products that are potential small businesses. Through this analysis, DOE has determined the expected effects of this rulemaking on these covered small businesses and whether a FRFA was needed (*i.e.,* whether DOE could certify that this rulemaking would not have a significant impact).

As described, DOE is incorporating by reference the latest version of the industry standard HRF–1–2019, which results in certain substantive changes in the test procedure compared to the existing approach, some of which may impact costs incurred by manufacturers.

DOE is combining the stabilization period with the test period for certain products. This change would likely decrease test duration by at least 6 hours for these models (reflecting the 3-hour minimum test period duration at two temperature settings) and up to 48 hours (reflecting 24-hour test periods at each setting). 84 FR 70842, 70862. DOE estimated that this would translate to a cost savings of $500 per test for these models (an estimated 10 percent of total testing costs). *Id.* Based on review of the CCMS Database, DOE identified 325 models affected by the amendment of the stabilization period, representing five small domestic manufacturers. *Id.* Additionally, based on data from DOE's CCMS Database, DOE anticipated that small domestic manufacturers would replace or modify existing models every 3.5 years; therefore, on average, small domestic manufacturers would introduce approximately 93 new or modified models each year that would use these shorter overall testing periods. *Id.* Given that DOE requires manufacturers to test at least two units per model, small manufacturers would on average conduct 186 tests annually using these shorter overall testing periods. *Id.* Using these estimates, DOE anticipated the stabilization amendment would save small domestic manufacturers approximately $93,000 per year. *Id.* Therefore, DOE determined that this proposed amendment to the test procedure would lead to cost savings for small domestic manufacturers. *Id.*

[34] Based on the initial $5,000 per unit testing cost estimate and the $500 savings due to the stabilization criteria proposed in this amended test procedure. DOE estimates that the stabilization period time savings would apply to most consumer refrigeration products.

[35] Available online at: *https://www.sba.gov/document/support--table-size-standards.*

[36] The NAICS Association updated its industry classification codes in early 2017. The previous 2012 NAICS code for consumer refrigerators, refrigerator-freezers, and freezers was 335222, household refrigerator and home freezer manufacturing.

[37] *www.regulations.doe.gov/certification-data.* Accessed September, 2020.

FSI commented in response to the December 2019 NOPR that DOE energy tests for small companies without their own test facilities may cost $5,000 per test, and this cost is an impediment to innovation. FSI further supported the use of computer-aided design (''CAD'') instead of volume measurements to reduce costs and improve accuracy and reproducibility of testing. FSI strongly urged DOE to simplify setup and test procedures to drive this cost down. FSI observed that innovation often comes from new and small companies and that increasing regulatory burden or complexity is a significant barrier to the kind of innovation taking place in these businesses. (FSI, No. 21, p. 2)

DOE recognizes these comments and notes they are similar to those submitted by FSI in response to the June 2017 RFI (FSI, No. 6, pp. 2–3), which DOE considered in the December 2019 NOPR. 84 FR 70842, 70862. DOE is not establishing any amendments to the test procedures for refrigeration products that would increase the cost of these tests at third-party or manufacturer test laboratories. DOE also understands that relying on CAD to calculate volumes decreases test burden compared to physically measuring volume on each test unit. Accordingly, DOE already allows manufacturers to use such designs in certifying product volumes. In 10 CFR 429.72, DOE states that total refrigerated volume of a basic model may be determined by performing a calculation of the volume based upon CAD models of the basic model in lieu of physical measurements of a production unit of the basic model, according to the applicable provisions in the test procedures for measuring volume. Regarding complexity of the test procedures, DOE notes that the amendments established in this final rule harmonize with the industry test method, improve clarity, and overall are expected to decrease costs associated with testing.

As discussed in section III.K of this document, DOE does not expect any other amendments established in this final rule to impact testing, certification, or labelling costs for manufacturers.

Overall, DOE estimates that the amendments for small businesses would translate to a cost savings of approximately $93,000 each year.

Therefore, DOE concludes that the cost effects accruing from the final rule would not have a ''significant economic impact on a substantial number of small entities,'' and that the preparation of a FRFA is not warranted. DOE has submitted a certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of refrigeration products 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 refrigeration products. (*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 of 1969

In this final rule, DOE establishes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for refrigeration products. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, 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

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

F. Review Under Executive Order 12988

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

other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this final rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (''UMRA'') requires each federal agency to assess the effects of federal regulatory actions on state, local, and tribal governments and the private sector. Public Law 104–4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action resulting in a rule that may cause the expenditure by state, local, and tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a federal agency to develop an effective process to permit timely input by elected officers of state, local, and tribal governments on a proposed ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at *https://energy.gov/gc/office-general-counsel.* DOE examined this final rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

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

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

I. Review Under Executive Order 12630

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

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

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). 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 *https://www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf.* DOE has reviewed this final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

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

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

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

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

The modifications to the test procedures for refrigeration products adopted in this final rule incorporate testing methods contained in certain sections of HRF–1–2019. DOE has evaluated this standard and is unable to conclude whether it fully complies 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 has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

M. Congressional Notification

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

N. Description of Materials Incorporated by Reference

In this final rule, DOE incorporates by reference the test procedure published

by AHAM, titled ''Energy and Internal Volume of Consumer Refrigeration Products,'' HRF–1–2019. HRF–1–2019 is an industry-accepted test procedure for measuring the energy consumption of electric (single-phase, alternating current) refrigerators, refrigerator-freezers, freezers or miscellaneous refrigeration products. Specifically, the test procedure codified by this final rule references various sections of HRF–1–2019 that address test setup, instrumentation, test conduct, and calculations.

Copies of HRF–1–2019 can be obtained from the Association of Home Appliance Manufacturers, 1111 19th Street NW, Suite 402, Washington, DC 20036, (202) 872–5955, or go to *https://www.AHAM.org.*

The incorporation by reference of AS/NZS 4474.1:2007 in appendix A to subpart B of part 430 has already been approved by the Director of the Federal Register and there are no changes in this final rule.

V. Approval of the Office of the Secretary

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

List of Subjects

10 CFR Part 429

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

10 CFR Part 430

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

Signing Authority

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

Signed in Washington, DC, on September 30, 2021.

Treena V. Garrett,

Federal Register Liaison Officer, U.S. Department of Energy.

For the reasons stated in the preamble, DOE amends parts 429 and 430 of chapter II of title 10, Code of Federal Regulations as set forth below:

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

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

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

■ 2. Section 429.14 is amended by revising paragraphs (b)(3) and (d) to read as follows:

§ 429.14 Consumer refrigerators, refrigerator-freezers and freezers.

* * * * *

(b) * * *

(3) Pursuant to § 429.12(b)(13), a certification report shall include the following additional product-specific information: Whether the basic model has variable defrost control (in which case, manufacturers must also report the values, if any, of CT_L and CT_M (See section 5.3 of appendix A and appendix B to subpart B of 10 CFR part 430) used in the calculation of energy consumption), whether the basic model has variable anti-sweat heater control (in which case, manufacturers must also report the values of heater Watts at the ten humidity levels (5%, 15%, 25%, 35%, 45%, 55%, 65%, 75%, 85%, and 95%) used to calculate the variable anti-sweat heater ''Correction Factor''), and whether testing has been conducted with modifications to the standard temperature sensor locations, as specified in section 5.1(g) of appendices A and B to subpart B of 10 CFR part 430, as applicable.

* * * * *

(d) *Product category determination.* Each basic model shall be certified according to the appropriate product category as defined in § 430.2 based on compartment volumes and compartment temperatures.

(1) Compartment volumes used to determine product category shall be the mean of the measured compartment volumes for each tested unit of the basic model according to the provisions in section 4.1 of appendix A of subpart B of part 430 of this chapter for refrigerators and refrigerator-freezers and section 4.1 of appendix B of subpart B of part 430 of this chapter for freezers, or the compartment volumes of the basic model as calculated in accordance with § 429.72(c); and

(2) Compartment temperatures used to determine product category shall be the mean of the measured compartment temperatures at the coldest setting for each tested unit of the basic model according to the provisions of appendix A of subpart B of part 430 of this chapter for refrigerators and refrigerator-freezers and appendix B of subpart B of part 430 of this chapter for freezers.

■ 3. Section 429.61 is amended by revising paragraphs (b)(3) and (d) to read as follows:

§ 429.61 Consumer miscellaneous refrigeration products.

* * * * *

(b) * * *

(3) Pursuant to § 429.12(b)(13), a certification report coolers or combination cooler refrigeration products shall include the following additional product-specific information: Whether the basic model has variable defrost control (in which case, manufacturers must also report the values, if any, of CT_L and CT_M (See section 5.3 in appendix A to subpart B of part 430 of this chapter) used in the calculation of energy consumption), whether the basic model has variable anti-sweat heater control (in which case, manufacturers must also report the values of heater Watts at the ten humidity levels (5%, 15%, 25%, 35%, 45%, 55%, 65%, 75%, 85%, and 95%) used to calculate the variable anti-sweat heater ''Correction Factor''), and whether testing has been conducted with modifications to the standard temperature sensor locations, as specified in section 5.1(g) of appendix A to subpart B of part 430 of this chapter.

* * * * *

(d) Product category determination. Each basic model of miscellaneous refrigeration product must be certified according to the appropriate product category as defined in § 430.2 based on compartment volumes and compartment temperatures.

(1) Compartment volumes used to determine product category shall be the mean of the measured compartment volumes for each tested unit of the basic model according to the provisions in section 4.1 of appendix A to subpart B of part 430 of this chapter, or the compartment volumes of the basic model as calculated in accordance with § 429.72(d); and

(2) Compartment temperatures used to determine product category shall be the mean of the measured compartment temperatures at the coldest setting for each tested unit of the basic model according to the provisions of appendix A to subpart B of part 430 of this chapter. For cooler compartments with temperatures below 39 °F (3.9 °C) but no lower than 37 °F (2.8 °C), the compartment temperatures used to determine product category shall also include the mean of the measured compartment temperatures at the warmest setting for each tested unit of the basic model according to the provisions of appendix A to subpart B of part 430 of this chapter.

■ 4. Section 429.134 is amended by revising paragraphs (b)(2) and (l)(2) to read as follows:

§ 429.134 Product-specific enforcement provisions.

* * * * *

(b) * * *

(2) *Test for models with two compartments, each having its own user-operable temperature control.* The test described in section 5.2(b) of the applicable test procedure for refrigerators or refrigerator-freezers in appendix A to subpart B of 10 CFR part 430 shall be used for all units of a tested basic model before DOE makes a determination of noncompliance with respect to the basic model.

* * * * *

(l) * * *

(2) Test for models with two compartments, each having its own user-operable temperature control. The test described in section 5.2(b) of the applicable test procedure in appendix A to subpart B part 430 of this chapter shall be used for all units of a tested basic model before DOE makes a determination of noncompliance with respect to the basic model.

* * * * *

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

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

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

■ 6. Section 430.3 is amended by revising paragraph (i)(4) to read as follows:

§ 430.3 Materials incorporated by reference.

* * * * *

(i) * * *

(4) AHAM HRF–1–2019 (''HRF–1–2019''), Energy and Internal Volume of Consumer Refrigeration Products, Copyright © 2019, IBR approved for appendices A and B to subpart B of this part.

* * * * *

■ 7. Section 430.23 is amended by revising paragraphs (a)(1)(ii), (a)(2)(ii), (a)(3)(ii), (a)(4) and (5), (b)(1)(ii), (b)(2)(ii), (b)(3)(ii), (b)(4) and (5); (ff)(1)(ii), (ff)(2)(ii), (ff)(3)(ii), and (ff)(4) and (5) to read as follows:

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

* * * * *

(a) * * *

(1) * * *

(ii) The average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to appendix A of this subpart; and

* * * * *

(2) * * *

(ii) Half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just before shipping, each in kilowatt-hours per cycle, determined according to appendix A of this subpart; and

* * * * *

(3) * * *

(ii) The average per-cycle energy consumption for the specified cycle type, determined according to appendix A of this subpart; and

* * * * *

(4) The energy factor, expressed in cubic feet per kilowatt-hour per cycle, shall be:

(i) For models without an anti-sweat heater switch, the quotient of:

(A) The adjusted total volume in cubic feet, determined according to appendix A of this subpart, divided by—

(B) The average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to appendix A of this subpart, the resulting quotient then being rounded to the second decimal place; and

(ii) For models having an anti-sweat heater switch, the quotient of:

(A) The adjusted total volume in cubic feet, determined according to appendix A of this subpart, divided by—

(B) Half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just before shipping, each in kilowatt-hours per cycle, determined according to appendix A of this subpart, the resulting quotient then being rounded to the second decimal place.

(5) The annual energy use, expressed in kilowatt-hours per year and rounded to the nearest kilowatt-hour per year, shall be determined according to appendix A of this subpart.

* * * * *

(b) * * *

(1) * * *

(ii) The average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to appendix B of this subpart; and

* * * * *

(2) * * *

(ii) Half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just before shipping, each in kilowatt-hours per cycle, determined according to appendix B of this subpart; and

* * * * *

(3) * * *

(ii) The average per-cycle energy consumption for the specified cycle type, determined according to appendix B of this subpart; and

* * * * *

(4) The energy factor, expressed in cubic feet per kilowatt-hour per cycle, shall be:

(i) For models without an anti-sweat heater switch, the quotient of:

(A) The adjusted total volume in cubic feet, determined according to appendix B of this subpart, divided by—

(B) The average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to appendix B of this subpart, the resulting quotient then being rounded to the second decimal place; and

(ii) For models having an anti-sweat heater switch, the quotient of:

(A) The adjusted total volume in cubic feet, determined according to appendix B of this subpart, divided by—

(B) Half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just before shipping, each in kilowatt-hours per cycle, determined according to appendix B of this subpart, the resulting quotient then being rounded to the second decimal place.

(5) The annual energy use, expressed in kilowatt-hours per year and rounded to the nearest kilowatt-hour per year, shall be determined according to appendix B of this subpart.

* * * * *

(ff) * * *

(1) * * *

(ii) The average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to appendix A of this subpart; and

* * * * *

(2) * * *

(ii) Half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just before shipping, each in kilowatt-hours per cycle, determined according to appendix A of this subpart; and

* * * * *

(3) * * *

(ii) The average per-cycle energy consumption for the specified cycle type, determined according to appendix A of this subpart; and

* * * * *

(4) The energy factor, expressed in cubic feet per kilowatt-hour per cycle, shall be:

(i) For models without an anti-sweat heater switch, the quotient of:

(A) The adjusted total volume in cubic feet, determined according to appendix A of this subpart, divided by—

(B) The average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to appendix A of this subpart, the resulting quotient then being rounded to the second decimal place; and

(ii) For models having an anti-sweat heater switch, the quotient of:

(A) The adjusted total volume in cubic feet, determined according to appendix A of this subpart, divided by—

(B) Half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just before shipping, each in kilowatt-hours per cycle, determined according to appendix A of this subpart, the resulting quotient then being rounded to the second decimal place.

(5) The annual energy use, expressed in kilowatt-hours per year and rounded to the nearest kilowatt-hour per year, shall be determined according to appendix A of this subpart.

* * * * *

■ 8. Appendix A to subpart B of part 430 is revised to read as follows:

Appendix A to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Refrigerators, Refrigerator-Freezers, and Miscellaneous Refrigeration Products

Note: Prior to April 11, 2022, any representations of volume and energy use of refrigerators, refrigerator-freezers, and miscellaneous refrigeration products must be based on the results of testing pursuant to either this appendix or the procedures in appendix A as it appeared at 10 CFR part 430, subpart B, appendix A, in the 10 CFR parts 200 to 499 edition revised as of January 1, 2019. Any representations of volume and energy use must be in accordance with whichever version is selected. On or after April 11, 2022, any representations of volume and energy use must be based on the results of testing pursuant to this appendix.

For refrigerators and refrigerator-freezers, the rounding requirements specified in sections 4 and 5 of this appendix are not required for use until the compliance date of any amendment of energy conservation standards for these products published after October 12, 2021.

1. Referenced Materials

DOE incorporated by reference AHAM HRF–1–2019, *Energy and Internal Volume of Consumer Refrigeration Products* (''HRF–1–2019''), and AS/NZS 4474.1:2007, *Performance of Household Electrical Appliances—Refrigerating Appliances; Part 1: Energy Consumption and Performance, Second Edition* (''AS/NZS 4474.1:2007''), in their entirety in § 430.3; however, only enumerated provisions of these documents are applicable to this appendix. If there is any conflict between HRF–1–2019 and this appendix or between AS/NZS 4474.1:2007 and this appendix, follow the language of the test procedure in this appendix, disregarding the conflicting industry standard language.

(a) AHAM HRF–1–2019, (''HRF–1–2019''), Energy and Internal Volume of Consumer Refrigeration Products:

(i) Section 3—Definitions, as specified in section 3 of this appendix;

(ii) Section 4—Method for Determining the Refrigerated Volume of Consumer Refrigeration Products, as specified in section 4.1 of this appendix;

(iii) Section 5—Method for Determining the Energy Consumption of Consumer Refrigeration Products (excluding Table 5–1 and sections 5.5.6.5, 5.8.2.1.2, 5.8.2.1.3, 5.8.2.1.4, 5.8.2.1.5, and 5.8.2.1.6), as specified in section 5 of this appendix; and

(iv) Section 6—Method for Determining the Adjusted Volume of Consumer Refrigeration Products, as specified in section 4.2 of this appendix;

(b) AS/NZS 4474.1:2007, (''AS/NZS 4474.1:2007''), Performance of Household Electrical Appliances—Refrigerating Appliances; Part 1: Energy Consumption and Performance, Second Edition:

(i) Appendix M—Method of Interpolation When Two Controls are Adjusted, as specified in sections 5.2(b) and 5.3(e) of this appendix.

(ii) [Reserved]

If there is any conflict between HRF–1–2019 and this appendix or between AS/NZS 4474.1:2007 and this appendix, follow the language of the test procedure in this appendix, disregarding the conflicting industry standard language.

2. Scope

This appendix provides the test procedure for measuring the annual energy use in kilowatt-hours per year (kWh/yr), the total refrigerated volume in cubic feet (ft^3), and the total adjusted volume in cubic feet (ft^3) of refrigerators, refrigerator-freezers, and miscellaneous refrigeration products.

3. Definitions

Section 3, *Definitions,* of HRF–1–2019 applies to this test procedure. In case of conflicting terms between HRF–1–2019 and DOE's definitions in this appendix or in § 430.2, DOE's definitions take priority.

Through-the-door ice/water dispenser means a device incorporated within the cabinet, but outside the boundary of the refrigerated space, that delivers to the user on demand ice and may also deliver water from within the refrigerated space without opening an exterior door. This definition includes dispensers that are capable of dispensing ice and water or ice only.

4. Volume

Determine the refrigerated volume and adjusted volume for refrigerators, refrigerator-freezers, and miscellaneous refrigeration products in accordance with the following sections of HRF–1–2019, respectively:

4.1. Section 4, Method for Determining the Refrigerated Volume of Consumer Refrigeration Products; and

4.2. Section 6, Method for Determining the Adjusted Volume of Consumer Refrigeration Products.

5. Energy Consumption

Determine the annual energy use (''AEU'') in kilowatt-hours per year (kWh/yr), for refrigerators, refrigerator-freezers, and miscellaneous refrigeration products in accordance with section 5, *Method for Determining the Energy Consumption of Consumer Refrigeration Products,* of HRF–1–2019, except as follows.

5.1. Test Setup and Test Conditions

(a) In section 5.3.1 of HRF–1–2019, the top of the unit shall be determined by the refrigerated cabinet height, excluding any accessories or protruding components on the top of the unit.

(b) The ambient temperature and vertical ambient temperature gradient requirements specified in section 5.3.1 of HRF–1–2019 shall be maintained during both the stabilization period and the test period.

(c) The power supply requirements as specified in section 5.5.1 of HRF–1–2019 shall be maintained based on measurement intervals not to exceed one minute.

(d) The ice storage compartment temperature requirement as specified in

section 5.5.6.5 in HRF–1–2019 is not required.

(e) For cases in which setup is not clearly defined by this test procedure, manufacturers must submit a petition for a waiver (See section 6 of this appendix).

(f) If the interior arrangements of the unit under test do not conform with those shown in Figures 5–1 or 5–2 of HRF–1–2019, as appropriate, the unit must be tested by relocating the temperature sensors from the locations specified in the figures to avoid interference with hardware or components within the unit, in which case the specific locations used for the temperature sensors shall be noted in the test data records maintained by the manufacturer in accordance with 10 CFR 429.71, and the certification report shall indicate that non-standard sensor locations were used. If any temperature sensor is relocated by any amount from the location prescribed in Figure 5–1 or 5–2 of HRF–1–2019 in order to maintain a minimum 1-inch air space from adjustable shelves or other components that could be relocated by the consumer, except in cases in which the Figures prescribe a temperature sensor location within 1 inch of a shelf or similar feature (*e.g.,* sensor T3 in Figure 5–1), this constitutes a relocation of temperature sensors that must be recorded in the test data and reported in the certification report as described in this paragraph.

5.2. Test Conduct

(a) Standard Approach

(i) For the purposes of comparing compartment temperatures with standardized temperatures, as described in section 5.6 of HRF–1–2019, the freezer compartment temperature shall be as specified in section 5.8.1.2.5 of HRF–1–2019, the fresh food compartment temperature shall be as specified in section 5.8.1.2.4 of HRF–1–2019, and the cooler compartment temperature shall be as specified in section 5.8.1.2.6 of HRF–1–2019.

(ii) In place of Table 5–1 in HRF–1–2019, refer to Table 1 of this section.

TABLE 1—TEMPERATURE SETTINGS: GENERAL CHART FOR ALL PRODUCTS

First test		Second test		Energy calculation based on:
Setting	Results	Setting	Results	
Mid for all Compartments ..	All compartments below standard reference temperature.	Warmest for all Compartments.	All compartments below standard reference temperature.	Second Test Only.
			One or more compartments above standard reference temperature.	First and Second Test.
	One or more compartments above standard reference temperature.	Coldest for all Compartments.	All compartments below standard reference temperature.	First and Second Test.
			One or more compartments above standard reference temperature.	Model may not be certified as compliant with energy conservation standards based on testing of this unit. Confirm that unit meets product definition. If so, see section 6 of this appendix.

(b) Three-Point Interpolation Method (Optional Test for Models with Two Compartments and User-Operable Controls). As specified in section 5.6.3(6) of HRF–1–2019, and as an optional alternative to section 5.2(a) of this appendix, perform three tests such that the set of tests meets the ''minimum requirements for interpolation'' of AS/NZS 4474.1:2007 appendix M, section M3, paragraphs (a) through (c) and as illustrated in Figure M1. The target temperatures txA and txB defined in section M4(a)(i) of AS/NZ 4474.1:2007 shall be the standardized temperatures defined in section 5.6 of HRF–1–2019.

5.3. Test Cycle Energy Calculations

Section 5.8.2, *Energy Consumption,* of HRF–1–2019 applies to this test procedure, except as follows:

(a)(i) For refrigerators and refrigerator-freezers: To demonstrate compliance with the energy conservation standards at 10 CFR 430.32(a) applicable to products manufactured on or after September 15, 2014, IET, expressed in kilowatt-hours per cycle, equals 0.23 for a product with one or more automatic icemakers and otherwise equals 0 (zero).

(ii) For miscellaneous refrigeration products: To demonstrate compliance with the energy conservation standards at 10 CFR 430.32(aa) applicable to products manufactured on or after October 28, 2019, IET, expressed in kilowatt-hours per cycle, equals 0.23 for a product with one or more automatic icemakers and otherwise equals 0 (zero).

(b) In place of section 5.8.2.1.2 of HRF–1–2019, use the calculations provided in this section. For units with long-time automatic defrost control using the two-part test period, the test cycle energy shall be calculated as:

$$\mathrm{ET} = \left(\frac{1440 \times K \times EP1}{T1}\right) + \left[EP2 - \left(EP1 \times \frac{T2}{T1}\right)\right] \times \left[\frac{12}{CT}\right] \times K$$

Where:

ET = test cycle energy expended in kilowatt-hours per day;

1440 = conversion factor to adjust to a 24-hour average use cycle in minutes per day;

K = dimensionless correction factor of 1.0 for refrigerators and refrigerator-freezers and 0.55 for miscellaneous refrigeration products.

EP1 = energy expended in kilowatt-hours during the first part of the test;

EP2 = energy expended in kilowatt-hours during the second part of the test;

T1 and T2 = length of time in minutes of the first and second test parts, respectively;

CT = defrost timer run time or compressor run time between defrosts in hours required to go through a complete cycle, rounded to the nearest tenth of an hour;

12 = factor to adjust for a 50-percent run time of the compressor in hours per day.

(c) In place of sections 5.8.2.1.3 and 5.8.2.1.4 of HRF–1–2019, use the calculations provided in this section. For units with variable defrost control, the test cycle energy shall be calculated as set forth in section 5.3(a) of this appendix with the following addition:

CT shall be calculated equivalent to:

$$CT = \frac{CT_L \times CT_M}{F \times (CT_M - CT_L) + CT_L}$$

Where:

CT_L = the least or shortest compressor run time between defrosts used in the variable defrost control algorithm (greater than or equal to 6 but less than or equal to 12 hours), or the shortest compressor run time between defrosts observed for the test (if it is shorter than the shortest run time used in the control algorithm and is greater than 6 hours), or 6 hours (if the shortest observed run time is less than 6 hours), in hours rounded to the nearest tenth of an hour;

CT_M = the maximum compressor run time between defrosts in hours rounded to the nearest tenth of an hour (greater than CT_L but not more than 96 hours);

For variable defrost models with no values of CT_L and CT_M in the algorithm, the default values of 6 and 96 shall be used, respectively.

F = ratio of per day energy consumption in excess of the least energy and the maximum difference in per-day energy consumption and is equal to 0.20.

(d) In place of section 5.8.2.1.5 of HRF–1–2019, use the calculations provided in this section. For multiple-compressor products with automatic defrost, the two-part test method in section 5.7.2.1 of HRF–1–2019 shall be used, and the test cycle energy shall be calculated as:

$$\mathrm{ET} = \left(\frac{1440 \times K \times EP1}{T1}\right) + \sum_{i=1}^{D}\left[\left(EP2_i - \left(EP1 \times \frac{T2_i}{T1}\right)\right) \times \left(\frac{12}{CT_i}\right) \times K\right]$$

Where:

ET, 1440, 12, and K are defined in section 5.3(a) of this appendix;

EP1, and T1 are defined in section 5.3(a) of this appendix;

i = a subscript variable that can equal 1, 2, or more that identifies each individual compressor system that has automatic defrost;

D = the total number of compressor systems with automatic defrost;

$EP2_i$ = energy expended in kilowatt-hours during the second part of the test for compressor system i;

$T2_i$ = length of time in minutes of the second part of the test for compressor system i;

CT_i = compressor run time between defrosts of compressor system i, rounded to the nearest tenth of an hour, for long-time automatic defrost control equal to a fixed time in hours, and for variable defrost control equal to:

$$CT_i = \frac{CT_{L,i} \times CT_{M,i}}{F \times \left(CT_{M,i} - CT_{L,i}\right) + CT_{L,i}}$$

Where:

$CT_{L,i}$ = for compressor system i, the shortest cumulative compressor-on time between defrost heater-on events used in the variable defrost control algorithm (CT_L for the compressor system with the longest compressor run time between defrosts must be greater than or equal to 6 but less than or equal to 12 hours), in hours rounded to the nearest tenth of an hour;

$CT_{M,i}$ = for compressor system i, the maximum compressor-on time between defrost heater-on events used in the variable defrost control algorithm (greater than $CT_{L,i}$ but not more than 96 hours), in hours rounded to the nearest tenth of an hour;

For defrost cycle types with no values of CT_L and CT_M in the algorithm, the default values of 6 and 96 shall be used, respectively.

F = ratio of per day energy consumption in excess of the least energy and the maximum difference in per-day energy consumption and is equal to 0.20.

(e) In place of section 5.8.2.1.6 of HRF–1–2019, use the calculations provided in this section. For units with long-time automatic defrost control and variable defrost control with multiple defrost cycle types, the two-part test method in section 5.7.2.1 of HRF–1–2019 shall be used, and the test cycle energy shall be calculated as:

$$\mathrm{ET} = \left(\frac{1440 \times K \times EP1}{T1}\right) + \sum_{i=1}^{D}\left[\left(EP2_i - \left(EP1 \times \frac{T2_i}{T1}\right)\right) \times \left(\frac{12}{CT_i}\right) \times K\right]$$

Where:

ET, 1440, 12, and K are defined in section 5.3(a) of this appendix;

EP1, and T1 are defined in section 5.3(a) of this appendix;

i = a subscript variable that can equal 1, 2, or more that identifies the distinct defrost cycle types applicable for the product;

D = the total number of defrost cycle types;

$EP2_i$ = energy expended in kilowatt-hours during the second part of the test for defrost cycle type i;

$T2_i$ = length of time in minutes of the second part of the test for defrost cycle type i;

CT_i = defrost timer run time or compressor run time between instances of defrost cycle type i, rounded to the nearest tenth of an hour;

12 = factor to adjust for a 50-percent run time of the compressor in hours per day.

(i) For long-time automatic defrost control, CTi shall be equal to a fixed time in hours rounded to the nearest tenth of an hour. For cases in which there are more than one fixed CT value for a given defrost cycle type, an average fixed CT value shall be selected for this cycle type.

(ii) For variable defrost control, CTi shall be calculated equivalent to:

$$CT_i = \frac{CT_{L,i} \times CT_{M,i}}{F \times \left(CT_{M,i} - CT_{L,i}\right) + CT_{L,i}}$$

Where:

$CT_{L,i}$ = the least or shortest compressor run time between instances of the defrost cycle type i in hours rounded to the nearest tenth of an hour (CT_L for the defrost cycle type with the longest compressor run time between defrosts must be greater than or equal to 6 but less than or equal to 12 hours);

$CT_{M,i}$ = the maximum compressor run time between instances of defrost cycle type i in hours rounded to the nearest tenth of an hour (greater than $CT_{L,i}$ but not more than 96 hours);

For cases in which there are more than one CT_M and/or CT_L value for a given defrost cycle type, an average of the CT_M and CT_L values shall be selected for this defrost cycle type. For defrost cycle types with no values of CT_L and CT_M in the algorithm, the default values of 6 and 96 shall be used, respectively.

F = ratio of per day energy consumption in excess of the least energy and the maximum difference in per-day energy consumption and is equal to 0.20.

(f) If the three-point interpolation method of section 5.2(b) of this appendix is used for setting temperature controls, the average per-cycle energy consumption shall be defined as follows:

$E = E_x + IET$

Where:

E is defined in 5.9.1.1 of HRF–1–2019;
IET is defined in 5.9.2.1 of HRF–1–2019; and
E_x is defined and calculated as described in appendix M, section M4(a) of AS/NZS 4474.1:2007. The target temperatures t_{xA} and t_{xB} defined in section M4(a)(i) of AS/NZS 4474.1:2007 shall be the standardized temperatures defined in section 5.6 of HRF–1–2019.

6. Test Procedure Waivers

To the extent that the procedures contained in this appendix do not provide a means for determining the energy consumption of a basic model, a manufacturer must obtain a waiver under § 430.27 to establish an acceptable test procedure for each such basic model. Such instances could, for example, include situations where the test setup for a particular basic model is not clearly defined by the provisions of this appendix. For details regarding the criteria and procedures for obtaining a waiver, please refer to § 430.27.

■ 9. Appendix B to subpart B of part 430 is revised to read as follows:

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

Note: Prior to April 11, 2022, any representations of volume and energy use of freezers must be based on the results of testing pursuant to either this appendix or the procedures in appendix B as it appeared at 10 CFR part 430, subpart B, appendix B, in the 10 CFR parts 200 to 499 edition revised as of January 1, 2019. Any representations of volume and energy use must be in accordance with whichever version is selected. On or after April 11, 2022, any representations of volume and energy use must be based on the results of testing pursuant to this appendix.

For freezers, the rounding requirements specified in sections 4 and 5 of this appendix are not required for use until the compliance date of any amendment of energy conservation standards for these products published after October 12, 2021.

1. Referenced Materials

DOE incorporated by reference HRF–1–2019, *Energy and Internal Volume of Consumer Refrigeration Products* (''HRF–1–2019'') in its entirety in § 430.3; however, only enumerated provisions of this document are applicable to this appendix. If there is any conflict between HRF–1–2019 and this appendix, follow the language of the test procedure in this appendix, disregarding the conflicting industry standard language.

(a) AHAM HRF–1–2019, (''HRF–1–2019''), Energy and Internal Volume of Consumer Refrigeration Products:

(i) Section 3—Definitions, as specified in section 3 of this appendix;

(ii) Section 4—Method for Determining the Refrigerated Volume of Consumer Refrigeration Products, as specified in section 4.1 of this appendix;

(iii) Section 5—Method for Determining the Energy Consumption of Consumer Refrigeration Products (excluding Table 5–1 and sections 5.5.6.5, 5.8.2.1.2, 5.8.2.1.3, 5.8.2.1.4, 5.8.2.1.5, and 5.8.2.1.6), as specified in section 5 of this appendix; and

(iv) Section 6—Method for Determining the Adjusted Volume of Consumer Refrigeration Products, as specified in section 4.2 of this appendix.

(b) Reserved.

If there is any conflict between HRF–1—2019 and this appendix, follow the language of the test procedure in this appendix, disregarding the conflicting industry standard language.

2. Scope

This appendix provides the test procedure for measuring the annual energy use in kilowatt-hours per year (kWh/yr), the total refrigerated volume in cubic feet (ft^3), and the total adjusted volume in cubic feet (ft^3) of freezers.

3. Definitions

Section 3, *Definitions,* of HRF–1–2019 applies to this test procedure. In case of conflicting terms between HRF–1–2019 and DOE's definitions in this appendix or in § 430.2, DOE's definitions take priority.

Through-the-door ice/water dispenser means a device incorporated within the cabinet, but outside the boundary of the refrigerated space, that delivers to the user on demand ice and may also deliver water from within the refrigerated space without opening an exterior door. This definition includes dispensers that are capable of dispensing ice and water or ice only.

4. Volume

Determine the refrigerated volume and adjusted volume for freezers in accordance with the following sections of HRF–1–2019, respectively:

4.1. Section 4, Method for Determining the Refrigerated Volume of Consumer Refrigeration Products; and

4.2. Section 6, Method for Determining the Adjusted Volume of Consumer Refrigeration Products.

5. Energy Consumption

Determine the annual energy use (''AEU'') in kilowatt-hours per year (kWh/yr), for freezers in accordance with section 5, *Method for Determining the Energy Consumption of Consumer Refrigeration Products,* of HRF–1–2019, except as follows.

5.1. Test Setup and Test Conditions

(a) In section 5.3.1 of HRF–1–2019, the top of the unit shall be determined by the refrigerated cabinet height, excluding any accessories or protruding components on the top of the unit.

(b) The ambient temperature and vertical ambient temperature gradient requirements specified in section 5.3.1 of HRF–1–2019 shall be maintained during both the stabilization period and the test period.

(c) The power supply requirements as specified in section 5.5.1 of HRF–1–2019 shall be maintained based on measurement intervals not to exceed one minute.

(d) The ice storage compartment temperature requirement as specified in section 5.5.6.5 in HRF–1–2019 is not required.

(e) For cases in which setup is not clearly defined by this test procedure, manufacturers must submit a petition for a waiver (See section 6 of this appendix).

(f) If the interior arrangements of the unit under test do not conform with those shown in Figure 5–2 of HRF–1–2019, as appropriate, the unit must be tested by relocating the temperature sensors from the locations specified in the figures to avoid interference with hardware or components within the unit, in which case the specific locations used for the temperature sensors shall be noted in the test data records maintained by the manufacturer in accordance with 10 CFR 429.71, and the certification report shall indicate that non-standard sensor locations were used. If any temperature sensor is relocated by any amount from the location prescribed in Figure 5–2 of HRF–1- 2019 in order to maintain a minimum 1-inch air space from adjustable shelves or other components that could be relocated by the consumer, except in cases in which the Figure prescribes a temperature sensor location within 1 inch of a shelf or similar feature, this constitutes a relocation of temperature sensors that must be recorded in the test data and reported in the certification report as described in this paragraph.

5.2. Test Conduct

(a) For the purposes of comparing compartment temperatures with standardized temperatures, as described in section 5.6 of HRF–1–2019, the freezer compartment temperature shall be as specified in section 5.8.1.2.5 of HRF–1–2019.

(b) In place of Table 5–1 in HRF–1–2019, refer to Table 1 of this section.

TABLE 1—TEMPERATURE SETTINGS FOR FREEZERS

First test		Second test		Energy calculation based on:
Setting	Results	Setting	Results	
Mid	Below standard reference temperature.	Warmest	Below standard reference temperature.	Second Test Only.
			Above standard reference temperature.	First and Second Test.
	Above standard reference temperature.	Coldest	Below standard reference temperature.	First and Second Test.
			Above standard reference temperature.	Model may not be certified as compliant with energy conservation standards based on testing of this unit. Confirm that unit meets product definition. If so, see section 6 of this appendix.

5.3. Test Cycle Energy Calculations

Section 5.8.2, *Energy Consumption,* of HRF–1–2019 applies to this test procedure, except as follows:

(a) *For freezers:* To demonstrate compliance with the energy conservation standards at 10 CFR 430.32(a) applicable to products manufactured on or after September 15, 2014, IET, expressed in kilowatt-hours per cycle, equals 0.23 for a product with one or more automatic icemakers and otherwise equals 0 (zero).

(b) In place of section 5.8.2.1.2 of HRF–1–2019, use the calculations provided in this section. For units with long-time automatic defrost control using the two-part test period, the test cycle energy shall be calculated as:

$$\mathrm{ET} = \left(\frac{1440 \times K \times EP1}{T1}\right) + \left[EP2 - \left(EP1 \times \frac{T2}{T1}\right)\right] \times \left[\frac{12}{CT}\right] \times K$$

Where:

ET = test cycle energy expended in kilowatt-hours per day;

1440 = conversion factor to adjust to a 24-hour average use cycle in minutes per day;

K = dimensionless correction factor of 0.7 for chest freezers and 0.85 for upright freezers.

EP1 = energy expended in kilowatt-hours during the first part of the test;

EP2 = energy expended in kilowatt-hours during the second part of the test;

T1 and T2 = length of time in minutes of the first and second test parts, respectively;

CT = defrost timer run time or compressor run time between defrosts in hours required to go through a complete cycle, rounded to the nearest tenth of an hour;

12 = factor to adjust for a 50-percent run time of the compressor in hours per day.

(c) In place of sections 5.8.2.1.3 and 5.8.2.1.4 of HRF–1–2019, use the calculations provided in this section. For units with variable defrost control, the test cycle energy shall be calculated as set forth in section 5.3(a) of this appendix with the following addition:

CT shall be calculated equivalent to:

$$CT = \frac{CT_L \times CT_M}{F \times (CT_M - CT_L) + CT_L}$$

Where:

CT_L = the least or shortest compressor run time between defrosts used in the variable defrost control algorithm (greater than or equal to 6 but less than or equal to 12 hours), or the shortest compressor run time between defrosts observed for the test (if it is shorter than the shortest run time used in the control algorithm and is greater than 6 hours), or 6 hours (if the shortest observed run time is less than 6 hours), in hours rounded to the nearest tenth of an hour;

CT_M = the maximum compressor run time between defrosts in hours rounded to the nearest tenth of an hour (greater than CT_L but not more than 96 hours);

For variable defrost models with no values of CT_L and CT_M in the algorithm, the default values of 6 and 96 shall be used, respectively.

F = ratio of per day energy consumption in excess of the least energy and the maximum difference in per-day energy consumption and is equal to 0.20.

6. Test Procedure Waivers

To the extent that the procedures contained in this appendix do not provide a means for determining the energy consumption of a basic model, a manufacturer must obtain a waiver under § 430.27 to establish an acceptable test procedure for each such basic model. Such instances could, for example, include situations where the test setup for a particular basic model is not clearly defined by the provisions of this appendix. For details regarding the criteria and procedures for obtaining a waiver, please refer to § 430.27.

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