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10 CFR Parts 429 and 430
Energy Conservation Program: Test Procedures for Refrigerators, Refrigerator-Freezers, and Freezers; Final Rule

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[Docket No. EERE–2012–BT–TP–0016]

RIN 1904–AC76

Energy Conservation Program: Test Procedures for Refrigerators, Refrigerator-Freezers, and Freezers

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

ACTION: Final rule.

SUMMARY: On July 10, 2013, the U.S. Department of Energy (DOE) issued a notice of proposed rulemaking (NOPR) to amend the test procedures for refrigerators, refrigerator-freezers, and freezers. That proposed rulemaking serves as the basis for this action. This final rule amends the test procedure that will be required for the testing of these products starting on September 15, 2014. The amendments include test procedures for products with multiple compressors and an alternative method for measuring and calculating energy consumption for refrigerator-freezers and refrigerators with freezer compartments. DOE is also amending certain aspects of the test procedure in order to ensure better test accuracy and repeatability. This final rule does not address the proposal's approach regarding the measurement of energy use associated with ice making, nor does it address the proposed treatment of built-in products, as DOE plans to address these topics in a future rule.

DATES: The effective date of this rule is May 21, 2014. Manufacturers will be required to use the amendments made in this rule to rate their products starting October 20, 2014.

The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register as of 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 regulations.gov. All documents in the docket are listed in the regulations.gov index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

A link to the docket Web page can be found at: *http://www.regulations.gov/#!docketDetail;D=EERE-2012-BT-TP-0016*. This is a link to the docket Web page for this final rule on the regulations.gov site. The regulations.gov Web page contains simple instructions on how to access all documents, including public comments, in the docket.

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

FOR FURTHER INFORMATION CONTACT: Mr. Lucas Adin, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE–2J, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 287–1317. Email: *Lucas.Adin@ee.doe.gov*.

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, GC–71, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–8145. Email: *Michael.Kido@hq.doe.gov*.

SUPPLEMENTARY INFORMATION:

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

AS/NZS 44474.1:2007, Performance of household electrical appliances—Refrigerating appliances, Part 1: Energy consumption and performance, Second edition, published August 15, 2007.

Interested parties can purchase copies of Australian/New Zealand standards at *http://www.standards.org.au/SearchandBuyAStandard/Pages/default.aspx*.

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I. Authority and Background

Title III of the Energy Policy and Conservation Act of 1975 (42 U.S.C. 6291, et seq.; ''EPCA'' or ''the Act'') sets forth a variety of provisions designed to improve energy efficiency. (All references to EPCA refer to the statute as amended through the American Energy Manufacturing Technical Corrections Act (AEMTCA), Public Law 112–210 (Dec. 18, 2012).) Part B of title III, which for editorial reasons was redesignated as Part A upon incorporation into the U.S. Code (42 U.S.C. 6291–6309, as codified), establishes the ''Energy Conservation Program for Consumer Products Other Than Automobiles.'' These consumer products include refrigerators, refrigerator-freezers, and freezers (collectively, ''refrigeration products''), the subject of this final rule. (42 U.S.C. 6292(a)(1))

Under EPCA, the energy conservation program consists essentially of four parts: (1) Testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. The testing requirements consist of test procedures that manufacturers of covered products must use as the basis for (1) certifying to DOE that their products comply with the

applicable energy conservation standards adopted under EPCA, and (2) making representations about the efficiency of those products. Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA.

By way of background, the National Appliance Energy Conservation Act of 1987 (NAECA), Public Law 100–12, amended EPCA by including, among other things, performance standards for refrigeration products. (42 U.S.C. 6295(b)) On November 17, 1989, DOE amended these performance standards for products manufactured on or after January 1, 1993. 54 FR 47916. DOE subsequently published a correction to revise these new standards for three product classes. 55 FR 42845 (October 24, 1990). DOE again updated the performance standards for refrigeration products on April 28, 1997, for products manufactured starting on July 1, 2001. 62 FR 23102.

EISA 2007 amended EPCA by requiring DOE to publish a final rule determining whether to amend the energy conservation standards for refrigeration products manufactured starting in 2014. (42 U.S.C. 6295(b)(4)) Consistent with this requirement, DOE initiated an effort to consider amendments to the standards for refrigeration products. As part of this effort, DOE issued a framework document on September 18, 2008, that discussed the various issues involved with amending the standards and potential changes to the test procedure. 73 FR 54089. DOE later prepared preliminary analyses that examined in greater detail the impacts amended standards would be likely to have on a national basis. DOE published a notice of public meeting (NOPM) to initiate a discussion of these analyses, 74 FR 58915 (Nov. 16, 2009), and held a public meeting on December 10, 2009, to discuss its preliminary findings. At that meeting, and in submitted written comments, interested parties indicated that the energy conservation standards for refrigeration products should address the energy use associated with automatic icemakers. They added, however, that a test procedure to measure icemaking energy use had not yet been sufficiently developed to provide a basis for the standards. (Energy Conservation Standards for Refrigerators, Refrigerator-Freezers, and Freezers, Docket No. EERE–2008–BT–STD–0012; American Council for an Energy Efficient Economy (ACEEE), No. 46 at p. 1; California Investor Owned Utilities (IOUs), No. 39 at p. 2; LG, No. 44 at pp. 2–3; Natural Resources Defense Council (NRDC), No. 42 at p. 2; Northeast Energy Efficiency Partnership (NEEP), No. 41 at p. 1; Northwest Power and Conservation Council (NPCC), No. 36 at p. 1; Sub-Zero, No. 43 at pp. 2–3; Appliance Standards Awareness Project (ASAP), Public Meeting Transcript, No. 30 at pp. 28–29; Association of Home Appliance Manufacturers (AHAM), No. 37 at p. 2; General Electric, No. 40 at p. 1)

DOE also initiated a test procedure rulemaking to help address a variety of test procedure-related issues identified in the energy conservation standard rulemaking's framework document by publishing a notice of proposed rulemaking (NOPR) on May 27, 2010. 75 FR 29824 (hereafter referred to as ''the May 2010 NOPR''). The May 2010 NOPR proposed to use a fixed value of 84 kilowatt-hours (kWh) per year to represent the icemaking energy use for those refrigeration products equipped with automatic icemakers. The NOPR also indicated that DOE would consider adopting an approach based on testing to determine icemaking energy use if a suitable test procedure could be developed. (*Id.* at 29846–29847) A broad group of stakeholders [1] submitted a joint comment supporting DOE's proposal to use a temporary fixed placeholder value to represent the energy use of automatic icemakers. It also urged DOE to initiate a rulemaking no later than January 1, 2012, and publish a final rule no later than December 31, 2012, to amend the test procedures to incorporate a laboratory-based measurement of icemaking energy use. The joint comment further recommended that DOE publish a final rule by July 1, 2013, and amend the energy conservation standards scheduled to take effect in 2014 to account for the differences in energy use of icemakers measured using the new test procedure as compared with the 84 kWh per year fixed placeholder value. (Test Procedure for Refrigerators, Refrigerator-Freezers, and Freezers, Docket Number EERE–2009–BT–TP–0003; Joint Comment, No. 20 at 5–6)

In keeping with the timeline suggested in the joint comment, AHAM provided DOE in early January 2012 with a draft test procedure that could be used to measure automatic icemaker energy usage. (AHAM Refrigerator, Refrigerator-Freezer and Freezer Ice Making Energy Test Procedure, Revision 1.0—12/14/11,[2] No. 4) Subsequently, consistent with the suggestions made by commenters and DOE's previously stated intentions, DOE initiated work to develop the NOPR that was published on July 10, 2013. Prior to the NOPR's publication, AHAM had drafted a revised test procedure and submitted it to DOE for consideration on July 18, 2012. (AHAM Refrigerator, Refrigerator-Freezer and Freezer Ice Making Energy Test Procedure, Revision 2.0—7/10/12,[3] No. 5) The proposal in the July 10, 2013 NOPR (''July 2013 NOPR'') sought to improve the accuracy of certain aspects of the test procedure that DOE had recently promulgated in 2012. The NOPR proposed a method for measurement of the energy usage associated with icemaking, which was based on the revised approach suggested by AHAM. The NOPR also proposed several other test procedure amendments designed to clarify the test procedures, adopt a test method for multiple-compressor products based on an approach DOE had previously permitted certain manufacturers to use through test procedure waivers, and allow use of an alternative test method for products with both fresh food and freezer compartments with separate temperature controls.

In response to the NOPR, AHAM submitted comments to DOE requesting that DOE grant its members more time to respond to (1) the proposal for measurement of energy usage associated with icemaking and (2) DOE's request for comment regarding testing of built-in products in a built-in configuration. (AHAM, No. 24 at p. 1) DOE granted the comment period extension request for these two topics. See 78 FR 53374 (Aug. 29, 2013). After having carefully considered these additional comments, DOE is finalizing an approach that temporarily declines to address the proposed icemaking test procedure amendments and the comments received regarding built-in products, while implementing the remainder of its proposal.

Based on available data, this final rule is not expected to alter the measured energy use of any covered product as measured under the existing test procedures in Appendices A and B. Thus, these changes do not require an amendment to the energy conservation standards with which these products

[1] The signatories to these comments included the Association of Home Appliance Manufacturers, the American Council for an Energy-Efficient Economy, the Natural Resources Defense Council, the Alliance to Save Energy, the Alliance for Water Efficiency, the Appliance Standards Awareness Project, the Northwest Power and Conservation Council, the Northeast Energy Efficiency Partnerships, the Consumer Federation of America, the National Consumer Law Center, Earthjustice, and the California Energy Commission.

[2] Subsequently referred to as ''AHAM Draft Test Procedure''.

[3] Subsequently referred to as ''AHAM Revised Draft Test Procedure''.

must comply beginning on September 15, 2014. Additional details regarding the adjustments made in this final rule are discussed below.

General Test Procedure Rulemaking Process

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE follows when prescribing or amending test procedures for covered products. EPCA provides that any test procedures prescribed or amended under this section shall be reasonably designed to produce test results that measure the energy efficiency, energy use or estimated annual operating cost of a covered product during a representative average use cycle or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

In addition, if DOE determines that a test procedure amendment is warranted, DOE must publish proposed test procedures and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6293(b)(2)) Finally, in any rulemaking to amend a test procedure, DOE must first determine to what extent, if any, the proposed test procedure would alter the measured energy efficiency of any covered product as determined under the existing test procedure. (42 U.S.C. 6293(e)(1)) If DOE determines that the amended test procedure would alter the measured efficiency of a covered product, EPCA specifies the manner in which to amend the applicable energy conservation standard. (42 U.S.C. 6293(e)(2))

This final rule amends the test procedures that manufacturers must use to demonstrate compliance with the energy conservation standards starting on September 15, 2014 (i.e., 10 CFR part 430, subpart B, appendices A and B). DOE has determined that none of the amendments to the test procedures adopted in this final rule change the measured energy use of the products that will be required to use the prescribed testing methods. DOE's analyses demonstrate that the amendments to Appendices A and B, including the incorporation of an optional ''triangulation'' method, will not affect measured energy use to an extent that would necessitate a change to any of the energy conservation standards for the products that would be affected by this rule. (42 U.S.C. 6293(e)(1)(2)) To demonstrate the effects of these amendments under consideration, the July 2013 NOPR discussed the anticipated impacts adopted by this rule. This evaluation is discussed in further detail in section III.E.2 of this final rule.

Refrigerators and Refrigerator-Freezers

DOE's test procedures for refrigerators and refrigerator-freezers are found at 10 CFR part 430, subpart B, appendices A1 (currently in effect) and A (required for rating products starting September 15, 2014). These procedures are the result of numerous evolutionary steps taken since DOE initially established its test procedures for refrigerators and refrigerator-freezers in a final rule published in the **Federal Register** on September 14, 1977. See 42 FR 46140. See also 78 FR 41612–41613 (July 10, 2013) (detailing the regulatory history of the DOE test procedures for refrigerators and refrigerator-freezers).

On December 16, 2010, DOE issued a final and interim final rule that laid out a revised test procedure for refrigeration products. See 75 FR 78809. That rule established a new Appendix A, via an interim final rule. The new Appendix A included a number of comprehensive changes to help improve the measurement of energy consumption of refrigerators and refrigerator-freezers. These changes included, among other things: (1) Adding new compartment temperatures and volume-adjustment factors, (2) adding new methods for measuring compartment volumes, (3) modifying the long-time automatic defrost test procedure to ensure that the test procedure measures all energy use associated with the defrost function, and (4) adding test procedures for products with a single compressor and multiple evaporators with separate active defrost cycles. DOE noted that the compartment temperature changes introduced by Appendix A would significantly impact the measured energy use and affect the calculated adjusted volume and energy factor (i.e., adjusted volume divided by energy use) values. Lastly, the interim final rule addressed icemaking energy use by including a fixed value for manufacturers to add when calculating the energy consumption of those products equipped with an automatic icemaker. Using available data submitted by the industry, this value was set at 84 kWh per year. See 75 FR 78810, 78859 and 78871 (Dec. 16, 2010) (specifying the daily value of 0.23 kWh for products equipped with an automatic icemaker).[4]

Freezers

DOE's test procedures for freezers are found at 10 CFR part 430, subpart B, appendices B1 (currently in effect) and B (required for the rating of products starting in 2014). As with refrigerators and refrigerator-freezers, these procedures are the result of numerous evolutionary steps taken since DOE established its test procedures for freezers in a final rule published in the **Federal Register** on September 14, 1977. See 42 FR 46140. See also 78 FR 41612–41613 (July 10, 2013) (detailing the regulatory history of the DOE test procedures for freezers).

As with refrigerators and refrigerator-freezers, the December 16, 2010 notice also clarified testing requirements for freezers under Appendix B1 and created a new Appendix B, the latter of which must be used starting in September 2014. That new test procedure changed a number of aspects of the procedure detailed in Appendix B1, including, among other things: (1) The freezer volume adjustment factor, (2) methods for measuring compartment volumes, and (3) the long-time automatic defrost test procedure. In addition, Appendix B addresses icemaking energy use by implementing for freezers the same procedure adopted for refrigerator-freezers; parties must apply a fixed energy use value when calculating the energy consumption of freezers with automatic icemakers. 75 FR 78810.

Finalization of the Test Procedure Rulemaking for Products Manufactured Starting in 2014

The December 2010 interim final rule established comprehensive changes to the manner in which refrigeration products are tested by creating new Appendices A and B. In addition to the changes discussed above, these new appendices also include the modifications to Appendices A1 and B1 that were finalized and adopted on December 16, 2010. DOE provided an initial comment period on the interim final rule, which ended on February 14, 2011, and subsequently reopened the comment period on September 15, 2011 (76 FR 57612) to allow for further public feedback in response to the promulgation of the final energy conservation standards that were published on the same day. 76 FR 57516. This re-opening permitted interested parties to comment on the interplay between the test procedures and the energy conservation standards, and provided DOE with additional information to consider before making any final changes to the test procedures of Appendices A and B prior to their mandatory use. 76 FR 57612–57613. That comment period ended on October 17, 2011.

DOE also considered comments related to a petition for a test procedure waiver that had a direct bearing on elements of the test procedures used in

[4] Multiplying 0.23 by 365 days per year yields 84 kWh.

Appendix A. See 76 FR 16760 (March 25, 2011) (Petition No. RF–018, Samsung Electronics America, Inc. (Samsung)).

During the comment periods that DOE provided, interested parties raised a number of issues for DOE to consider. The submitted comments included the following suggested changes: (1) Modifying the test procedure for multiple-compressor systems to reduce test burden; (2) modifying the test period for the second part of the test for products with long-time or variable defrost to assure proper accounting of all energy use associated with defrost; (3) developing separate test procedures and standards for products combining wine storage with fresh food compartments; (4) allowing an alternative three-test interpolation approach as an option to potentially improve measurement accuracy at the cost of greater test burden for those manufacturers choosing to use it; (5) adjusting the test procedure's anti-circumvention provisions; and (6) adjusting the default values for CT_L and CT_M (the longest and shortest duration of compressor run time between defrosts) used in the energy use equations for products that do not have defined values for these parameters in their control algorithms. (Test Procedure for Refrigerators, Refrigerator-Freezers, and Freezers, Docket Number EERE–2009–BT–TP–0003; Sub-Zero, No. 42; AHAM, No. 43, Whirlpool, No. 44) Stakeholders recommended that all of these changes be adopted as part of Appendices A and B. In the final rule published on January 25, 2012 (''January 2012 Final Rule''), DOE considered the changes recommended by stakeholders. 77 FR 3559. DOE declined to adopt certain changes recommended for Appendices A and B because the nature of those recommendations had not, in DOE's view, been presented in a manner that would have afforded the public with a sufficient opportunity to comment on those issues. (Id.)

Nevertheless, after finalizing the rule setting out Appendices A and B, DOE reviewed these various suggestions and considered including them as part of the test procedures for refrigeration products. As a result of this review, DOE proposed some of these recommended amendments in the July 2013 NOPR. In that NOPR, DOE proposed (1) modified test procedures for products with multiple-compressor systems, (2) use of an alternative method for measuring and calculating energy use at standardized temperatures for refrigerator-freezers and refrigerators with freezer compartments, and (3) the modification of the anti-circumvention language currently applicable to testing of refrigerators, refrigerator-freezers, and freezers. This final rule adopts these proposed amendments into the test procedures.

Waivers

DOE granted a limited number of petitions for waiver from the test procedures for refrigeration products between the publication of the December 2010 final rule and the publication of the July 2013 NOPR. On January 10, 2012, DOE published a decision and order (D&O) responding to two waiver petitions from Samsung addressing products with multiple defrost cycle types. 77 FR 1474. That notice prescribed a procedure to account for the energy use from the multiple defrost cycles of a single-compressor-based system. The approach is identical to the procedure established for Appendix A in the January 25, 2012 Final Rule. 77 FR 3559. DOE also issued a D&O that granted a waiver to GE Appliances (GE) to use the same test procedure for similar products. See 77 FR 75426 (Dec. 20, 2012) (GE waiver). In effect, these waivers permit these companies to test certain products that, due to their characteristics, cannot be tested according to the prescribed test procedure (i.e., Appendix A1) or for which use of the prescribed test procedure evaluates the model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data. (*See* 10 CFR 430.27(a)(1))

DOE also granted a waiver to Sub-Zero, Inc. (Sub-Zero) to address that company's multiple-compressor products. See 77 FR 5784 (Feb. 6, 2012) (Sub-Zero waiver). That waiver permitted Sub-Zero to use the same test procedure that AHAM had recommended that DOE adopt for both Appendix A1 and Appendix A. (Test Procedure for Refrigerators, Refrigerator-Freezers, and Freezers, Docket Number EERE–2009–BT–TP–0003; AHAM, No. 43 at pp. 2–3) DOE also granted similar waivers permitting the use of the same procedure to GE, LG, and Samsung.[5] This final rule adopts a test procedure for multiple-compressor products that is based on the initial Sub-Zero waiver procedure.

Finally, on August 16, 2012, DOE granted a waiver to Sanyo E&E Corporation (Sanyo) to address a hybrid refrigeration product, i.e., a product combining wine storage compartments in a product otherwise defined by DOE as a refrigerator. See 77 FR 49443 (D&O granting Sanyo's petition for waiver (Sanyo waiver)). The waiver cites a guidance document that DOE published in February 2011, which indicates that products combining a wine storage compartment and a fresh food compartment are considered refrigerators and should be tested as such.[6] The waiver further explains that the Sanyo hybrid product cannot be tested with its wine storage compartment at the standardized temperature required for testing refrigerators using Appendix A1 (i.e., 38 °F), and that doing so would result in a non-representative energy use measurement. Hence, DOE granted Sanyo's request that it be allowed to test its product using a standardized temperature of 55 °F for the wine storage compartment. *Id.* Because the Sanyo waiver is based upon testing in accordance with the Appendix A1 test procedure, it will terminate on September 15, 2014, when use of the Appendix A1 test procedure is no longer permitted.

After DOE grants a waiver, the agency must, pursuant to its waiver provisions, initiate a rulemaking to amend its regulations to eliminate the continued need for the waiver. 10 CFR 430.27 (m). This final rule addresses this requirement for the Sub-Zero waiver by amending Appendix A to include a test procedure for multiple-compressor products that is based on the Sub-Zero waiver procedure. The Sub-Zero, Samsung, LG, and GE waivers for multiple-compressor products will terminate on September 15, 2014, the same date that manufacturers must use the test procedures in Appendix A for testing. DOE does not currently anticipate that additional products on the market with single-compressor-based systems using multiple defrost cycles will be introduced prior to September 15, 2014, since it is DOE's understanding that this is a system design unique to those manufacturers who are currently covered by these waivers. Hence, at this time, DOE will not amend Appendix A1 to include this particular alternative test procedure.

Stakeholder Summary

At the public meeting held on July 25, 2013, DOE discussed the NOPR, detailed the proposed revisions, and solicited oral comments from meeting

[5] See 78 FR 18327 (March 26, 2013) (LG Decision and Order), 78 FR 35899 (June 14, 2013) (Samsung Decision and Order), and 78 FR 38699 (June 27, 2013) (GE Decision and Order).

[6] This guidance is posted in DOE's online Guidance and FAQ database, and is available for viewing at *http://www1.eere.energy.gov/guidance/default.aspx?pid=2&spid=1.*

participants. Numerous stakeholders attended the meeting and/or provided written comments. These parties are identified in Table I.1 below.[7]

TABLE I–1—STAKEHOLDERS THAT SUBMITTED COMMENTS ON THE INTERIM FINAL RULE

Name	Acronym	Type *	Oral comments	Written comments
Association of Home Appliance Manufacturers	AHAM	IR	☐	☐
BSH Home Appliances Corporation	BSH	M		☐
Felix Storch, Inc.	FSI	M		☐
GE Appliances & Lighting	GE	M	☐	☐
Panasonic Appliances Refrigeration Systems Corporation of America.	PAPRSA	M	☐	☐
American Council for an Energy-Efficient Economy	ACEEE	EA	☐	
Sub Zero Group, Inc.	Sub Zero	M		☐
Whirlpool Corporation	Whirlpool	M	☐	☐
Michael Fitzgibbon	Mr. Fitzgibbon	I		☐
Allen Cornelison	Mr. Cornelison	I		☐
Liebherr-Canada Ltd.	Liebherr	M		☐
Underwriters Laboratory	UL	TL	☐	

* IR: Industry Representative; M: Manufacturer; EA: Efficiency/Environmental Advocate; I: Individual; TL: Test Laboratory.

II. Summary of the Final Rule

DOE's most recent amendments to the test procedures for refrigeration products made a number of significant improvements. Even with these amendments, there remained a number of pending issues that DOE was unable to address. This final rule addresses those remaining issues and finalizes the test procedure for manufacturers to use when certifying their basic models as compliant with the energy conservation standards starting on September 15, 2014. In finalizing these procedures, DOE accounted for comments interested parties made in response to the July 2013 NOPR. These amendments will not result in a significant change in measured energy use as compared with the test procedures as established by the previous January 2012 Final Rule.

Some of the improvements in this final rule could also have been implemented in the current test procedures as well as the procedures that will be required for certification starting September 15, 2014. However, the current test procedures will continue to be used only for a limited time. Hence, DOE did not make any substantive amendments to these test procedures, which are contained in Appendices A1 and B1. (The notice does, however, include amendments that would correct certain cross-references in these appendices to sections of 10 CFR Part 429.) The amendments and issues that have been adopted are summarized in Section III.

This rule makes a series of changes that include incorporation of a multiple-compressor test procedure, an optional triangulation test procedure, and other clarifications to the test procedure. This rulemaking does not address the ice making test procedure and built-in testing topics due to the more complex analysis required to evaluate the merits of the proposals. DOE also extended the comment period for those topics, as requested by interested parties. DOE expects to publish a separate final rule addressing those topics after the extended comment period comes to a close.

III. Discussion

This final rule contains a number of amendments to the refrigerator, refrigerator-freezer, and freezer test procedures. The following section discusses in further detail the various issues addressed by this final rule. Table III–1 below lists the subsections of this section and indicates where the amendments are located. Section A identifies the products covered by the final rule; section B specifies the compliance dates that apply to the amendments; section C discusses the key test procedure amendments made in this final rule; section D discusses additional test procedure topics, including DOE interpretations of certain test procedure issues; and section E discusses compliance of the final rule with other EPCA requirements.

TABLE III–1—DISCUSSION SUBSECTIONS

Section	Title	Affected appendices	
		A	B
III.A	Products Covered by the Final Rule	No changes	
III.B	Compliance Dates for the Amended Test Procedures	X	X
III.C.1	Multiple-compressor Test	X	
III.C.2	Triangulation	X	
III.C.3	Anti-Circumvention Language	*	
III.C.4	Incomplete Cycling	X	X
III.C.5	Correction of Temperature Measurement Period	X	X
III.C.6	Mechanical Temperature Controls	X	X
III.C.7	Ambient Temperature Gradient	X	X

[7] Because the comments of Michael Fitzgibbon and Allen Cornelison address subjects not associated with the proposals detailed in the NOPR, this rule will not discuss those comments in detail.

TABLE III–1—DISCUSSION SUBSECTIONS—Continued

Section	Title	Affected appendices	
		A	B
III.C.8	Elimination of Reporting of Product Height	X	X
III.C.9	Definitions Associated with Defrost Cycles	**	
III.C.10	Measurement of Product Volume using Computer-Aided Design Models	X	X
III.C.11	Corrections to Temperature Setting Logic Tables	X	X
III.C.12	Default Minimum Compressor Run-Time Between Defrosts for Variable Defrost Models.	X	X
III.C.13	Treatment of "Connected" Products	X	X
III.C.14	Changes to Confidentiality of Certification Data	***	
III.C.15	Package Loading		X
III.C.16	Rear Clearance During Testing	X	X
III.C.17	Other Minor Corrections †	X	X
III.C.19	Relocation of Shelving	X	X
III.D.1	Icemaking	No changes	
III.D.2	Built-In Products		
III.D.3	Volume Measurement Issues		
III.D.4	Treatment of Products That are Operable as a Refrigerator or Freezer		
III.D.5	Stabilization Period		
III.E.1	Test Burden		
III.E.2	Change in Measured Energy Use		
III.E.3	Standby and Off Mode Energy Use		

* This amendment appears in 10 CFR 430.23, but affects testing using all four appendices.
** This amendment appears in 10 CFR 429.14, but affects certification reporting for products tested using Appendices A and B.
*** This amendment includes proposed modifications to 10 CFR 429.14.
† This section also discusses an amendment to 10 CFR 430.2.

A. Products Covered by the Final Rule

These amendments cover those products that meet the definition for refrigerator, refrigerator-freezer, or freezer, as codified in 10 CFR 430.2. The definitions for refrigerator and refrigerator-freezer were amended in the December 16, 2010 final rule. See 75 FR 78817 and 78848.

B. Compliance Dates for the Amended Test Procedures

The amendments in this final rule are made to sections 429.14, 429.72, 429.134, 430.2, 430.3, and 430.23 and in Appendices A and B. Manufacturers are required to use the amendments made to Appendices A and B to rate their products starting October 20, 2014.

Some of the proposed amendments that aim to improve measurement accuracy by clarifying certain aspects of the test procedures or to reduce test burden could potentially be considered for adoption in the current test procedures (*i.e.,* Appendices A1 and B1). However, these appendices will be obsolete after September 15, 2014, so DOE did not propose to amend them. DOE requested comments on this approach in the July 2013 NOPR. No stakeholders indicated that DOE should adopt any of the proposed amendments in the current test procedures. Whirlpool commented that it did not support making changes to Appendices A1 and B1. (Whirlpool, No. 27 at p. 2) This final rule does not make any changes to the current test procedures of Appendices A1 and B1.

The proposed amendments that apply to Appendices A and B will be effective 30 days after issuance of a final rule, but manufacturers will not be required to use this procedure until September 15, 2014. Beginning on that date, Appendices A and B will be mandatory for certifying that products comply with the applicable energy conservation standards and for making representations regarding the energy use or operating costs of covered refrigeration products. Pursuant to guidance issued by DOE on June 29, 2012,[8] DOE permits manufacturers to use Appendices A and B before this 2014 date if they choose to do so, provided that they indicate in their certification submissions that their ratings are based on Appendix A or B and that the products comply with the 2014 standards.

[8] This and other DOE guidance documents are located in the Guidance and Frequently Asked Questions database, at *http://www1.eere.energy.gov/guidance/default.aspx?pid=2&spid=1.*

C. Test Procedure Amendments Incorporated in This Final Rule

1. Multiple-compressor Test

DOE proposed to replace the existing dual compressor test procedures in Appendix A with test procedures for multiple-compressor products, based on procedures developed by Sub-Zero and AHAM and permitted for use in test procedure waivers for Sub-Zero (*see* 77 FR 5784 (Feb. 6, 2012)), GE (*see* 78 FR 38699 (June 27, 2010)), Samsung (*see* 78 FR 35901 (June 14, 2013)), and LG Electronics, Inc. (*see* 78 FR 18327 (Mar. 26, 2013)). The July 2013 NOPR discussed the necessity of using a unique test procedure to accommodate multiple-compressor products to reduce the so-called "truncation error" that can occur when measuring the energy use of multiple compressors whose cycles are not synchronized. 78 FR 41629–30 (July 10, 2013). The following sections discuss each aspect of DOE's proposal and the changes finalized in this final rule.

Multiple-Compressor Definition

DOE proposed to define the term "multiple-compressor" in lieu of the term "dual compressor" to provide general applicability to all refrigeration products that have more than one compressor. Although DOE is not aware

of any current refrigeration products with more than two sealed compressor systems, taking this broader approach in defining this particular term would ensure that products using more than two sealed refrigeration systems that might be manufactured and sold in the future are addressed by DOE's regulations. Because DOE did not receive any comments objecting to this proposal, and for the reasons discussed above, DOE is adopting its proposed definition of ''multiple-compressor'' products in a new section 1.16 of Appendix A.

Temperature Cycles

DOE proposed to allow test periods for multiple-compressor refrigeration products to be determined based on compartment temperatures as an alternative to relying on compressor cycles. For multiple-compressor products, it may be difficult to determine which individual compressor is associated with events such as compressor cycle starts and stops. Thus, reliably identifying individual compressor cycles by examining power measurement data may prove difficult. As an alternative, DOE proposed to permit test periods to be selected based on the cycles of the compartment temperatures associated with the compressor systems. In proposing this alternative approach, DOE expressed its belief that complete temperature cycles are equivalent to complete compressor cycles because temperature cycle endpoints coincide nearly exactly with the relevant compressor cycle endpoints. Since the operation of the compressor causes the refrigeration system to reduce compartment temperatures, compressor and temperature cycles are inherently equivalent. In general, these temperature cycles would coincide with their corresponding compressor cycles (*i.e.,* the compartment temperature falls as the compressor operates and rises when the compressor is not operating). However, using an approach based on temperature cycles may be easier to apply because the compartment temperature measurements of separate compressor systems are not combined like total product power inputs are, potentially making identification of test periods easier than when using the power input measurements to identify compressor cycles.

In its comments on the NOPR, GE opposed DOE's proposal. It indicated that using temperature cycles instead of compressor cycles to determine the endpoints of a test period could impact the measured energy use. GE provided data demonstrating that the impact on the overall energy use measurement could be as large as 9.6 percent in some cases. (GE, No. 31 at p. 2) AHAM also opposed DOE's proposal for five reasons: (1) Temperature and compressor cycles do not always correlate with each other, (2) selecting temperature cycle starts and stops are more subjective than for compressor cycles, (3) unlike compressor cycles, temperature cycles could not be used for every product, (4) variable speed compressor products may not have true temperature cycles reflective of operation, and (5) software for identifying temperature cycle maxima and minima would be complicated to develop and may rely on compressor cycles. (AHAM, No. 30 at p. 11–12)

DOE notes that it proposed its temperature cycle-based approach based on the belief that the approach may be beneficial in some circumstances, by making identification of appropriate cycles easier. However, the stakeholder comments clearly indicate that allowing this alternative is unnecessary and, in some cases, potentially detrimental to the accuracy of the energy consumption measurement of a given product. Accordingly, DOE is not adopting its proposed temperature cycle approach and is continuing to require that the identification of test periods be accomplished using compressor cycles.

However, DOE will adopt the proposed definition for temperature cycles. As described later in section III.C.9, DOE's definition for ''stable operation'' allows for confirmation of stability for products with non-cycling compressors that have cycling temperatures; the concept of temperature cycles is needed for this reason and is being adopted.

Measurement Frequency

The current test procedure allows compartment temperature measurements to be taken at up to four-minute intervals (*See* Appendix A, sections 2.9 and 5.1.1). This approach, because of its lower measurement precision, permits more truncation error to occur while testing multiple-compressor products than would occur with shorter measurement intervals. Truncation error occurs when a test period comprising a whole number of one compressor's cycles includes an incomplete portion of the other compressor's cycles. The test procedures developed by Sub-Zero and AHAM reduce the potential magnitude of truncation error by requiring the measurements of multiple-compressor systems to be recorded at regular intervals not to exceed one minute. (Test Procedure for Residential Refrigerators, Refrigerator-Freezers, and Freezers, Docket No. EERE–2009–BT–TP–0003, AHAM, No. 43 at p. 3) Therefore, the July 2013 NOPR proposed to decrease the maximum time between subsequent measurements by decreasing the time period between intervals to not exceed one minute in duration when testing multiple-compressor products.

Both AHAM and GE supported DOE's proposal to increase the measurement frequency to at least once per minute. (AHAM, No. 30 at p. 12; GE, No. 31 at p. 3) With no stakeholder opposition to DOE's proposal, DOE is adopting its proposal that the measurement frequency for multiple-compressor products be no less than once per minute to limit truncation error.

Neither the test procedure contained in the dual- and multiple-compressor test procedure waivers (e.g., the Sub-Zero waiver) nor the NOPR proposal explicitly indicated which measurements would be required to be recorded every minute. It is DOE's understanding that the data collected on a once-per-minute basis would include product power input, product energy use, and compartment temperature. These are the measurements that would require higher-frequency collection in order to improve the precision of the energy use measurement: The power input measurement is needed to identify the applicable test period (*i.e.,* the time when compressors stop and start), and the measured energy use and compartment temperature are used in the calculation of annual energy use. To improve the clarity of the data collection requirement, this final rule clarifies that the requirement for once-per minute acquisition frequency applies to these three measurements. These changes appear in a new section 4.2.3.1 of Appendix A, which addresses measurement frequency for multiple-compressor products.

Stabilization Period

DOE proposed to apply the stabilization requirement of section 2.9 of Appendix A to multiple-compressor products instead of requiring the 24-hour stabilization period that is used in recent waivers. (The stabilization requirement in Appendix A, required for single-compressor products, stipulates that the average rate of temperature change of the product's compartments must not exceed 0.042 °F per hour.) DOE proposed use of the section 2.9 approach for multiple-compressor products to reduce the burden when testing these products, the majority of which achieve stabilization in under 24 hours, and to ensure that

the existing stabilization requirement is met for any product that requires more than 24 hours to achieve stabilization. The proposal would also have allowed the use of temperature cycles rather than compressor cycles to determine steady-state conditions, for example, for products that might have non-cycling compressors but whose compartment temperatures may cycle.

GE and AHAM opposed the DOE proposed stabilization requirements for multiple-compressor products, claiming such products have no true stabilization period. (GE, No. 31 at p. 4; AHAM, No. 30 at p. 13) DOE notes that all products have a period of operation after plug-in or a change in temperature settings during which compartment temperatures gradually approach and eventually equate with, or at least fluctuate near, the targeted temperatures determined by user operable controls. The test procedures have specific provisions to ensure that measurements are made during stable operation. This is true even for the test procedures for multiple-compressor products that are covered under waivers.[9]

Nevertheless, DOE believes that the 24-hour stabilization requirement found in these waivers—and as suggested by commenters—would adequately ensure stabilization is achieved for multiple-compressor products. DOE notes that commenters have suggested that reducing the test burden associated with a 24-hour duration for the stabilization period is less important than avoiding the potential complications that may arise from added test procedure complexity when verifying stability. Therefore, this final rule adopts the longer, but simpler, 24-hour stabilization period for multiple-compressor products, as recommended by AHAM and GE. Because the stabilization period will be a fixed number of hours, the proposed use of temperature cycles as an alternative to compressor cycles to define the stabilization period is unnecessary and is not adopted.

First Part of the Test

For multiple-compressor products with at least two cycling compressors, DOE proposed that the first part of the test last at least 24 hours with no defrost cycle interruption. For cases in which defrost cycles do not allow a full 24-hour test period, the July 2013 NOPR proposed allowing a shorter 18-hour test period. In other words, if a potential test period extends to only 18 hours before being interrupted by a defrost, this 18-hour test period could be used as the first part of the test rather than waiting for the next period of operation between defrosts, which would add at least a day to the test time. However, if the initial candidate test period extends fully to 24-hours before being interrupted by a defrost, the full 24 hours would be used for the test period. DOE did not propose to adopt AHAM's approach, which allows aggregating multiple separate segments of running time to increase the total test period time to accrue the minimum of 24 hours. DOE explained that each individual segment of running time would introduce its own truncation error, thus defeating the purpose of requiring a long 24-hour test period. After quantifying the maximum possible truncation error for refrigerators in the DOE test sample, DOE tentatively determined that allowing an 18-hour period would be a reasonable compromise to balance test burden and accuracy.

In response to the DOE proposal, AHAM indicated that DOE's approach would be more complicated than the waiver approach and that some products may require several weeks of testing to satisfy the minimum 18-hour requirement of the proposal. (AHAM, No. 30 at p.14) AHAM also stated that the energy use differences presented in the NOPR showing the difference between AHAM's aggregated approach and the proposed single-segment approach were not necessarily entirely attributable to truncation error. (*Id.*) In addition, AHAM stated that DOE may have proposed not to allow multiple segments because DOE is concerned about test circumvention. (*Id.*) AHAM also stated that it did not agree with DOE's characterization of the maximum of one percent error in the energy measurement as insignificant, asserting that such measurement error could represent the difference between a product satisfying or failing to meet the energy conservation standards. (*Id.*)

While a one percent error may, in certain cases, potentially be significant, increasing the precision of a test can also introduce additional test burden, and the competing demands of precision and managing test burden generally require that compromises be made in establishing test procedures. It is for this reason that DOE proposed that the first part of the test be a continuous period of stable operation. As described in the NOPR, DOE's analysis shows that truncation error can approach and/or exceed one percent of the measurement when the first part of the test is allowed to be less than 24 hours and/or when the first part of the test is allowed to include separate time periods, each with an average duration under 24 hours. (The average duration of the time period would be the total test period time divided by the number of time segments used (e.g., the average duration would be 12 hours if two intervals were used to comprise a 24-hour test period).) If two time segments are included in a 24-hour total test period, two truncation events are included, and the potential truncation error is twice as large compared to a single, continuous period of stable operation. Likewise, if three segments are used, the potential truncation error is three times as large.

DOE notes that the analysis presented in the NOPR calculates truncation error directly—it does not represent multiple measurements for which other parameters might affect the measurement, as suggested by AHAM. See 78 FR 41633 (July 10, 2013).

DOE believes that allowing an 18-hour test period would be an acceptable compromise between test precision and test burden in cases in which a defrost interrupts a candidate test period. Rather than require waiting through the defrost and the next 24 hours of steady operation, DOE decided to adopt an approach that allows use of the 18-hour period as the test period for the first part of the test. In so doing, DOE opted to make a small reduction in precision to avoid having to add 24 hours or more test time. On the other hand, if defrosting does not interrupt a candidate test period, allowing it to extend to 24 hours, the additional six hours of test time would be justified to enhance the test precision. This is why DOE proposed to allow the 18-hour test period only when the test period is interrupted by a defrost.

AHAM stated that some products could require weeks of extra testing to sufficiently satisfy even a requirement of an 18-hour minimum duration for the test period. (AHAM, No. 30 at p. 14) However, AHAM did not provide sufficient detail regarding this possibility to allow quantification of the related test burden. To the extent that a product cannot obtain 18 hours of steady operation between defrosts, alternative test methods for such products may have to be developed. As indicated by AHAM, should a one percent error occur with test periods shorter than 18 hours or with test periods comprised of separate running

[9] See, e.g., ''Decision and Order Granting a Waiver to GE Appliances From the Department of Energy Residential Refrigerator and Refrigerator-Freezer Test Procedures'', Case No. RF–029, 78 FR 38699 (June 27, 2013). This waiver test procedure has specific requirements for stability and steady state, including, for example, ''Steady State for EP1: The temperature average for the first and last compressor cycle of the test period must be within 1.0 degrees F (0.6 degrees C) of the test period temperature average for each compartment.'' (*Id.* at pp. 38700–1).

periods, such an error could potentially make the difference between compliance and non-compliance for a borderline-compliant product. (AHAM, No. 30 at p. 15) Consequently, it would be inadvisable to allow the potential error to be greater than this by allowing use of multiple run segments or a reduction in the minimum test period duration. To mitigate this risk, this final rule retains the first-part test period requirements proposed in the NOPR. In response to AHAM's comment regarding circumvention, DOE notes that although the agency is concerned about circumvention, DOE evaluated the proposal primarily based on balancing test precision and test burden.

The July 2013 NOPR also proposed that products with cycling compressors be tested using a test period for the first part of the test comprising a whole number of compressor or temperature cycles of a ''primary'' compressor. DOE proposed that the freezer compressor would be considered the ''primary'' compressor if it cycles, and the fresh food compressor would be considered the ''primary'' compressor if the freezer compressor does not cycle. The test procedures of the multiple-compressor product waivers require that the test period for the first part of the test consist of a whole number of freezer compressor cycles.[10] The proposal was consistent with the waiver procedure, except that it specified that the test period would be based on cycles of the fresh food compressor if the freezer compressor does not cycle. DOE received no comments on this topic, other than AHAM's objection to the use of temperature cycles, which is discussed above. As a result, DOE will adopt the proposal for basing the first-part test period on the cycles of a primary compressor, and the proposed requirement for selecting the primary compressor.

Lastly, the July 2013 NOPR proposed to require that the first part of the test be a period of stable operation. AHAM strongly opposed this approach, arguing that it would be too restrictive, particularly for products with variable speed compressors. (AHAM, No. 30 at p. 15) AHAM indicated that ''it does not matter whether the product reaches stability during that period or not—stability is not needed for the existing waiver approach.'' AHAM further indicated that DOE should not mandate the design of products by requiring stability. (*Id.*) The DOE test procedures—including those set forth in DOE waivers for multiple-compressor products[11]—have specific provisions to ensure that measurements are made during stable operation. DOE further notes that in the waiver test procedures, the test period for the first part of the test, ''is calculated for a whole number of freezer compressor cycles . . .'' and that testers are instructed to, ''make this determination [i.e., that the unit under test has reached steady state for the first part of the test] for the fresh food compartment for the fresh food compressor cycles closest to the start and end of the test period.'' 78 FR 38700, 38701 (June 27, 2013). This language clearly implies that it is written for a system with cycling compressors, and that it requires stability to ensure that compartment temperatures do not rise or fall significantly during the test period. The DOE proposal, being based on the test procedure waivers, is consistent with the requirement for stability, but it also anticipates the potential for non-cycling compressors by providing a method to verify steady operation for the first part of the test for such products. The test procedure established by this final rule retains this approach. If there are products in existence that cannot properly be tested using this method, DOE believes that they would also not be properly tested using the waiver test procedure and, hence, DOE believes such products would require a different waiver with a different alternative test procedure.

Second Part of the Test

For the second part of the test, the July 2013 NOPR proposed a test period in which either the starting or stopping of the compressor can be used to determine both the beginning and end of the test period. For example, if a compressor start is used to determine the beginning of a test period, a later compressor start would be used to determine the end of the test period. Alternatively, a test period could begin and end when the compressor stops. Thus, a test period could extend from a compressor start to a compressor start or a compressor stop to a compressor stop, but not from a compressor start to a compressor stop or vice versa. In addition, the start and end of the test period must take place during stable operation before and after the target defrost cycle. DOE did not propose a 24-hour test period for the second part of the test because it concluded that increasing the period duration would not reduce the magnitude of the truncation error that might occur. 78 FR 41634–41636 (July 10, 2013).

The DOE proposal for multiple-compressor systems was consistent with Appendix A's requirement that the test period for the second part of the test for products with long-time or variable defrost must start and end during stable operation. Appendix A requires that the compartment temperatures for the compressor cycles prior to and after the second part of the test be within 0.5 °F of their temperature averages for the first part of the test (*See* Appendix A, section 4.2.1.1), as opposed to the 1.0 °F requirement of the Sub-Zero waiver and the AHAM proposal. DOE stated in the July 2013 NOPR that this same tolerance for ensuring that the test period does not include any events associated with the defrost cycle (such as precooling or recovery) should apply to multiple-compressor systems as well as single-compressor systems because the events before, during, and after the defrost cycles of both types of products have the same basic functions (removing frost from the evaporator) and same basic control sequence (optional precooling, heating, temperature recovery). However, DOE proposed a multiple-compressor system test procedure that would also require that the compressor cycles examined to confirm stable operation at the start and end of the second part of the test be the first and last compressor cycles (or temperature cycles) within the test period, consistent with the granted waivers. DOE believed that this approach would better ensure that the test period begins and ends during stable operation because the examination of compressor or temperature cycles would occur within the test period, and would not involve cycles that may fall outside the test period. In the special case where there are no cycling compressors, DOE proposed to require that the test period start and end when the compartment temperatures are within 0.5 °F of their averages for the first part of the test, which is also consistent with the Appendix A test procedure (*See* Appendix A, section 4.2.1.2).

Both AHAM and GE supported DOE's attempt to reduce the burden of the second part of the test for multiple-compressor products by not requiring that the test period last 24 hours.

[10] See, e.g., ''Decision and Order Granting a Waiver to GE Appliances From the Department of Energy Residential Refrigerator and Refrigerator-Freezer Test Procedures'', Case No. RF–029, 78 FR 38699, 38700 (June 27, 2013).

[11] See, e.g., ''Decision and Order Granting a Waiver to GE Appliances From the Department of Energy Residential Refrigerator and Refrigerator-Freezer Test Procedures'', Case No. RF–029, 78 FR 38699 (June 27, 2013). This waiver test procedure has specific requirements for stability and steady state, including, for example, ''Steady State for EP1: The temperature average for the first and last compressor cycle of the test period must be within 1.0 degrees F (0.6 degrees C) of the test period temperature average for each compartment.'' *Id.* at pp. 38700–1.

(AHAM, No. 30 at p. 15; GE, No. 31 at p. 5) However, AHAM and GE indicated that DOE's dataset was not large enough to support the proposal as is. (*Id.*) AHAM also stated that DOE's proposal would cause an equal number of (if not more) concerns and complexity. (*Id.*) However, rather than detailing any specific concerns, AHAM recommended that DOE adopt the approach for the second part of the test found in the test procedure waivers for multiple-compressor products. AHAM offered to develop an improved procedure in the future.

Although the stakeholders did not clarify which aspect of DOE's proposal could not be supported by the limited dataset, DOE assumes that the key issue was the reduction of the test period for the second part of the test, eliminating the need for a duration of 24 hours. DOE notes that its conclusion that the 24-hour duration was unnecessary was based primarily on consideration of the energy use equations, and that its supporting data served as confirmation and demonstration of its initial conclusions that a 24-hour test period duration did not improve test accuracy. As discussed in the July 2013 NOPR, the term in the energy use equation that represents the contribution of defrost is not divided by the duration of the second part of the test, as is the term in the equation that represents the contribution of steady-state operation, which is divided by the duration of the first part of the test. This means that any truncation error introduced when measuring the energy usage for the second part of the test would not be reduced by selecting a longer test period, as would occur for the first part of the test. While DOE would not object to testers using continuous test periods as long as 24 hours for the second part of the test, DOE believes that combining multiple non-continuous running periods to accrue 24 hours of test period duration is inappropriate, because adding any additional running period has the potential to add additional truncation error to the calculation. Hence, DOE is adopting its proposed approach for the second part of the test for multiple-compressor products.

One-Part Test Simplification

In the July 2013 NOPR, DOE proposed a one-part test for multiple-compressor products for which (a) only one compressor system has automatic defrost and (b) that defrost is neither long-time defrost nor variable defrost. DOE noted in the July 2013 NOPR that the proposed test period would start at a point during a defrost period and end at the same point during the subsequent defrost period, which is the same approach taken by the existing test procedure for single-compressor products with automatic defrost that is neither long-time nor variable (*See* Appendix A, section 4.2). DOE proposed using a single test period to minimize the test burden for products with short-time automatic defrost for only one of the compressor systems.

GE commented that it is not aware of these types of products. (GE, No. 31 at p. 4) AHAM also questioned whether there are enough (or any) products that satisfy DOE's description to warrant a separate procedure or whether it would instead be sufficient to use the existing waiver approach. (AHAM, No. 30 at p. 13) DOE proposed this simplification to reduce test burden. However, the stakeholder comments indicate that there is no need for such a reduction in burden, due to the lack of applicable products, so DOE is not adopting this proposal. Instead, all products will have to be tested using the two-part test method as described in this final rule.

Test Simplifications for Tests With One or No Cycling Compressors

In the July 2013 NOPR, DOE proposed another test simplification for multiple-compressor products with either one or no cycling compressors. That proposal would allow use of the provisions in sections 4.1 and 4.2 of Appendix A for the first and second part of the test. Specifically, if only one of the compressors cycles, the test period for the first part of the test would be at least three hours long and comprise two or more complete cycles of the cycling compressor. Further, if none of the compressors cycle, the test period for the first part of the test would be three hours long. Both GE and AHAM indicated that DOE's proposal may not accurately account for the energy use of a model that has one cycling compressor and a second variable speed compressor. (GE, No. 31 at p. 4; AHAM, No. 30 at p. 14) DOE proposed this simplification to reduce test burden. However, commenters indicated that there are circumstances for which the approach would not work and suggested that burden reduction was unnecessary in this case. Hence, this final rule does not adopt the proposal to simplify the test procedure for multiple-compressor products with no more than one cycling compressor. Instead, these products will require the full first part of the test adopted in this final rule.

Energy Use Equations

DOE proposed an energy use equation for multiple-compressor systems similar to the equation found in Appendix A for products with single compressors and multiple defrost cycle types. For both of these product types, the energy use for each distinct defrost cycle is added separately using its corresponding CT value (*i.e.,* hours of compressor operation between defrosts) to adjust the measurement to represent the defrost cycle's average contribution to energy use per 24 hours (*See* Appendix A, section 5.2.1.5). DOE received no comment on this proposal and therefore adopts it in this final rule.

Effect on Measured Energy Use

DOE notes that the July 2013 NOPR proposed to replace the existing test procedure's dual compressor system test in Appendix A with a new test procedure that would address products using multiple-compressor systems. When modifying test procedures, DOE considers the extent to which the energy use or energy efficiency measurement may be altered under a proposed procedure. (42 U.S.C. 6293(e)(1)) As noted earlier, Appendix A will not be required for certifying compliance until the compliance date of the new refrigeration product energy conservation standards. 77 FR 3559 (Jan. 25, 2012). DOE is aware of very few products that have multiple-compressor systems and has received petitions for waiver from the existing test procedure from Sub-Zero, GE, LG, and Samsung for testing of dual compressor products, which DOE has granted. 77 FR 5784 (Feb. 6, 2012), 78 FR 38699 (Jun. 27, 2013), 78 FR 18327 (Mar. 26, 2013), 78 FR 35899 (Jun. 14, 2013). DOE's tentative view, at the time of the July 2013 NOPR, was that its proposed test procedure for multiple-compressor products would not significantly impact the manner in which such products would be tested using the test procedure of the waivers. DOE requested comment on the existence of other multiple-compressor products, how these products are tested (e.g., whether they use the existing dual compressor test procedure of Appendix A1), and whether the measurement of energy use would change using the proposed test procedure.

GE responded that there are differences in measured energy consumption based on the proposal, citing the differences in the measurement depending on whether the test periods are determined based on compressor cycles or temperature cycles. (GE, No. 31 at p. 5) As previously discussed, DOE is finalizing the test procedure without the option of using temperature cycles to determine test periods—only a compressor-cycle-based approach is being adopted, which

is the same one used in the test procedure waivers. Hence, DOE concludes that the measurement differences cited by GE would no longer be relevant.

Additionally, AHAM cited the potential one percent truncation error as evidence that the proposed test procedure could impact measured energy use and indicated that DOE should analyze the data that it collected to determine if the measurement could change when using the proposed test procedure. (AHAM, No. 30 at p. 16) DOE acknowledges there is a potential for truncation error when using the waiver test procedure (which is a question of overall accuracy). DOE believes that the measurement resulting from the procedure adopted in this final rule would result in a more accurate and representative measurement of the product's energy use rather than an actual change in measured energy use.

Sub-Zero responded that the waiver test procedure is accurate, repeatable, and has been verified through use at independent laboratories and in the ''industry verification program.'' [12] It added that the proposed test procedure would be more complicated, time-consuming, difficult to conduct and potentially less accurate and repeatable than the waiver test procedure. Sub-Zero also pointed to the specific areas of concern contained in the AHAM comments. (Sub Zero, No. 32 at pp. 1–2) In this final rule, DOE has modified the procedure by addressing many of the key concerns raised in the AHAM comments. As discussed above, the remaining key difference between the procedure finalized in this final rule and the waiver test procedure pertains to the waiver test procedure's use of non-continuous running periods to accrue a full 24 hours of testing time for both parts of the test. As discussed above, DOE believes that allowing non-continuous running periods subjects the test procedure to risk of greater error, based on DOE's testing and analysis. DOE believes that the potential error is likely to be greater than the one percent that AHAM separately suggested may not be acceptable. Were DOE to accept AHAM's recommended approach, the risk of increasing the truncation error would be even larger than under the approach DOE is adopting today. DOE notes that it received no details of any work by industry, to which Sub-Zero alluded in its comments, to validate the waiver test procedure. Consequently, DOE's views regarding the potential impacts of the procedure are based on a review of its own data and the fundamental fact that each additional running period introduced into the energy use equation can compound the truncation error with the addition of another truncation event. Hence, DOE has not adopted the waiver test procedures' allowance of the use of non-continuous running periods. Instead, DOE will adopt the approach proposed in the July 2013 NOPR, which requires a single segment of time to comprise the test period. In this way, the risk of truncation error will be substantially reduced, compared to the current test procedure waiver approach that some manufacturers have been permitted to use.

DOE received no comments indicating the existence of other multiple-compressor products other than those identified in waivers and no comments indicating that any products are tested using the existing dual compressor test procedure.

Elimination of Multiple-Compressor Test Procedure Waivers

DOE notes that, consistent with its regulations, the Sub-Zero, GE, LG, and Samsung dual compressor waivers will terminate once parties are required to use the multiple-compressor test procedures of Appendices A and B to demonstrate compliance with DOE regulations (*i.e.,* on September 15, 2014). (*See* 10 CFR 430.27(m))

Multiple-Compressor Products With Manual Defrost

These new procedures for multiple-compressor products apply only to multiple-compressor products with automatic defrost. DOE received no comment revealing the existence of multiple-compressor products with manual defrost and has not made changes in the test procedure to account for such products.

2. Triangulation

The July 2013 NOPR proposed incorporating a modified version of the so-called ''triangulation'' interpolation approach described in Australian/New Zealand Standard 4474.1–2007 [13] (AS/NZ 4474.1–2007) as an option to calculate energy use. DOE's test procedures generally require conducting the energy test for two different settings of the temperature control. See, e.g., 10 CFR Part 430, Subpart B, Appendix A, section 3.2.1. The energy use is calculated as a weighted average of the measurements of the two tests, depending on the compartment temperatures measured during the tests, to represent the energy use that would occur if the compartment temperature were exactly equal to its standardized temperature. See, e.g., Appendix A, section 6.2.1.2. As described in the NOPR, for products with two compartments, this calculation often represents the operation of a product in which one of the compartments is cooler than its standardized temperature. 78 FR 41636–41637 (July 10, 2013). The triangulation approach resolves this issue by using a weighted average of the energy use measured from three tests, thus allowing calculation of the energy use that would occur when both compartment temperatures exactly equal their standardized temperatures. The July 2013 NOPR explained in detail why the triangular interpolation of the measurements for three temperature settings results in a more accurate measurement of energy when compared to the linear interpolation using two temperature settings. (*Id.* at 41637).

The NOPR proposed to incorporate by reference parts of Appendix M of AS/NZS 4474.1–2007 as an optional interpolation method. A new section 3.3 of the test procedure would reference subsections M3.a through M3.c and Figure M1 of appendix M of AS/NZS 4474.1–2007 to specify the requirements for the three-setting test procedure as an alternative to using the requirements of section 3.2 of Appendix A. The procedure would clarify that the target temperatures t_{xA} and t_{xB} discussed in the Australia/New Zealand procedure would be the standardized temperatures as defined in section 3.2 of the DOE test procedure. However, DOE proposed to require that the first two of the three tests comply with the requirements for the two-test method contained in Appendix A, section 3.2.1. DOE included this requirement because it would also allow for use of the current energy calculations as well as the triangulation energy calculations. 78 FR 41639 (July 10, 2013).

AHAM submitted comments supporting the adoption of a triangulation approach. (AHAM, No. 30 at p. 17) However, AHAM suggested that DOE not require that the first two settings of the triangulation test adhere to the provisions in Appendix A for a two-setting test because AS/NZS 4474.1–2007 allows test facilities to

[12] The Sub-Zero comment did not clarify, but DOE believes that the ''industry verification program'' referred to in Sub-Zero's comments may be the verification program managed by AHAM—see *http://www.aham.org/industry/ht/d/Items/cat_id/49796/pid/1220/cids/389,425,49796.*

[13] ''Australian/New Zealand Standard, Performance of Household Electrical Appliances—Refrigerating Appliances, Part 1: Energy Consumption and Performance'', AS/NZS 4474.1:2007, Appendix M, available for purchase at *http://infostore.saiglobal.com/store/results2.aspx?searchType=simple&publisher=all&keyword=AS/NZS%204474.*

choose the settings of all tests for more accurate results. (*Id.*) As a result, AHAM asked DOE to reconsider this aspect of its proposal in order to harmonize with AS/NZS 4474.1–2007 as well as with the refrigerator test standard currently under development by the International Electrotechnical Commission (IEC), as represented by its Committee Draft for Vote (CDV) of Part 1 of IEC 62552.2 *Household refrigerating appliances—Characteristics and test methods.* (*Id.*)

DOE agrees with AHAM that allowing greater flexibility in the selection of temperature settings may provide more accurate results. As described in AS/NZS 4474.1–2007, when the three sets of measured compartment temperatures (freezer compartment temperature paired with fresh food compartment temperature) are plotted on a graph of freezer temperature versus fresh food compartment temperature, the triangle formed by the points must enclose the point representing the pair of standardized temperatures (*i.e.,* 0 °F freezer compartment temperature and 39 °F fresh food compartment temperature). Ensuring that the three tests meet this requirement may be much more difficult if the first two tests must be conducted exactly as dictated by the DOE test procedure. Therefore, DOE is permitting any three sets of temperature control settings to be selected for the optional triangulation approach, provided that the temperature settings for each individual compartment all represent median, coldest, or warmest settings. DOE is adopting this approach based on its belief that it is important to provide a valid measurement of energy use at the standardized compartment temperatures, and that using the settings prescribed for the current two-test approach is not essential to achieving this objective because the triangulation interpolation method is designed to work with any three settings with temperatures that surround the target standardized temperatures (*i.e.,* for which the plotted triangle encloses the standardized temperature point, as described above).

The July 2013 NOPR proposed a new section 6.2.2.3 detailing the calculation of energy use under the proposed triangulation approach. This proposed section would require using the calculations described in section M4.a of AS/NZS 4474.1–2007 to determine the energy consumption of the tested unit but excluding the energy use contribution of icemaking. The fixed value of energy use associated with icemaking, defined in section 6.2.2.1, would be added to this result for products with automatic icemakers. DOE received no comment on this proposal. Accordingly, DOE is adopting its proposed approach.

Finally, during the 2013 public meeting, GE commented that DOE should consider incorporation of the single test to measure energy consumption found in Appendix L of AS/NZS 4474.1–2007. (This test requires that the compartment temperatures measured during the test are both no higher than their standardized temperatures.) (GE, NOPR Public Meeting Transcript, No. 23 at p. 99) Using a single test would reduce test burden, assuming the measured compartment temperatures are lower than their standardized temperatures for the first selected test setting and additional tests are not needed. However, in this final rule, DOE has decided not to incorporate a single setting test because stakeholders have not been provided adequate time to review the details of the suggested procedure. DOE may consider this procedure in the future.

Certification

DOE proposed to amend section 429.14(b) to require manufacturers to identify which interpolation method they used to rate and certify a particular basic model (i.e., triangulation or a two-setting test). In the NOPR, DOE noted that more than one unit is tested for each rating (*See,* for example, 10 CFR 429.11(b), which indicates a sample size minimum of two units). Therefore, DOE proposed to require that all units of a given model that are tested for certification purposes be tested using the same test method and that the certification report indicate whether the triangulation method was used.

AHAM suggested that DOE not require manufacturers to report which method was used for certification testing (*i.e.,* whether the two-test method or the triangulation method was used) because this would add to manufacturer reporting burden, and because DOE can request to see test reports of certified models if it wishes to confirm whether products were tested using triangulation. (AHAM, No. 30 at p. 17) AHAM also indicated that test facilities should be permitted to use different methods for each unit within a model's sample to prevent unnecessary added test burden. (*Id.*) For example, individual units may have refrigeration and control systems tuned so that both compartments have temperatures equal to their standardized temperatures at equivalent temperature control settings. For such units, the calculated energy use (e.g., per Appendix A, section 6.2.2.2) would be the same when using the freezer compartment interpolation and the fresh food interpolation, and use of a third test and a triangular interpolation would not change the result.

Viewed from within the context of compliance with the applicable energy conservation standard, an individual unit may satisfy the applicable standard with sufficient margin using the two-test method while other units within the same model sample may require the triangulation method to satisfy the relevant energy standard with sufficient margin. Because triangulation might not be required for testing of all units in a sample to show that the model meets the applicable energy conservation standard, and to limit the required test burden, DOE will not adopt the proposed requirement that triangulation must be used for all units tested to certify compliance for a given model if the test for one of the units uses the method. Further, because measurements using the two-test method would generally be more conservative (indicating higher energy use), but be only slightly different than measurements made using triangulation, DOE considers both methods to be valid. Hence, in order to further reduce the burden associated with certification, DOE will not require certification reports to indicate whether triangulation was used for testing.

Regarding testing options generally, DOE notes that because the two-test method generally yields results that are more conservative than the triangulation test (*i.e.,* higher energy use), DOE proposed to permit manufacturers to continue using the two-part test at their discretion. By permitting manufacturers to continue using the simpler two-part test, DOE intended to limit the overall burdens that are placed on the industry. However, given that tests conducted using the triangulation approach may potentially, for certain basic models, yield more representative results, DOE proposed to use this particular method when conducting assessment testing, pursuant to 10 CFR 429.104, and enforcement testing, pursuant to 10 CFR 429.110, if either (a) the manufacturer indicates that the triangulation method was used for rating the model, or (b) certain conditions are observed during the first two tests of a given unit of a basic model that suggest that a third test might yield a more representative measurement than the two-test method. Specifically, if the calculated energy use using Appendix A, section 6.2.2.2 (one measurement based on use of the fresh food compartment temperature and the other based on the freezer compartment temperature) differs by more than five

percent of the greater of the two results for any tested unit of the basic model, DOE proposed that it would use the triangulation method for any assessment or enforcement testing for all units of that basic model. This approach may, in certain circumstances, require retesting of a unit previously tested if, for example, condition (b) above did not apply for the test conducted for a first unit of a tested model but did apply for later tests. AHAM suggested that DOE use the triangulation approach whenever testing units within its verification programs to guarantee accuracy. (AHAM, No. 30 at p. 17) DOE is specifying in a new section 429.134 that DOE will use the triangulation test prior to making a finding of noncompliance with respect to a particular basic model for that particular sample of tested units because the two-test method in some cases will result in a more conservative measure of energy use. In other circumstances, however, to limit unnecessary testing, DOE will not necessarily use the triangulation method.

3. Anti-Circumvention Language

Revisions Addressing Past Stakeholder Comments

DOE proposed to revise the anti-circumvention language in sections 10 CFR 430.23(a)(10)(ii) and 10 CFR 430.23(b)(7)(ii) to better reflect the wording found in the AHAM's HRF–1–2008 procedure, as had been recommended in comments by AHAM and Whirlpool that were provided during the December 2010 interim final rule comment period. (*See* ''Test Procedure for Residential Refrigerators, Refrigerator-Freezers, and Freezers,'' Docket No. EERE–2009–BT–TP–0003, No. 16 at p. 4, No. 12 at p. 2) The current DOE anti-circumvention language was modeled after section 1.2 of HRF–1–2008 and parts of the DOE language are nearly identical to the HRF–1–2008 language. DOE proposed to bring the DOE language into even closer alignment with HRF–1–2008 in the July 2013 NOPR because such changes would not weaken the requirements and would help achieve better consistency with the nearly identical industry standard, which would generally make testing more consistent. DOE also proposed to move the four examples (currently section 10 CFR 430.23(a)(10)(ii)A–D) describing components operating in a manner inconsistent with operation under typical room conditions to follow the paragraph describing operational behavior that DOE identifies as constituting anti-circumvention. 10 CFR 430.23(a)(10)(i)

In response to the July 2013 NOPR, AHAM and Whirlpool supported the proposed revisions to the anti-circumvention sections. (AHAM, No. 30 at p. 17; Whirlpool, No. 27 at p. 2) However, BSH commented that DOE should refer to the draft IEC test procedure [14] for guidance on how to improve DOE's anti-circumvention sections. (BSH, No. 21 at p. 1) DOE notes that changes to the anti-circumvention sections were proposed in response to earlier industry feedback and comment, which did not mention the IEC draft test procedure language. DOE reviewed the IEC draft test procedure, which has two key provisions that are not in the DOE test procedure—(a) the IEC draft test procedure provides detailed guidance on how to detect circumvention once suspected, and (b) the IEC draft test procedure identifies what is not considered to be circumvention. The IEC draft describes these provisions in detail. While DOE believes that the inclusion of these provisions may have merit, the agency wishes to ensure that the public receives a sufficient opportunity to review these provisions. Therefore, DOE is not adopting BSH's suggestion at this time but may consider proposing these provisions in the future. DOE received no other comments on its proposed revisions to the anti-circumvention language and is adopting its proposed changes for these sections.

Components That Operate Differently During Testing

The July 2013 NOPR discussed inquiries from Whirlpool and Samsung about when to apply for a test procedure waiver for products that operate differently during testing as compared to typical field operation. This scenario is addressed in a clause of the existing anti-circumvention language of the DOE test procedure that DOE did not propose to modify. See, e.g., 10 CFR 430.23(a)(10) (indicating that a manufacturer must obtain a waiver if (i) a product contains energy consuming components that operate differently during the prescribed testing than they would during representative average consumer use, and (ii) applying the prescribed test to the product would evaluate it in a manner that is unrepresentative of its true energy consumption). DOE also issued guidance on this matter on May 28, 2013. That guidance provides a framework for assessing the potential need for a waiver within the context of the existing anti-circumvention provisions.[15] As a result, the July 2013 NOPR did not propose a specific amendment to the provisions of 430.23(a)(10) (and 430.23(b)(7) for freezers) to further address the concerns raised by the Whirlpool and Samsung inquiries. The NOPR did, however, request comment on the need for a potential test procedure revision.

AHAM agreed with DOE's approach—i.e., not to modify the current anti-circumvention language to accommodate products that operate differently during testing. AHAM indicated that the May 2013 guidance document sufficiently addresses this issue. This final rule makes no changes to the current anti-circumvention language.

4. Incomplete Cycling

In the July 2013 NOPR, DOE proposed changing the incomplete cycling compressor test procedure to improve its accuracy and ease test burden. Specifically, DOE proposed to eliminate the 24-hour test period requirement for products exhibiting compressor cycles that exceed 12 hours in length, and instead require that the test period be comprised of a single compressor cycle. The July 2013 NOPR discusses the advantages of the proposal compared to the current requirement in section 4.1 of Appendices A and B. 78 FR 41640–41641 (July 10, 2013).

During the NOPR public meeting, GE mentioned that based on its experience, test facilities in the U.S. and abroad base test periods on a whole number of compressor cycles rather than using the 24-hour test period that is required in the DOE procedure for products with incomplete cycling. (GE, Public Meeting Transcript, No. 23 at p. 105; GE, No. 31 at p. 7) In DOE's view, using a whole number of compressor cycles yields an accurate measurement of the energy use of a product with incomplete cycling. GE supported the DOE proposal and agreed with DOE that test periods should be based on whole numbers of compressor cycles rather than be set at 24 hours for incomplete cycling products. (*Id.*) AHAM also agreed with the DOE proposal. However, AHAM recommended that DOE remove the term ''incomplete cycling'' from the test procedures and instead modify section 4.1 of Appendices A and B to simply state, ''If fewer than two compressor

[14] Committee Draft for Vote (CDV) of Part 1 of IEC 62552.2 Household refrigerating appliances—Characteristics and test methods.

[15] This guidance is posted in DOE's online Guidance and FAQ database, and is available for viewing at: *http://www1.eere.energy.gov/guidance/default.aspx?pid=2&spid=1.*

cycles occur during a 24-hour period, then a single complete compressor cycle may be used.'' (AHAM, No. 30 at p. 18) DOE notes that section 4.1 is the only place in either Appendix A or B that uses the term incomplete cycling. DOE agrees that the term is not needed and is adopting the change suggested by AHAM.

Additionally, AHAM suggested that DOE modify the test procedures to allow the data used to establish steady state conditions (e.g., as described in Appendix A, section 2.9) to be used when performing the first part of the two-part test for products with long-time or variable defrost. (AHAM, No. 30 at p. 18) AHAM argued that its approach would be better than requiring separate periods for verifying stabilization and the test period because of the shortened test time. (*Id.*) AHAM indicated that requiring a separate period to comprise the first part of the test made sense when data were collected manually because stability needed to be determined before collecting test data. However, current electronic data acquisition systems can collect data during the stability period without added burden. Finally, AHAM recommended that DOE adopt AHAM's proposal for all products and not just incomplete cycling products. (*Id.*) GE made essentially the same comment during the public meeting. (GE, Public Meeting Transcript, No. 23 at pp. 105–6) DOE notes that adopting these changes at this time would not allow adequate time for stakeholder input, but DOE may consider this approach in a future rulemaking.

5. Correction of Temperature Measurement Period

In the July 2013 NOPR, DOE proposed to address an inconsistency in the existing test procedure associated with temperature measurements for short-time defrost products (*i.e.,* products whose defrost is neither long-time nor variable). Specifically, DOE proposed to require that the compartment temperatures used in energy use calculations for these products be the averages of the measured temperatures taken in a compartment during a stable period of compressor operation containing no defrost cycle or events associated with a defrost cycle, such as precooling or recovery, that includes at least two complete compressor or temperature cycles (if the compressor cycles on and off or the temperature cycles up and down) and is at least three hours in duration—essentially the same test period specified in section 4.1 of the test procedure for products with manual defrost, except that for these short-time defrost products this test period would be used for temperature measurement only, whereas it is used for both energy and temperature measurement for manual defrost products. DOE received no comments regarding this proposal. However, as discussed in section III.C.1, stakeholders objected to using temperature cycles to define test periods. Hence, DOE is adopting its proposed amendments to section 5.1.2 of Appendices A and B for correcting the test procedure requirements for measuring compartment temperatures, except for the option to select test periods based on temperature cycles.

6. Mechanical Temperature Controls

Recently, third-party test facilities have asked DOE to clarify how to determine the proper settings for mechanical temperature controls. Specifically, they inquired whether, when setting mechanical controls to the warmest or coldest setting, the control should be adjusted to the position at the last number or symbol on the control, or whether it should be positioned to the most extreme physical positions of the control. In response to these inquiries, DOE proposed requiring that mechanical controls be set to the highest or lowest number or symbol indicated on the control. DOE proposed this method instead of the alternative because of the possibility of unintentionally turning off the unit when moving the control to the extreme physical position for the warmest setting.

GE noted that different test facilities follow different methods for determining the warmest and coldest settings. (GE, No. 31 at p. 7) GE and Whirlpool supported DOE's proposal because it would ensure that all test setups are the same, and because the proposal is consistent with the current Canadian Standards Association (CSA) test standard C300–08, ''Energy Performance and Capacity of Household Refrigerators, Refrigerator-Freezers, Freezers, and Wine Chillers,'' (''CSA C300–08''). Section 5.1.7.1(b) of CSA C300–08 requires that control settings must be at the ''marked warmest or coldest settings.'' (GE, No. 31 at p.7; Whirlpool, No. 27 at p. 3))

FSI supported DOE's intent to limit the interpretive nature of the test procedure, but stated that some products use temperature controls with ''extreme cold'' positions that bypass the thermostat and are intended only for short-duration, rapid cool-down of newly inserted food. It also noted that the behavior of some compact products may be erratic at extreme temperature control settings. (FSI, No. 20 at p. 7) (FSI did not provide details of this erratic nature or why this behavior would occur specifically in compact products.) FSI recommended that the procedure use control settings for warm and cold operation that are one position higher and lower than the median position. (*Id.*) DOE notes that this method has not been previously raised or considered, and FSI provided no data to support its suggested approach. As a result, in the absence of any supporting data and with no opportunity for public comment on this approach, DOE is declining to include FSI's additional recommendations and is adopting into section 3.2.1 of Appendices A and B the proposed amendment for mechanical controls. DOE notes, however, that any party that believes that testing a given model in accordance with the DOE test procedure will yield materially inaccurate comparative data must apply for a test procedure waiver.

7. Ambient Temperature Gradient

Location of Ambient Temperature Sensors

Appendices A and B reference HRF–1–2008 for ambient temperature measurement requirements. However, the version of HRF–1–2008 in use at the time DOE was preparing the July 2013 NOPR did not specify the location of sensors to measure ambient temperature. As a result, DOE proposed to add sensor location requirements in a new section 2.1.1. The proposal specified that the ambient temperature be recorded at points located 3 feet above the floor and 10 inches from the center of the two sides of the unit, the same locations that have been used for refrigerator testing for decades. See, e.g., HRF–1–1979, sec. 7.4.3.1, incorporated by reference in 10 CFR part 430, subpart B, Appendix A1.

FSI opposed DOE's proposal to measure ambient temperature on the sides of the units. (FSI, No. 20 at pp. 7–8) However, based on FSI's additional comments, DOE believes that FSI objected to DOE's proposal to require additional measurement of ambient temperature at heights of 2 inches and 7 feet (or one foot above the top of the unit, whichever is higher) rather than its proposal to require the two ambient temperature measurements at the locations used in the current test procedure. DOE believes that FSI's concern is about the proposed requirement for four additional ambient temperature sensors. This issue is associated with maintenance of the ambient temperature gradient rather than specifically the measurement of

ambient temperature, which is discussed below.

AHAM, GE, and Whirlpool supported the proposed sensor locations. (AHAM, No. 30 at p. 19; GE, No. 31 at p. 7; Whirlpool, No. 27 at p. 4) AHAM stated that it issued an errata document in April 2013 for HRF–1–2008 to correct its inadvertent omission of specified temperature sensor locations. Given the publication of the errata, AHAM indicated that the new section of Appendices A and B proposed in the NOPR to address this issue may not be required (AHAM, No. 30 at p. 19), likely basing this statement on the assumption that, once the errata were published, they would be considered to be incorporated by reference in DOE's test procedures with the surrounding sections of HRF–1–2008. DOE notes that its test procedures would have to be amended to clarify that the new section of HRF–1–2008 is incorporated by reference; when DOE incorporates a standard, the standard is only incorporated as it exists at the time of incorporation. As such, DOE had to specifically incorporate the November 17, 2009 Errata to make them a part of the DOE test procedure.[16] However, some of the proposals for the new ambient temperature section in Appendices A and B that DOE is adopting, discussed below, are not the same as the language in HRF–1–2008. Hence, DOE has decided to adopt the proposal to insert the ambient temperature requirements directly in section 2.1.1 of Appendices A and B. DOE notes that its requirements for ambient temperature measurement are consistent with the requirements in HRF–1–2008, including the recent errata, but that the adopted text more clearly describes the requirements.

Relocation and Shielding

In the July 2013 NOPR, DOE noted that the requirements in Appendices A and B suggest that relocating ambient temperature sensors is appropriate when necessary to avoid the impact of the warming effect of the condensing unit. DOE does not believe that this relocation is appropriate for the reasons outlined in the NOPR. See 78 FR 41643 (July 10, 2013). Hence, DOE proposed to eliminate the temperature sensor relocation option. This option is suggested by section 5.3.1 of HRF–1–2008, which is incorporated by reference in Appendices A and B: ''Temperature measuring devices shall be located or shielded so that indicated temperatures are not affected by the operation of the condensing unit or adjacent units.'' DOE proposed language to clarify that shielding is allowed but not relocation of the sensor. DOE proposed to include the modified language in Appendices A and B in the revised section 2.1 addressing ambient temperature requirements. DOE received no stakeholder comments opposed to the modified language. Hence, DOE adopts this proposal in this final rule.

Condenser Temperature Sensor

FSI commented that heat can build up behind refrigerators with rear-wall condensers, especially if they are placed near a wall. FSI recommended that DOE require placing a temperature sensor behind any unit with a rear mounted condenser. (FSI, No. 20 at p. 7) FSI provided no details on the exact placement of such a sensor, nor recommendations regarding the purpose or use of the measurement. DOE agrees that heat can build up behind any refrigeration product when placed close to a rear wall, which is the positioning required in the test procedure. The test procedure requires units to be placed with minimal clearance to a rear wall because such placement is very common in consumers' homes—and the test procedure attempts to reproduce any impact that such field placement can have on a refrigerator's performance. See 75 FR 78820–78821. Because FSI provided no supporting details regarding its recommendation and because DOE has no other basis on which to require accounting for heat buildup behind the cabinet, DOE is declining to adopt it.

Maintaining the Ambient Temperature Gradient During Testing

Appendices A and B currently require that the ambient temperature gradient be ''maintained during the test.'' Further, section 5.3.1 of HRF–1–2008, incorporated by reference in section 2.2 of Appendices A and B, indicates that, ''Unless the area is obstructed by shields or baffles, the gradient is to be maintained from 2 inches (5.1 cm) above the floor or supporting platform to a height 1 foot (30.5 cm) above the unit under test.'' DOE explained that this language from HRF–1–2008 is vague as to whether the ambient temperature gradients must be maintained if there are shields or baffles present. DOE proposed to eliminate this ambiguity by (1) removing the reference to HRF–1–2008 section 5.3.1 from section 2.2 of Appendices A and B and (2) revising section 2.1 of Appendices A and B to explain that parties must shield temperature measuring devices when measuring ambient temperature, if necessary to prevent the indicated temperatures from being affected by the condensing unit or adjacent units. DOE received no stakeholder opposition on this proposal and is adopting this proposal.

Regarding the maintenance of ambient temperature gradients, DOE recognized that at least some test facilities have faced difficulties with this requirement, particularly in light of the current lack of specificity in Appendices A and B on how to demonstrate that the temperature gradient is being maintained during testing. DOE proposed to require the use of temperature sensors on both sides of the test sample at 2 inches above the floor, 36 inches above the floor, and either 7 feet above the floor or one foot above the top of the cabinet, whichever is higher. The 36-inch sensors have always been required, as discussed above, and the proposal added four additional required sensors. However, as discussed in the NOPR, most test laboratories already employ the four additional ambient temperature sensors. 78 FR 41644 (July 10, 2013). In addition, DOE proposed that the gradient would be maintained during testing at locations between the two pairs of vertically-adjacent sensors on each side (*i.e.,* between the 2-inch and 36-inch temperature sensors and also between the 36-inch and highest positioned sensors).

FSI objected to the proposed additional temperature sensors to measure the temperature gradient, indicating that while this approach might be suitable for large products with condensers mounted underneath the cabinets, most compact refrigerators have condensers mounted on their rear walls. (FSI, No. 20 at p. 7) The comment did not clarify why maintaining the ambient temperature gradient would not be necessary for accurately measuring the energy use of compact refrigerators. However, FSI also recommended that DOE investigate the frequency at which tests are likely to be invalidated under the proposed requirements due to occurrence of excessive temperature gradients. (*Id.* at p. 8) In DOE's work with test laboratories testing refrigerators, all of these test laboratories have used the four additional temperature sensors to document maintenance of the temperature gradient. While most of the laboratories have had no trouble maintaining the gradient, in some cases there have been issues with maintaining it. However, in such situations, both the laboratory and DOE have agreed that the inability to show that the gradient has been maintained indicates that the test does not follow the *existing* test procedure,

[16] See 10 CFR 430.3(h)(6).

not simply the procedure as proposed in the July 2013 NOPR. Therefore, DOE believes that the 2013 NOPR proposal for ambient temperature gradients would not increase the frequency at which tests would be invalidated due to excessive temperature gradients. The requirement to maintain the gradient has been part of the procedure since development of HRF–1–1979 and the proposal to document maintenance of the gradient is simply a clarification that DOE is at this time adding to the test procedure instructions.

AHAM requested that DOE revise the language of the proposal to better accommodate compact products and products that are less than six feet tall by eliminating the clause ''7 feet (2.2 m) or to a height'' from the proposal in section 2.1.2. (AHAM, No. 30 at p. 19) For a product less than six feet tall, the clause in question would require ambient temperature sensors at locations more than 1 foot above the top of the unit. DOE agrees that maintaining the temperature gradient at heights greater than 1 foot above the unit is not necessary, since the temperature gradient at a distance more than 1 foot from the unit is not likely to affect its performance. Therefore, DOE is adopting AHAM's suggested modification to the DOE proposal in section 2.1.2 of Appendices A and B because the ambient temperature gradient in the space more than one foot above the unit should not affect test results.

Finally, DOE proposed that the temperature measured by ambient temperature sensors be recorded in the test data underlying certifications in accordance with 10 CFR 429.71. DOE received no comment specific to this proposal and therefore adopts this proposal in section 2.1.2 of Appendices A and B.

Revising Ambient Temperature Requirements for Appendices A and B

As mentioned previously, the ambient temperature requirements in Appendices A and B as finalized in the January 2012 Final Rule incorporate by reference certain sections of HRF–1–2008. Because DOE proposed in the July 2013 NOPR to modify some of these requirements, it also proposed to adopt directly into the appendices a modified version of the ambient temperature requirements of HRF–1–2008. This would create new sections 2.1.1 through 2.1.4 for both Appendices A and B and would remove the incorporation by reference for HRF–1–2008, section 5.3.1. DOE received no comments opposed to this amendment and therefore adopts it in this final rule.

8. Elimination of Reporting of Product Height

In the July 2013 NOPR, DOE proposed to eliminate the requirement for manufacturers to report product height in certification reports as currently specified in 10 CFR 429.14(b)(2). DOE made this proposal because the September 2011 Energy Conservation Standard final rule eliminated the 36-inch height restriction in the definition for compact products, effectively expanding the ''compact'' definition to include products with a total volume less than 7.75 cubic feet and height exceeding 36 inches. FSI, GE, Whirlpool, and AHAM all supported the DOE proposal. (FSI, No. 20 at p. 8; GE, No. 31 at p. 7; Whirlpool, No. 27 at p. 4; AHAM, No. 30 at p. 21) No commenter objected to this approach. As a result, DOE is adopting its proposal.

9. Definitions Associated With Defrost Cycles

In its proposal, DOE noted that the January 2012 Final Rule amendments modified the test periods for products with long-time or variable defrost (*See,* e.g., Appendix A, section 4.2.1). 77 FR 3563–3568 (Jan. 25, 2012). That rule provided that the first part of the test would be a stable period of compressor operation that includes no portions of the defrost cycle, such as precooling or recovery. See 77 FR 3563 (Jan. 25, 2012) for a detailed explanation of the concepts of ''precooling'' and ''temperature recovery.'' However, DOE did not define the terms ''precooling'' and ''temperature recovery,'' nor did it define what comprises a ''stable period of compressor operation.'' As a result, DOE proposed definitions for each of these terms in the July 2013 NOPR to clarify the requirements of the test procedure.

Stable Operation Definition

The July 2013 NOPR proposed to establish a definition for the term ''stable operation,'' for which the rate of change of the compartment temperature would be no more than 0.042 °F per hour. This is consistent with the existing test procedure requirement for determining steady-state operation (*See,* for example, Appendix A, section 2.9). For products with compressor cycles, or temperature cycles resulting from the cycling of a system component such as a damper or fan, the average compartment temperatures measured for two separate cycles within a selected period would be compared to determine stability. For products with no temperature cycling, any two points within a period would be compared to determine stability.

AHAM's comment supported the DOE proposal to establish a definition for stable operation. AHAM did, however, suggest that DOE change ''rate of change'' to ''difference in compartment temperatures,'' explaining that this description ''more accurately represents the fact that the test compares the temperature difference between two two-hour periods based on the time between those periods.'' (AHAM, No. 30 at p. 21) DOE agrees that the rate of change is calculated as the difference between two temperature values (measured either at two different times or as the average temperatures during two different time periods representing cycles) divided by the elapsed time between those times (or time periods). This is described explicitly in sections (A) and (B) of the proposed definition. In order to avoid potential misinterpretation that the words ''rate of change'' might mean something different, DOE will modify the definition to call this ''average rate of change''.

AHAM also suggested that DOE include a diagram to assist with the definition of stable operation. (AHAM, No. 30 at p. 21) DOE notes that the figure provided in AHAM's written comments suggests a more restrictive approach in defining stable operation than DOE had intended. AHAM's figure indicates that the two periods that are compared to quantify the temperature rate of change are at least two hours long and that they are separated by at least 3 hours. The definition of stable operation neither has nor was intended to have this restriction, which is part of the current requirement for verifying that steady-state conditions exist (*see* Appendix A, section 2.9). The section 2.9 requirements are used at the start of a test to verify that the compartment temperatures of a product are no longer rapidly decreasing. In contrast, the stable operation definition, while based on the same 0.042 °F per hour (equal to 1 °F per 24 hours), is used to identify periods when the compartment temperatures are not changing or are changing in a repetitive cyclic pattern with minimal upward or downward drift of the per-cycle average temperature. DOE believes that the definition, with the revision regarding temperature difference as suggested by AHAM, is sufficiently clear.

DOE also notes that the definition allows for the evaluation of stable operation for products that do not have cycling compressors but have cycling compartment temperatures. The cycles evaluated to determine existence of

stable operation may be temperature cycles. For this reason, DOE retains its proposed definition of temperature cycles in the test procedures.

DOE also proposed to define ''stable period of compressor operation'' as a period of stable operation for a product with a compressor. 78 FR 41645 (July 10, 2013). AHAM commented that this term was not needed, since the concept is sufficiently clear without having to explicitly define the term, once ''stable operation'' has been defined. DOE acknowledges that the added definition for ''stable period of compressor operation'' is not necessary and has not added it to appendices A or B in this final rule.

Precooling & Recovery Definitions

AHAM also objected to DOE's proposed definitions for precooling and recovery, indicating that Figure 1, which is in Appendices A and B, adequately defines these terms. (AHAM, No. 30 at p. 20) In addition, AHAM claimed that the DOE proposal conflicts with the graphical representation in Figure 1 of Appendices A and B. AHAM indicated that if definitions are established, they should agree with the illustration of ''T2'' in the figure, the test period for the second part of the test. AHAM further suggested that Figure 1 does not define the end of the precool or the start of recovery and that definitions for the terms also should not define these times. (*Id.*)

DOE notes that Figure 1 provides an example illustrating the test period for the second part of the test for a product with a cycling compressor. The figure includes examples of precool and recovery cycles, but it does not illustrate precooling and/or recovery for all situations. Furthermore, the intent of the second part of the test is to capture all product operation that either (1) significantly lowers the compartment temperature before defrost initiation or (2) restores compartment temperatures afterwards. This intent is clear from at least two provisions in the current regulatory text. First, the last sentence in section 4.2.1 of Appendix A as finalized by the January 2012 Final Rule states that ''[t]he second part is designed to capture the energy consumed during all of the events occurring with the defrost control sequence that are outside of stable operation.'' This section clearly identifies operation that is associated with defrost activity and is not consistent with stable operation, *i.e.,* activity that the second part of test is designed to capture. Second, section 4.2.1.1 notes that a ''precooling'' cycle, which is an extended compressor cycle that lowers the temperature(s) of one or both compartments prior to energizing the defrost heater, must be included in the second part of the test.

DOE believes that the proposed definitions for precooling and recovery are consistent with the language in section 4.2.1 describing the second part of the test. AHAM provided an example of a product that cycles from +1 °F to −1 °F and then changes its cycling from +2 °F to −2 °F with equivalent temperature averages. (AHAM, No. 30 at p. 20) AHAM indicated that the second cycle would be considered precooling according to the proposed definition. (*Id.*) DOE agrees that in AHAM's example, the second cycle would be considered precooling because it would have had to include an ''extended compressor cycle that lowers the temperature(s) of one or both compartments prior to energizing the defrost heater.'' In order to cool the compartment the four degrees from +2 °F to −2 °F, the compressor would likely have had to operate twice as long as it would have taken to cool the compartment the two degrees from +1 °F to −1 °F. This would clearly be an extended compressor cycle and would be considered part of the second part of the test under the test procedure of Appendix A as finalized in the January 2012 Final Rule.

AHAM also recommended that DOE use the same terms already existing in Figure 1 (*i.e.,* ''precool cycles'' instead of ''precooling'' and ''recovery cycle'' instead of ''recovery''). (*Id.*) DOE reiterates that Figure 1 illustrates the concepts of precooling and recovery but does not represent all possible defrost cycles. For example, Figure 2 of Appendix A shows a different example, which has ''precool'' and ''recovery'' periods, rather than cycles. DOE does not agree that it should avoid defining the term ''precooling'', which is already used in section 4.2.1 of Appendix A. Hence, DOE does not consider it necessary to use the identical terminology used in Figure 1, as AHAM recommended, and is adopting the ''precooling'' definition as proposed, but has added text to section 4.2.1.1 of Appendices A and B to emphasize that the figure is for illustrative purposes and does not represent all possible defrost cycles.

In response to the proposed definition for ''recovery,'' AHAM indicated that the proposal was problematic because it does not give a numerical definition of when the product has recovered and only references the temperature range. (AHAM, No. 30 at p. 20) DOE notes that the proposed recovery definition does not need a quantitative criterion. It is the period of refrigeration system operation that occurs after the defrost heater has been energized and before steady operation resumes. Hence, recovery can be considered to be complete when steady operation has resumed. This final rule adopts the recovery definition as proposed.

10. Measurement of Product Volume Using Computer-Aided Design Models

To facilitate the accurate measurement of product volume, DOE proposed to permit the use of computer-aided design (CAD) models for measuring and computing the volume of refrigerators, refrigerator-freezers, and freezers for the purposes of certifying compliance with the DOE energy conservation standards for these products. 78 FR 41645–41646 (July 10, 2013). AHAM supported the DOE proposal and indicated that the proposal is consistent with current industry practice. AHAM, No. 30 at pp. 5–6) As a result, DOE is allowing CAD volume calculations to be used. This change will be made in a new section 429.72(c) of 10 CFR part 429.

DOE also proposed regulatory language explaining how DOE would measure volume and calculate the maximum allowable energy use for the purpose of assessment and enforcement testing. DOE proposed to use the average of the adjusted volumes measured for the tested units, rather than the rated adjusted volume, for calculating the allowable energy use, if the average of the total refrigerated volume measurements is not within a prescribed tolerance of the rated total refrigerated volume. This tolerance would be 2 percent of the rated volume or 0.5 cubic feet, whichever is larger, for standard-size products and 2 percent of the rated volume or 0.2 cubic feet, whichever is larger, for compact products. Whirlpool supported this proposal. (Whirlpool, No. 27 at p. 4) DOE proposed to add a new section 429.134 of 10 CFR part 429 to include the proposed volume requirements. DOE received no objections to this approach and is adopting these proposals.

11. Corrections to Temperature Setting Logic Tables

The July 2013 NOPR proposed corrections to the temperature setting logic tables in Appendices A and B. 78 FR 41646–41647 (July 10, 2013). The December 16, 2010 Interim Final Rule established these tables to illustrate the requirements for setting temperature controls during testing. However, these tables were added to the CFR with extra horizontal lines that make the requirements unclear. DOE received no

comment opposing the proposal to correct these logic tables. As a result, DOE will adopt the proposed revisions to the setting logic tables.

12. Minimum Compressor Run-Time Between Defrosts for Variable Defrost Models

The DOE test procedures in Appendices A and B provide specific provisions for calculating the energy use of models with variable defrost, which DOE defines generally as an automatic defrost system in which successive defrost cycles are determined by an operating condition variable or variables other than solely compressor operating time. These calculations include CT_L (minimum compressor run time between defrosts in hours) and CT_M (maximum compressor run time between defrosts in hours). Parties must report CT_L and CT_M values to DOE in their certification reports. If a party does not report such values for a given basic model, DOE would, in any verification or enforcement testing of the basic model, calculate the energy use of the basic model using the default values of 6 and 96 for CT_L and CT_M.

When DOE uses the CT_L and CT_M values reported by the manufacturer rather than the default values, the resulting energy use measurements are typically more representative of the product's actual operation because they represent the actual minimum and maximum amounts of compressor run time between defrosts that the model's control system is designed to use. Thus, the actual compressor run time between defrosts should never be less than CT_L and never greater than CT_M. However, in certain DOE testing of models for which the manufacturer reported values of CT_L and CT_M in the certification report, DOE has found that the number of hours of compressor operation between defrost cycles observed in the test data was less than the CT_L value reported by the manufacturer in its certification report. This difference suggests either that the certified value was erroneous or that the model did not operate as designed. In either case, the energy use calculated using the values reported by the manufacturer would not be representative of how the model actually performed during the test and how it would be expected to perform in the field. In the July 2013 NOPR, DOE proposed to require that the value for CT_L be the shortest compressor run time between defrosts observed during the test, if this observed time is less than the value of CT_L reported in the certification report. 78 FR 41647 (July 10, 2013).

AHAM supported this proposal but explained that products with demand defrost (*i.e.,* those that do not have an algorithm with values of CT_L and CT_M, but instead defrost when necessary) should not be penalized for an observed value of compressor run time between defrosts lower than six hours, which is the CT_L value that would be used according to Appendix A as finalized by the January 2012 final rule. (AHAM, No. 30 at p. 22) (Decreasing CT_L would increase the calculated annual energy use.) DOE is not convinced that a CT_L value equal to 6 hours is the most appropriate value to represent defrost energy use, if a shorter value is observed during testing, because it would yield an inaccurate representation of the tested unit's energy use. However, DOE is concerned about inconsistency in test results that may occur if the proposal is adopted. For instance, the observation of compressor operation less than six hours between defrosts may be a random occurrence, dependent on a variety of factors that lead to the control system determining that a defrost is necessary. Such an event may occur sporadically, which could yield inconsistent test results for different tests of the same unit or different units of the same model. DOE may revisit the issue in a future rulemaking, but is not adopting the proposal for use of the observed value of minimum compressor run-time between defrosts in this final rule for products with no values of for CT_L and CT_M in the algorithm. Instead, the test procedure retains the existing requirements pertaining to the use of a minimum CT_L value of 6 hours where there are no values for CT_L and CT_M in the algorithm, and will require use of the minimum observed value of CT_L if less than the certified value, but will require that it be no less than 6 and no greater than 12.

13. Treatment of ''Connected'' Products

As part of the Version 5.0 ENERGY STAR Specification for Residential Refrigerators and Freezers, DOE developed, in cooperation with the EPA, specifications and test methods for refrigerators and refrigerator-freezers that have the capability to enable consumer-authorized energy related commands, such as demand-response signals from a utility.[17] Products with this capability are referred to generally as ''connected'' products in the final draft version of ENERGY STAR Version 5.0 and its associated test method. (ENERGY STAR Connected Refrigerators and Freezers Final Draft Test Method, No. 14) The draft test method addresses aspects of testing specific to the demand response functionality, but refers to the DOE test procedure in Appendix A to Subpart B of 10 CFR Part 430 for test setup and test conditions. However, the Appendix A test procedure finalized in the January 2012 Final Rule does not address whether the communication module of a connected product should be in active communication mode or a non-communicating mode during the standard DOE energy test, which is used in section 6 of the demand response test to establish the baseline energy consumption. (ENERGY STAR Connected Refrigerators and Freezers Final Draft Test Method, No. 14, p. 3)

After carefully considering how to address connected products, DOE views connectivity as a feature that is subject to section 5.5.2.e of HRF–1–2008, which Appendix A incorporates by reference. That provision states that customer accessible features, not required for normal operation, which are electrically powered, manually initiated, and manually terminated, shall be set at their lowest energy usage positions when adjustment is provided. In the NOPR, DOE applied this approach to cabinet-integrated communications modules on the basis that this feature is not required for normal operation of the product. To ensure that Appendix A provides sufficient clarity on the condition of the communication module of connected products during the DOE energy test, DOE proposed to amend section 2 of the Appendix A test procedure to specify that the communication module, if integrated into the cabinet, must be energized but placed in the lowest energy use position, and there shall be no active communication during testing. DOE noted that some products may be manufactured without an integrated communication module, and instead will have the capability to allow connection of a module supplied by another manufacturer. In these cases, DOE would not specify a test condition for the communication module since the module used for the test will not be part of the basic model produced by the manufacturer. Thus, the proposed amendment to section 2 of the test procedure did not require connection of communication modules for products designed for use of an externally-connected module. Finally, while the ENERGY STAR specification for connected products addresses only refrigerators and refrigerator-freezers, DOE also proposed to add the same provisions to Appendix B to

[17] For additional background on the ENERGY STAR Version 5.0 Specification for Residential Refrigerators and Freezers, go to *https://energystar.gov/products/specs/node/125*.

accommodate any future provisions made for connected freezers. 78 FR 41647 (July 10, 2013).

AHAM opposed the DOE proposal. AHAM indicated that a communication module's connection to a network may not be the lowest energy use position because the energy consumed is not completely in the manufacturer's control. AHAM claimed that the energy consumption when connected to a network mode will vary depending on transmission range, networking technology deployed, and the size and frequency of the data transmissions, all of which may be influenced by devices outside the refrigerator or by parties other than the manufacturer. (AHAM, No. 30 at p. 22)

AHAM also stated that the DOE proposal encourages manufacturers to not integrate communication modules within units because models that do not have integrated communication modules would not need to be tested while connected to a network. (AHAM, No. 30 at p. 22) DOE noted in the July 2013 NOPR that it could not require that models without integrated communication modules be tested with the modules energized, because the designs of third-party modules are not standardized and manufacturers of the refrigeration products cannot generally specify which modules are used with their products. Therefore, requiring products to be tested with an external communication device would not be appropriate.

DOE's key concern regarding on-board communication modules is that the test procedure should measure the energy that the module may use even when the product is not connected to a network for demand-response control. However, DOE recognizes that there would be a potential disincentive to design products with on-board modules if the test required that they be energized and connected during the test. Hence, DOE has modified its proposed approach concerning communication modules by requiring that products with on-board modules be tested in the configuration in which they leave the factory, rather than being energized and connected to a network. These changes are made in section 2.11 of Appendix A and 2.8 of Appendix B. DOE expects that, under this requirement, manufacturers will ship the units in their lowest energy use state, and the energy use associated with the communication module should be nearly or exactly zero, essentially equivalent to the non-existent module power contribution for test of a product designed to use an external communication module.[18]

While DOE has some concerns about communication modules engaged in intermittent higher-energy-use operations when in the presence of communications networks, there is insufficient information at this time regarding the potential for such operation and the likely energy use impact. Furthermore, DOE recognizes that it may be a challenge to develop a test procedure that provides consistent and accurate measurement of the energy use of such communications modules that is representative of their field energy use. DOE may consider development of such a test in the future.

14. Changes to Confidentiality of Certification Data

Section 429.14(b) specifies the data that manufacturers of residential refrigerators, refrigerator-freezers, and freezers must provide to DOE when certifying compliance for each basic model. Data submitted for the items in paragraph (b)(2) (*e.g.,* annual energy use and total adjusted volume) are treated by DOE as public data whereas the data for items in paragraph (b)(3) (e.g., the values for CT_L and CT_M used in the energy use calculation in section 5.2.1.3) are evaluated on a case-by-case basis. The items listed in paragraph (b)(3) include specific information related to variable defrost control, variable anti-sweat heater control, and the use of alternate temperature sensor locations. For models with variable defrost and variable anti-sweat heaters, manufacturers must notify DOE whether certain products have these features, the values for anti-sweat heater power levels at 10 different relative humidity conditions, and the values of the variable defrost parameters, CT_L, and CT_M. Since publishing the current version of section 429.14, DOE has determined that there is no clear reason why whether a model has variable defrost, whether a model has variable anti-sweat heater control or whether the manufacturer used alternate temperature sensor locations should not be public information. DOE proposed to move these items to paragraph (b)(2), making them public data. The other details of variable defrost operation and variable anti-sweat heater control would remain in paragraph (b)(3).

GE, AHAM, Whirlpool, and FSI all submitted comments opposing the DOE proposal. AHAM's comment stated its preference that this information not be made public. (AHAM, No. 30 at pp. 23–24) AHAM stated that DOE could seek additional information from manufacturers on a case-by-case basis, such as the specific locations of temperature sensors. (*Id.*) For its explanation of why the information should be treated as confidential, AHAM referred to the comments it made in response to the compliance, certification, and enforcement rulemaking that resulted in the March 7, 2011 final rule (*see* Docket EERE–2010–BT–CE–0014, No. 98 at p. 6). DOE notes, however, those comments addressed the confidentiality of the CT_L and CT_M values and the actual sensor placement locations—none of which DOE proposed to make public. FSI commented that how each manufacturer obtains the energy consumption of models should be kept confidential. FSI also stated that simplifying the CCMS reporting would be beneficial to all companies, especially smaller companies. (FSI, No. 20 at p. 8) DOE notes that variable defrost can be considered a standard feature for products with electronic controls, which provide the capability to determine the appropriate defrost frequency. GE stated, without further explanation, that information regarding the presence of either variable defrost or variable anti-sweat heaters constitute trade secrets and should not be made public. (GE, No. 31 at p. 9) Contrary to GE's assertion, however, many manufacturers, including GE, have applied for test procedure waivers for models with variable anti-sweat heater controls and have publicly provided a list of models that have this feature. DOE also notes that 33 percent of the models in the CCMS database have been reported to have variable defrost and 5 percent have been reported to have variable anti-sweat heaters, suggesting that these features are fairly common among models available in the industry. For these reasons, and the absence of any specific reasons demonstrating that the presence of these features in already-marketed products constitutes a trade secret or that their disclosure would be likely to cause substantial competitive harm, DOE does not believe that revealing the presence of these features reveals any part of a model's design that could be considered a trade secret or confidential commercial information. However, because several of the comments suggest that parties may have misunderstood the

[18] Since units will be tested in their ''as shipped'' condition, a unit that is not shipped in its lowest energy use condition will use a higher amount of energy than if it had been shipped in the lowest energy use condition. Consequently, manufacturers will have a strong incentive to ensure that all units are shipped set to their lowest energy use setting.

information DOE proposed to make public, DOE will allow another opportunity for comment in another rulemaking prior to reaching a final decision regarding this aspect of its proposal.

15. Package Loading

Section 2.2 of the DOE test procedure for residential freezers, which is located in appendix B1 to subpart B of 10 CFR part 430 (Appendix B1), references the HRF–1–1979 test procedure for provisions related to certain operational conditions and product set-up procedures. Among these is a specific provision described in section 7.4.3.3 of HRF–1–1979, which requires that the freezer compartment be loaded to 75% of the maximum number of filled packages that can be fitted into the compartment, and that the 75% load be fitted into the compartment to permit air circulation around and above the load. The requirements applicable to these products in appendix B to subpart B of 10 CFR part 430 (Appendix B) and the section it references in the HRF–1–2008 procedure (section 5.5.5.3) are identical except that package loading is required only for manual defrost freezers, whereas it is required by HRF–1–1979 for all freezer types.

DOE learned that test laboratories may not all use the same approach to determine the number of packages they must load into a unit prior to testing. To ensure consistency, DOE proposed a method that would require an initial step of filling the compartment completely with as many packages as physically possible. This step would provide an indication of the number of packages required for a 100% fill. The tester would then calculate the number of packages required for a 75% fill, remove packages based on the calculation to achieve the required 75% fill, and adjust the packages to assure the necessary air gaps and the tiered or pyramid form needed for thermocouple placement. DOE proposed placing the description of this method in section 2.9 of Appendix B. The proposed text specified that the number of packages representing the completely filled condition and the number left in the compartment for the test should both be recorded in the test data and maintained as part of the test record in accordance with 10 CFR 429.71. Because section 5.5.5.3 of HRF–1–2008 also applies these requirements to each shelf of a multi-shelf freezer, the requirement to count and record the number of packages would apply on a per-shelf basis for such products. 78 FR 41649 (July 10, 2013).

GE, Whirlpool, and AHAM all agreed with DOE's proposed package loading procedures. (GE, No. 31 at p. 8; Whirlpool, No. 27 at p. 4; AHAM, No. 30 at p. 23) Therefore, this final rule adopts this amendment with one further minor clarification: In the event that the 75% loading calculation results in a fraction, parties shall round to the nearest whole number to determine the required number of packages for loading.

16. Product Clearance to the Wall During Testing

In the December 16, 2010 interim final rule, which established Appendices A and B, DOE included provisions to address product clearances to the wall during testing. 75 FR 78810. Specifically, section 2.8 of Appendix A and section 2.6 of Appendix B both require that the space between the plane of the cabinet's back panel and the vertical surface behind the cabinet (*i.e.,* the test chamber wall or simulated wall) be the minimum distance in accordance with the manufacturer's instructions or 2 inches, whichever is less. These sections specified that if the product has permanent rear spacers that extend beyond this distance, the product must be located with the spacers in contact with the vertical surface. However, DOE received a request for guidance from AHAM dated May 22, 2013 (AHAM Guidance Request) indicating that these provisions may not be sufficiently clear for cases in which the back of the test unit is not all on one plane due to protrusions or surface irregularities. (AHAM Guidance Request, No. 15, p. 2) AHAM requested that DOE clarify these sections by referencing the Committee Draft for Vote (CDV) version of Part 1 of IEC 62552.2 *Household refrigerating appliances—Characteristics and test methods.* According to AHAM, this reference provides guidance on product-to-rear wall spacing that is consistent with section 2.8 but is more specific regarding the treatment of irregular surfaces.

Because the IEC reference that AHAM suggested was not finalized by the time of the NOPR, and because DOE generally seeks to limit the number of external references incorporated in the DOE test procedure, DOE declined to propose incorporation by reference of the IEC procedure that AHAM suggested. However, to improve consistency in testing, DOE proposed to adopt revised language for section 2.8 that is intended to accomplish the same objective. Specifically, DOE proposed to specify that, for the purposes of determining the appropriate clearance to the wall for the test, the rear plane of the cabinet is the largest flat surface at the rear of the cabinet. The proposed test procedure would also have indicated that individual features, such as brackets, compressors, or condensers that protrude from the rear plane could not be used as the basis for determining the rear clearance. AHAM agreed with this DOE proposal. (AHAM, No. 30 at p. 9)

PAPRSA opposed this proposal, explaining that disallowing manufacturers to measure rear wall clearance from the plane of a rear wall-mounted external condenser represents an unfair burden on products with rear-mounted condensers. PAPRSA explained that the proposed requirement would leave manufacturers with less than 12 months to develop measures to make up for the additional reduction in rear-wall clearance under the new September 15, 2014 standards. (PAPRSA, No. 28 at p. 2) Based upon PAPRSA's comments, DOE agrees that there are valid reasons to consider a rear-mounted condenser as the rear plane of the cabinet for the purposes of positioning the unit for testing, provided that the heat exchanging portion of the condenser is in fact mounted on the rear of the cabinet and consists of a uniformly flat (plane-shaped) array of refrigerant tubes (*i.e.,* not a rear-mounted condenser that is nearly uniformly flat, but with one or two refrigerant tubes protruding farther beyond the rear surface of the cabinet than the main plane of the condenser). DOE has modified the proposal to allow a rear-wall condenser to be considered the rear plane if it is plane-shaped and if the total surface area of the condenser plane is at least one-quarter of the total area of the rear face of the cabinet (*i.e.,* the unit's height times its width). This ratio is based upon DOE's evaluation of products currently available on the market that have rear-mounted condensers and is intended to include all such products that would be most appropriately tested using this provision. The modified language provides a tolerance on flatness of the rear-wall condenser of plus or minus one-quarter inch (*i.e.,* the plane would have to be uniformly flat) and indicates how the area of the rectangular plane would be determined. Therefore, today DOE adopts the proposal for rear clearance except that it allows rear-wall condensers that are planar and sufficiently large to be considered the rear plane for the maximum 2-inch clearance requirement.

FSI disagreed with the proposed exclusion of protrusions extending beyond the rear plane when considering

the rear-wall clearance, indicating that there may be many design reasons to include such protrusions. FSI also commented that DOE's discussion regarding products that might be installed with a slight rear tilt was unnecessary because manufacturers' installation instructions generally require level installation. (FSI, No. 20 at p. 9) DOE believes that the exclusion of protrusions is necessary in order to ensure consistency in test results. There may be multiple protrusions, and it may not be clear which protrusion is the appropriate one for measuring the rear clearance. In addition, allowing the clearance to be measured from a small protrusion incentivizes the incorporation of a minor extension beyond the rear plane simply to obtain additional clearance for the test, while the protrusion would most likely be pushed against the rear wall in field installations. Hence, this final rule retains, in section 2.8 of Appendix A and 2.6 of Appendix B, the requirement that clearance be measured from the rear plane. Regarding the potential for rearward tilt, the proposed language simply addresses set-up requirements in cases in which the manufacturers' instructions lead to installing the unit such that the rear plane is not perfectly parallel to the rear wall. Since DOE has identified products for which the manufacturer's instructions would result in installation with a slight rearward tilt, DOE believes that adopting this provision as proposed will more accurately reflect the intended use of each product and will have no effect on products for which the instructions do not result in a rearward tilt.

17. Other Minor Corrections

In the July 2013 NOPR, DOE noted a minor error in section 6, ''Calculation of Derived Results From Test Measurements,'' of Appendix A. Section 6.2.2.2 provides the method for calculating average per-cycle energy use (''E'') for refrigerators and refrigerator-freezers through calculations based on compartment temperatures. This section currently states that ''E'' is defined in section 6.2.1.1. However, section 6.2.1.1 did not define the term ''E'' and contained only the equation E = ET1 + IET, which DOE felt did not sufficiently clarify the term's meaning. Since the term ''E'' has the same basic meaning for all portions of section 6.2, DOE proposed to define this term in the introductory text of section 6.2 and to modify the text in the subsequent sections to refer to the definition consistently. For consistency, DOE proposed nearly identical changes for Appendix B. DOE received no comment opposing this proposal and therefore adopts this change in this final rule.

DOE also noted that a certain aspect of the definition of ''compact refrigerator/refrigerator-freezer/freezer'' in 10 CFR 430.2, which distinguishes the product classes in section 430.32(a) for compact products from the classes for standard-size products, could potentially cause confusion. Specifically, compact products are defined to be under 7.75 cubic feet in volume. The definition used the term ''rated volume,'' which is not defined or listed elsewhere in DOE's test procedures or reporting requirements for these products. The definition is intended to refer to ''total refrigerated volume,'' but ''rated volume'' could potentially be confused with ''adjusted volume,'' which is a different measurement. To prevent confusion regarding the applicability of this definition, and to ensure standard terminology is used throughout DOE's regulations, DOE proposed to amend the definition of ''compact refrigerator/refrigerator-freezer/freezer'' in 10 CFR 430.2 to specifically indicate that the definition applies to the product's total refrigerated volume. DOE received no comments in opposition to this proposal and therefore adopts this change in this final rule.

AHAM raised other minor issues in its guidance request to DOE dated May 22, 2013, referred to previously in section III.C.13. See also 79 FR 41649. AHAM stated that the last sentence of the existing definition of ''Defrost cycle type'', found in section 1.9 of Appendix A (as finalized by the January 2012 Final Rule), may be causing confusion. This sentence states that ''defrost achieved regularly during the compressor off-cycles by warming the evaporator without active heat addition is not a defrost cycle type.'' AHAM stated that this sentence could be interpreted as indicating that off-cycle defrost is not considered to be a type of automatic defrost. (AHAM Guidance Request, No. 15, p. 2) DOE inserted the clause in section 1.9 regarding off-cycle defrost as part of the December 2010 Interim Final Rule in response to AHAM's comments during that rulemaking that off-cycle defrost should not be considered a defrost cycle type. 75 FR 78838 (Dec. 16, 2010). This clause was intended to distinguish off-cycle defrosts from the unique types of defrost cycles that involve a defrost heater, whose energy use contributions must be measured individually for products with multiple defrost cycle types. See Appendix A, section 4.2.4. However, as AHAM pointed out in its recent comments, the current language in section 1.9 is not intended to indicate that off-cycle defrost is not a form of automatic defrost. DOE clarified this issue as part of the preliminary analysis for the energy conservation standard rulemaking that ended September 15, 2011. (Energy Conservation Standards for Residential Refrigerators, Refrigerator-Freezers, and Freezers, 2009–12–10 Public Meeting Presentation Slides, Docket No. EERE–2008–BT–STD–0012, No. 28 at p. 21)

DOE understands AHAM's concerns about possible misinterpretation of the cited sentence. To resolve this issue, DOE proposed to revise the definition of ''defrost cycle type'' in section 1.9 of Appendix A to clarify that off-cycle defrost is a form of automatic defrost, even though it is not considered a defrost cycle type for the purposes of the test procedure for products with multiple defrost cycle types. AHAM supported the proposed revision. (AHAM, No. 30 at p. 24) As a result, DOE is adopting the revised definition in this final rule for section 1.11 of Appendix A.

18. Relocation of Shelving for Temperature Sensors

HRF–1–2008, section 5.5.4, which is incorporated into the DOE test procedures by reference (*See* section 2.2 of Appendices A and B), requires at least one inch of air space separating the thermal mass of a temperature sensor from contact with any surface. In the case of interference with hardware at the specified sensor locations, section 5.5.4 requires that the temperature sensors be placed at the nearest locations such that there will be a one-inch air space separating the sensor mass from the hardware. In the July 2013 NOPR, DOE stated that, if the sensor is near shelving or other components whose position is adjustable by the consumer, it is more appropriate to relocate the shelf or component than to relocate the sensor. However, HRF–1–2008 section 5.5.2(a) requires that shelves and bins be evenly spaced throughout the compartment. As a result, DOE proposed to revise the test procedures to indicate that temperature sensor location would take precedence over the position of shelving and components whose position is adjustable by consumers, even if this means that the separation between shelves is not precisely equal. Specifically, DOE proposed to add language to Appendices A and B, section 5.1, indicating that consumer-movable shelves and other components should be moved to maintain temperature sensor clearance requirements, allowing the temperature

sensor locations to remain as specified in HRF–1–2008 Figure 5–1 or 5–2, but that parties should otherwise adhere as closely as practicable to the shelf-placement requirements of section 5.5.2 of HRF–1–2008 (including the requirement that shelves and door bins be evenly spaced). 78 FR 41649 (July 10, 2013).

AHAM commented that the DOE proposal will impact some products significantly more than others. AHAM claimed that the range of impacts is so great that DOE should not make this change to the test procedure at this time. AHAM also stated that DOE's proposal could result in measurements that are unrepresentative of actual consumer use. The test data AHAM provided showed an average impact of −0.58 kWh per year with a range of −21 kWh per year to +18 kWh per year. (AHAM, No. 30 at p. 10) DOE agrees that the proposal may have an impact on measured energy use for a small percentage of products. Therefore, DOE will not adopt its proposal to prioritize temperature sensor locations over shelf placement. More specifically, the test will require that the shelves be placed in accordance with the requirements in section 5.5.2 of HRF–1–2008, and the sensors then be placed in the locations required in Figure 5–1 or 5–2 of HRF–1–2008. If the sensors cannot be placed in those locations due to interference with hardware, they must be relocated as to maintain the required 1-inch air gap between the sensor and adjacent hardware.

Further, DOE is modifying the language in section 5.1 of Appendices A and B. In each appendix, this section (1) explains where parties must place temperature sensors and (2) requires parties that use alternative sensor locations for a particular basic model to (a) record the locations in the test data maintained in accordance with 10 CFR 429.71 and (b) report the use of ''non-standard'' temperature sensor locations in certification reports for the basic model, as required by 10 CFR 429.14(b)(3). DOE is revising this section to specify that this reporting is required if the sensors are moved by any amount from the locations specified in Figure 5–1 or 5–2 of HRF–1–2008 in order to maintain the required 1-inch clearance from adjustable shelves or other components whose location is consumer-adjustable. Such reporting will give DOE notice in the case of verification testing that special attention must be paid to the specific locations of temperature sensors and shelves to ensure both are located in a manner consistent with the approach used in certification tests. Further, if there is any question about the locations, DOE may request manufacturers' test reports to review exact locations of the sensors and components.

D. Other Matters Related to the Test Procedure and Discussion of Proposals Not Adopted in This Final Rule

1. Icemaking Test Procedure

Nearly all refrigerator-freezers currently sold either have a factory-installed automatic icemaker or are ''icemaker-kitable''—*i.e.,* they are manufactured with the necessary water tubing, valve(s), and icemaker mounting hardware to allow quick installation of an automatic icemaker at any time after the product leaves the factory. Ice production increases the energy use of a refrigerator-freezer in two ways: (1) Some icemaker components (e.g., the mold heater and the gear motor) consume energy, and (2) additional refrigeration is required to cool and freeze incoming water and to remove the heat generated by icemaker components (e.g., the mold heater). The current test procedure for refrigerators and refrigerator-freezers does not measure the energy use associated with ice production. Specifically, HRF–1–1979, section 7.4.2 (which is incorporated by reference into Appendix A1) states, ''Automatic icemakers are to be inoperative during the test''.

In the May 2010 NOPR DOE issued when proposing amendments to the test procedure that will become required later this year, DOE indicated that energy use associated with automatic icemaking represents 10 to 15 percent of the rated energy use of typical refrigeration products. See 75 FR 29846–29847 (May 27, 2010). As discussed in section I of this rule, stakeholders commented, in response to DOE's presentation of its preliminary analysis supporting the recently completed energy conservation standard rulemaking, that the test procedures and energy conservation standards for refrigeration products should address icemaking energy use. (*See, e.g.,* Energy Conservation Standards for Refrigerators, Refrigerator-Freezers, and Freezers, Docket No. EERE–2008–BT–STD–0012; ACEEE, No. 46 at p. 1).

However, stakeholders also commented that a test procedure to measure icemaking energy use had not yet been sufficiently developed. (Energy Conservation Standards for Refrigerators, Refrigerator-Freezers, and Freezers, Docket No. EERE–2008–BT–STD–0012; AHAM, No. 37 at p. 2: General Electric, No. 40 at p. 1) To avoid delaying the energy conservation standard rulemaking, DOE published the new Appendix A test procedure and related energy conservation standard with a fixed placeholder energy use value of 84 kWh per year for products with automatic icemakers, to represent the average amount of energy consumed in ice production. 75 FR 78842–78843 (Dec. 10, 2010) and 76 FR 57538 (Sept. 15, 2011). (The 84 kWh per year value is equivalent to the 0.23 kWh per day value found in Appendices A and B, Section 6.2.2.1. That 0.23 kWh per day value is multiplied by 365 (*See,* e.g., 10 CFR 430.23(a)(1)), which yields an annual consumption of 84 kWh per year.)

In 2010, joint stakeholders, including manufacturers and efficiency advocates, drafted a consensus agreement that outlined recommendations for new energy and water conservation standards, test procedures, tax incentives and ENERGY STAR criteria for major home appliances. As part of that agreement, AHAM agreed to develop an icemaking test procedure before January 1, 2012. (Test Procedure for Residential Refrigerators, Refrigerator-Freezers, and Freezers, Docket No. EERE–2009–BT–TP–0003, Joint Comment, No. 20 at p. 5) In early January 2012, AHAM provided DOE with a draft of its icemaking test procedure, ''AHAM Refrigerator, Refrigerator-Freezer, and Freezer Ice Making Energy Test Procedure, Revision 1.0—12/14/11''. (AHAM Draft Test Procedure, No. 4) That draft indicated that it would apply to refrigerators, refrigerator-freezers and freezers, as defined in 10 CFR 430.2, that are equipped with a single automatic icemaker (including non-icemaker-equipped models that could be readily retrofitted with an optional automatic icemaker).

In July 2012, AHAM provided DOE with a revision of its icemaking test procedure, ''AHAM Refrigerator, Refrigerator-Freezer, and Freezer Ice Making Energy Test Procedure, Revision 2.0—07/10/12''. (AHAM Revised Draft Test Procedure, No. 5) The AHAM Revised Draft Test Procedure would have applied to products that have one or more automatic icemakers. In addition, it includes several revisions to the AHAM Draft Test Procedure.

The July 2013 NOPR proposed an icemaking test procedure based largely on the AHAM Revised Draft Test Procedure. However, stakeholders requested additional time to review and comment on DOE's proposal. (AHAM, No. 24 at p. 1) In order to allow stakeholders additional time to review its proposed amendments for measurement of icemaking energy use,

DOE will delay finalization of these amendments. As part of this process, DOE will provide the public with an additional opportunity to weigh in with their views regarding the icemaking test procedure through public notice and comment. Consequently, this final rule includes no amendments to the test procedures associated with measurement of icemaking energy use.

The July 2013 NOPR also proposed to define ''through-the-door ice and water dispenser,'' explaining that this term appears in discussions of both icemaking operations and volume calculations within HRF–1–2008, which is incorporated by reference in Appendices A and B. The proposed definition indicated that a through-the-door ice/water dispenser could dispense ice only, both ice and water, or water only. 78 at 41620 (July 10, 2013). AHAM commented that the ''through-the-door ice and water dispenser'' definition should not include ''water only'' dispensers because this language would confuse product class determinations. (AHAM, No. 24 at p. 8–9) DOE agrees that, although an ice and water dispenser may dispense water, the term as used in HRF–1–2008 is not intended to denote water-only dispensers. Hence, this final rule modifies the definition so that it applies to ice-only and ice/water dispensers, but not water-only dispensers.

2. Built-In Refrigeration Products

The July 2013 NOPR provided data showing the impact on measured energy use of testing built-in products in a built-in configuration. DOE requested information from stakeholders regarding this issue, including (a) additional data showing the impact on the energy use measurement of testing such products in a built-in condition, (b) the test burden that would be incurred with such a requirement, and (c) whether the DOE test procedure should require testing of built-in products in a built-in condition. AHAM requested an extension of the comment period to January 31, 2014, to allow stakeholders more time to prepare comments on this issue. (AHAM, No. 24 at p. 1) DOE granted this request. Hence, given the need for DOE to thoroughly review these comments and any accompanying data, DOE will address this issue more fully in a future notice.

3. Specific Volume Measurement Issues

As part of the same May 22, 2013 guidance request referred to previously in this final rule, AHAM requested that DOE clarify certain provisions of its prescribed method for measuring product interior volume in section 5.3 of Appendices A and B. Section 5.3 references section 4 of HRF–1–2008 in both Appendices A and B. Section 4.2.2 of HRF–1–2008 lists several components that parties must deduct from the measured interior volume, including ''the volume of air ducts required for proper cooling and operation of the unit.'' Specifically, AHAM asked DOE whether this particular provision includes only air ducts that supply cold air to the fresh food and freezer compartments, or to all air ducts within the unit. (AHAM Guidance Request, No. 15, p. 2) The guidance request did not include specific examples of ducts other than those that supply air to the fresh food and freezer compartments, which are both required for proper cooling and operation of the unit. In the July 2013 NOPR, DOE stated that it was aware of air ducts used to cool icemaking compartments and that such ducts would also be required for proper operation of any refrigeration product that is equipped with an automatic icemaker, or any kitable product with an icemaking compartment that could have an automatic icemaker installed after shipment. As of the July 2013 NOPR, DOE was not aware of any other specific examples. However, since the volume measurement method generally excludes volumes occupied by components that are not intended to be removed by the user and that occupy space that cannot be used for storage, which are both likely to apply to an air duct, DOE took the view that parties should deduct the volume of any air duct in the interior of the cabinet from the measured product volume.

AHAM responded by asking DOE not to require deduction of the measured volume of all air ducts in the interior of the cabinet, such as those that transfer cold air from an interior compartment to another enclosed space within the compartment. AHAM stated that DOE may have misunderstood the use of the term ''unit'' in HRF–1–2008, which AHAM claimed is intended to refer to the entire refrigeration system, and suggested that DOE may be interpreting ''unit'' to mean the entire product. As explained by AHAM, the air ducts that are required ''for the proper operation of the unit'' are those required for providing air flow from the refrigeration system to the fresh food/freezer/separate auxiliary compartments and that air ducts that supply fresh food, freezer, and separate auxiliary compartments should be deducted from the total volume, which is consistent with the DOE view expressed in the July 2013 NOPR. However, AHAM also indicated that the temperature inside special compartments and icemaker compartments are not included in the overall compartment temperature measurement, and thus their associated air ducts should not be required for proper operation of the refrigeration system. (AHAM, No. 30 at p. 7)

DOE responded to AHAM's request for clarification on whether the air duct volumes are included in the measured volume in the July 2013 NOPR by clarifying how the currently required test procedure must be followed. Further, DOE notes that HRF–1–2008 is not sufficiently descriptive as to indicate that certain ducts are treated differently from others for the purposes of volume measurement, or that the term ''unit'' has a specific meaning within this particular context. DOE's interpretation is based upon the past use of the term ''unit,'' which it believes is otherwise consistent with the remainder of the HRF–1–2008 test procedure, the DOE test procedure, and the testing methods for other products. Hence, DOE has not modified its interpretation that the volume of any air ducts in the cabinet would be deducted from the product's total refrigerated volume.

In addition, the July 2013 NOPR clarified whether the volume of water tanks used for chilling of water to be dispensed in a product's water dispenser should be included or excluded in the calculation of total refrigerated volume. The NOPR indicated that if a water tank is integral to a product's dispenser, it would be excluded from the volume, but that otherwise, it would be included. 78 FR 41651 (July 10, 2013). AHAM commented that the tank would always be in the product's refrigerated space and thus should always be included in the product's total refrigerated volume, regardless of its proximity to the dispenser. (AHAM, No. 30 at p. 7) After consideration of AHAM's comment, DOE agrees that the volume of any water tank housed within the refrigerated space should be included in the calculation of total refrigerated volume. and notes that this provision is not limited to water tanks, but would apply to any other component that is located entirely within the refrigerated volume and not specifically excluded from the volume measurement by section 4.2.2 of HRF–1–2008.

4. Treatment of Products That Are Operable as a Refrigerator or Freezer

In the July 2013 NOPR, DOE addressed concerns regarding the appropriate test setting for products with a single compartment that can operate either as an electric refrigerator or freezer, as defined in 10 CFR 430.2. DOE noted that section 2.7 of Appendix

A1 and Section 2.7 of Appendix A both require compartments that are convertible (*e.g.,* from fresh food to freezer) to be operated in the highest energy use position. 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. In July 2013 NOPR, DOE stated that if the product is marketed as both an electric refrigerator and as a freezer, the product must be tested as both covered products, must meet both applicable standards, and must be certified as meeting both standards. If, however, the product is marketed only as a refrigerator or only as a freezer, the product must (1) be tested in accordance with the applicable test procedure, (2) meet the appropriate standard for that product, and (3) be certified accordingly. 78 FR 41651 (July 10, 2013).

AHAM commented that the DOE proposal for convertible products would impose an added test burden on manufacturers. Instead, AHAM suggested that DOE require that products be tested in the most energy intensive position, which AHAM claims is consistent with industry practice. (AHAM, No. 30 at p. 24) AHAM acknowledges that its own suggestion would still require test facilities to test convertible products as both a refrigerator and a freezer, but would be less burdensome than the DOE proposal. (*Id.*) DOE notes that the most energy intensive configuration may not be the configuration for which energy use is closer to the maximum allowable energy use for that particular configuration. Specifically, in certain cases, the lower energy use position (*i.e.,* testing as a refrigerator) could result in measured energy use that is more likely to exceed the standard for the applicable refrigerator standard than the freezer standard when measured in the freezer configuration. Since such products must be able to meet the standard for each type of product, in DOE's view, certifying compliance with only one of the configurations is incomplete. After further consideration, in part based on AHAM's comment, DOE recognized that the language in the NOPR is inconsistent with the DOE's existing regulatory definitions. Therefore, to ensure that consumers receive the most accurate information, DOE is requiring that convertible products be tested and certified as both refrigerators and freezers if the products meet the applicable definition(s). Furthermore, DOE notes that the definitions are applicable to a given model based on the performance of that model when operating under typical field conditions—not at the test procedure conditions.

To ensure that this requirement is clearly indicated in the regulations, DOE has added a new paragraph 10 CFR 429.14(c) to include this requirement. Specifically, 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.

5. Stabilization Period

AHAM's May 22, 2013 guidance request asked whether the stabilization period (*See* section 2.9 of Appendix A1 for an example) has a maximum time constraint. (AHAM Guidance Request, No. 15, p. 4) The stabilization period for products with cycling compressors consists of two separate time periods, each of which lasts at least two hours and comprises a whole number of compressor cycles, with an intervening time period of at least three hours. Specifically, AHAM asked whether the two time periods in question have a maximum duration or if they must be selected to be as short as possible while still satisfying the requirements. (*Id.*) In the July 2013 NOPR, DOE stated that neither of these requirements is explicitly stated in the test procedure, and neither is implied. DOE further indicated that the two time periods in question may be extended, for example, if there is irregular cycling of the compressor that makes the first possible selection of such a time period non-representative of the average compartment temperatures for the captured time period. However, it would not be consistent with the test procedure to select two sets of time periods that would allow stability to appear to have been achieved when it has not. Alternative selections of time periods that satisfy the test procedure requirements should also demonstrate that stability has been achieved. At the time of the July 2013 NOPR, DOE did not believe that changes to the test procedure regulatory language were required to address this issue. 78 FR 41651 (July 10, 2013).

In its comments, GE expressed concerns that DOE's view would allow selection of the three time periods used to evaluate steady state operation (*i.e.,* the two periods for which average temperatures are measured and the intervening period separating the first two) to be left wholly to the discretion of the test facility, which could result in different test results for the same set of test data. (GE, No. 31 at p. 9) However, GE did not provide specific examples that show clearly why DOE should amend the stability requirements (*e.g.,* to require the shortest stability time period that meets the requirements of section 2.9 of Appendix A). DOE believes that, in general, if stability is demonstrated for the shortest time period meeting the requirements that can be examined for a given time period of product operation, evaluation of the steady state condition should also be confirmed if different periods are selected for verifying that steady state operation has been reached. In other words, in a typical case, if the confirmation of steady state depends on the selection of specific time periods, while disregarding other adjacent time periods, the product has not fully reached steady state. In general, DOE expects that a test laboratory will select the shortest possible stabilization period in any case, in order to shorten test time. The test procedure has never had a maximum duration for the stabilization periods, and DOE believes GE's comment does not provide sufficient information to justify a maximum duration. Therefore, DOE is declining to amend the stabilization requirements in the test procedure.

E. Compliance With Other EPCA Requirements

1. Test Burden

EPCA requires that the test procedures DOE prescribes or amends be reasonably designed to produce test results that measure the energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average

use cycle or period of use. These procedures must also not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) DOE has concluded that the amendments proposed in this final rule satisfy these requirements.

Some of the test procedure amendments made in this final rule clarify how existing provisions of the test should be conducted, or otherwise represent minor changes to the test that do not significantly affect the equipment required for testing or the time required to conduct it. These amendments include changes to the anti-circumvention language and ambient temperature gradient requirements, and clarifications regarding how to set mechanical temperature controls. AHAM suggested that ambient temperature gradient requirements could add an initial burden as test facilities adjust to accommodate the clarifying amendments. For example, laboratories may have to purchase additional thermocouples and fixtures to hang them. AHAM also suggested that ambient temperature amendments would require rewriting data acquisition software and could require some laboratories to obtain data acquisition hardware/equipment. (AHAM, No. 30 at p. 25) FSI expressed concern that the ambient temperature gradient requirements may invalidate some tests, leading to additional testing time, and that some test chambers may not be able to meet the requirements without significant facility modifications. (FSI, No. 20 at p. 8)

DOE notes that it expects test facilities may need to make slight modifications to adhere to the clarified version of the ambient temperature requirements, particularly in demonstrating that the temperature gradients have been maintained. DOE does not consider the small initial costs involved with temperature sensors and ambient temperature fixtures to be significant compared to the costs of running multiple tests. In addition, based on comments received on previous rulemaking proposals involving data collection methods, DOE expects all test facilities to already have the data acquisition systems to adhere to all of the requirements being adopted today. Therefore, DOE believes this requirement is not likely to result in a significant additional test burden. As discussed in section III.C.6, DOE considers the amendments concerning the maintenance of the ambient temperature gradient to merely clarify the test procedure by specifying how to interpret the existing requirement for maintenance of the gradient. Hence, DOE does not consider these amendments to impose any new test facility requirements.

This final rule also makes other changes, none of which would have a significant impact on burden. First, the modifications in the test procedure for incomplete cycling products could increase or decrease test time, as discussed in the NOPR. 78 FR 41641 (July 10, 2013). However, based on tests conducted by DOE, the impact on test time for the amendment being adopted does not appear significant. FSI submitted comments that suggest it would incur significant test burden because the incomplete cycling modifications would increase test complexity. (FSI, No. 20 at p.6) DOE does not agree with this claim. The DOE proposal simply aligns the test procedure for incomplete-cycling products with those for products with cycling compressors by requiring a whole number of compressor cycles—the only difference being that a single compressor cycle is acceptable if the cycle takes at least 12 hours. In DOE's view, this change does not constitute an increase in complexity. In DOE testing conducted prior to publication of the July 2013 NOPR, only four chest freezers tested have exhibited incomplete cycling. The impacts in test time for these four products were reductions for three products of 0.5, 3, and 10 hours and an increase for the fourth of 1.4 hours. 78 FR 41614 (July 10, 2103). These results show that the impact on test burden would be small and limited primarily to chest freezers.

Second, this final rule introduces an optional triangulation approach for products with two temperature controls. AHAM and FSI both submitted comments stating that reporting whether the triangulation method was used is an unnecessary burden. (AHAM, No. 30 at p. 17; FSI, No. 20 at p.5) DOE notes that it proposed to allow the use of triangulation in response to the request of stakeholders in a previous refrigeration product test procedure rulemaking and that the use of this approach, as implemented in this final rule, is on an optional basis. However, DOE has not adopted the proposed requirement to indicate in certification reports whether the method was used in testing—hence, it is DOE's belief that the amendments adopting triangulation represent no added burden.

Additionally, the test procedure modifications for products with multiple-compressors are, for the most part, consistent with the test procedures of existing test procedure waivers. This final rule eliminates most of the provisions of the multiple-compressor test procedure that DOE proposed in the NOPR that stakeholders criticized due to the potential added test burden. The key exception is the requirement that the first part of the test must be a continuous time period. However, as discussed in section III.C.1, DOE has imposed this requirement to limit the potential impact of truncation error; allowing the waiver approach could potentially introduce error in excess of the one percent that AHAM views as unacceptable. (*See* AHAM, No. 30 at p. 15)

DOE acknowledges that some test facilities may need time to adjust to the various test procedure modifications made in this final rule but believes that the modest burden associated with these adjustments is appropriate given the need for test results to be accurate and repeatable.

Other amendments, including changes to the anti-circumvention language, the specifications for setting mechanical temperature controls, and the adoption of new definitions associated with defrost cycles, would clarify the test procedures but not add any new requirements that would increase test burden.

2. Changes in Measured Energy Use

When DOE modifies test procedures, it must determine to what extent, if any, the new test procedure would alter the measured energy use of covered products. (42 U.S.C. 6293(e)(1)) For the reasons described below, DOE has determined that none of the test procedure amendments would significantly alter the projected measured energy use of covered products.

The test procedure amendments in this final rule would affect the test procedures that will be required for certifying compliance with the amended energy conservation standards, the compliance date of which is September 15, 2014. Table III–1 indicates which parts of DOE's test procedures would be affected by this rule's amendments. As part of its evaluation of this rule, DOE has examined what impact it would likely have on the measured energy use of refrigeration products.

Many of the changes made to Appendices A and B through this final rule clarify the manner in which the test should be conducted, or otherwise represent minor changes to the test or reporting requirements that would not affect measured energy use. These amendments include changes to the anti-circumvention language, clarifications for setting mechanical temperature controls, modified ambient temperature gradient requirements, new definitions to help clarify test

requirements, elimination of the requirement to report product height, use of CAD models for measuring refrigerated volume, and corrections to the temperature setting logic tables.

The modification of the test period for products that experience incomplete cycling could affect only a small minority of products and only to a minimal extent. To DOE's knowledge, the only products that exhibit incomplete cycling are chest freezers. As described in section III.C.4, the accuracy of the measured energy use for such products would be improved. The measured energy use, to the extent it varies, would not necessitate a change in the standards for the single class of products that could theoretically be affected by this rule's amendments. For these reasons, DOE does not believe an adjustment of the energy conservation standard is necessary for this test procedure change.

DOE's modifications addressing products with multiple-compressors are not expected to alter the measured energy use for these products. The test procedure as amended by this rule is functionally equivalent to the test procedure in the waivers that DOE has previously granted for products with multiple-compressors, differing primarily in the length and composition of test periods. AHAM commented that allowing test facilities to use temperature cycles would have a significant impact on the energy measurement. (AHAM, No. 30 at p. 11) As a result, DOE decided not to allow the use of temperature cycles to define test periods. DOE does not believe that any of the other changes applicable to products with multiple-compressors are likely to affect the measured energy use of any product currently known to DOE.

As described in section III.C.2, the triangulation test method may, in certain cases, provide a slightly more accurate measurement of the actual energy consumption of a given product. This method would yield lower energy use measurements for some products as compared with the two-test method of the current DOE test procedures (*See* Appendix A1, section 3.1.2). Given that the triangulation method would be optional, in DOE's view, the overall impact of this optional test on energy use measurement will likely be insignificant and would not require any change to the relevant standards.

3. Standby and Off Mode Energy Use

EPCA directs DOE to include standby mode and off mode energy consumption when amending test procedures and that this energy consumption be integrated into the overall energy consumption descriptor for the product, unless DOE determines that the current test procedures for the product already fully account for and incorporate the standby and off mode energy consumption of the covered product. (42 U.S.C. 6295(gg)(2)(A)(i)) 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. A given refrigeration product being tested could include auxiliary features that draw power in a standby or off mode. In such instances, HRF–1–1979 and HRF–1–2008, both of which are incorporated in relevant part into DOE's test procedures, generally instruct manufacturers to set certain auxiliary features to the lowest power position during testing. In this lowest power position, any standby or off mode energy use of such auxiliary features would be included in the energy measurement. As a result, the July 2013 NOPR did not propose any additional changes to account for standby and off mode energy consumption, since the current (and proposed) procedures address these modes. AHAM and GE submitted comments supporting DOE's position on this issue. (AHAM, No. 30 at p. 19; GE, No. 31 at p.9) Therefore, DOE maintains the position that no specific amendments are needed to address standby or off-mode energy use for these products.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

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

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601, et seq.) requires preparation of an initial regulatory flexibility analysis (IFRA) for any rule that by law must be proposed for public comment, 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 Web site: *http://energy.gov/gc/office-general-counsel.*

DOE reviewed the test procedures in this final rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. This final rule prescribes test procedures that will be used to determine compliance with energy conservation standards for the products that are the subject of this rulemaking.

The Small Business Administration (SBA) considers an 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, which relies on size standards and codes established by the North American Industry Classification System (NAICS). The threshold number for NAICS code 335222, which applies to Household Refrigerator and Home Freezer Manufacturing, is 1,000 employees.

DOE conducted a market survey to determine whether any manufacturers of products covered by this final rule were small businesses. During its market survey, DOE used all available public information to create a list of companies that manufacture refrigerators, refrigerator-freezers, or freezers covered by this rulemaking. DOE reviewed these data to determine whether the entities met the SBA's definition of a small business manufacturer of refrigerators, refrigerator-freezers, or freezers and screened out 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. DOE identified three small businesses at the time of the July 2013 NOPR and an additional small business presented itself during the July 2013 NOPR comment period. However, DOE initially concluded that none of the test procedure modifications adopted in this final rule would pose a significant burden on manufacturers in this industry.

FSI submitted comments indicating that, as a small business, the test procedure modifications would unfairly impact its certification activities.

Specifically, FSI argued that the following modifications would unfairly impact it: (a) Clarifications to the ambient temperature sensors requirements; (b) the optional triangulation energy calculation method; (c) modifications to the testing requirements for incomplete cycling products; and (d) clarifications to what DOE considers to make up a unit's rear wall. FSI's claims of test burden are discussed in section III.E.1 (Testing Burden). However, for the reasons discussed in section III.E.1, DOE concludes that FSI's claims of test burden are overstated.

Reiterating the conclusions enumerated above, DOE acknowledges that additional ambient temperature sensors will be required and their temperatures recorded, but this is expected to be a modest impact as compared to the overall cost associated with testing. Specifically, DOE estimated an additional cost per product test station of $395, which includes the labor involved in equipment setup. This represents approximately 1 percent of the total cost of a typical four-station test chamber, assuming additional sensors are needed for all four test stations. In the worst case, in which a test facility must purchase additional data acquisition equipment and software, the cost could be as high as $1,500, although DOE expects that few if any test laboratories would incur costs at this level. DOE further concludes that claims regarding repeated tests or test facility upgrades associated with the ambient temperature requirements would be necessary under the existing test procedures, and that the amendments of this final rule would not represent an increase in test burden beyond the requirement for sensors and added data collection to verify compliance with the requirements. DOE does not agree with FSI that the inclusion of the optional (and voluntary) triangulation test would add any burden to a manufacturer choosing not to use this method. DOE has also not adopted the proposed amendment requiring reporting of whether this optional approach is used in testing.

Therefore, DOE concludes that the test procedure amendments of this final rule will not have a significant impact on small manufacturers under the provisions of the Act. These amendments do not require use of test facilities or test equipment that differ in any substantive way from the test facilities or test equipment that manufacturers currently use to evaluate the energy efficiency of these products. Further, the amended test procedures will not be significantly more difficult or time-consuming to conduct than the current test procedures that manufacturers must use to certify compliance with the energy conservation standards that must be met. For these reasons, DOE concludes and certifies that the rule would not have a significant economic impact on a substantial number of small entities. Accordingly, DOE has not prepared a regulatory flexibility analysis for this rulemaking. DOE has transmitted the certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the SBA for review under 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of refrigerators, refrigerator-freezers, and freezers must certify to DOE that their products comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their products according to the DOE test procedures for refrigerators, refrigerator-freezers, and freezers, including any amendments adopted for those test procedures. DOE has established regulations regarding the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including refrigerators, refrigerator-freezers, and freezers. 76 FR 12422 (March 7, 2011). The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 20 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

DOE is amending its test procedure for refrigerators, refrigerator-freezers, and freezers. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321, *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, this rule amends an existing rule without affecting the amount, quality or distribution of energy usage, and, therefore, will not result in any environmental impacts. Thus, this rulemaking is covered by Categorical Exclusion A5 under 10 CFR part 1021, subpart D, which applies to any rulemaking that interprets or amends an existing rule without changing the environmental effect of that rule. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

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

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, ''Civil Justice Reform,'' 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) Eliminate drafting errors and ambiguity; (2) write

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

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. 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 *http://energy.gov/gc/office-general-counsel.* DOE examined this final rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

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

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

I. Review Under Executive Order 12630

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

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

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

K. Review Under Executive Order 13211

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

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

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

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

The proposed modifications to the test procedures addressed by this action incorporate testing methods contained in certain sections of the commercial standards, AHAM Standards HRF–1–1979 and HRF–1–2008. DOE has evaluated these two versions of 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. 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, Reporting and recordkeeping requirements.

10 CFR Part 430

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

Issued in Washington, DC, on April 10, 2014.

Kathleen B. Hogan,

Deputy Assistant Secretary for Energy Efficiency, Energy Efficiency and Renewable 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.

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

§ 429.14 Residential refrigerators, refrigerator-freezers and freezers.

(a) * * *

(3) The value of total refrigerated volume of a basic model reported in accordance with paragraph (b)(2) of this section shall be the mean of the total refrigerated volumes measured for each tested unit of the basic model or the total refrigerated volume of the basic model as calculated in accordance with § 429.72(c).

(b) * * *

(2) Pursuant to § 429.12(b)(13), a certification report shall include the following public product-specific information: The annual energy use in kilowatt hours per year (kWh/yr); the total refrigerated volume in cubic feet (ft^3); and the adjusted total volume in cubic feet (ft^3).

(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 (For an example, see section 5.2.1.3 in appendix A 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 specified by the figures referenced in section 5.1 of appendices A1, B1, A, and B to subpart B of 10 CFR part 430.

■ 3. Add § 429.72 to read as follows:

§ 429.72 Alternative methods for determining non-energy ratings.

(a) *General.* Where § 429.14 through § 429.54 authorize the use of an alternative method for determining a physical or operating characteristic other than the energy consumption or efficiency, such characteristics must be determined either by testing in accordance with the applicable test procedure and applying the specified sampling plan provisions established in those sections or as described in the appropriate product-specific paragraph below. In all cases, the computer-aided design (CAD) models, measurements, and calculations used to determine the rating for the physical or operating characteristic shall be retained as part of the test records underlying the certification of the basic model in accordance with § 429.71.

(b) *Testing.* [Reserved]

(c) *Residential refrigerators, refrigerator-freezers, and freezers.* The total refrigerated volume of a basic model of refrigerator, refrigerator-freezer, or freezer may be determined by performing a calculation of the volume based upon computer-aided design (CAD) models of the basic model in lieu of physical measurements of a production unit of the basic model. Any value of total refrigerated volume of a basic model reported to DOE in a certification of compliance in accordance with § 429.14(b)(2) must be calculated using the CAD-derived volume(s) and the applicable provisions in the test procedures in 10 CFR part 430 for measuring volume, and must be within two percent, or 0.5 cubic feet (0.2 cubic feet for compact products), whichever is greater, of the volume of a production unit of the basic model measured in accordance with the applicable test procedure in 10 CFR part 430.

■ 4. Add § 429.134 to read as follows:

§ 429.134 Product-specific enforcement provisions.

(a) *General.* The following provisions apply to assessment and enforcement testing of the relevant products.

(b) *Refrigerators, refrigerator-freezers, and freezers*— (1) *Verification of total refrigerated volume.* The total refrigerated volume of the basic model will be measured pursuant to the test requirements of 10 CFR part 430 for each unit tested. The results of the measurement(s) will be averaged and compared to the value of total refrigerated volume certified by the manufacturer. The certified total refrigerated volume will be considered valid only if:

(i) The measurement is within two percent, or 0.5 cubic feet (0.2 cubic feet for compact products), whichever is greater, of the certified total refrigerated volume, or

(ii) The measurement is greater than the certified total refrigerated volume.

(A) If the certified total refrigerated volume is found to be valid, the certified adjusted total volume will be used as the basis for calculation of maximum allowed energy use for the basic model.

(B) If the certified total refrigerated volume is found to be invalid, the average measured adjusted total volume will serve as the basis for calculation of maximum allowed energy use for the tested basic model.

(2) *Test for models with two compartments, each having its own user-operable temperature control.* The test described in section 3.3 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.

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 430.2 is amended by revising the definition of ''compact refrigerator/refrigerator-freezer/freezer'' to read as follows:

§ 430.2 Definitions.

* * * * *

Compact refrigerator/refrigerator-freezer/freezer means any refrigerator, refrigerator-freezer or freezer with a total refrigerated volume of less than 7.75 cubic feet (220 liters). (Total refrigerated volume shall be determined using the applicable test procedure appendix prescribed in subpart B of this part.)

* * * * *

■ 7. Section 430.3 is amended by adding paragraph (e) to read as follows:

§ 430.3 Materials incorporated by reference.

* * * * *

(e) *AS/NZS.* Australian/New Zealand Standard, 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*.

(1) AS/NZS 4474.1:2007, Performance of Household Electrical Appliances—Refrigerating Appliances; Part 1: Energy Consumption and Performance, Second edition, published August 15, 2007, IBR approved for Appendix A to Subpart B.

(2) [Reserved]

* * * * *

■ 8. Section 430.23 is amended by revising paragraphs (a)(10) and (b)(7) to read as follows:

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

* * * * *

(a) * * *

(10) The following principles of interpretation should be applied to the test procedure. The intent of the energy test procedure is to simulate typical room conditions (approximately 70 °F (21 °C)) with door openings by testing at 90 °F (32.2 °C) without door openings. Except for operating characteristics that are affected by ambient temperature (for example, compressor percent run time), the unit, when tested under this test procedure, shall operate in a manner equivalent to the unit in typical room conditions.

(i) The energy used by the unit shall be calculated when a calculation is provided by the test procedure. 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 exempted by this test procedure, shall operate in an equivalent manner during energy testing under this test procedure, or be accounted for by all calculations as provided for in the test procedure. Examples:

(A) Energy saving features that are designed to operate when there are no door openings for long periods of time shall not be functional during the energy test.

(B) The defrost heater shall neither function nor turn off differently during the energy test than it would when in typical room conditions. Also, the product shall not recover differently during the defrost recovery period than it would in typical room conditions.

(C) Electric heaters that would normally operate at typical room conditions with door openings shall also operate during the energy test.

(D) Energy used during adaptive defrost shall continue to be tested and adjusted per the calculation provided for in this test procedure.

(ii) DOE recognizes that there may be situations that the test procedures do not completely address. In such cases, a manufacturer must obtain a waiver in accordance with the relevant provisions of 10 CFR part 430 if:

(A) A product contains energy consuming components that operate differently during the prescribed testing than they would during representative average consumer use and

(B) Applying the prescribed test to that product would evaluate it in a manner that is unrepresentative of its true energy consumption (thereby providing materially inaccurate comparative data).

(b) * * *

(7) The following principles of interpretation should be applied to the test procedure. The intent of the energy test procedure is to simulate typical room conditions (approximately 70 °F (21 °C)) with door openings by testing at 90 °F (32.2 °C) without door openings. Except for operating characteristics that are affected by ambient temperature (for example, compressor percent run time), the unit, when tested under this test procedure, shall operate in a manner equivalent to the unit in typical room conditions.

(i) The energy used by the unit shall be calculated when a calculation is provided by the test procedure. 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 exempted by this test procedure, shall operate in an equivalent manner during energy testing under this test procedure, or be accounted for by all calculations as provided for in the test procedure. Examples:

(A) Energy saving features that are designed to operate when there are no door openings for long periods of time shall not be functional during the energy test.

(B) The defrost heater shall neither function nor turn off differently during the energy test than it would when in typical room conditions. Also, the product shall not recover differently during the defrost recovery period than it would in typical room conditions.

(C) Electric heaters that would normally operate at typical room conditions with door openings shall also operate during the energy test.

(D) Energy used during adaptive defrost shall continue to be tested and adjusted per the calculation provided for in this test procedure.

(ii) DOE recognizes that there may be situations that the test procedures do not completely address. In such cases, a manufacturer must obtain a waiver in accordance with the relevant provisions of 10 CFR part 430 if:

(A) A product contains energy consuming components that operate differently during the prescribed testing than they would during representative average consumer use and

(B) Applying the prescribed test to that product would evaluate it in a manner that is unrepresentative of its true energy consumption (thereby providing materially inaccurate comparative data).

* * * * *

■ 9. Appendix A to subpart B of part 430 is amended:

■ a. By revising the introductory text;

■ b. In section 1. Definitions, by:

■ i. Redesignating section 1.18 as 1.26;

■ ii. Redesignating section 1.17 as 1.25;

■ iii. Redesignating section 1.16 as 1.23;

■ iv. Redesignating section 1.15 as 1.21;

■ v. Redesignating section 1.14 as 1.20;

■ vi. Redesignating section 1.13 as 1.19;

■ vii. Redesignating section 1.12 as 1.15;

■ viii. Redesignating section 1.11 as 1.13;

■ ix. Redesignating section 1.10 as 1.12;

■ x. Redesignating section 1.9 as 1.11 and revising the newly designated section 1.11;

■ xi. Redesignating section 1.8 as 1.10;

■ xii. Redesignating section 1.7 as 1.9;

■ xiv. Redesignating section 1.6 as 1.7;

■ xv. Redesignating section 1.5 as 1.6;

■ xvi. Adding sections 1.5, 1.8, 1.14, 1.16, 1.17, 1.18, 1.22, and 1.24;

■ c. In section 2. Test Conditions, by:

■ i. Revising sections 2.1, 2.2, and 2.8;

■ ii. Adding sections, 2.1.1, 2.1.2, 2.1.3, and 2.11;
■ d. In section 3. Test Control Setting, by:
■ i. Revising section 3.2.1;
■ ii. Revising Tables 1 and 2;
■ iii. Adding section 3.3;
■ e. In section 4. Test Period, by:
■ i. Revising sections 4.1, 4.2, 4.2.1.1, and 4.2.3;
■ ii. Adding sections 4.2.3.1, 4.2.3.2, 4.2.3.3, 4.2.3.4, 4.2.3.4.1, and 4.2.3.4.2;
■ f. In section 5. Test Measurements, by revising sections 5.1, 5.1.1, 5.1.2, 5.2.1.3, 5.2.1.4, and 5.3;
■ g. In section 6. Calculation of Derived Results from Test Measurements, by:
■ i. Revising sections 6.2, 6.2.1, 6.2.2, 6.2.2.1, and 6.2.2.2;
■ ii. Adding section 6.2.2.3.

The additions and revisions read as follows:

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

Beginning on September 15, 2014, the test procedures in appendix A must be used to determine compliance with energy conservation standards for refrigerators and refrigerator-freezers. Prior to September 15, 2014, manufacturers may continue to use appendix A1 or may elect to use appendix A early to show compliance with the September 15, 2014 energy conservation standards. Manufacturers must use a single appendix for all representations of energy use of a basic model, including certifications of compliance, and may not use appendix A1 for certain representations and appendix A for other representations.

1. Definitions

* * * * *

1.5 ''AS/NZS 44474.1:2007'' means Australian/New Zealand Standard 44474.1:2007, Performance of household electrical appliances—Refrigerating appliances, Part 1: Energy consumption and performance. Only sections of AS/NZS 44474.1:2007 (incorporated by reference; see § 430.3) specifically referenced in this test procedure are part of this test procedure. In cases where there is a conflict, the language of the test procedure in this appendix takes precedence over AS/NZS 44474.1:2007.

* * * * *

1.8 ''Complete temperature cycle'' means a time period defined based upon the cycling of compartment temperature that starts when the compartment temperature is at a maximum and ends when the compartment temperature returns to an equivalent maximum (within 0.5 °F of the starting temperature), having in the interim fallen to a minimum and subsequently risen again to reach the second maximum. Alternatively, a complete temperature cycle can be defined to start when the compartment temperature is at a minimum and end when the compartment temperature returns to an equivalent minimum (within 0.5 °F of the starting temperature), having in the interim risen to a maximum and subsequently fallen again to reach the second minimum.

* * * * *

1.11 ''Defrost cycle type'' means a distinct sequence of control whose function is to remove frost and/or ice from a refrigerated surface. There may be variations in the defrost control sequence such as the number of defrost heaters energized. Each such variation establishes a separate distinct defrost cycle type. However, defrost achieved regularly during the compressor off-cycles by warming of the evaporator without active heat addition, although a form of automatic defrost, does not constitute a unique defrost cycle type for the purposes of identifying the test period in accordance with section 4 of this appendix.

* * * * *

1.14 ''Ice storage bin'' means a container in which ice can be stored.

* * * * *

1.16 ''Multiple-compressor'' refrigerator or refrigerator-freezer means a refrigerator or refrigerator-freezer with more than one compressor.

1.17 ''Precooling'' means operating a refrigeration system before initiation of a defrost cycle to reduce one or more compartment temperatures significantly (more than 0.5 °F) below its minimum during stable operation between defrosts.

1.18 ''Recovery'' means operating a refrigeration system after the conclusion of a defrost cycle to reduce the temperature of one or more compartments to the temperature range that the compartment(s) exhibited during stable operation between defrosts.

* * * * *

1.22 ''Stable operation'' means operation after steady-state conditions have been achieved but excluding any events associated with defrost cycles. During stable operation the average rate of change of compartment temperature must not exceed 0.042 °F (0.023 °C) per hour for all compartment temperatures. Such a calculation performed for compartment temperatures at any two times, or for any two periods of time comprising complete cycles, during stable operation must meet this requirement.

(A) If compartment temperatures do not cycle, the relevant calculation shall be the difference between the temperatures at two points in time divided by the difference, in hours, between those points in time.

(B) If compartment temperatures cycle as a result of compressor cycling or other cycling operation of any system component (e.g., a damper, fan, or heater), the relevant calculation shall be the difference between compartment temperature averages evaluated for whole compressor cycles or complete temperature cycles divided by the difference, in hours, between either the starts, ends, or mid-times of the two cycles.

* * * * *

1.24 ''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.

* * * * *

2. Test Conditions

2.1 Ambient Temperature Measurement. Temperature measuring devices shall be shielded so that indicated temperatures are not affected by the operation of the condensing unit or adjacent units.

2.1.1 Ambient Temperature. The ambient temperature shall be recorded at points located 3 feet (91.5 cm) above the floor and 10 inches (25.4 cm) from the center of the two sides of the unit under test. The ambient temperature shall be 90.0 ± 1.0 °F (32.2 ± 0.6 °C) during the stabilization period and the test period.

2.1.2 Ambient Temperature Gradient. The test room vertical ambient temperature gradient in any foot of vertical distance from 2 inches (5.1 cm) above the floor or supporting platform to a height of 1 foot (30.5 cm) above the top of the unit under test is not to exceed 0.5 °F per foot (0.9 °C per meter). The vertical ambient temperature gradient at locations 10 inches (25.4 cm) out from the centers of the two sides of the unit being tested is to be maintained during the test. To demonstrate that this requirement has been met, test data must include measurements taken using temperature sensors at locations 10 inches (25.4 cm) from the center of the two sides of the unit under test at heights of 2 inches (5.1 cm) and 36 inches (91.4 cm) above the floor or supporting platform and at a height of 1 foot (30.5 cm) above the unit under test.

2.1.3 Platform. A platform must be used if the floor temperature is not within 3 °F (1.7 °C) of the measured ambient temperature. If a platform is used, it is to have a solid top with all sides open for air circulation underneath, and its top shall extend at least 1 foot (30.5 cm) beyond each side and front of the unit under test and extend to the wall in the rear.

2.2 Operational Conditions. The unit under test shall be installed and its operating conditions maintained in accordance with HRF–1–2008 (incorporated by reference; see § 430.3), sections 5.3.2 through section 5.5.5.5 (excluding section 5.5.5.4). Exceptions and clarifications to the cited sections of HRF–1–2008 are noted in sections 2.3 through 2.8, and 5.1 of this appendix.

* * * * *

2.8 Rear Clearance.

(a) General. The space between the lowest edge of the rear plane of the cabinet and a vertical surface (the test room wall or simulated wall) shall be the minimum distance in accordance with the manufacturer's instructions, unless other provisions of this section apply. The rear plane shall be considered to be the largest flat surface at the rear of the cabinet, excluding features that protrude beyond this surface, such as brackets or compressors.

(b) Maximum clearance. The clearance shall not be greater than 2 inches (51 mm) from the lowest edge of the rear plane to the

vertical surface, unless the provisions of paragraph (c) of this section apply.

(c) If permanent rear spacers or other components that protrude beyond the rear plane extend further than the 2 inch (51 mm) distance, or if the highest edge of the rear plane is in contact with the vertical surface when the unit is positioned with the lowest edge of the rear plane at or further than the 2 inch (51 mm) distance from the vertical surface, the appliance shall be located with the spacers or other components protruding beyond the rear plane, or the highest edge of the rear plane, in contact with the vertical surface.

(d) Rear-mounted condensers. If the product has a flat rear-wall-mounted condenser (i.e., a rear-wall-mounted condenser with all refrigerant tube centerlines within 0.25 inches (6.4 mm) of the condenser plane), and the area of the condenser plane represents at least 25% of the total area of the rear wall of the cabinet, then the spacing to the vertical surface may be measured from the lowest edge of the condenser plane.

* * * * *

2.11 Refrigerators and Refrigerator-Freezers with Demand-Response Capability. Refrigerators and refrigerator-freezers 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.

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3. Test Control Settings

3.2 * * *

3.2.1 A first test shall be performed with all compartment temperature controls set at their median position midway between their warmest and coldest settings. For mechanical control systems, (a) knob detents shall be mechanically defeated if necessary to attain a median setting, and (b) the warmest and coldest settings shall correspond to the positions in which the indicator is aligned with control symbols indicating the warmest and coldest settings. For electronic control systems, the test shall be performed with all compartment temperature controls set at the average of the coldest and warmest settings; if there is no setting equal to this average, the setting closest to the average shall be used. If there are two such settings equally close to the average, the higher of these temperature control settings shall be used. A second test shall be performed with all controls set at their warmest setting or all controls set at their coldest setting (not electrically or mechanically bypassed). For all-refrigerators, this setting shall be the appropriate setting that attempts to achieve compartment temperatures measured during the two tests that bound (*i.e.,* one is above and one is below) the standardized temperature for all-refrigerators. For refrigerators and refrigerator-freezers, the second test shall be conducted with all controls at their coldest setting, unless all compartment temperatures measured during the first part of the test are lower than the standardized temperatures, in which case the second test shall be conducted with all controls at their warmest setting. Refer to Table 1 of this appendix for all-refrigerators or Table 2 of this appendix for refrigerators with freezer compartments and refrigerator-freezers to determine which test results to use in the energy consumption calculation. If any compartment is warmer than its standardized temperature for a test with all controls at their coldest position, the tested unit fails the test and cannot be rated.

TABLE 1—TEMPERATURE SETTINGS FOR ALL-REFRIGERATORS

First test		Second test		Energy calculation based on:
Settings	Results	Settings	Results	
Mid	Low	Warm	Low	Second Test Only.
			High	First and Second Tests.
	High	Cold	Low	First and Second Tests.
			High	No Energy Use Rating.

TABLE 2—TEMPERATURE SETTINGS FOR REFRIGERATORS WITH FREEZER COMPARTMENTS AND REFRIGERATOR-FREEZERS

First test		Second test		Energy calculation based on:
Settings	Results	Settings	Results	
Fzr Mid	Fzr Low	Fzr Warm	Fzr Low	Second Test Only.
FF Mid	FF Low	FF Warm	FF Low.	
			Fzr Low	First and Second Tests.
			FF High.	
			Fzr High	First and Second Tests.
			FF Low.	
			Fzr High	First and Second Tests.
			FF High.	
	Fzr Low	Fzr Cold	Fzr Low	No Energy Use Rating.
	FF High	FF Cold	FF High.	
			Fzr Low	First and Second Tests.
			FF Low.	
	Fzr High	Fzr Cold	Fzr High	No Energy Use Rating.
	FF Low	FF Cold	FF Low.	
			Fzr Low	First and Second Tests.
			FF Low.	
	Fzr High	Fzr Cold	Fzr Low	First and Second Tests.
	FF High	FF Cold	FF Low.	
			Fzr Low	No Energy Use Rating.
			FF High.	
			Fzr High	No Energy Use Rating.
			FF Low.	
			Fzr High	No Energy Use Rating.
			FF High.	

Notes: Fzr = Freezer Compartment, FF = Fresh Food Compartment.

* * * * *

3.3 Optional Test for Models with Two Compartments and User Operable Controls. As an alternative to section 3.2, perform three tests such that the set of tests meets the ''minimum requirements for interpolation'' of AS/NZS 44474.1:2007 (incorporated by reference; see § 430.3) appendix M, section M3, paragraphs (a) through (c) and as illustrated in Figure M1. The target temperatures t_{xA} and t_{xB} defined in section M4(a)(i) of AS/NZ 44474.1:2007 shall be the standardized temperatures defined in section 3.2 of this appendix.

4. Test Period

* * * * *

4.1 Non-automatic Defrost. If the model being tested has no automatic defrost system, the test period shall start after steady-state conditions (see section 2.9 of this appendix) have been achieved and be no less than three hours in duration. During the test period, the compressor motor shall complete two or more whole compressor cycles. (A compressor cycle is a complete ''on'' and a complete ''off'' period of the motor.) If no ''off'' cycling occurs, the test period shall be three hours. If fewer than two compressor cycles occur during a 24-hour period, then a single complete compressor cycle may be used.

4.2 Automatic Defrost. If the model being tested has an automatic defrost system, the test period shall start after steady-state conditions have been achieved and be from one point during a defrost period to the same point during the next defrost period. If the model being tested has a long-time automatic defrost system, the alternative provisions of section 4.2.1 may be used. If the model being tested has a variable defrost control, the provisions of section 4.2.2 shall apply. If the model is a multiple-compressor product with automatic defrost, the provisions of section 4.2.3 shall apply. If the model being tested has long-time automatic or variable defrost control involving multiple defrost cycle types, such as for a product with a single compressor and two or more evaporators in which the evaporators are defrosted at different frequencies, the provisions of section 4.2.4 shall apply. If the model being tested has multiple defrost cycle types for which compressor run time between defrosts is a fixed time of less than 14 hours for all such cycle types, and for which the compressor run times between defrosts for different defrost cycle types are equal to or multiples of each other, the test period shall be from one point of the defrost cycle type with the longest compressor run time between defrosts to the same point during the next occurrence of this defrost cycle type. For such products not using the procedures of section 4.2.4, energy consumption shall be calculated as described in section 5.2.1.1 of this appendix.

* * * * *

4.2.1.1 Cycling Compressor System. For a system with a cycling compressor, the second part of the test starts at the termination of the last regular compressor ''on'' cycle. The average temperatures of the fresh food and freezer compartments measured from the termination of the previous compressor ''on'' cycle to the termination of the last regular compressor ''on'' cycle must both be within 0.5 °F (0.3 °C) of their average temperatures measured for the first part of the test. If any compressor cycles occur prior to the defrost heater being energized that cause the average temperature in either compartment to deviate from its average temperature for the first part of the test by more than 0.5 °F (0.3 °C), these compressor cycles are not considered regular compressor cycles and must be included in the second part of the test. As an example, a ''precooling'' cycle, which is an extended compressor cycle that lowers the temperature(s) of one or both compartments prior to energizing the defrost heater, must be included in the second part of the test. The test period for the second part of the test ends at the termination of the first regular compressor ''on'' cycle after both compartment temperatures have fully recovered to their stable conditions. The average temperatures of the compartments measured from this termination of the first regular compressor ''on'' cycle until the termination of the next regular compressor ''on'' cycle must both be within 0.5 °F (0.3 °C) of their average temperatures measured for the first part of the test. See Figure 1. Note that Figure 1 illustrates the concepts of precooling and recovery but does not represent all possible defrost cycles.

4.2.3 Multiple-compressor Products with Automatic Defrost.

4.2.3.1 Measurement Frequency. Measurements of power input, cumulative electric energy consumption (watt-hours or kilowatt-hours), and compartment temperature shall be taken at regular intervals not exceeding one minute.

4.2.3.2 Steady-state Condition. Steady state shall be considered to have been attained after 24 hours of operation after the last adjustment of the temperature controls.

4.2.3.3 Primary Compressor. If at least one compressor cycles, test periods shall be based on compressor cycles associated with the primary compressor system (these are referred to as ''primary compressor cycles''). If the freezer compressor cycles, it shall be the primary compressor system.

4.2.3.4 Test Periods. The two-part test described in this section shall be used. The first part is a stable continuous period of compressor operation that includes no defrost cycles or events associated with a defrost cycle, such as precooling or recovery, for any compressor system. The second part is a continuous test period designed to capture the energy consumed during all of the events occurring with the defrost control sequence that are outside of stable operation. The second part of the test shall be conducted separately for each automatic defrost system present.

4.2.3.4.1 First Part of Test. If at least one compressor cycles, the test period for the first part of the test shall include a whole number of complete primary compressor cycles comprising at least 24 hours of stable operation, unless a defrost occurs prior to completion of 24 hours of stable operation, in which case the first part of the test shall include a whole number of complete primary compressor cycles comprising at least 18 hours of stable operation. If no compressor cycles, the first part of the test shall comprise at least 24 hours of stable operation, unless a defrost occurs prior to completion of 24 hours of stable operation, in which case the first part of the test shall comprise at least 18 hours of stable operation.

4.2.3.4.2 Second Part of Test. (a) If at least one compressor cycles, the test period for the second part of the test starts during stable operation before all portions of the defrost cycle, at the beginning of a complete primary compressor cycle. The test period for the second part of the test ends during stable operation after all portions of the defrost cycle, including recovery, at the termination of a complete primary compressor cycle. The start and stop for the test period shall both occur either when the primary compressor starts or when the primary compressor stops. For each compressor system, the compartment temperature averages for the first and last complete compressor cycles that lie completely within the second part of the test must be within 0.5 °F (0.3 °C) of the average compartment temperature measured for the first part of the test. If any one of the compressor systems is non-cycling, its compartment temperature averages during the first and last complete primary compressor cycles of the second part of the test must be within 0.5 °F (0.3 °C) of the average compartment temperature measured for the first part of the test.

(b) If no compressor cycles, the test period for the second part of the test starts during stable operation before all portions of the defrost cycle, when the compartment temperatures of all compressor systems are within 0.5 °F (0.3 °C) of their average temperatures measured for the first part of the test. The test period for the second part ends during stable operation after all portions of the defrost cycle, including recovery, when the compartment temperatures of all compressor systems are within 0.5 °F (0.3 °C) of their average temperatures measured for the first part of the test.

5. Test Measurements

* * * * *

5.1 Temperature Measurements. (a) Temperature measurements shall be made at the locations prescribed in Figures 5.1 and 5.2 of HRF–1–2008 (incorporated by reference; see § 430.3) and shall be accurate to within ±0.5 °F (0.3 °C). No freezer temperature measurements need be taken in an all-refrigerator model.

(b) If the interior arrangements of the unit under test do not conform with those shown in Figure 5.1 and 5.2 of HRF–1–2008, 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–1–2008 in order to maintain a minimum 1-inch air space from adjustable shelves or other

components that could be relocated by the consumer, this constitutes a relocation of temperature sensors that shall be recorded in the test data and reported in the certification report as described above.

5.1.1 Measured Temperature. The measured temperature of a compartment is the average of all sensor temperature readings taken in that compartment at a particular point in time. Measurements shall be taken at regular intervals not to exceed 4 minutes. Measurements for products with multiple-compressor systems shall be taken at regular intervals not to exceed one minute.

5.1.2 Compartment Temperature. The compartment temperature for each test period shall be an average of the measured temperatures taken in a compartment during the test period as defined in section 4 of this appendix. For long-time automatic defrost models, compartment temperatures shall be those measured in the first part of the test period specified in section 4.2.1 of this appendix. For models with variable defrost controls, compartment temperatures shall be those measured in the first part of the test period specified in section 4.2.2 of this appendix. For models with automatic defrost that is neither long-time nor variable defrost, the compartment temperature shall be an average of the measured temperatures taken in a compartment during a stable period of compressor operation that (a) includes no defrost cycles or events associated with a defrost cycle, such as precooling or recovery, (b) is no less than three hours in duration, and (c) includes two or more whole compressor cycles. If the compressor does not cycle, the stable period used for the temperature average shall be three hours in duration.

* * * * *

5.2 * * *

5.2.1 * * *

5.2.1.3 Variable Defrost Control. The energy consumption in kilowatt-hours per day shall be calculated equivalent to:

$ET = (1440 \times EP1/T1) + (EP2 - (EP1 \times T2/T1)) \times (12/CT)$,

Where:

1440 is defined in 5.2.1.1 and EP1, EP2, T1, T2, and 12 are defined in 5.2.1.2;

$CT = (CT_L \times CT_M)/(F \times (CT_M - CT_L) + CT_L)$;

CT_L = 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), in hours rounded to the nearest tenth of an hour;

CT_M = 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);

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.

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

5.2.1.4 Multiple-compressor Products with Automatic Defrost. For multiple-compressor products, the two-part test method in section 4.2.3.4 of this appendix must be used. The energy consumption in kilowatt-hours per day shall be calculated equivalent to:

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

Where:

1440, EP1, T1, and 12 are defined in 5.2.1.2;

i = a 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 = the compressor run time between defrosts for compressor system i in hours 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

$(CT_{Li} \times CT_{Mi})/(F \times (CT_{Mi} - CT_{Li}) + CT_{Li})$;

Where:

CT_{Li} = for compressor system i, 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), in hours rounded to the nearest tenth of an hour;

CT_{Mi} = for compressor system i, the maximum compressor run time between defrosts in hours rounded to the nearest tenth of an hour (greater than CT_{Li} but not more than 96 hours); and

F = default defrost energy consumption factor, equal to 0.20.

For variable defrost models with no values for CT_{Li} and CT_{Mi} in the algorithm, the default values of 6 and 96 shall be used, respectively.

* * * * *

5.3 Volume Measurements. (a) The unit's total refrigerated volume, VT, shall be measured in accordance with HRF–1–2008 (incorporated by reference; see § 430.3), section 3.30 and sections 4.2 through 4.3. The measured volume shall include all spaces within the insulated volume of each compartment except for the volumes that must be deducted in accordance with section 4.2.2 of HRF–1–2008, and be calculated equivalent to:

VT = VF + VFF

Where:

VT = total refrigerated volume in cubic feet,

VF = freezer compartment volume in cubic feet, and

VFF = fresh food compartment volume in cubic feet.

(b) In the case of products with automatic icemakers, the volume occupied by the automatic icemaker, including its ice storage bin, is to be included in the volume measurement.

(c) Total refrigerated volume is determined by physical measurement of the test unit. Measurements and calculations used to determine the total refrigerated volume shall be retained as part of the test records underlying the certification of the basic model in accordance with 10 CFR 429.71.

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6. Calculation of Derived Results From Test Measurements

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6.2 Average Per-Cycle Energy Consumption. The average per-cycle energy consumption for a cycle type, E, is expressed in kilowatt-hours per cycle to the nearest one hundredth (0.01) kilowatt-hour and shall be calculated according to the sections below.

6.2.1 All-Refrigerator Models. The average per-cycle energy consumption shall depend upon the temperature attainable in the fresh food compartment as shown below.

* * * * *

6.2.2 Refrigerators and Refrigerator-Freezers. The average per-cycle energy consumption shall be defined in one of the following ways as applicable.

6.2.2.1 If the fresh food compartment temperature is at or below 39 °F (3.9 °C) during both tests and the freezer compartment temperature is at or below 15°F (−9.4 °C) during both tests of a refrigerator or at or below 0°F (−17.8 °C) during both tests of a refrigerator-freezer, the average per-cycle energy consumption shall be:

E = ET1 + IET

Where:

ET is defined in 5.2.1;

IET, expressed in kilowatt-hours per cycle, equals 0 (zero) for products without an automatic icemaker, and equals 0.23 for products with an automatic icemaker; and

The number 1 indicates the test period during which the highest freezer compartment temperature was measured.

6.2.2.2 If the conditions of 6.2.2.1 do not exist, the average per-cycle energy consumption shall be defined by the higher of the two values calculated by the following two formulas:

$E = ET1 + ((ET2 - ET1) \times (39.0 - TR1)/(TR2 - TR1)) + IET$

and

$E = ET1 + ((ET2 - ET1) \times (k - TF1)/(TF2 - TF1)) + IET$

Where:

ET is defined in 5.2.1;

IET is defined in 6.2.2.1;

TR and the numbers 1 and 2 are defined in 6.2.1.2;

TF = freezer compartment temperature determined according to 5.1.4 in degrees F; 39.0 is the standardized temperature for fresh food compartments in degrees F; and

k is a constant 15.0 for refrigerators or 0.0 for refrigerator-freezers, each being standardized freezer compartment temperatures in degrees F.

6.2.2.3 Optional Test for Models with Two Compartments and User Operable Controls. If the procedure of section 3.3 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 6.2.1.1;

IET is defined in 6.2.2.1; and

E_x is defined and calculated as described in AS/NZS 44474.1:2007 (incorporated by reference; see § 430.3) appendix M, section M4(a). The target temperatures t_{xA} and t_{xB} defined in section M4(a)(i) of AS/NZS 44474.1:2007 shall be the standardized temperatures defined in section 3.2 of this appendix.

* * * * *

■ 10. Appendix B to subpart B of part 430 is amended:

■ a. By revising the introductory text;

■ b. In section 1. Definitions, by:

■ i. Redesignating section 1.15 as 1.21;

■ ii. Redesignating section 1.14 as 1.19;

■ iii. Redesignating section 1.13 as 1.17;

■ iv. Redesignating section 1.12 as 1.16;

■ v. Redesignating section 1.11 as 1.15;

■ vi. Redesignating section 1.10 as 1.13;

■ vii. Redesignating section 1.9 as 1.11;

■ viii. Redesignating sections 1.6 through 1.8 as 1.7 through 1.9 respectively;

■ ix. Adding sections 1.6, 1.10, 1.12, 1.14, 1.18, and 1.20;

■ c. In section 2. Test Conditions, by;

■ i. Revising sections 2.1, 2.2, 2.3, and 2.6;

■ ii. Adding sections 2.1.1, 2.1.2, 2.1.3, 2.8, and 2.9;

■ d. Revising section 3.2.1 and Table 1 in section 3. Test Control Settings;

■ e. Revising sections 4.1 and 4.2.1.1 in section 4. Test Period;

■ f. Revising sections 5.1, 5.1.2, 5.2.1.3, and 5.3 in section 5. Test Measurements;

■ g. In section 6. Calculation of Derived Results from Test Measurements, by:

■ i. Revising section 6.2;

■ ii. Removing section 6.2.1;

■ iii. Redesignating section 6.2.1.1 as 6.2.1 and revising the newly designated section 6.2.1;

■ iv. Redesignating section 6.2.1.2 as 6.2.2 and revising the newly designated section 6.2.2;

■ v. Redesignating section 6.2.2 as 6.2.3 and revising the newly designated section 6.2.3.

The additions and revisions read as follows:

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

Beginning on September 15, 2014, the test procedures in appendix B must be used to determine compliance with energy conservation standards for freezers. Prior to September 15, 2014, manufacturers may continue to use appendix B1 or may elect to use appendix B early to show compliance with the September 15, 2014 energy conservation standards. Manufacturers must use a single appendix for all representations of energy use of a basic model, including certifications of compliance, and may not use appendix B1 for certain representations and appendix B for other representations.

1. Definitions

* * * * *

1.6 ''Complete temperature cycle'' means a time period defined based upon the cycling of compartment temperature that starts when the compartment temperature is at a maximum and ends when the compartment temperature returns to an equivalent maximum (within 0.5 °F of the starting temperature), having in the interim fallen to a minimum and subsequently risen again to reach the second maximum. Alternatively, a complete temperature cycle can be defined to start when the compartment temperature is at a minimum and end when the compartment temperature returns to an equivalent minimum (within 0.5 °F of the starting temperature), having in the interim risen to a maximum and subsequently fallen again to reach the second minimum.

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1.10 ''Ice storage bin'' means a container in which ice can be stored.

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1.12 ''Precooling'' means operating a refrigeration system before initiation of a defrost cycle to reduce one or more compartment temperatures significantly (more than 0.5 °F) below its minimum during stable operation between defrosts.

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1.14 ''Recovery'' means operating a refrigeration system after the conclusion of a defrost cycle to reduce the temperature of one or more compartments to the temperature range that the compartment(s) exhibited during stable operation between defrosts.

* * * * *

1.18 ''Stable operation'' means operation after steady-state conditions have been achieved but excluding any events associated with defrost cycles. During stable operation the average rate of change of compartment temperature must not exceed 0.042 °F (0.023 °C) per hour. Such a calculation performed for compartment temperatures at any two times, or for any two periods of time comprising complete cycles, during stable operation must meet this requirement.

(a) If compartment temperatures do not cycle, the relevant calculation shall be the difference between the temperatures at two points in time divided by the difference, in hours, between those points in time.

(b) If compartment temperatures cycle as a result of compressor cycling or other cycling operation of any system component (e.g., a damper, fan, or heater), the relevant calculation shall be the difference between compartment temperature averages evaluated for whole compressor cycles or complete temperature cycles divided by the difference, in hours, between either the starts, ends, or mid-times of the two cycles.

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1.20 ''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.

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2. Test Conditions

2.1 Ambient Temperature Measurement. Temperature measuring devices shall be shielded so that indicated temperatures are not affected by the operation of the condensing unit or adjacent units.

2.1.1 Ambient Temperature. The ambient temperature shall be recorded at points located 3 feet (91.5 cm) above the floor and 10 inches (25.4 cm) from the center of the two sides of the unit under test. The ambient temperature shall be 90.0 ±1.0 °F (32.2 ±0.6 °C) during the stabilization period and the test period.

2.1.2 Ambient Temperature Gradient. The test room vertical ambient temperature gradient in any foot of vertical distance from 2 inches (5.1 cm) above the floor or supporting platform to a height of 1 foot (30.5 cm) above the top of the unit under test is not to exceed 0.5 °F per foot (0.9 °C per meter). The vertical ambient temperature gradient at locations 10 inches (25.4 cm) out from the centers of the two sides of the unit being tested is to be maintained during the test. To demonstrate that this requirement has been met, test data must include measurements taken using temperature sensors at locations 10 inches (25.4 cm) from the center of the two sides of the unit under test at heights of 2 inches (5.1 cm) and 36 inches (91.4 cm) above the floor or supporting platform and at a height of 1 foot (30.5 cm) above the unit under test.

2.1.3 Platform. A platform must be used if the floor temperature is not within 3 °F (1.7 °C) of the measured ambient temperature. If

a platform is used, it is to have a solid top with all sides open for air circulation underneath, and its top shall extend at least 1 foot (30.5 cm) beyond each side and front of the unit under test and extend to the wall in the rear.

2.2 Operational Conditions. The freezer shall be installed and its operating conditions maintained in accordance with HRF–1–2008 (incorporated by reference; see § 430.3), sections 5.3.2 through section 5.5.5.5 (but excluding sections 5.5.5.2 and 5.5.5.4). The quick freeze option shall be switched off except as specified in section 3.1 of this appendix. Additional clarifications are noted in sections 2.3 through 2.9 of this appendix.

2.3 Anti-Sweat Heaters. The anti-sweat heater switch is to be on during one test and off during a second test. In the case of a freezer with variable anti-sweat heater control, the standard cycle energy use shall be the result of the calculation described in 6.2.3.

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2.6 Rear Clearance.

(a) General. The space between the lowest edge of the rear plane of the cabinet and a vertical surface (the test room wall or simulated wall) shall be the minimum distance in accordance with the manufacturer's instructions, unless other provisions of this section apply. The rear plane shall be considered to be the largest flat surface at the rear of the cabinet, excluding features that protrude beyond this surface, such as brackets or compressors.

(b) Maximum clearance. The clearance shall not be greater than 2 inches (51 mm) from the lowest edge of the rear plane to the vertical surface, unless the provisions of subsection (c) of this section apply.

(c) If permanent rear spacers or other components that protrude beyond the rear plane extend further than the 2 inch (51 mm) distance, or if the highest edge of the rear plane is in contact with the vertical surface when the unit is positioned with the lowest edge of the rear plane at or further than the 2 inch (51 mm) distance from the vertical surface, the appliance shall be located with the spacers or other components protruding beyond the rear plane, or the highest edge of the rear plane, in contact with the vertical surface.

(d) Rear-mounted condensers. If the product has a flat rear-wall-mounted condenser (*i.e.,* a rear-wall-mounted condenser with all refrigerant tube centerlines within 0.25 inches (6.4 mm) of the condenser plane), and the area of the condenser plane represents at least 25% of the total area of the rear wall of the cabinet, then the spacing to the vertical surface may be measured from the lowest edge of the condenser plane.

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2.8 Freezers with Demand-Response Capability. Freezers 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.

2.9 For products that require the freezer compartment to be loaded with packages in accordance with section 5.5.5.3 of HRF–1–2008, the number of packages comprising the 75% load shall be determined by filling the compartment completely with the packages that are to be used for the test, such that the packages fill as much of the usable refrigerated space within the compartment as is physically possible, and then removing from the compartment a number of packages so that the compartment contains 75% of the packages that were placed in the compartment to completely fill it. If multiplying the total number of packages by 0.75 results in a fraction, the number of packages used shall be rounded to the nearest whole number, rounding up if the result ends in 0.5. For multi-shelf units, this method shall be applied to each shelf. For both single- and multi-shelf units, the remaining packages shall be arranged as necessary to provide the required air gap and thermocouple placement. The number of packages comprising the 100% and 75% loading conditions shall be recorded in the test data maintained in accordance with 10 CFR 429.71.

3. Test Control Settings

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3.2 * * *

3.2.1 A first test shall be performed with all temperature controls set at their median position midway between their warmest and coldest settings. For mechanical control systems, (a) knob detents shall be mechanically defeated if necessary to attain a median setting, and (b) the warmest and coldest settings shall correspond to the positions in which the indicator is aligned with control symbols indicating the warmest and coldest settings. For electronic control systems, the test shall be performed with all compartment temperature controls set at the average of the coldest and warmest settings; if there is no setting equal to this average, the setting closest to the average shall be used. If there are two such settings equally close to the average, the higher of these temperature control settings shall be used. A second test shall be performed with all controls set at either their warmest or their coldest setting (not electrically or mechanically bypassed), whichever is appropriate, to attempt to achieve compartment temperatures measured during the two tests that bound (*i.e.,* one is above and one is below) the standardized temperature. If the compartment temperatures measured during these two tests bound the standardized temperature, then these test results shall be used to determine energy consumption. If the compartment temperature measured with all controls set at their coldest setting is above the standardized temperature, the tested unit fails the test and cannot be rated. If the compartment temperature measured with all controls set at their warmest setting is below the standardized temperature, then the result of this test alone will be used to determine energy consumption. Also see Table 1 of this appendix, which summarizes these requirements.

TABLE 1—TEMPERATURE SETTINGS FOR FREEZERS

First test		Second test		Energy calculation based on:
Settings	Results	Settings	Results	
Mid	Low	Warm	Low	Second Test Only.
			High	First and Second Tests.
	High	Cold	Low	First and Second Tests.
			High	No Energy Use Rating.

* * * * *

4. Test Period

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4.1 Non-automatic Defrost. If the model being tested has no automatic defrost system, the test period shall start after steady-state conditions (see section 2.7 of this appendix) have been achieved and be no less than three hours in duration. During the test period, the compressor motor shall complete two or more whole compressor cycles. (A whole compressor cycle is a complete ''on'' and a complete ''off'' period of the motor.) If no ''off'' cycling occurs, the test period shall be three hours. If less than two compressor cycles occur during a 24-hour period, then a single complete compressor cycle may be used.

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4.2 * * *

4.2.1 * * *

4.2.1.1 Cycling Compressor System. For a system with a cycling compressor, the second part of the test starts at the termination of the last regular compressor ''on'' cycle. The average temperature of the compartment measured from the termination of the previous compressor ''on'' cycle to the termination of the last regular compressor ''on'' cycle must be within 0.5 °F (0.3 °C) of the average temperature of the compartment measured for the first part of the test. If any compressor cycles occur prior to the defrost heater being energized that cause the average temperature in the compartment to deviate from the average temperature for the first part of the test by more than 0.5 °F (0.3 °C), these compressor cycles are not considered regular

compressor cycles and must be included in the second part of the test. As an example, a ''precooling'' cycle, which is an extended compressor cycle that lowers the compartment temperature prior to energizing the defrost heater, must be included in the second part of the test. The test period for the second part of the test ends at the termination of the first regular compressor ''on'' cycle after the compartment temperatures have fully recovered to their stable conditions. The average temperature of the compartment measured from this termination of the first regular compressor ''on'' cycle until the termination of the next regular compressor ''on'' cycle must be within 0.5 °F (0.3 °C) of the average temperature of the compartment measured for the first part of the test. See Figure 1. Note that Figure 1 illustrates the concepts of precooling and recovery but does not represent all possible defrost cycles.

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5. Test Measurements

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5.1 Temperature Measurements. (a) Temperature measurements shall be made at the locations prescribed in Figure 5.2 of HRF–1–2008 (incorporated by reference; see § 430.3) and shall be accurate to within ±0.5 °F (0.3 °C).

(b) If the interior arrangements of the unit under test do not conform with those shown in Figure 5.2 of HRF–1–2008, the unit may 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–1–2008 in order to maintain a minimum 1-inch air space from adjustable shelves or other components that could be relocated by the consumer, this constitutes a relocation of temperature sensors that shall be recorded in the test data and reported in the certification report as described above.

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5.1.2 Compartment Temperature. The compartment temperature for each test period shall be an average of the measured temperatures taken in a compartment during the test period as defined in section 4 of this appendix. For long-time automatic defrost models, compartment temperature shall be that measured in the first part of the test period specified in section 4.2.1 of this appendix. For models with variable defrost controls, compartment temperature shall be that measured in the first part of the test period specified in section 4.2.2 of this appendix. For models with automatic defrost that is neither long-time nor variable defrost, the compartment temperature shall be an average of the measured temperatures taken in a compartment during a stable period of compressor operation that (a) includes no defrost cycles or events associated with a defrost cycle, such as precooling or recovery, (b) is no less than three hours in duration, and (c) includes two or more whole compressor cycles. If the compressor does not cycle, the stable period used for the temperature average shall be three hours in duration.

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5.2 * * *

5.2.1 * * *

5.2.1.3 Variable Defrost Control. The energy consumption in kilowatt-hours per day shall be calculated equivalent to:

$ET = (1440 \times EP1/T1) + (EP2 - (EP1 \times T2/T1)) \times (12/CT)$,

Where:

1440 is defined in 5.2.1.1 and EP1, EP2, T1, T2, and 12 are defined in 5.2.1.2;

$CT = (CT_L \times CT_M)/(F \times (CT_M - CT_L) + CT_L)$;

CT_L = 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), in hours rounded to the nearest tenth of an hour;

CT_M = 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);

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.

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

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5.3 Volume Measurements. (a) The unit's total refrigerated volume, VT, shall be measured in accordance with HRF–1–2008 (incorporated by reference; see § 430.3), section 3.30 and sections 4.2 through 4.3. The measured volume shall include all spaces within the insulated volume of each compartment except for the volumes that must be deducted in accordance with section 4.2.2 of HRF–1–2008.

(b) In the case of freezers with automatic icemakers, the volume occupied by the automatic icemaker, including its ice storage bin, is to be included in the volume measurement.

(c) Total refrigerated volume is determined by physical measurement of the test unit. Measurements and calculations used to determine the total refrigerated volume shall be retained as part of the test records underlying the certification of the basic model in accordance with 10 CFR 429.71.

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6. Calculation of Derived Results From Test Measurements

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6.2 Average Per-Cycle Energy Consumption. The average per-cycle energy consumption for a cycle type, E, is expressed in kilowatt-hours per cycle to the nearest one hundredth (0.01) kilowatt-hour, and shall be calculated according to the sections below.

6.2.1 If the compartment temperature is always below 0.0 °F (−17.8 °C), the average per-cycle energy consumption shall be equivalent to:

$E = ET1 + IET$

Where:

ET is defined in 5.2.1;

The number 1 indicates the test period during which the highest compartment temperature is measured; and

IET, expressed in kilowatt-hours per cycle, equals 0 (zero) for products without an automatic icemaker, and equals 0.23 for products with an automatic icemaker.

6.2.2 If one of the compartment temperatures measured for a test period is greater than 0.0 °F (17.8 °C), the average per-cycle energy consumption shall be equivalent to:

$E = ET1 + ((ET2 - ET1) \times (0.0 - TF1)/(TF2 - TF1)) + IET$

Where:

IET is defined in 6.2.1 and ET is defined in 5.2.1;

TF = freezer compartment temperature determined according to 5.1.3 in degrees F;

The numbers 1 and 2 indicate measurements taken during the first and second test period as appropriate; and

0.0 = standardized compartment temperature in degrees F.

6.2.3 Variable Anti-Sweat Heater Models. The standard cycle energy consumption of a freezer with a variable anti-sweat heater control (E_{std}), expressed in kilowatt-hours per day, shall be calculated equivalent to:

E_{std} = E + (Correction Factor) where E is determined by 6.2.1, or 6.2.2, whichever is appropriate, with the anti-sweat heater switch in the ''off'' position or, for a product without an anti-sweat heater switch, the anti-sweat heater in its lowest energy use state.

Correction Factor = (Anti-sweat Heater Power × System-loss Factor) × (24 hrs/1 day) × (1 kW/1000 W)

Where:

Anti-sweat Heater Power = 0.034 * (Heater Watts at 5%RH)
+ 0.211 * (Heater Watts at 15%RH)
+ 0.204 * (Heater Watts at 25%RH)
+ 0.166 * (Heater Watts at 35%RH)
+ 0.126 * (Heater Watts at 45%RH)
+ 0.119 * (Heater Watts at 55%RH)
+ 0.069 * (Heater Watts at 65%RH)
+ 0.047 * (Heater Watts at 75%RH)
+ 0.008 * (Heater Watts at 85%RH)
+ 0.015 * (Heater Watts at 95%RH)

Heater Watts at a specific relative humidity = the nominal watts used by all heaters at that specific relative humidity, 72 °F ambient (22.2 °C), and DOE reference freezer (FZ) average temperature of 0 °F (−17.8 °C).

System-loss Factor = 1.3

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