

## DEPARTMENT OF ENERGY

## 10 CFR Parts 429 and 430

[Docket No. EERE-2011-BT-TP-0054]

RIN 1904-AC63

**Energy Conservation Program: Test Procedures for Residential Clothes Dryers**

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

**ACTION:** Final rule.

**SUMMARY:** On January 2, 2013, the U.S. Department of Energy (DOE) issued a notice of proposed rulemaking (NPR) to amend the test procedures for residential clothes dryers. DOE also published a supplemental NPR (SNOPR) on February 7, 2013, to propose additional amendments to the clothes dryer test procedure. Those proposed rulemakings serve as the basis for today's action. This final rule updates the reference to the latest edition of the International Electrotechnical Commission (IEC) Standard 62301, "Household electrical appliances—Measurement of standby power," Edition 2.0 2011-01. For the test procedures at both appendix D and appendix D1 to the same subpart, DOE is adopting amendments to clarify the cycle settings used for the test cycle, the requirements for the gas supply for gas clothes dryers, the installation conditions for console lights, the method for measuring the drum capacity, the maximum allowable weighing scale range, and the allowable use of a relative humidity meter. This final rule also amends the DOE clothes dryer test procedure to create a new appendix D2 that includes the amendments discussed above and testing methods for more accurately measuring the effects of automatic cycle termination.

**DATES:** *Effective date:* The effective date of this rule is September 13, 2013.

*Compliance date:* Compliance with the amended test procedure in appendix D for the purposes of compliance with current energy conservation standards, as well as representations, is required beginning February 10, 2014 until January 1, 2015. Compliance with the amended test procedure in appendix D1 for the purpose of compliance with the January 1, 2015 energy conservation standards, as well as representations, is required beginning January 1, 2015. Appendix D2 may be used for informational purposes and compliance with the provisions in appendix D2 may be required at a later date. Voluntary

early compliance with appendix D1 or appendix D2 is permitted.

*Incorporation by reference:* The incorporation by reference of certain publications listed in this rule was approved by the Director of the **Federal Register** September 13, 2013.

**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](http://regulations.gov). All documents in the docket are listed in the [regulations.gov](http://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;dc=FR%252BPR%252BN%252BO%252BSR;rpp=10;po=0;D=EERE-2011-BT-TP-0054>. This Web page will contain a link to the docket for this notice on the [regulations.gov](http://regulations.gov) site. The [regulations.gov](http://regulations.gov) Web page will contain 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](mailto:Brenda.Edwards@ee.doe.gov).

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**SUPPLEMENTARY INFORMATION:****Table of Contents**

- I. Authority and Background
  - A. General Test Procedure Rulemaking Process
  - B. DOE Clothes Dryer Test Procedure
    - 1. January 2011 Final Rule
    - 2. August 2011 RFI
    - 3. January 2013 NPR
    - 4. February 2013 SNOPR
- II. Summary of the Final Rule
  - A. Automatic Termination Control Procedures.
  - B. Incorporation of IEC Standard 62301 (Second Edition).
  - C. Clarifications to Test Conditions.
- III. Discussion
  - A. Products Covered by This Test Procedure Rulemaking
  - B. Automatic Cycle Termination
    - 1. Joint Petition to Amend the Clothes Dryer Test Procedure
    - 2. January 2013 NPR Analysis
    - 3. January 2013 SNOPR Proposed Amendments and Today's Final Rule
  - a. Definitions

- b. Test Load
- c. Automatic Termination Control Dryer Test Cycle
- d. Automatic Termination Control Dryer Field Use Factor
- e. Wrinkle Prevention Mode and the Determination of the Completion of the Test Cycle
- f. New Appendix D2
- C. Timed Dry Test Method
- D. Incorporating by Reference IEC Standard 62301 Second Edition for Measuring Standby Mode and Off Mode Power
- E. Technical Correction to the Calculation of the Per-cycle Combined Total Energy Consumption
- F. Clarifications to Test Conditions
  - 1. Cycle Settings
  - 2. Gas Supply Requirements
  - 3. Console Lights
  - 4. Drum Capacity Measurements
  - 5. Maximum Allowable Scale Range
  - 6. Relative Humidity Meter
- G. Additional Test Procedure Issues
  - 1. Consumer Usage Patterns and Capabilities
    - a. Annual Clothes Dryer Use Cycles
    - b. Initial Remaining Moisture Content and Moisture Removed During Test Cycle
  - c. Test Load Weight
  - d. Exhaust Conditions
- 2. Test Load Bone-Dry Weight Measurement
  - 3. Ventless Clothes Dryer Preconditioning
  - 4. Room Ambient Humidity Requirements
  - 5. Measurement of Drying Cycle Time
- 6. Clothes Dryer Energy Conservation Standards
- H. Effects of Proposed Test Procedure Revisions on Compliance with Standards
  - 1. Active Mode
  - 2. Standby Mode and Off Mode
- I. Compliance with Other EPCA Requirements
  - 1. Test Burden
  - 2. Certification Requirements
  - 3. Compliance date of final amended test procedures
- IV. Procedural Issues and Regulatory Review
  - A. Review Under Executive Order 12866
  - B. Review Under the Regulatory Flexibility Act
  - C. Review Under the Paperwork Reduction Act of 1995
  - D. Review Under the National Environmental Policy Act of 1969
  - E. Review Under Executive Order 13132
  - F. Review Under Executive Order 12988
  - G. Review Under the Unfunded Mandates Reform Act of 1995
  - H. Review Under the Treasury and General Government Appropriations Act, 1999
  - I. Review Under Executive Order 12630
  - J. Review Under Treasury and General Government Appropriations Act, 2001
  - K. Review Under Executive Order 13211
  - L. Review Under Section 32 of the Federal Energy Administration Act of 1974
  - M. Congressional Notification
  - N. Approval of the Office of the Secretary

**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 include residential clothes dryers, the subject of today’s notice. (42 U.S.C. 6292(a)(8))

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 the U.S. Department of Energy (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.

#### *A. General Test Procedure Rulemaking Process*

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

In addition, if DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6293(b)(2)) Finally, in any rulemaking to amend a test procedure, DOE must 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, DOE must amend the

applicable energy conservation standard accordingly. (42 U.S.C. 6293(e)(2))

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

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

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

In any test procedure amendment, DOE must consider the most current versions of International Electrotechnical Commission (IEC) Standard 62301, “Household electrical appliances—Measurement of standby power,” and IEC Standard 62087, “Methods of measurement for the power consumption of audio, video, and related equipment.” *Id.*

#### *B. DOE Clothes Dryer Test Procedure*

DOE’s test procedures for clothes dryers are codified in appendix D and appendix D1 to subpart B of Title 10 of the Code of Federal Regulations (CFR). DOE established its test procedure for clothes dryers at appendix D in a final rule published in the **Federal Register** on September 14, 1977 (the September 1977 Final Rule). 42 FR 46145. On May 19, 1981, DOE published a final rule to amend the test procedure by establishing a field-use factor for clothes dryers with automatic termination controls, clarifying the test cloth specifications and clothes dryer preconditioning, and making editorial and minor technical changes. 46 FR 27324. The test procedure includes provisions for determining the energy factor (EF) for clothes dryers, which is a measure of the total energy required to dry a standard test load of laundry to a “bone dry”<sup>1</sup> state.

<sup>1</sup> “Bone dry” is defined in the DOE clothes dryer test procedure as a condition of a load of test

#### *1. January 2011 Final Rule*

On January 6, 2011, DOE published in the **Federal Register** a final rule for the residential clothes dryer and room air conditioner test procedure rulemaking (76 FR 972) (January 2011 Final Rule), in which it (1) adopted the provisions for the measurement of standby mode and off mode energy use for those products; and (2) adopted several amendments to the clothes dryer and room air conditioner test procedures concerning the active mode for these products. 76 FR 972 (Jan. 6, 2011). DOE created a new appendix D1 in 10 CFR part 430 subpart B that contained the amended test procedure for clothes dryers. Manufacturers must use the test procedures in appendix D1 to demonstrate compliance with energy conservation standards for clothes dryers as of January 1, 2015. (76 FR 52852 (Aug. 24, 2011), 76 FR 52854 (Aug. 24, 2011))

For clothes dryer standby mode and off mode, the January 2011 Final Rule amended the DOE clothes dryer test procedure to incorporate by reference specific clauses from the IEC Standard 62301, “Household electrical appliances—Measurement of standby power,” (first edition June 2005) (IEC Standard 62301 First Edition) regarding test conditions and test procedures for measuring standby mode and off mode power consumption, as well as language to clarify application of these provisions for measuring standby mode and off mode power consumption in clothes dryers. In addition, DOE adopted definitions of modes based on the relevant provisions from IEC Standard 62301 Second Edition Committee Draft for Vote (IEC Standard 62301 CDV). DOE established the Combined Energy Factor (CEF) for clothes dryers to integrate energy use in the standby mode and off mode with the energy use of the main functions of the product.<sup>2</sup> 76 FR 972, 975–6 (Jan. 6, 2011).

For clothes dryer active mode, in the January 2011 Final Rule, DOE adopted testing methods for ventless clothes dryers, test cloth preconditioning requirements for clothes dryer energy tests, test conditions for gas clothes dryers, test conditions for clothes dryer

clothes which has been dried in a dryer at maximum temperature for a minimum of 10 minutes, removed and weighed before cool down, and then dried again for 10-minute periods until the final weight change of the load is 1 percent or less. (10 CFR subpart B, appendix D, section 1.2)

<sup>2</sup> The CEF is defined as the clothes dryer test load weight in pounds divided by the sum of the per-cycle standby and off mode energy consumption and either the total per-cycle electric dryer energy consumption or the total per-cycle gas dryer energy consumption expressed in kilowatt hours (kWh).

drum capacity measurement, and amendments to reflect current clothes dryer usage patterns and capabilities and to update the references to the relevant industry test standard (Association of Home Appliance Manufacturers (AHAM) Standard HLD-1-2009). 76 FR 972, 976–8 (Jan. 6, 2011).

In the January 2011 Final Rule, DOE did not adopt amendments to more accurately measure automatic cycle termination that were proposed earlier in the rulemaking<sup>3</sup> because DOE concluded that they did not adequately measure the energy consumption of clothes dryers equipped with such systems using the test load specified in the DOE test procedure. DOE stated that clothes dryers with automatic termination sensing control systems, which infer the RMC<sup>4</sup> of the load from the properties of the exhaust air such as temperature and humidity, may be designed to stop the cycle when a load of varying weights, composition, and size has a higher RMC than the RMC obtained using the proposed automatic cycle termination test procedure in conjunction with the existing DOE test load.<sup>5</sup> In considering whether other test loads would be appropriate to incorporate into the DOE test procedure to produce both representative and repeatable test results, however, DOE noted that manufacturers indicated that test load types and test cloth materials different than those specified in the DOE test procedure do not produce results as repeatable as those obtained using the test load as currently specified. 76 FR 977 (Jan. 6, 2011).

## 2. August 2011 RFI

On August 12, 2011, DOE published a Request for Information (RFI) to further investigate the effects of automatic cycle termination on clothes dryer energy efficiency (August 2011 RFI). 76 FR 50145. DOE sought information, data, and comments regarding methods for more accurately

measuring the effects of automatic cycle termination in the clothes dryer test procedure. In particular, DOE sought comment on the following: (1) The characteristics of loads of varying weights, composition, and size, (2) the accuracy of different automatic cycle termination sensors and controls, (3) the target final RMC used by manufacturers to maintain consumer satisfaction, (4) the effects of the characteristics of water (*i.e.*, hardness and conductivity) used for wetting the test load prior to testing, and (5) the cycle settings selected by consumers for automatic termination cycles. In response to the August 2011 RFI, interested parties commented that DOE should amend the clothes dryer test procedure to include provisions to account for the effectiveness of automatic cycle termination and amend the relevant energy conservation standards based on the effects of the test procedure changes according to EPCA.

## 3. January 2013 NOPR

On January 2, 2013, DOE published a notice of proposed rulemaking (NOPR) (January 2013 NOPR) (78 FR 152) to propose amendments to the DOE clothes dryer test procedure in 10 CFR part 430, subpart B, appendix D1, to include methods for more accurately measuring the effects of automatic cycle termination. DOE also proposed to update the reference to the latest edition of the IEC Standard 62301, “Household electrical appliances—Measurement of standby power,” Edition 2.0 2011–01 (IEC Standard 62301 (Second Edition) or “Second Edition”) for measuring standby mode and off mode energy consumption, along with additional clarifying language. For the test procedures at both appendix D and appendix D1, DOE proposed in the January 2013 NOPR to clarify the cycle settings used for the test cycle and the requirements for the gas supply for gas clothes dryers. 78 FR 152, 154–155 (Jan. 2, 2013). DOE also held a public meeting on February 6, 2013 (hereafter referred to as the February 2013 public meeting) to hear oral comments on and solicit information relevant to the January 2013 NOPR.

## 4. February 2013 SNO PR

On February 7, 2013, DOE published a supplemental notice of proposed rulemaking (SNO PR) to consider inquiries regarding specific provisions in the current clothes dryer test procedures (February 2013 SNO PR). DOE proposed amendments to clarify the installation conditions for console lights, the method for measuring the drum capacity, the maximum allowable scale range, and the allowable use of a

relative humidity meter. 78 FR 8992 (Feb. 7, 2013).

## II. Summary of the Final Rule

### A. Automatic Termination Control Procedures.

In this final rule, DOE amends the test procedures for clothes dryers in 10 CFR part 430, subpart B to create a new appendix D2 to include methods for more accurately measuring the effects of automatic cycle termination. As discussed in section III.I.3, DOE determined that the amended automatic cycle termination test procedure for clothes dryers represents a significantly different testing methodology that may impact the energy consumption of some clothes dryers more than others and would potentially require additional product re-design to meet the January 1, 2015 standards. As a result, to maintain the same basic test procedure that is required for use to determine compliance with the January 1, 2015 clothes dryer standards, DOE is not amending appendix D1 in today’s final rule to include provisions for more accurately measuring the effects of automatic cycle termination. The newly created appendix D2 with such amendments will not be required for use to determine compliance with either the current or the January 1, 2015 energy conservation standards for clothes dryers. DOE will continue to evaluate products on the market and collect data on clothes dryer automatic cycle termination to evaluate when the compliance date for the amended test procedure in appendix D2 will be required.

The amended test method in appendix D2 requires that clothes dryers with automatic cycle termination controls be tested using the “Normal” automatic termination cycle setting. Where the drying temperature setting can be chosen independently, it shall be set to the maximum. Where the dryness level setting can be chosen independently, it shall be set to the “normal” or “medium” dryness level setting.<sup>6</sup> The amendments also specify that the clothes dryer be allowed to run until the completion of the drying cycle, including the cool-down period, to achieve a final RMC of no more than 2 percent. If the final measured RMC is above 2 percent, the test shall be considered invalid and a new test cycle shall be run using the highest dryness

<sup>3</sup> The test method proposed in a supplemental notice of proposed rulemaking involved testing clothes dryers with automatic termination controls using the “normal” setting (and where the temperature setting can be chosen independently of the program, DOE proposed to use the highest temperature level) and a test load with a starting moisture content of  $57.5 \pm 0.33$  percent, allowing the dryer to run until the heater switches off for the final time at the end of the drying cycle to achieve a final remaining moisture content of no more than 5 percent. 75 FR 37594, 37612–20 (June 29, 2010).

<sup>4</sup> RMC is the ratio of the weight of water contained by the test load to the bone-dry weight of the test load, expressed as a percent.

<sup>5</sup> The DOE test load is composed of cotton mommie test cloths that are each 24 inches by 36 inches in dimensions and are a blend of 50-percent cotton and 50-percent polyester.

<sup>6</sup> Most clothes dryers available on the market provide separate settings for the “temperature level” and “dryness level.” The temperature level refers to the temperature of the hot air used to dry the load in the drum. The dryness level refers to the desired remaining moisture content of the load at the completion of the drying cycle.

level setting. DOE notes that a final RMC of 2 percent using the DOE test load is more representative of clothes dryers currently on the market than the 5-percent final RMC specified in the existing test procedure and the new requirement is representative of the maximum consumer-accepted final RMC. DOE is including an additional clarification that the cycle shall be considered complete when the clothes dryer indicates to the user that the cycle has finished (by means of a display, indicator light, audible signal, or other signal) and the heater and drum/fan motor shuts off for the final time. If the clothes dryer is equipped with a wrinkle prevention feature (*i.e.*, that continuously or intermittently tumbles the clothes dryer drum after the clothes dryer indicates to the user that the cycle has finished) that is activated by default in the condition as shipped by the manufacturer, the wrinkle prevention mode would be included in the test measurement cycle unless it precluded the necessary automatic termination cycle program, temperature setting, or dryness setting. In addition, if a manufacturer's user manual specifies that the wrinkle prevention mode is recommended to be activated for normal use even if it is not done so in the as-shipped condition, the product would be tested with the wrinkle prevention mode activated per manufacturer's instructions.

In the January 2013 NOPR, DOE proposed to apply a field use factor of 0.80 for clothes dryers with automatic cycle termination to account for the measured energy consumption at the end of the automatic termination cycle

drying the DOE test load below 2-percent RMC. 78 FR 152, 170 (Jan. 2, 2013). Based on comments from interested parties and review of available field use data, DOE determined that eliminating the field use factor for automatic termination control dryers will produce test results that are more representative of consumer use. As a result, in today's final rule, DOE is eliminating the field use factor in appendix D2 for clothes dryers with automatic termination controls because the test method directly measures any over-drying energy consumption.

For clothes dryers with only timed dry control settings, the amendments adopted in the new appendix D2 require that the existing timed dry test cycle be used, but change the allowable final RMC range from 2.5–5 percent to 1–2.5 percent. DOE is also amending the test procedure in appendix D2 to change the normalization in the calculation of the per-cycle energy consumption to represent the energy consumption required to dry the test load to 2-percent RMC. These changes provide consistency with the test method for automatic cycle termination and are representative of the final RMC of clothes dryers currently on the market using the DOE test load.

Appendix D2 may be used for informational purposes, but will not be required for use to determine compliance with either the current or the January 1, 2015 energy conservation standards for clothes dryers. DOE is not amending appendix D1 in today's final rule to include the amendments for more accurately measuring the effects of

automatic cycle termination discussed above.

#### *B. Incorporation of IEC Standard 62301 (Second Edition).*

The IEC published IEC Standard 62301 (Second Edition) on January 27, 2011. Consistent with EPCA requirements for amending test procedures to include standby and off mode procedures (42 U.S.C. 6295(gg)(2)(A)), DOE analyzed this latest version of the IEC standard and determined that it provides for improvement for some measurements of standby mode and off mode energy use. Accordingly, DOE adopts amendments in today's final rule to incorporate certain provisions of the IEC Standard 62301 (Second Edition), along with clarifying language, into the DOE clothes dryer test procedures in both appendix D1 and appendix D2.

#### *C. Clarifications to Test Conditions.*

DOE is amending 10 CFR part 430, subpart B, appendices D, D1, and D2 to clarify: (1) The cycle settings used for the test cycle, (2) the requirements for the gas supply for gas clothes dryers, (3) the installation conditions for console lights, (4) the method for measuring the drum capacity, (5) the maximum allowable weighing scale range for drum capacity and test cloth measurements, and (6) the allowable use of a relative humidity meter.

#### *D. Summary of Test Provisions.*

Table II.1 presents the key test procedure provisions in appendix D, D1, and D2.

TABLE II.1—TEST PROCEDURE PROVISIONS

Test provisions	Appendix D	Appendix D1	Appendix D2
Standby/Off Mode Test Methods ...	None .....	Incorporates by reference IEC Standard 62301 (Second Edition) with additional clarifications.	Incorporates by reference IEC Standard 62301 (Second Edition) with additional clarifications.
Ventless Dryer Test Methods .....	No .....	Yes .....	Yes.
Number of Cycles Per Year .....	416 .....	283 .....	283.
Referenced AHAM Standard .....	HLD-1-1974 .....	HLD-1-2009 .....	HLD-1-2009.
Test Load Weight .....	Standard Size Dryers: 7.00 ± .07 pounds. Compact Size Dryers: 3.00 ± .03 pounds.	Standard Size Dryers: 8.45 ± .085 pounds. Compact Size Dryers: 3.00 ± .03 pounds.	Standard Size Dryers: 8.45 ± .085 pounds. Compact Size Dryers: 3.00 ± .03 pounds.
Detergent Specifications for Test Cloth Preconditioning.	AHAM Standard Test Detergent IIA.	AHAM Standard Test Detergent Formula 3.	AHAM Standard Test Detergent Formula 3.
Water Temperature for Test Load Preparation.	100 °F ± 5 °F .....	60 °F ± 5 °F .....	60 °F ± 5 °F.
Starting RMC of Test Load .....	70 ± 3.5 percent .....	57.5 ± 3.5 percent .....	57.5 ± 0.33 percent.

TABLE II.1—TEST PROCEDURE PROVISIONS—Continued

Test provisions	Appendix D	Appendix D1	Appendix D2
Cycle and Settings Used for Test ..	Timed Dry Cycle, Maximum Temperature.	Timed Dry Cycle, Maximum Temperature.	Automatic Termination Control Dryers: “Normal” Automatic Dry Cycle; Maximum Temperature (if separately selectable); “Normal” or “Medium” Dryness (or, if no such designations, at midpoint between min. and max. settings). Timer Dryers: Timed Dry Cycle, Maximum Temperature.
RMC of Test Load at Which Test is Stopped.	Stopped manually at 2.5–5 percent RMC.	Stopped manually at 2.5–5 percent RMC.	Automatic Termination Control Dryers: Allowed to run until completion of automatic cycle. Must be below 2-percent RMC or additional test with highest dryness level setting must be run. Timer Dryers: Stopped manually at 1–2.5 percent RMC.
Cool Down .....	Clothes dryer not permitted to advance into cool down.	Clothes dryer not permitted to advance into cool down.	Cool down period included in automatic cycle test.
Field Use Factor (multiplied by per-cycle energy consumption to account for over drying).	= 1.04 for automatic termination control dryers.  = 1.18 for timer dryers .....	= 1.04 for automatic termination control dryers.  = 1.18 for timer dryers .....	No field use factor for automatic termination control dryers.  = 1.18 for timer dryers.
Clarifications: • Cycle settings used for the test cycle • Requirements for the gas supply for gas clothes dryers • Installation conditions for console lights • Method for measuring the drum capacity • Maximum allowable scale range • Allowable use of a relative humidity meter	Yes .....	Yes .....	Yes.

### III. Discussion

#### A. Products Covered by This Test Procedure Rulemaking

Today’s amendments to DOE’s clothes dryer test procedure cover both electric and gas clothes dryers. DOE defines a clothes dryer to mean a cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation, with blower(s) driven by an electric motor(s) and either gas or electricity as the heat source. 10 CFR 430.2. DOE is not amending the definition for clothes dryers in DOE’s regulations.

Hydromatic Technologies Corporation (Hydromatic) commented that its “hybrid electric” clothes dryer should be a covered product and should be considered before setting any standards or test procedures. (Hydromatic, Public Meeting Transcript, No. 10 at pp. 24–27, 116–118) <sup>7</sup> DOE notes that the

Hydromatic’s clothes dryer would be considered a covered product under the definition of an electric clothes dryer in 10 CFR 430.2 because the heat source is electricity. The definition does not limit electric clothes dryers to any specific method or technology by which the heat is generated from the electrical supply, such as an electric resistance heater or heat pump technology.

#### B. Automatic Cycle Termination

In today’s final rule, DOE is adopting amendments to the clothes dryer test procedure in 10 CFR part 430, subpart B to create a new appendix D2 that

during the February 6, 2013, NOPR public meeting, was recorded in the public meeting transcript in the docket for the residential clothes dryer test procedure rulemaking (Docket No. EERE–2011–BT–TP–0054), and is available for review at [www.regulations.gov](http://www.regulations.gov). This particular notation refers to a comment (1) made by the Hydromatic Technologies Corporation during the public meeting; (2) recorded in document number 10, which is the public meeting transcript that is filed in the docket of the residential clothes dryer test procedure rulemaking; and (3) which appears on pages 24–27 and 116–118 of document number 10.

includes methods to more accurately measure the effects of automatic cycle termination. DOE is not including these methods for automatic cycle termination in appendix D1 for the reasons discussed in section III.I.3.

The DOE test procedures for clothes dryers in 10 CFR part 430, subpart B, appendices D and D1 require manufacturers to apply a field use factor to the per-cycle drying energy consumption to determine the performance of clothes dryers equipped with both automatic cycle termination and timers. For clothes dryers with automatic termination control, the test procedures do not distinguish between the types of sensing control system (e.g., temperature-sensing or moisture-sensing controls) nor consider the sophistication and accuracy of the control system. Gas or electric clothes dryers with time termination control (*i.e.*, those clothes dryers equipped with a timer to determine the end of a drying cycle) are assigned a field use factor of 1.18, while clothes dryers with automatic

<sup>7</sup> A notation in the form “Hydromatic, Public Meeting Transcript, No. 10 at pp. 24–27, 116–118” identifies an oral comment that DOE received

termination are assigned a field use factor of 1.04. Because the test procedure requires the measurement of a timed drying cycle in which the tester manually stops the drying cycle when the test load reaches 2.5–5 percent RMC, the field use factors are intended to account for consumers that may dry loads beyond the 2.5–5 percent RMC specified in the test procedure. The field use factor for timer dryers was derived from a field study conducted by the Oklahoma Gas and Electric Company in 1971, consisting of 64 households and 33,000 loads of clothing, as well as data reported by AHAM representing the energy consumption in 1972 of 2,983,200 production units of clothes dryers. 42 FR 46145, 46146 (Sept. 14, 1977). For automatic termination control dryers, the field use factor was derived from a field study conducted by AHAM in 1977 involving 72 households. 45 FR 46762–63 (July 10, 1980); 46 FR 27324 (May 19, 1981).

In an SNOPR published on June 29, 2010 (75 FR 37594) (June 2010 SNOPR) in advance of the January 2011 Final Rule, DOE proposed to revise its clothes dryer test procedure to include definitions of, and provisions for, testing both timer dryers and automatic termination control dryers based on the methodology provided in Australia/New Zealand (AS/NZS) Standard 2442.1: 1996, “Performance of household electrical appliances—Rotary clothes dryers, Part 1: Energy consumption and performance” (AS/NZS Standard 2442.1) and AS/NZS Standard 2442.2: 2000, “Performance of household electrical appliances—Rotary clothes dryers, Part 2: Energy labeling requirements” (AS/NZS Standard 2442.2). 75 FR 37594, 37598 (June 29, 2010). DOE proposed to incorporate the testing methods from these international test standards, along with a number of clarifications, to measure the energy consumption for both timer dryers and automatic termination control dryers. The measurement would account for the energy consumed by the clothes dryer after the load reaches an RMC of 5 percent. 75 FR 37594, 37599 (June 29, 2010). The proposed test method in the June 2010 SNOPR specified that a clothes dryer with automatic cycle termination controls be tested using the “normal” cycle setting, and where the temperature setting can be chosen independently of the program, it would be set to the highest level. The clothes dryer would then be allowed to run until the heater switched off for the final time at the end of the drying cycle. If the final RMC was higher than 5 percent,

the test would be re-run using the highest dryness level setting. *Id.*

In addition to the provisions for automatic termination control dryers, DOE also proposed testing methods in the June 2010 SNOPR for timer dryers based on AS/NZS Standard 2442.1. The proposed test method specified that the clothes dryer be operated at the maximum temperature setting until the final RMC of the load was between 5 and 6 percent. The procedure would then be repeated to dry the load until the final RMC was between 4 and 5 percent, with the results from these two tests used to interpolate the value of the per-cycle energy consumption required to dry the test load to exactly 5-percent RMC. 75 FR 37594, 37617 (June 29, 2010).

As discussed in the January 2011 Final Rule, DOE conducted testing of representative residential clothes dryers using the automatic cycle termination test procedure proposed in the June 2010 SNOPR. The results of the testing revealed that all of the clothes dryers tested significantly over-dried the DOE test load to near bone dry and, as a result, the measured EF values were significantly lower than EF values obtained using the existing DOE test procedure in appendix D. 76 FR 972, 977 (Jan. 6, 2011). In the January 2011 Final Rule, DOE concluded that the test procedure amendments for automatic cycle termination proposed in the June 2010 SNOPR do not adequately measure the energy consumption of clothes dryers equipped with such systems using the test load specified in the DOE test procedure. Clothes dryers with automatic termination sensing control systems may infer the RMC of the load from the properties of the exhaust air such as temperature and humidity or by using conductivity sensor bars to determine the amount of moisture in the load when the load comes in contact with the sensors. DOE noted in the January 2011 Final Rule that these automatic termination sensing control systems may be designed for consumer use to dry loads of varying weights, composition, and size, which may have different moisture retention properties than the existing DOE test load, and therefore, may result in a higher measured RMC than the RMC obtained using the existing DOE test load with the proposed automatic cycle termination test procedure. In considering whether other test loads would be appropriate to incorporate into the DOE test procedure to produce both representative and repeatable test results, however, DOE noted that manufacturers indicated that test load types and test cloth materials different

than those specified in the DOE test procedure do not produce results as repeatable as those obtained using the test load as currently specified. As a result, in the January 2011 Final Rule, DOE did not adopt the amendments to more accurately measure automatic cycle termination that were originally proposed in the June 2010 TP SNOPR. 76 FR 972, 977–78 (Jan. 6, 2011).

#### 1. Joint Petition To Amend the Clothes Dryer Test Procedure

As discussed in section I of this notice, DOE published the August 2011 RFI to further investigate the effects of automatic cycle termination on clothes dryer energy efficiency. 76 FR 50145 (Aug. 12, 2011). DOE sought information, data, and comments regarding methods for more accurately measuring the effects of automatic cycle termination in the residential clothes dryer test procedure. In particular, DOE sought comment on the following: (1) The characteristics of loads of varying weights, composition, and size, (2) the accuracy of different automatic cycle termination sensors and controls, (3) the target final RMC used by manufacturers to maintain consumer satisfaction, (4) the effects of the characteristics of water (*i.e.*, hardness and conductivity) used for wetting the test load prior to testing, and (5) the cycle settings selected by consumers for automatic termination cycles.

In response to the August 2011 RFI, DOE received the “Joint Petition to Amend the Test Procedure for Residential Clothes Dryers to Include Provisions Related to Automatic Termination Controls” (the “Joint Petition”), a comment submitted by groups representing manufacturers (AHAM, Whirlpool Corporation (Whirlpool), General Electric Company (GE), Electrolux, LG Electronics, Inc. (LG), BSH Home Appliances (BSH), Alliance Laundry Systems (ALS), Viking Range, Sub-Zero Wolf, Friedrich A/C, U-Line, Samsung, Sharp Electronics, Miele, Heat Controller, AGA Marvel, Brown Stove, Haier, Fagor America, Airwell Group, Arcelik, Fisher & Paykel, Scotsman Ice, Indesit, Kuppersbusch, Kelon, and DeLonghi); energy and environmental advocates (American Council for an Energy Efficient Economy (ACEEE), Appliance Standards Awareness Project (ASAP), Natural Resources Defense Council (NRDC), Alliance to Save Energy (ASE), Alliance for Water Efficiency (AWE), Northwest Power and Conservation Council (NPCC), and Northeast Energy Efficiency Partnerships (NEEP)); and consumer groups (Consumer Federation of America (CFA) and the National

Consumer Law Center (NCLC)) (collectively, the “Joint Petitioners”). The Joint Petitioners commented that DOE should amend the clothes dryer test procedure to include provisions to account for the effectiveness of automatic cycle termination. (Joint Petition, No. 3 at pp. 1, 4–5)<sup>8</sup>

The Joint Petitioners recognized DOE’s concerns that the amendments for automatic cycle termination proposed in the June 2010 SNOPR may not properly measure the effectiveness of automatic termination controls, particularly in light of data that suggested that automatic termination control dryers may in fact be drying clothes to approximately 5-percent RMC rather than the less than 2-percent RMC resulting from testing using the DOE test cloth. The Joint Petitioners noted that the DOE test cloth is uniform, for purposes of repeatability and reproducibility, but likely dries faster and more uniformly than a load of varying weights, composition, and size. (Joint Petition, No. 3 at p. 5)

As part of the Joint Petition, AHAM members provided test data on clothes dryers with automatic termination controls representing 60 percent of shipments, measuring the final RMC at the completion of a “normal” automatic cycle, including cool down, using the DOE test load. The data showed that all tested models had a final RMC below 2 percent. The Joint Petitioners stated that because there are few consumer complaints that automatic termination control dryers do not dry clothes, this market-representative final RMC from testing using the DOE test cloth best approximates the maximum consumer-accepted final RMC. (Joint Petition, No. 3 at pp. 5–6)

Based on this data, the Joint Petitioners stated that DOE should amend the clothes dryer test procedure to include the full automatic termination cycle, including cool down. The Joint Petitioners stated that testing the entire cycle is more representative of actual consumer use and is less of a test burden for manufacturers than DOE’s proposal in the June 2010 SNOPR to stop the clothes dryer when the heater switches off for the final time at the end of the drying cycle. In addition, the Joint Petitioners commented that the test procedure should be amended to state

that the final RMC when testing units with automatic termination controls shall be no more than 2 percent when testing with the DOE test load to be representative of clothes dryers currently on the market. Any test in which the final RMC is 2 percent or less should be considered valid. If the final RMC is greater than 2 percent, the test would be invalid and a new test run would be conducted using the highest dryness level setting. (Joint Petition, No. 3 at p. 6)

AHAM withdrew its support for the petition in a letter to DOE dated May 29, 2012, stating that the petition was predicated on DOE’s adoption of test procedure provisions to account for automatic termination controls by December 31, 2011. (AHAM, No. 5 at pp. 1–2) DOE acknowledged AHAM’s withdrawal but continued to consider the substantive provisions to account for such controls.

## 2. January 2013 NOPR Analysis

For the January 2013 NOPR, DOE selected a representative sample of 20 clothes dryers encompassing all clothes dryer product classes to evaluate potential amendments for automatic cycle termination. DOE considered features such as rated energy factor, rated capacity, control type (*i.e.*, electromechanical versus electronic), and automatic cycle termination sensor technology (if advertised) when selecting units to be most representative of products currently available on the U.S. market. DOE initially conducted testing for all test units according to the DOE clothes dryer test procedure in 10 CFR part 430, subpart B, appendix D1. Appendix D1 requires that the DOE test load, initially soaked with an RMC of  $57.5 \pm 3.5$  percent, be dried using the timed dry and maximum temperature settings until the test load has reached a final RMC of 2.5 to 5 percent without allowing the clothes dryer to advance into a cool-down phase. A field use factor is then applied to the measured per-cycle energy consumption to account for the over-drying energy consumption associated with the use of either timer dryers or automatic termination control dryers. DOE then conducted testing of these units using automatic cycle termination test methodologies with different test loads to evaluate the effects of these potential test procedure amendments on the measured efficiency as compared to the existing DOE test procedure in 10 CFR part 430, subpart B, appendix D1. DOE also conducted additional testing to evaluate repeatability and reproducibility of the test results. 78 FR 152, 157–158 (Jan. 2, 2013).

In conducting the testing for the January 2013 NOPR, DOE used the DOE test load and the test load specified in both the AHAM clothes dryer test standard HLD-1-2009, “Household Tumble Type Clothes Dryers,” and the IEC test standard 61121, “Tumble dryers for household use—Methods for measuring the performance,” Edition 3 (2005), which consists of cotton bed sheets, towels, and pillowcases. DOE concluded in the August 2011 RFI that clothes dryers with automatic termination sensing control systems may be designed to stop the cycle when a load of varying weights, composition, and size has a higher RMC than the RMC obtained using the automatic termination drying cycle in conjunction with the existing DOE test load. 76 FR 50145, 50146 (Aug. 12, 2011).

As part of the January 2013 NOPR, DOE conducted the testing for the proposed automatic cycle termination test methodology according to the DOE test procedure in appendix D1, with the following modifications. The test load was prepared with a starting RMC of  $57.5 \text{ percent} \pm 0.33 \text{ percent}$ . The controls were set as follows:

- Instead of using the timed dry cycle setting, the “normal” automatic termination cycle setting was selected. If a “normal” cycle setting was not provided, then the test cycle recommended by manufacturers for drying cotton or linen clothes was used.
- Where the temperature setting could be chosen independently of the program, the highest level was selected.
- Where the dryness level setting could be chosen independently of the program, it was set to the “normal” or “medium” level. If such designation was not provided, then the dryness level was set at the mid-point between the minimum and maximum settings. 78 FR 152, 158 (Jan. 2, 2013).

The clothes dryer was then allowed to run until the completion of the cycle, including the cool-down period. At the completion of the cycle, the clothes were weighed to determine the final RMC. If the final RMC was below 2 percent for the DOE test load, the test was considered valid. If the RMC was higher than 2 percent (*i.e.*, the test load contained more moisture than would be acceptable to consumers), the test was considered invalid and was re-run using the highest dryness level setting. DOE selected the 2-percent RMC threshold based on data presented in the Joint Petitioners’ comment regarding RMC levels acceptable to consumers, discussed above. For the IEC/AHAM test load, similar test conditions were applied except that the threshold value for the final RMC was changed from 2

<sup>8</sup> A notation in the form “Joint Petition, No. 3 at pp. 1, 4–5” identifies a written comment: (1) Made by the Joint Petition; (2) recorded in document number 2 that is filed in the docket of the residential clothes dryer test procedure rulemaking (Docket No. EERE-2011-BT-TP-0054) and available for review at [www.regulations.gov](http://www.regulations.gov); and (3) that appears on pages 1 and 4–5 of document number 2.

percent to 5 percent because of the more varied composition of the IEC/AHAM test load. *Id.*

For each specific testing methodology, DOE conducted a series of three identical tests for each model to evaluate the repeatability of test results.<sup>9</sup> DOE presented the test results in the January 2013 NOPR, which are summarized in Table III.1. DOE noted in

the January 2013 NOPR that for the automatic cycle termination tests using the DOE test load, all of the tests resulted in a lower measured CEF (*i.e.*, higher per-cycle energy use) compared to the DOE test procedure, ranging from a 3.5 percent to 41.9 percent decrease in CEF. Similarly, for the automatic cycle termination tests using the IEC/AHAM test load, DOE noted that all of the tests

resulted in a lower measured CEF compared to the DOE test procedure, ranging from a 6.1 percent to 40.3 percent decrease. In addition, the majority of tested units had a lower CEF for the automatic cycle termination test with the IEC/AHAM test load than with the DOE test load. 78 FR 152, 159–160 (Jan. 2, 2013).

TABLE III.1—JANUARY 2013 NOPR DOE TEST PROCEDURE AND AUTOMATIC CYCLE TERMINATION TEST RESULTS

Product class	DOE test procedure (Appendix D1) CEF (lb/kWh)	Automatic cycle termination—DOE test load		Automatic cycle termination—IEC/AHAM test load	
		CEF <sup>1</sup> (lb/kWh)	% Change	CEF <sup>1</sup> (lb/kWh)	% Change
Vented Electric Standard .....	3.79	3.16	– 16.6	3.03	– 20.0
Vented Electric Compact (240V) .....	3.54	2.79	– 21.1	2.68	– 24.4
Vented Electric Compact (120V) .....	3.75	2.18	– 41.9	2.42	– 35.6
Vented Gas .....	3.39	2.92	– 13.9	2.79	– 17.7
Ventless Electric Compact (240V) .....	2.98	2.73	– 8.4	2.63	– 11.9
Ventless Electric Combination Washer/Dryer ..	2.54	2.45	– 3.9	2.29	– 9.7

<sup>1</sup> No field use factor for automatic cycle termination applied to results.

In the January 2013 NOPR, DOE also presented the average final RMC from the automatic cycle termination tests with both the DOE and IEC/AHAM test loads, as well as the cycle settings used for each test unit. The test data showed that the final RMC ranged from 0.4 percent to 2.0 percent for the DOE test load and 1.3 to 4.7 percent for the IEC/AHAM test load. DOE also noted that for nearly all of the test units, the average final RMC was higher for the tests using the IEC/AHAM test load. The higher measured per-cycle energy use and final RMC for the IEC/AHAM test load compared to the DOE test load is likely due to the ability of the IEC/AHAM test load to retain more water during the drying process than the DOE test load, which gives off moisture more readily and terminates the drying cycle

sooner. In addition, as discussed above, clothes dryers with automatic termination sensing control systems may be designed to stop the cycle when a load of varying weights, composition, and size has a higher RMC than the RMC obtained using the DOE test load. 78 FR 152, 160 (Jan. 2, 2013).

DOE noted in the January 2013 NOPR that manufacturers have indicated that test load types and test cloth materials different than those specified in the DOE test procedure do not produce results as repeatable as those obtained using the DOE test load. Therefore, for each test unit, DOE examined the test-to-test variation in CEF among the three tests conducted using the DOE test procedure and among the three tests using the automatic cycle termination test methodology. DOE presented the

test-to-test variation results in the January 2013 NOPR, which are summarized in Table III.2. The analysis showed that the test-to-test variation for the automatic cycle termination tests with the DOE test load is slightly lower than the test-to-test variation with the IEC/AHAM test load, and that both are higher than the test-to-test variation for the DOE test procedure. DOE noted that the more consistent results for the current DOE test procedure are likely due to the use of the timed dry cycle rather than the automatic termination cycles, which may have additional variation in results due to the performance of temperature and moisture sensors and the automatic termination control strategies. 78 FR 152, 160–161 (Jan. 2, 2013).

TABLE III.2—JANUARY 2013 NOPR CEF TEST-TO-TEST VARIATION

	CEF Test-to-test variation (%)		
	DOE test procedure (Appendix D1)	Automatic cycle termination— DOE test load	Automatic cycle termination— IEC/AHAM test load
Minimum .....	0.18	0.16	0.16
Maximum .....	2.08	5.7	6.44
Average .....	0.87	1.87	2.07

In the January 2013 NOPR, to evaluate the effect of test load composition on repeatability, DOE then ran appendix D1 again for a subset of 10 of the clothes

dryers in its test sample, using the IEC/AHAM test cloth instead of the DOE test cloth. For each of these units, DOE conducted three repeat tests. DOE stated

that it believes that using the timed dry cycle and requiring that the clothes dryer be stopped manually allow for better evaluation of the effect of the test

<sup>9</sup> For this series of tests, DOE did not make any modifications to the water used to wet the test loads.



load composition alone on repeatability by limiting other factors, such as automatic termination sensor performance, that may contribute to variability of results from test to test. The results from this testing were presented in the January 2013 NOPR and are summarized in Table III.3. The results showed a test-to-test variation in CEF (expressed in terms of standard error) of 1.02 percent for the IEC/AHAM test load as compared to the 0.87 percent test-to-test variation for the DOE timed dry test procedure with the DOE test load. 78 FR 152, 161 (Jan. 2, 2013).

TABLE III.3—JANUARY 2013 NOPR CEF TEST-TO-TEST VARIATION FOR APPENDIX D1 WITH IEC/AHAM TEST LOADS

	Timed Dry-IEC/AHAM test load— CEF test-to-test standard error (%)
Minimum .....	0.31
Maximum .....	1.42
Average .....	1.02

DOE noted in the January 2013 NOPR that in addition to the use of the IEC/AHAM test load producing less repeatable results from test to test, the reproducibility of test results from lab to lab must also be considered because different test laboratories may be using different lots of test cloth. To evaluate

the reproducibility of test results from lab to lab, DOE conducted testing of 9 units at an independent test laboratory with different lots of the DOE and IEC/AHAM test loads using the automatic cycle termination test method. The results showed that the lab-to-lab reproducibility of test results was, on average, 3.0 percent for the existing DOE test load and 4.7 percent for the IEC/AHAM test load. 78 FR 152, 161–162 (Jan. 2, 2013).

As part of the automatic cycle termination testing for the January 2013 NOPR, DOE tested a number of units in the test sample at an independent test laboratory that measured and recorded the energy consumption and an estimated instantaneous RMC of the test load throughout the test cycle. The estimated RMC was determined based on the weight of the test load, measured in place during the test cycle, and the rotation of the drum. Based on this testing, DOE decided to develop a field use factor to account for the over-drying energy consumption using the automatic cycle termination test method with the DOE test load at the end of the cycle when the load is dried below 2-percent RMC. 78 FR 152, 162 (Jan. 2, 2013).

Using the independent test laboratory's data, DOE evaluated the measured energy consumption at different times during the cycle—when the test load initially reached 5-percent RMC, when it reached 2-percent RMC,

and at the end of the cycle (including after cool down). The test data showed that the energy consumption measured over a full automatic termination dry cycle is 11–72 percent greater than the energy consumption during the test cycle when the test load initially reaches 5-percent RMC, and 4–62 percent greater than the energy consumption when the test load initially reaches 2-percent RMC (before any moisture regain during cool down/tumbling). DOE also noted that while the final RMC of the DOE test load using the automatic cycle termination test method was between 0.4 percent and 2.0 percent at the completion of the test cycle for all of the clothes dryers in DOE's test sample, this RMC was achieved either after the end of a cool-down period, during which the clothes dryer tumbles with no added heat after the conclusion of the heated drying, or after an extended period of operation at nearly 0-percent RMC when the heater is cycled off and on. The independent test laboratory's data showed that during cool down or non-heated tumbling, the test load regains moisture from the room air. As a result, the final RMC of the test load at the completion of the cycle after the cool-down/tumbling period is higher than the RMC of the load when the heater turns off for the final time. 78 FR 152, 162 (Jan. 2, 2013).

TABLE III.4—JANUARY 2013 NOPR—MEASURED AUTOMATIC CYCLE TERMINATION ENERGY CONSUMPTION AT SPECIFIC RMC LEVELS

Product class	Test unit	Automatic cycle termination sensor technology	Energy consumption (kWh)		
			5% RMC	2% RMC	End of cycle (measured RMC (%)) <sup>1</sup>
Vented Electric Standard .....	1	Moisture + Temp .....	1.945	2.070	2.624 (1.2)
	2	Temperature .....	2.068	2.233	3.119 (0.9)
	4	Moisture + Temp .....	2.160	2.318	2.405 (0.7)
	6	Moisture + Temp .....	2.091	2.280	3.141 (1.9)
Vented Electric Compact (240V) .....	10	Temperature .....	0.823	0.875	1.418 (2.0)
Vented Gas .....	13	Moisture + Temp .....	2.375	2.569	2.905 (0.8)
	15	Moisture + Temp .....	2.347	2.532	3.161 (1.2)
	17	Moisture + Temp .....	2.300	2.482	2.843 (1.2)

<sup>1</sup> As noted above, the test load regained moisture during the cool-down/tumbling period.

Based on the test data, DOE noted that for all of the clothes dryers tested at the independent test laboratory, the DOE test load reached 2-percent RMC before the clothes dryer initially began cycling the heater on and off. The test data also showed that the cool-down/tumbling period can contribute a significant amount of energy consumption

associated with over-drying and moisture regain when using the DOE test load. DOE observed that two test units, both of which used the same moisture sensor technology and dried the test load to final RMCs of close to 1 percent at the end of the cycle, had significantly different total measured energy consumption. One of these test

units achieved this final RMC with only a brief cool-down period, while the other test unit repeatedly heated, tumbled, and regained moisture before the final cool down. DOE stated in the January 2013 NOPR that it believes that the difference in energy consumption between these two units is most likely a function of the control strategy rather

than the accuracy of the sensors. 78 FR 152, 163–166 (Jan. 2, 2013).

As part of the January 2013 NOPR, DOE conducted further analysis to develop an appropriate field use factor to account for the measured energy consumption at the end of the automatic

termination cycle below 2-percent RMC using the DOE test load (including any cool-down/tumbling period). DOE calculated a field use factor of 0.80 for automatic termination control dryers by taking the average of the difference between the measured energy

consumption to initially reach 2-percent RMC and the measured energy consumption at the end of the test cycle. 78 FR 152, 166 (Jan. 2, 2013). The results of this analysis showing the application of the 0.8 field use factor are presented in Table III.5.

TABLE III.5—JANUARY 2013 NOPR—AUTOMATIC CYCLE TERMINATION TEST RESULTS WITH ADJUSTED FIELD USE FACTOR

Product class	Test unit	Per-cycle energy consumption (kWh)		
		2% RMC	End of test—measured	End of test—field adjusted
Vented Electric Standard .....	1	2.070	2.624	2.099
	2	2.233	3.119	2.495
	4	2.318	2.405	1.924
	6	2.280	3.141	2.513
Vented Electric Compact (240V) .....	10	0.875	1.418	1.134
Vented Gas .....	13	2.569	2.905	2.324
	15	2.532	3.161	2.528
	17	2.482	2.843	2.274

DOE noted in the January 2013 NOPR that the IEC recently revised its test standard for clothes dryers, IEC Standard 61121. 78 FR 152, 166 (Jan. 2, 2013). IEC Standard 61121 Fourth Edition, which published in February 2012, notes that the characteristics of

the water used for wetting the test load prior to the test, particularly the conductivity, can influence the test results when testing automatic termination control dryers with moisture sensors. Clothes dryers with moisture sensors use conductivity

sensor bars to determine the amount of moisture in the load when the load comes in contact with the sensors. Table III.6 provides the characteristics of either soft or hard water to be used for appliance testing under IEC Standard 61121.

TABLE III.6—IEC STANDARD 61121 REQUIREMENTS FOR COMPOSITION OF SOFT AND HARD WATER FOR CLOTHES DRYER TESTING

Property	Unit	Water type	
		Standard soft water	Standard hard water
Total hardness .....	Millimols per liter (mmol/l) (Ca <sup>2+</sup> /Mg <sup>2+</sup> ) .....	0.50 ± 0.20 .....	2.50 ± 0.20
Conductivity (at 20°C) .....	Microsiemens per centimeter (μS/cm) .....	150 ± 50 .....	750 ± 150

In the August 2011 RFI, DOE requested information and data on these effects of the characteristics of the water used to wet the test load on the measured efficiency, as well as any potential testing burden associated with the requirements for modifying the water supply used for wetting the test load. DOE did not receive any comments or information on this issue. DOE conducted testing for the January 2013 NOPR to evaluate the effects of using supply water modified to meet the specifications in the IEC Standard 61121 on the measured efficiency compared to using supply water according to the requirements of appendix D1. For this series of tests, DOE conducted tests on 16 units using the same automatic cycle termination methodology discussed above, except that the water used to wet the test load prior to the test met the conditions presented in Table III.6 for

standard soft water. 78 FR 152, 167 (Jan. 2, 2013). DOE selected the soft water requirements from IEC Standard 61121 rather than the hard water requirements to more closely match the existing DOE clothes dryer test procedure, which also requires the use of soft water.<sup>10</sup> For each test method, DOE again conducted three identical tests for each test unit. The test results did not show a correlation between the average measured CEF and water supply specifications for the automatic cycle termination tests with either the DOE or IEC/AHAM test loads. Similar to the measured CEF discussed above, there was no definitive correlation between the average measured final RMC or the test-to-test variation and the water supply specifications. Based on the test results,

<sup>10</sup> 10 CFR part 430, subpart B, appendix D1, section 2.6.3 requires the use of soft water with 17 parts per million hardness or less.

DOE determined that the modifications to the water supply specified in IEC Standard 61121 did not have a definitive effect on the measured CEF as compared to the water requirements specified in the existing DOE test procedure. In addition, the repeatability testing showed that the IEC water hardness specifications did not improve overall the test-to-test repeatability. 78 FR 152, 167–169 (Jan. 2, 2013).

DOE conducted additional testing on two clothes dryers to evaluate the lab-to-lab reproducibility using both supply water specifications in automatic cycle termination tests with the IEC/AHAM test load. These tests showed that the IEC supply water may produce more reproducible results from lab to lab with the IEC/AHAM test load. DOE noted, however, that the percentage difference in test results from lab to lab was within the test-to-test variation for a given lab using the IEC/AHAM test load. For

these reasons, DOE did not propose amendments in the January 2013 NOPR to include in the amendments to appendix D1 the supply water specifications from IEC Standard 61121. DOE noted that if additional test results are made available showing that IEC supply water characteristics produce more repeatable and reproducible test results than the requirements in appendix D1, DOE may consider such amendments in a future test procedure rulemaking. 78 FR 152, 166 (Jan. 2, 2013).

### 3. January 2013 NOPR Proposed Amendments and Today's Final Rule

Based on the testing and analysis discussed above, DOE proposed amendments to the clothes dryer test procedure in 10 CFR part 430, subpart B, appendix D1 in the January 2013 NOPR to more accurately measure the energy consumption of automatic termination control dryers. 78 FR 152, 169 (Jan. 2, 2013).

#### a. Definitions

DOE proposed in the January 2013 NOPR to amend the clothes dryer test procedure in appendix D1 to add definitions for both automatic termination control dryers and timer dryers. DOE proposed to define "automatic termination control dryer" as a clothes dryer that can be preset to carry out at least one sequence of operations to be terminated by means of a system assessing, directly or indirectly, the moisture content of the load. An automatic termination control dryer with a supplementary timer or that may also be manually controlled would be tested as an automatic termination control dryer. DOE proposed to define "timer dryer" as a clothes dryer that can be preset to carry out at least one operation to be terminated by a timer, but may also be manually controlled, and does not include any automatic termination function. 78 FR 152, 169–170 (Jan. 2, 2013).

AHAM and ALS commented that they did not oppose the proposed definitions for automatic termination control dryer and timer dryer. (AHAM, No. 17 at p. 12; ALS, No. 16 at p. 3) Based on these comments and the discussion above, DOE is adopting these definitions for automatic termination control dryer and timer dryer in today's final rule.

#### b. Test Load

The existing DOE test procedure in 10 CFR part 430, subpart B, appendix D1, section 2.6 specifies that the test load be composed of 50-percent cotton and 50-percent polyester momie weave cloth.

Section 2.7 in appendix D1 requires that test loads be prepared with a starting RMC of 57.5 percent  $\pm$  3.5 percent. DOE proposed amendments in January 2013 NOPR to change the starting RMC from 57.5 percent  $\pm$  3.5 percent to 57.5 percent  $\pm$  0.33 percent. DOE stated in the January 2013 NOPR that it believes that the starting RMC of 57.5 percent  $\pm$  0.33 percent, which was used for the testing presented above, and originally proposed in the June 2010 SNOPR, would produce the most repeatable results, particularly for automatic termination control dryers. DOE noted that allowing a wide range in the starting RMC, such as the  $\pm$  3.5 percent specified in the current DOE test procedure, would result in significantly different results using the proposed automatic cycle termination test procedure because a test load with a starting RMC of 61 percent would contain approximately 0.6 pounds (lb) of water more than a test load with a starting RMC of 54 percent for standard-size loads. 78 FR 152, 170 (Jan. 2, 2013). As a result, DOE specifically proposed to amend 10 CFR part 430, subpart B, appendix D1, section 2.7.1, "Compact size dryer load," and section 2.7.2, "Standard size dryer load," to require that water be extracted from the wet test loads by spinning the load until the moisture content of the load is 52.5–57.5 percent of the bone-dry weight of the test load. Final mass adjustments would be made, such that the moisture content is 57.5 percent  $\pm$  0.33 percent by adding water uniformly to the load in a very fine spray. DOE noted that requiring water to be extracted to achieve an RMC between 52.5 percent and 57.5 percent would serve as an initial preparation step prior to the final mass adjustments to obtain a test load with an RMC of 57.5  $\pm$  0.33 percent proposed above. 78 FR 152, 170 (Jan. 2, 2013).

#### Test Load Composition

In response to the January 2013 NOPR, The Northwest Energy Efficiency Alliance (NEEA) and NPCC jointly commented (hereafter "NEEA & NPCC") that the DOE test load is not representative of the laundry loads being dried in a representative average use cycle. NEEA & NPCC stated that the data from the NEEA residential laundry field use study, which included 50 households in the Pacific Northwest United States metered from January 2012 to March 2012, show that the fabrics in the loads being washed and dried are much heavier than those in the DOE test load. NEEA & NPCC added that the outcomes for the field data, in terms of RMC from the clothes washer,

drying cycle time, and clothes dryer energy use, are all substantially different than those produced using the test procedure proposed in the January 2013 NOPR. (NEEA & NPCC, No. 21 at pp. 3–4, 10; NPCC, Public Meeting Transcript, No. 10 at p. 114; NEEA, Public Meeting Transcript, No. 10 at p. 17) NEEA added that: (1) The current DOE test load is consistent and the ply is fairly thin, (2) the IEC Standard 61121 mixed load has thinner fabric but more cotton than the DOE load, (3) the IEC Standard 61121 cotton load is also fairly thin and not substantively different than the DOE ply, (4) the AS/NZS Standard 2442 load is mostly cotton and has a large range of ply thicknesses and resembles loads that are seen in the field, and (5) the AHAM HLD–1–1992 test load is cotton and has a large range of ply thicknesses. Pacific Gas and Electric Company, San Diego Gas and Electric Company, and Southern California Edison (hereafter "California Investor Owned Utilities (IOUs)") and NEEA commented that the test-to-test and lab-to-lab variation based on DOE's testing is slightly higher for the IEC cotton load as compared to the DOE test load, but, given that the amount of energy that it takes to dry the IEC cotton load is greater, the results as a percentage of per-cycle energy use are not significantly different. The California IOUs added that, given the far greater differences observed between the actual clothes dryer energy use per load in the field and what is measured using the DOE test procedure, this minimal increase in testing variability is justifiable to provide an accurate representation of energy use. (NEEA, Public Meeting Transcript, No. 10 at pp. 17, 19–21, 22; California IOUs, Public Meeting Transcript, No. 10 at p. 64)

NEEA & NPCC and the California IOUs noted that when DOE tested the IEC/AHAM test load and allowed the clothes dryers to shut off at 5-percent RMC or less (rather than 2-percent RMC with the DOE test load), all of the clothes dryers used more energy per load but left the clothes less dry than the tests with the DOE test load. The California IOUs added that the average efficiency drop from the existing appendix D1 results was 3.9 percent for automatic termination with the DOE test load and 9.7 percent with the IEC/AHAM test load and that the choice of a test load affects the final test outcome more than the choice of final RMC or most of the other factors being considered in the test procedure. NEEA & NPCC and the California IOUs commented that this difference would increase with an even more realistic test load, such as the AHAM HLD–1–1992

test load. The California IOUs added that removing the last few percent RMC from the load is an inefficient process, and that if the test procedure required the IEC/AHAM test load to be dried 2-percent RMC, the difference in efficiency compared to the existing appendix D1 test procedure would widen further. (NEEA & NPCC, No. 21 at p. 5; California IOUs, No. 22 at p. 14; California IOUs, Public Meeting Transcript, No. 10 at pp. 60–61, 64)

NEEA & NPCC and the California IOUs presented test data for 5 different clothes dryer models<sup>11</sup> comparing the drying time, measured per-cycle energy consumption, and CEF using the automatic termination test cycle with the DOE test load versus with a test load they considered more representative of real-world laundry loads. NEEA & NPCC noted that the drying times for the automatic termination test cycle with the real-world loads are quite similar from model to model, except for the clothes dryer with the moisture sensor bars that rotate with the drum and the heat pump clothes dryer. NEEA & NPCC and the California IOUs also noted that the CEF is lower for the tests with real world load as compared to the DOE test load in all cases, but the difference varies depending on the technology type. Based on this data, NEEA & NPCC and the California IOUs believe that it is inappropriate for DOE to adopt a single field use factor to adjust the per-cycle energy use from testing using the current DOE test load to represent how various technologies would perform with real-world laundry loads. NEEA & NPCC and the California IOUs commented that DOE should specify testing with a more realistic test load, such as the IEC cotton load or AHAM HLD–1–1992 test load, so that manufacturers would have an incentive to optimize their sensors and drying technology for real-world conditions. (NEEA & NPCC, No. 21 at pp. 10–12; California IOUs, No. 22 at pp. 21–22) NEEA & NPCC commented that a test load that is more reflective of real-world clothing, such as the IEC cotton test load or the AHAM HLD–1–1992 test load, would provide additional agreement between tested energy use and typical field energy use. NEEA & NPCC urged DOE to address this issue as soon as possible for both clothes washers and clothes dryers in a new rulemaking. (NEEA & NPCC, No. 21 at pp. 12–13)

NRDC, ASAP, ACEEE, and the California IOUs similarly commented that the current test load is not representative of real-world loads and results in significant underreporting of energy use. The California IOUs added that, as a result, the test procedure does not appropriately balance representativeness and repeatability. NRDC, ASAP, and the California IOUs requested DOE to address this issue as soon as possible in a new rulemaking. NRDC and ASAP commented that clothes dryers are likely the single largest opportunity for energy savings in home appliances, and modifying the test procedure so that it more accurately represents field energy use is critical to being able to capture these additional opportunities. (NRDC, No. 20 at p. 2; ASAP, Public Meeting Transcript, No. 10 at pp. 119–120; ACEEE, Public Meeting Transcript, No. 10 at pp. 114–115; California IOUs, No. 22 at pp. 14, 17)

Earthjustice commented that DOE's use of 5 percent as the target RMC using the AHAM test load recognizes that the AHAM load is more representative of the loads encountered in the field. Earthjustice stated that the NEEA field study data, which shows that heavier fabrics (such as the towels represented in the AHAM test load) make up a significant portion of household laundry loads, supports this conclusion. (Earthjustice, No. 15 at pp. 1–2)

The California IOUs stated that designs that reduce over-drying can, based on DOE's test data in January 2011 Final Rule, save about 0.3 to 0.6 kilowatt hours (kWh) of over-drying energy use per load relative to designs that inefficiently terminate the cycle. The California IOUs stated that, based on recent testing by Ecos, Consumer Reports, DOE, and Ecova, certain automatic termination test methods can actually result in a higher measured energy use relative to DOE's current timed dry test procedure because the DOE test cloths are already quite dry by the time many clothes dryers detect high exhaust temperatures and low humidity levels that indicate there is no water left in the load to evaporate. The California IOUs stated that it is difficult for these clothes dryers to prevent over-drying because the condition they are designed to detect occurs when the DOE test load has been over-dried. (California IOUs, No. 22 at p. 13)

The California IOUs commented that DOE should use the AHAM HLD–1–1992 bone-dry load weight (7.4 lb), which according to the NEEA field data more accurately represents field laundry loads than the DOE test load or the IEC/AHAM cotton load because it contains

a much wider range of fabric thicknesses and weights. The California IOUs stated that common items such as shirts, pants, socks, and other articles of clothing are three-dimensional, and therefore contain interior sides that are more difficult to dry than the two-dimensional DOE test cloths. The California IOUs added that these items vary quite widely in their moisture retention capability because of differences in thickness and synthetic content but, on average, retain more moisture per pound than the uniform DOE test cloth and require more energy to dry. The California IOUs stated that these items present automatic termination controls with greater difficulty than DOE's test cloths in determining when the load is dry. (California IOUs, No. 22 at pp. 17–18; California IOUs, Public Meeting Transcript, No. 10 at pp. 112–113) The Super Efficient Dryer Initiative (SEDI) also cited the Ecova testing in stating that the AHAM HLD–1–1992 test load is the most similar to typical laundry because it uses items of actual clothing with different fabrics and varying thicknesses. SEDI stated that the test results showed that drying test cloths that more closely resemble real-world clothing increased drying time and energy consumption, and that DOE should specify the use of the AHAM HLD–1–1992 test load in the clothes dryer test procedure. (SEDI, No. 14 at pp. 2–3)

The California IOUs commented that manufacturers are likely already using AHAM HLD–1 to evaluate drying performance. The California IOUs commented that if there is already a representative load that industry is using to determine drying performance, measuring energy at the same time as that test would reduce test burden. (California IOUs, Public Meeting Transcript, No. 10 at pp. 179–180) AHAM stated that the test burden associated with using the IEC/AHAM test load for energy and water testing would not be lower than the burden associated with using the DOE test load. AHAM stated that manufacturers use the IEC/AHAM test load for non-energy purposes, but use of the AHAM test procedure is voluntary and, thus, use of the IEC/AHAM test load for other purposes is outside of the regulatory context. AHAM also stated that it is not simple to measure the energy using the IEC/AHAM test load given the increased variability in test results, which will in turn increase the burden on manufacturers. AHAM added that it is critical that the DOE test procedure be as repeatable and reproducible as

<sup>11</sup> The 5 tested clothes dryers included: (1) A dryer with temperature sensing, (2) a dryer with stationary moisture sensing bars, (3) a dryer with moisture sensing bars that rotate with the drum, (4) a dryer with an exhaust air-to-air heat exchanger, and (5) a heat pump clothes dryer.

possible, especially given the more stringent standards. (AHAM, No. 17 at p. 15)

AHAM stated that the DOE test load, because it is comprised of uniform test cloth, produces more repeatable and reproducible results. AHAM, therefore, agreed with DOE's proposal to continue using the DOE test load at this time. AHAM stated that should such a change in the test load be considered in the future, extensive testing would be required to determine the appropriate test load and the impact of such a change on measured energy efficiency. AHAM indicated that it would be impossible to complete this work prior to the January 1, 2015 compliance date of the amended standards, even were it appropriate to make such a change during the 3-year lead time before the amended standards. (AHAM, No. 17 at p. 14) Samsung also supported using the DOE test load to minimize measurement system uncertainty, based on DOE's data and internal experience that the IEC/AHAM loads could result in higher variation. Samsung stated that even though the DOE load is different from real-world loads, it is expected that the DOE load will identify relative differences between the test units with higher precision. (Samsung, No. 13 at p. 2)

Hydromatic stated that there is no definition of a real-world test load. (Hydromatic, Public Meeting Transcript, No. 10 at pp. 40–55)

DOE recognizes interested parties concerns regarding the test load composition and the available field study data that show a variety of weights, composition, and size of consumer laundry loads. DOE did not receive any data or information from interested parties that would alter its determination that the test-to-test and lab-to-lab variation using the current IEC/AHAM test load is sufficiently higher than with the DOE test load to warrant the continued use of the DOE test load. Further, DOE concludes that specifying any alternative load with more variation in weights, composition, and size than the DOE test load would increase the test-to-test and lab-to-lab variation. Repeatable and reproducible test procedures are necessary to ensure that testing results are consistent from test to test and lab to lab especially for compliance and verification testing. In addition, although certain manufacturers may use AHAM HLD-1 for measuring clothes dryer performance and these manufacturers may experience reduced testing burden if DOE specified the IEC/AHAM load in its test procedure, the use of AHAM HLD-1 is voluntary and thus this

benefit may not apply to all manufacturers. For these reasons, DOE is not adopting amendments to the DOE test load in today's final rule. In addition, due to a lack of sufficient information at this time, DOE is not adopting a definition of a real-world load in today's final rule. DOE may continue collecting data on clothes dryer test loads and may consider amendments to the test load in a future rulemaking if data is made available showing that the variation from test to test and lab to lab can be reduced, particularly for different batches and lots of test loads.

#### Test Load Preparation

AHAM requested that DOE provide further definition of what is considered a "very fine spray" and what is meant by "uniform" when adding water to make the final mass adjustments. AHAM questioned whether testers should use a spray bottle, a detergent bottle with holes in it, or some other method, and that without clarity on these points, variation could be introduced into the test procedure. AHAM stated that the method for application of the water could impact the measured energy use. AHAM suggested that DOE further investigate the impact this method could have on measured energy use, including contacting manufacturers for input. AHAM stated that it cannot provide data on the impact on measured energy efficiency, if any, until DOE clarifies "very fine spray." (AHAM, No. 17 at p. 12) ALS opposed tightening the allowable range for the initial RMC to  $\pm 0.33$  percent because it claimed manufacturers and test labs will aim to be at the low end of this tolerance, and then try to utilize the proposed technique of "uniformly" misting with a "very fine spray" the outside of the test load to achieve the initial RMC. ALS believes that the sprayed moisture on the outside of the test load is the easiest to evaporate during the energy test and can skew the test result. (ALS, No. 16 at pp. 3–4)

DOE does not believe that the method for wetting the test load, which requires water to be initially extracted to achieve an RMC between 52.5 percent and 57.5 percent then making final mass adjustments to obtain a test load with an RMC of  $57.5 \pm 0.33$  percent by adding water uniformly to the load in a very fine spray, would significantly affect the measured efficiency at the extremes for the RMC conditions. Because the DOE test cloths are uniform and relatively thin, the water absorbed when making the final mass adjustments by adding water uniformly in a very fine spray

would be absorbed relatively equivalently to the water absorbed when initially dampening the test load. In addition, DOE notes that the allowable range for the initial RMC of  $57.5 \pm 0.33$  percent would result in a difference in the amount of water contained in the test load of only approximately 0.06 lb at the minimum and maximum values. As a result, DOE does not believe this allowable range for the initial RMC would measurably affect the efficiency and that further tightening the tolerances would add testing burden to achieve the initial RMC. DOE also notes that for the testing conducted for the January 2013 NOPR, the test technicians did not attempt to control the tolerances for wetting the test load tighter than the ranges specified in the test method (*i.e.*, the initial extraction achieve an RMC between 52.5 percent and 57.5 and the final mass adjustments to obtain a test load with an RMC of  $57.5 \pm 0.33$  percent). As a result, any effects in the measured efficiency would have been captured in the test-to-test variation for the automatic termination tests with the DOE test load (which was on average 1.87 percent). For these reasons, DOE is adopting the test load requirements proposed in the January 2013 NOPR and discussed above, with the following clarification. To provide a clear and consistent method, the amendments adopted in today's final rule specify in 10 CFR part 430, subpart B, appendix D2, section 2.7, that water added to make the final mass adjustments shall be uniformly distributed among all of the test cloths in a very fine spray using a spray bottle.

#### Automatic Termination Control Dryer Test Cycle

DOE proposed in the January 2013 NOPR to change the clothes dryer test cycle specified in 10 CFR part 430, subpart B, appendix D1, section 3.3 to require separate test methods for automatic termination control dryers and timer dryers. 78 FR 152, 170 (Jan. 2, 2013).

For automatic termination control dryers, DOE proposed to amend the clothes dryer test procedure to require the use of the control settings discussed in section III.B.2 of this notice. Specifically, DOE proposed to require that the "normal" automatic termination cycle program be selected for the test cycle, and that for clothes dryers that do not have a "normal" program, the cycle recommended by the manufacturer for drying cotton or linen clothes would be selected. 78 FR 152, 170 (Jan. 2, 2013). Where the drying temperature can be chosen independently of the program, it would be set to the maximum

temperature setting. *Id.* In addition, the proposed amendments would require that where the dryness level setting can be chosen independently of the program, the dryness level would be set to the “normal” or “medium” setting. *Id.* If such designation is not provided, then the dryness level would be set at the mid-point between the minimum and maximum settings. DOE also proposed to require that the cycle settings used for the test cycle be recorded. *Id.*

For the reasons explained below, DOE proposed that the clothes dryer would then be allowed to run until the completion of the cycle, including any cool-down period. After the cycle is complete, the test load would be weighed to determine the final RMC. If the final RMC is below 2 percent, the test would be considered valid. If the RMC is higher than 2 percent, the test would be considered invalid and would be re-run using the highest dryness level setting. *Id.*

DOE proposed in the January 2013 NOPR to measure the full automatic termination cycle, including any cool-down period, to be more representative of actual consumer use. DOE determined in the January 2013 NOPR that the proposed provision to include a cool-down period would result in less testing burden than the January 2011 Final Rule proposal to stop the test cycle when the heater switches off for the final time immediately before the cool-down period begins (76 FR 972, 998 (Jan. 6, 2011)), which would require the tester to monitor the clothes dryer and possibly run multiple test cycles to determine when the heater has switched off for the final time. 78 FR 152, 170 (Jan. 2, 2013).

As discussed above, DOE also proposed in the January 2013 NOPR to base the calculations for automatic termination control dryers on a nominal final RMC of 2 percent. This is a change from the existing test procedure, which requires that the clothes dryer test cycle be stopped when the final RMC is between 2.5 percent and 5 percent. Based on the data submitted in the Joint Petition and DOE's analysis, DOE tentatively concluded in the January 2013 NOPR that a final RMC of 2 percent using the DOE test load would be more representative of clothes dryers currently on the market and representative of the maximum consumer-accepted final RMC. *Id.*

NEEA stated that, based on its field study data, consumers select the medium temperature setting 52 percent of the time. (NEEA, Public Meeting Transcript, No. 10 at p. 21) The California IOUs commented that DOE

should update the required temperature settings in the test procedure to reflect consumer preferences, based on recent field measurements. The California IOUs stated that DOE should make these revisions in a new test procedure rulemaking. The California IOUs noted that the NEEA field data also show that consumers select the high and low temperature settings 35 percent and 13 percent of the time, respectively. (California IOUs, No. 22 at pp. 17, 20)

DOE does not have information to determine for the clothes dryer models included in the field study whether the temperature setting can be selected independently of the cycle program and whether the sample of clothes dryers in the field study is representative of the optional temperature settings for all clothes dryer shipments. As a result, DOE notes that there is uncertainty as to whether the temperature settings selected by participants in the NEEA field study, which included only 50 households in the Pacific Northwest, are representative of the selections of the nation as a whole. For these reasons, DOE is not considering changing the temperature settings for the automatic termination test cycle proposed in the January 2013 NOPR at this time. However, DOE notes that according to the provisions for the cycle settings proposed in the January 2013 NOPR, which specify that the highest temperature setting be used if the temperature setting can be chosen independently of the cycle program setting, six of the 14 units in DOE's test sample that had a temperature setting indicator on the control panel were unable to select the temperature setting separately from the cycle program and automatically used the medium temperature setting for the test cycle. In addition, DOE may continue to collect and consider available data and information on the temperature settings to consider whether changes to the temperature settings would be warranted in a future test procedure rulemaking.

NEEA stated that, based on its field study data, consumers select the normal dryness setting 57 percent of the time and the very dry setting 42 percent of the time. (NEEA, Public Meeting Transcript, No. 10 at p. 21) The California IOUs commented that many people use the very dry setting, and that it is not true that all consumers are satisfied with the dryness of their clothing when using the normal dryness setting, based on the study conducted by NRDC in 2011 that found that real clothing would have to be dried to approximately 2-percent final RMC in order to feel uniformly dry to the touch.

The California IOUs commented that, since the DOE test cloths are much easier to dry than real-world loads, the test cloths would need to be significantly lower than 2-percent final RMC to approximate a 2-percent final RMC in real clothing. The California IOUs stated that with a test load that more closely approximates real-world clothing, such as the AHAM HLD-1-1992 test load, a 2-percent final RMC would be appropriate. (California IOUs, No. 22 at pp. 20-21)

DOE notes that the NRDC report prepared by Ecova and referenced by the California IOUs states that the 2-percent RMC threshold for what consumers would consider “dry” for real-world clothing is an assertion made by NRDC and Ecova without any empirical basis.<sup>12</sup> As a result, DOE is not considering changing the dryness level settings for the automatic termination test cycle proposed in the January 2013 NOPR. In addition, for the reasons discussed above, DOE is not considering changing the DOE test load at this time.

NEEA & NPCC and the California IOUs commented that the NEEA field study showed that participants used timed drying 29 percent of the time, and the auto-termination cycle 71 percent of the time. NEEA & NPCC and the California IOUs considered 29 percent to be a significant fraction of total clothes dryer cycles, and therefore stated that the test procedure should require clothes dryers with automatic cycle termination to be tested both in the timed drying and auto cycle termination modes. (NEEA & NPCC, No. 21 at pp. 13-14; California IOUs, No. 22 at p. 11)

Because the field study sample was limited, DOE does not have sufficient information at this time to determine how frequently all consumers in the nation use the timed dry function versus the automatic cycle termination function and, thus, properly weight or apportion the energy consumption between the two drying modes in the clothes dryer test procedure. DOE also notes that Whirlpool submitted a comment in the last test procedure rulemaking asserting that, although the majority of consumers want timed dry cycle capability, they use it only 10 percent of the time. 76 FR 972, 995 (Jan. 6, 2011). In addition, requiring the measurement of both the automatic termination cycle and the timed dry cycle for automatic termination control

<sup>12</sup> Denkenberger, Serena Mau, Chris Calwell, and Eric Wanless. 2011. Residential Clothes Dryers: A Closer Look at Energy Efficiency Test Procedures and Savings Opportunities. Ecova and NRDC. p. 7.

dryers would significantly increase testing burden. As a result, DOE is not considering amendments in today's final rule to require the measurement of both the automatic termination cycle and the timed dry cycle for automatic termination control dryers.

#### d. Automatic Termination Control Dryer Field Use Factor

DOE proposed in the January 2013 NOPR that the measured test cycle energy consumption be multiplied by a field use factor of 0.80 to calculate the per-cycle energy consumption for automatic termination control dryers based on the data presented above in section III.B.2. DOE noted in the January 2013 NOPR that this field use factor would account for the measured energy consumption at the end of the automatic termination cycle drying the DOE test load below 2-percent RMC, which DOE determines to be representative of consumer-acceptable drying levels with loads of varying weights, composition, and size. 78 FR 152, 170 (Jan. 2, 2013).

AHAM and ALS opposed the proposed 0.80 field use factor, asserting that it is without technical or empirical justification. AHAM added that the Joint Petition did not include such a factor because it is not necessary under the proposed test procedure. AHAM and ALS stated that based on testing, DOE must rely on the proposed field use factor to justify the determination of a *de minimus* impact on the measured efficiency according to DOE's criteria (e.g., less than a 5-percent impact on measured efficiency). AHAM commented that it is inappropriate for DOE to include the 0.80 field use factor to avoid adjusting the standard, and that DOE should either provide a "crosswalk" or not make such significant test procedure changes except as part of a future standards rulemaking. (AHAM, No. 17 at p. 4; ALS, No. 16 at p. 3)

Samsung agreed with DOE's proposed field use factor. Samsung alternatively recommended that the 0.80 field use factor not be included in the test procedure and that the standard levels be adjusted to account for the energy increase due to the test procedure change according to 42 U.S.C. 6293(e)(2). (Samsung, No. 13 at p. 3)

NEEA & NPCC, ASAP, ACEEE, SEDI, and the California IOUs commented that the 0.80 field use factor for automatic termination cycles inappropriately adjusts per-cycle energy use, significantly underestimating the annual clothes dryer energy use measured in the field. (NEEA & NPCC, No. 21 at pp. 3–4; ASAP, Public Meeting Transcript, No. 10 at pp. 28, 85–86; ACEEE, Public

Meeting Transcript, No. 10 at pp. 200–201; SEDI, No. 14 at p. 3; California IOUs, No. 22 at p. 3) NEEA & NPCC stated that, based on its analysis and testing, the proposed test procedure estimates annual energy use that is approximately 30 percent lower than what is observed in the field. NEEA & NPCC commented that their testing demonstrates reasonably close agreement in energy use between DOE's proposed test procedure, but without the field use factor, and testing with a more real-world procedure. NEEA & NPCC stated that average annual clothes dryer energy use estimated from NEEA's 2012 field study is 920 kWh, and suggests that the field use factor should be closer to 1.1 or 1.2, assuming all other test procedure factors are unchanged. (NEEA & NPCC, No. 21 at p. 6) NEEA & NPCC strongly recommended that DOE not use a field use factor less than 1.0 to adjust the actual measured energy use from testing. (NEEA & NPCC, No. 21 at pp. 2–3, 12; NEEA, Public Meeting Transcript, No. 10 at pp. 87–92) NPCC added that the proposed field use factor is not consistent with the original proposal in the Joint Petition. (NPCC, Public Meeting Transcript, No. 10 at p. 104) The California IOUs commented that the NEEA field study data supports a field use adjustment factor of 1.0, or it should be removed entirely, since the field data consistently point to clothes dryers using more energy than they do under the DOE test procedure. (California IOUs, No. 22 at p. 6, 17; California IOUs, Public Meeting Transcript, No. 10 at pp. 170–171) SEDI added that CLASP-funded laboratory testing suggests that clothes dryers in the field consume more energy than would be measured by the proposed test procedure even without the field use factor. (SEDI, No. 14 at p. 3)

NEEA & NPCC and the California IOUs commented that DOE's data show that the average clothes dryer operating on an automatic termination cycle uses on the order of 25 percent more energy than it would if it terminated the cycle at optimum load dryness. NEEA & NPCC and the California IOUs commented that the difference between the end-of-cycle energy use and the energy use upon initially reaching 2-percent RMC represent an energy savings opportunity that manufacturers should be encouraged to pursue through modifications to automatic termination controls. NEEA & NPCC and the California IOUs stated that the proposed field use factor would revise the measured energy use for automatic termination control dryers that don't

terminate at an initial 2-percent RMC down to a value that might have been achieved if the clothes dryer terminated properly. (NEEA & NPCC, No. 21 at p. 6; California IOUs, No. 22 at p. 5; California IOUs, Public Meeting Transcript, No. 10 at pp. 76–77, 101–102)

The California IOUs noted that in two cases (DOE test units 4 and 17), the adjusted energy consumption is lower than the measured energy consumption at both 5-percent and 2-percent RMC, and likely represents the energy consumption at points in the cycle when the test load would have been damp to the touch. The California IOUs stated that the field-adjusted values that DOE presented, therefore, are not representative of field clothes dryer performance. The California IOUs also stated that DOE's sample of 8 clothes dryer models is not sufficiently large to provide statistically meaningful information on the field use factor. (California IOUs, No. 22 at pp. 5–6; California IOUs, Public Meeting Transcript, No. 10 at pp. 94–97)

NEEA & NPCC commented that DOE's testing showed, with one exception, that the final RMC values for the IEC/AHAM test load are higher than with the DOE test load but the increase in the final RMC was not consistent from model to model. NEEA & NPCC stated that, as a result, any single field use factor is problematic. (NEEA & NPCC, No. 21 at p. 5) NEEA & NPCC also noted that the proposed automatic termination test procedure significantly increases the range of tested efficiencies, but that this increase is not predictable for a given clothes dryer. NEEA & NPCC stated that the most and least efficient models using the current DOE test procedure are not the most and least efficient models using the proposed automatic termination test procedure but with a more realistic test load. NEEA & NPCC stated that the proposed field use factor will simply reduce the calculated per cycle energy use, thereby reducing the differentiation among models. (NEEA & NPCC, No. 21 at p. 6)

The Joint Efficiency Advocates commented that DOE should adjust the January 1, 2015 standards to account for the proposed test procedure amendments without the proposed field use factor. However, the Joint Efficiency Advocates stated that if DOE concludes that it cannot adjust the standard levels, DOE should proceed with the proposal in the January 2013 NOPR. (Joint Efficiency Advocates, No. 19 at pp. 2–3)

SEDI objected to the proposed 0.80 field use factor, but commented that if DOE chooses to retain the field use



factor, manufacturers should be required to report clothes dryer energy consumption both with and without the field use factor applied. SEDI stated that accurate energy consumption information is critical for energy efficiency programs to be able to evaluate potential for incentives for more efficient products. (SEDI, No. 14 at p. 3)

Earthjustice commented that DOE should revise the proposed field use factor for automatic termination control dryers. Earthjustice stated that DOE's test data show that the load composition has much less of an impact on the effectiveness of automatic termination controls than DOE's proposed field use factor assumes. Earthjustice commented that for nearly all of the 20 clothes dryers that DOE tested, the difference in CEF between the AHAM and DOE test loads was less than 10 percent, with an average reduction in CEF of about 4 percent. Earthjustice stated that the adjustment needed for the CEF ratings to better reflect real world conditions is not only much smaller than DOE has proposed, it is in the opposite direction, and that DOE's proposal would lead to CEFs that significantly overstate the energy efficiency of many automatic termination control dryers.

(Earthjustice, No. 15 at pp. 1–2)

Earthjustice stated that DOE's analysis shows that drying the DOE test load to 2-percent RMC at the end of the cycle reasonably approximates drying a test load that is more representative of the varied composition and heavier fabrics encountered in real world laundry loads to 5-percent RMC. Earthjustice stated that based on the test data in the January 2013 NOPR, the only field use factor that should be applied is a small correction to reflect that drying the AHAM test load to the end of a cycle achieving 5-percent RMC results in CEF levels about 4 percent below those measured drying the DOE test cloth as proposed in the January 2013 NOPR. (Earthjustice, No. 15 at p. 2)

Based on these comments and DOE's review of available data, DOE agrees that eliminating the field use factor for automatic termination control dryers will produce test results that are more representative of consumer use. As a result, in today's final rule, DOE is not adopting the 0.80 field use factor proposed in the January 2013 NOPR, but is instead removing the field use factor for automatic termination control dryers in appendix D2 because the test method directly measures the over-drying energy consumption. Because DOE is not amending appendix D or appendix D1 to include the methods for more accurately measuring the effects of

automatic cycle termination, as discussed in section III.B.3.f, DOE is not amending the current field use factors specified in section 4.1 in 10 CFR part 430, subpart B, appendix D and appendix D1.

#### e. Wrinkle Prevention Mode and the Determination of the Completion of the Test Cycle

In the January 2013 NOPR, DOE proposed for the automatic cycle termination test method that the clothes dryer shall be operated until the completion of the programmed cycle, including the cool-down period. 78 FR 152, 170 (Jan. 2, 2013).

NRDC commented that DOE should clarify the definition of "completion of test cycle" for clothes dryers with automatic termination controls. NRDC noted that many clothes dryers have post-cycle features, such as additional tumbling designed to prevent wrinkling, that may run after the clothes dryer has terminated the main drying cycle. NRDC stated that these features can sometimes be enabled by the user and sometimes are the default operational mode. NRDC recommended that DOE modify the proposed test procedure to clarify that the cycle is complete when the main cycle terminates and the clothes dryer indicates to the consumer that the load is finished. (NRDC, No. 20 at pp. 1–2; NRDC, Public Meeting Transcript, No. 10 at pp. 129–131) NRDC also urged DOE to conduct a new rulemaking as soon as possible to further revise the clothes dryer test procedure to address post-cycle energy use to better represent real world energy use. (NRDC, No. 20 at p. 2)

NEEA & NPCC commented that it is unclear whether the current test procedure is designed to capture the energy use associated with the wrinkle prevention mode, which is part of the default cycle in some clothes dryer models. NEEA & NPCC stated that the wrinkle prevention mode meets DOE's definition of an active mode, and yet DOE's testing stopped the test at the completion of the cool-down phase. NEEA & NPCC stated clothes dryers typically use 150–250 watts of power when rotating the drum (and by default in most models, the fan) and that over a few hours, the wrinkle prevention mode could use as much as 0.5 kWh depending on how often the feature is activated and for how long at the end of each cycle. NEEA & NPCC stated that this clothes dryer feature should be accounted for accurately in the test procedure, regardless of any increase in the test burden associated with the measurement. According to NEEA & NPCC, the potential energy use of this

function may be large enough to make the difference as to whether or not a clothes dryer complies with the standard, and so is not insignificant. (NEEA & NPCC, No. 21 at p. 14) NEEA added that if a cyclical wrinkle prevention period goes on indefinitely, it may cause issues with determining when to measure standby and off mode if the end of the cycle is not clearly defined. (NEEA, Public Meeting Transcript, No. 10 at pp. 154–155)

The California IOUs, Hydromatic, and the U.S. Environmental Protection Agency (EPA) also questioned how the wrinkle prevention mode would be tested and how the end of the cycle would be determined. The California IOUs stated that it is a relatively new feature, but it is becoming more prevalent. (California IOUs, Public Meeting Transcript, No. 10 at pp. 153, 154; Hydromatic, Public Meeting Transcript, No. 10 at pp. 124–128, 132–133; EPA, Public Meeting Transcript, No. 10 at pp. 122–123)

AHAM stated that the cycle ends when the clothes dryer signals to the consumer that the cycle is complete, and that wrinkle prevention or similar functions are selected by the user and should not be included in the DOE test unless they are activated by default in the condition as shipped. AHAM stated that this approach will minimize ambiguity for testers, thus resulting in less variation in the test procedure. (AHAM, No. 17 at p. 13) ALS similarly recommended testing with the default settings and not with other optional settings such as a wrinkle prevention extended cycle. (ALS, No. 16 at p. 4)

DOE conducted a market survey and testing to evaluate the wrinkle prevention mode. DOE noted that products operate in wrinkle prevention mode either intermittently or by continuously tumbling for a fixed period of time or until the user opens the clothes dryer door. Based on DOE's review of products currently available on the market, approximately 95 percent of products that are equipped with a wrinkle prevention feature offer it as a mode that must be manually selected by the user (*i.e.*, wrinkle prevention is turned off by default). Approximately 63 percent of products that are equipped with a wrinkle prevention feature operate in this mode by intermittently tumbling. For the products in DOE's test sample, the intermittent tumbling consisted of 3 to 5 seconds of tumbling every 5 to 10 minutes for a fixed period of time. Such intermittent tumbling was observed for all products on the market that operated in wrinkle prevention mode automatically by default after the end of the programmed cycle, with the



maximum duration among the sample units being 5 hours. DOE estimates that products that intermittently tumble for 5 hours would consume approximately 8.3 Wh in the wrinkle prevention mode. In the worst-case scenario for clothes dryers on the market for which the wrinkle prevention mode must be selected manually by the user, continuous tumbling was observed with a duration of up to 45 minutes and a corresponding energy consumption as much as approximately 188 Wh.

DOE is unaware of consumer usage data on how often consumers select the wrinkle prevention mode when this feature must be manually selected or data on the typical elapsed time between the end of the programmed cycle and when the consumer opens the clothes dryer door to remove the laundry load. As a result, DOE is not amending the test procedure to include the measurement of the wrinkle prevention mode when this feature must be manually selected by the consumer. As discussed in section III.F.1, DOE is adopting amendments to clarify for automatic termination control dryers that the test procedures specify requirements only for the automatic termination cycle program, temperature setting, and dryness setting, and do not specify modifications to any other optional settings that do not affect the automatic termination cycle program, temperature setting, or dryness setting. As a result, if a product is equipped with a wrinkle prevention feature that is activated by default in the condition as shipped by the manufacturer, the wrinkle prevention mode would be included in the test measurement cycle unless it precluded the necessary automatic termination cycle program, temperature setting, or dryness setting. DOE also notes that, based on the requirements that products be installed in accordance with manufacturers' instructions, if a manufacturers' user manual specifies that the wrinkle prevention mode is recommended to be activated for normal use even if it not done so in the as-shipped condition, the products would be tested with the wrinkle prevention mode activated as per manufacturer's instructions.

DOE is adopting amendments in today's final rule to clarify in 10 CFR part 430, subpart B, appendix D2, section 3.3.2, that the drying cycle is complete when the clothes dryer indicates to the user that the cycle has finished (by means of a display, indicator light, audible signal, or other signal) and the heater and drum/fan motor shuts off for the final time. If the clothes dryer is equipped with a wrinkle prevention mode (*i.e.*, that continuously

or intermittently tumbles the clothes dryer drum after the clothes dryer indicates to the user that the cycle has finished) that is activated by default in the as-shipped position or if manufacturers' instructions specify that the feature is recommended to be activated for normal use, the cycle shall be considered complete after the end of the wrinkle prevention mode.

#### f. New Appendix D2

With the exception of the field use factor and the compliance date, AHAM and ALS supported the proposed test procedure for automatic termination control dryers. In light of its objection to the proposed field use factor and compliance date, however, AHAM stated that it cannot support these changes at this time and DOE should instead defer the changes until compliance with a future standard, subsequent to the January 1, 2015 standards change. (AHAM, No. 17 at p. 13; ALS, No. 16 at p. 4)

Samsung supported the proposed automatic termination test method, including the maximum allowable RMC of 2 percent. Samsung stated that the proposed test procedure is representative of consumer usage because it measures the energy use of the most commonly selected cycle (Normal/Cottons and Linens) and includes the cool-down period. Samsung stated that the proposed test procedure would encourage manufacturers to refine their automatic termination feature to terminate drying very close to the target 2-percent RMC using the DOE test load, without the over-drying evidenced on some clothes dryer models during DOE testing, thus reducing real-world energy consumption. (Samsung, No. 13 at pp. 2–3)

ASAP, ASE, ACEEE, CFA, NCLC jointly commented (hereafter "the Joint Efficiency Advocates") and SEDI, NRDC, NEEA & NPCC, and the California IOUs commented that they generally support the proposed automatic termination test procedure amendments. The Joint Efficiency Advocates, NRDC, NEEA & NPCC, and the California IOUs noted that DOE's test data presented in the January 2013 NOPR show that there is wide variability among clothes dryers in the effectiveness of automatic termination controls, and that many clothes dryers waste a significant amount of energy at the end of the automatic termination cycle (up to 38 percent of energy use). NRDC and SEDI added that the proposed test procedure will capture this energy use at the end of the cycle and will result in differentiation of the

measured efficiency of individual clothes dryers. The Joint Efficiency Advocates stated that based on DOE's test data, the current test procedure in appendix D1 is not a good predictor of the efficiency of the complete automatic termination cycle. The Joint Efficiency Advocates, NEEA & NPCC, and the California IOUs stated that the proposed automatic cycle termination test procedure will encourage manufacturers to adopt improved automatic termination controls and will provide a significant national energy savings opportunity. The California IOUs added that DOE's sample is too small to conclusively estimate this savings opportunity, but a study conducted by NRDC on 15 clothes dryers concluded that a variety of energy-saving technologies, including automatic termination, could save 20 percent to 30 percent of overall energy consumption by preventing over-drying. (Joint Efficiency Advocates, No. 19 at pp. 1–2; SEDI, No. 14 at p. 2; NRDC, No. 20 at p. 1; NEEA & NPCC, No. 21 at pp. 2, 4–5; California IOUs, No. 22 at pp. 3–5)

Based on the comments from interested parties and for the reasons discussed above, DOE is adopting the automatic termination test method proposed in the January 2013 NOPR with modification as further discussed above. With regards to AHAM's comments concerning the compliance date, as discussed in section III.B.3.f and section III.I.3, DOE is amending the clothes dryer test procedure in 10 CFR part 430, subpart B to create a new appendix D2 that includes the testing methods for more accurately measuring the effects of automatic cycle termination. As discussed in section III.I.3, the newly created appendix D2 will not be required for use to determine compliance with the January 1, 2015 energy conservation standards for clothes dryers. DOE is not amending appendix D1 in today's final rule to include the amendments associated with automatic termination controls. Appendix D2 is for informational purposes only.

#### *Timed Dry Test Method*

For timer dryers, DOE proposed in the January 2013 NOPR to use the test method currently specified in 10 CFR part 430, subpart B, appendix D1, section 3.3, but with a revised final RMC requirement. The proposed test method would require that the clothes dryer be operated using the highest temperature setting and maximum time setting. The clothes dryer would then be allowed to run until the final RMC of the load is between 1.0 percent and 2.5

percent, at which point the test cycle would be stopped without permitting the clothes dryer to advance into the cool-down period and the test load would be weighed. DOE also proposed to add a clarification that the clothes dryer should not be stopped intermittently in the middle of the test cycle for any reason. DOE stated that this clarification would ensure that test technicians are not stopping the clothes dryer intermittently to weigh the test load to check whether the RMC is within the target range. Such a practice would alter the measured results because of the heat loss from the clothes dryer when the cycle is stopped. 78 FR 152, 171 (Jan. 2, 2013).

DOE proposed in the January 2013 NOPR to include separate calculations for the per-cycle energy consumption for timer dryers. The calculations would be similar to the calculations provided in the current DOE test procedure in 10 CFR part 430, subpart B, appendix D1, sections 4.1–4.3, except that the normalization of the per-cycle energy consumption to represent the energy consumption required to dry the test load to 4-percent RMC would be changed to represent the new target RMC of 2 percent. The per-cycle energy consumption calculation in the current test procedure applies a scaling factor of 53.5, which represents the RMC percentage point change from the nominal initial RMC of 57.5 percent to the nominal final RMC of 4 percent. The proposed amendments would change this scaling factor to 55.5 to reflect the new final RMC of 2 percent. DOE proposed a range of 1.0 percent to 2.5 percent for the allowable final RMC during the test cycle to reduce testing burden. DOE tentatively concluded in the January 2013 NOPR that requiring the tester to dry the test load to an exact RMC during the test cycle would be unduly burdensome because it could require the test to be repeated a significant number of times until the exact RMC is achieved. For the test procedure to produce repeatable results, the measured test cycle energy consumption is normalized to calculate the energy consumption required to dry the test load from exactly 57.5-percent RMC to 2-percent RMC, which is representative of clothes dryers currently on the market and of the maximum consumer-accepted final RMC. 78 FR 152, 171 (Jan. 2, 2013).

DOE proposed in the January 2013 NOPR that manufacturers continue to apply the field use factor needed to account for the energy consumption of timed drying beyond the 2-percent RMC specified in the test procedure. DOE did not propose any changes to the 1.18

field use factor for timer dryers because DOE stated that it is not aware of any data or studies more recent than the studies on which it was originally based that would indicate that this value is not currently representative of consumer use.

DOE did not propose in the January 2013 NOPR to include the cool-down period as part of the timed dry test cycle because the proposed test method requires drying the load to a specified RMC, at which point the test cycle is stopped by the test technician. DOE determined that specifying a timed dry cycle that includes the cool-down period to achieve a target final RMC would add significant testing burden on test technicians to determine and preset the appropriate time setting. DOE also noted that it would be difficult to ensure that testing results are repeatable and reproducible because different combinations of timed dry cycle length and cool-down period may be selected to dry a test load to the same final RMC.

AHAM commented that it did not oppose the proposed timed dry test method on a technical basis. AHAM stated, however, because it considers these changes to be part of the proposed amendments regarding automatic cycle termination controls, it cannot support these changes at this time. AHAM commented that DOE should defer the changes until compliance with future energy conservation standards, subsequent to the January 1, 2015 standards. (AHAM, No. 17 at p. 13) ALS also opposed the proposed timed drying test method because it opposed any test procedure change with an effective date concurrent with the January 1, 2015 standards. (ALS, No. 16 at p. 4) As discussed in section III.I.3, DOE is adopting the amendments to more accurately measure the effects of automatic cycle termination in a new appendix D2 that will not be required for use to determine compliance with the January 1, 2015 energy conservation standards for clothes dryers. As a result, in today's final rule, DOE is also adopting the timer dryer test methods presented above in 10 CFR part 430, subpart B, appendix D2, section 3.3.2. DOE is not amending appendix D1 in today's final rule to include these amendments.

*Incorporating by Reference IEC Standard 62301 Second Edition for Measuring Standby Mode and Off Mode Power*

As discussed in section I of today's final rule, EPCA, as amended by EISA 2007, requires that test procedures be amended to include standby mode and off mode energy consumption, taking

into consideration the most current versions of IEC Standards 62301 and 62087. (42 U.S.C. 6295(gg)(2)(A)) The January 2011 Final Rule incorporated in the test procedures for clothes dryers relevant provisions from IEC Standard 62301 (First Edition) for measuring standby mode and off mode power. 76 FR 972, 979–80 (Jan. 6, 2011). DOE reviewed the IEC Standard 62301 (First Edition) and concluded that it would be generally applicable to clothes dryers, although some clarification would be needed. Specifically, DOE adopted amendments for standby mode and off mode power measurements to provide a stabilization period of 30 to 40 minutes followed by an energy use measurement period of 10 minutes. 76 FR 986 (Jan. 6, 2011). With these clarifications in place, the January 2011 Final Rule referenced IEC Standard 62301 (First Edition) for the standby mode and off mode wattage measurements. DOE also incorporated into the clothes dryer test procedure definitions of “active mode,” “standby mode,” and “off mode” based on the definitions provided in IEC Standard 62301 CDV. 76 FR 981–85 (Jan. 6, 2011).

IEC Standard 62301 (Second Edition) published on January 27, 2011. Consistent with EPCA requirements for amending test procedures to include standby and off mode procedures, DOE considered IEC Standard 62301 (Second Edition) for amendments to the standby mode and off mode test procedures for clothes dryers in the January 2013 NOPR. (42 U.S.C. 6295(gg)(2)(A)) DOE determined that IEC Standard 62301 (Second Edition) is an internationally-accepted test procedure for measuring standby power in residential appliances, and it provides clarification to certain sections as compared to the First Edition. In the January 2013 NOPR, DOE proposed to update its reference to IEC Standard 62301 by incorporating certain provisions of IEC Standard 62301 (Second Edition), along with clarifying language, into the DOE test procedures for clothes dryers. 78 FR 152, 171 (Jan. 2, 2013).

AHAM and ALS commented that they support the incorporation by reference of IEC Standard 62301 (Second Edition). AHAM stated that the Second Edition contains a number of important clarifications not present in the First Edition and that adopting the Second Edition will allow for optimum international harmonization, which gives clarity and consistency to the regulated community. (AHAM, No. 17 at pp. 13–14; ALS, No. 16 at p. 4)

The suitability of specific clauses from IEC Standard 62301 (Second Edition) regarding testing conditions

and methodology for use in DOE's clothes dryer test procedure are discussed in the following paragraphs.

Section 4, paragraph 4.4 of the Second Edition revises the power measurement accuracy provisions of the First Edition. A more comprehensive specification of required accuracy is provided in the Second Edition, which depends upon the characteristics of the power being measured. Testers using the Second Edition are required to measure the crest factor and power factor of the input power, and to calculate a maximum current ratio (MCR) (paragraph 4.4.1 of the Second Edition). The Second Edition then specifies calculations to determine permitted uncertainty in MCR. DOE noted in the January 2013 NOPR, however, that the allowable uncertainty is the same or less stringent than the allowable uncertainty specified in the First Edition, depending on the value of MCR and the power level being measured. DOE determined that this change in the allowable uncertainty, however, maintains sufficient accuracy of measurements under a full range of possible measured power levels without placing undue demands on the instrumentation. These power measurement accuracy requirements were based upon detailed technical submissions to the IEC in the development of IEC Standard 62301 Final Draft International Standard (FDIS), which showed that commonly-used power measurement instruments were unable to meet the original requirements for certain types of loads. DOE concluded in the January 2013 NOPR that the incremental testing burden associated with the additional measurements and calculations is offset by the more reasonable requirements for testing equipment, while maintaining measurement accuracy deemed acceptable and practical by voting members for IEC Standard 62301 (Second Edition). For these reasons, DOE proposed in the January 2013 NOPR to incorporate by reference in 10 CFR part 430, subpart B, appendix D1, section 2.4.7 the power equipment specifications in section 4, paragraph 4.4 of IEC Standard 62301 (Second Edition). 78 FR 152, 171–172 (Jan. 2, 2013). AHAM commented that it supports incorporating by reference these provisions. (AHAM, No. 17 at p. 14) For the reasons discussed above, DOE adopts in today's final rule these amendments to its clothes dryer test procedure.

In the January 2013 NOPR, DOE noted that Section 5, paragraph 5.2 of IEC Standard 62301 (Second Edition) maintains the installation and setup procedures incorporated by reference in

the clothes dryer test procedure in the January 2011 Final Rule from the First Edition. These provisions require that the appliance be prepared and set up in accordance with manufacturer's instructions, and that if no instructions are given, then the factory or default settings shall be used, or where there are no indications for such settings, the appliance is tested as supplied.

Additionally, IEC Standard 62301 (Second Edition) adds certain clarifications to the installation and setup procedures in section 5, paragraph 5.2 of the First Edition regarding products equipped with a battery recharging circuit for an internal battery, as well as instructions for testing each relevant configuration option identified in the product's instructions for use. DOE stated in the January 2013 NOPR that it is not aware of any clothes dryer with an internal battery, or with a recharging circuit for such a battery. DOE also determined that a requirement to separately test each configuration option could substantially increase test burden and potentially conflicts with the requirement within the same section to set up the product in accordance with the instructions for use or, if no such instructions are available, to use the factory or default settings. Therefore, DOE tentatively concluded in the January 2013 NOPR that the portions of the installation instructions in section 5, paragraph 5.2 of IEC Standard 62301 (Second Edition) pertaining to batteries and the requirement for the determination, classification, and testing of all modes associated with every combination of available product configuration options (which may be more numerous than the modes associated with operation at the default settings) are not appropriate for the clothes dryer test procedures. Accordingly, DOE proposed qualifying language in the test procedure amendments in 10 CFR part 430, subpart B, appendix D1, section 2.1 to disregard those portions of the installation instructions. 78 FR 152, 172 (Jan. 2, 2013). AHAM commented that it does not oppose this proposal because it is also not aware of any clothes dryer with an internal battery or recharging circuit for such a battery. (AHAM, No. 17 at p. 14) Therefore, for the reasons discussed, DOE is amending the clothes dryer test procedure in today's final rule to incorporate by reference the installation instructions in section 5, paragraph 5.2 of IEC Standard 62301 (Second Edition) and to include qualifying language to disregard the portions pertaining to batteries and the requirement for the determination,

classification, and testing of all modes associated with every combination of available product configuration options.

The Second Edition also contains provisions for the power supply (section 4.3) and power-measuring instruments (section 4.4). Paragraph 4.3.2 requires that the value of the harmonic content of the voltage supply be recorded during the test and reported. As described previously, paragraph 4.4.1 requires the instrument to measure the crest factor and maximum current ratio. Paragraph 4.4.3 requires the instrument to be capable of measuring the average power or integrated total energy consumption over any operator-selected time interval. In the January 2013 NOPR, DOE stated that it is aware of commercially available power measurement instruments that can perform each of these required measurements individually. However, DOE is also aware that certain industry-standard instruments, such as the Yokogawa WT210/WT230 digital power meter and possibly others, are unable to measure harmonic content or crest factor while measuring average power or total integrated energy consumption. DOE is concerned that laboratories currently using power-measuring instruments without this capability would be required to purchase, at potentially significant expense, additional power-measuring instruments that are able to perform all these measurements simultaneously. Therefore, DOE proposed in the January 2013 NOPR for 10 CFR part 430, subpart B, appendix D1, sections 2.3.1.1 and 2.4.7 that if the power-measuring instrument is unable to perform these measurements during the actual test measurement, it would be acceptable to measure the total harmonic content, crest factor, and maximum current ratio immediately before and immediately after the actual test measurement to determine whether the requirements for the power supply and power measurement have been met. 78 FR 152, 172 (Jan. 2, 2013). AHAM commented that it supports this proposal. (AHAM, No. 17 at p. 14) For the reasons discussed, DOE adopts these amendments to its clothes dryer test procedure in today's final rule.

The other major changes in the Second Edition related to the measurement of standby mode and off mode power consumption in covered products involve measurement techniques and specification of the stability criteria required to measure that power. The Second Edition contains more detailed techniques to evaluate the stability of the power consumption and to measure the power consumption for loads with different

stability characteristics. According to the Second Edition, the user is given a choice of measurement procedures, including sampling methods, average reading methods, and a direct meter reading method. For the January 2013 NOPR, DOE evaluated these new methods in terms of test burden and improvement in results as compared to the methods adopted in the January 2011 Final Rule, which were based on IEC Standard 62301 (First Edition).

In the January 2011 Final Rule, DOE adopted provisions requiring that clothes dryer standby mode and off mode power be measured using section 5, paragraph 5.3 of IEC Standard 62301 (First Edition), clarified by requiring the product to stabilize for 30 to 40 minutes and using an energy use measurement period of 10 minutes. Further, for any clothes dryer in which the power varies over a cycle, as described in section 5, paragraph 5.3.2 of the First Edition, the January 2011 Final Rule adopted amendments to require the use of the average power approach in section 5, paragraph 5.3.2(a), with a 30- to 40-minute stabilization period and a 10-minute minimum measurement period, as long as the measurement period comprises one or more complete cycles. 76 FR 972, 979–980, 985–986 (Jan. 6, 2011).

For the January 2013 NOPR, DOE analyzed the potential impacts of referencing methodology from IEC Standard 62301 (Second Edition) rather than from the First Edition by comparing the provisions allowed by each under different scenarios of power consumption stability. Based on its analysis, DOE concluded that the use of the Second Edition would improve the accuracy and representativeness of power consumption measurements and would not be unduly burdensome to conduct. As a result, DOE proposed in the January 2013 NOPR to incorporate by reference the relevant paragraphs of section 5.3 of IEC Standard 62301 (Second Edition) in the clothes dryer test procedure in 10 CFR part 430, subpart B, appendix D1, section 3.6. 78 FR 152, 172–174 (Jan. 2, 2013).

AHAM commented that it does not oppose the proposed requirement to use the sampling method in section 5.3.2 of the Second Edition. (AHAM, No. 17 at p. 14) For the reasons discussed above, DOE amends the clothes dryer test procedure in today's final rule to require in 10 CFR part 430, subpart B, appendix D1, section 3.6 the use of the sampling method in section 5.3.2 of the Second Edition for all standby mode and off mode power measurements.

DOE also amends the reference in 10 CFR 430.3 to add IEC Standard 62301

(Second Edition). DOE is not replacing the reference to the First Edition in 10 CFR 430.3, because several test procedures for other covered products not addressed in today's notice incorporate provisions from it. In addition, there are a number of editorial changes necessary in appendix D1 to allow for the correct referencing to the Second Edition. For example, the definition section in appendix D1 must define the IEC Standard 62301 as the Second Edition instead of the First Edition. Also, there are certain section numbering differences in the Second Edition that impact the text of the measurement provisions of the relevant test procedures in appendix D1. In addition, the definition and section references discussed above are incorporated in appendix D2.

#### *E. Technical Correction to the Calculation of the Per-cycle Combined Total Energy Consumption*

In the January 2013 NOPR, DOE noted that 10 CFR part 430, subpart B, appendix D1, section 4.6, regarding the calculation of the per-cycle combined total energy consumption contains a reference to an incorrect section number. The per-cycle standby mode and off mode energy consumption,  $E_{TSO}$ , which is contained in section 4.5, is incorrectly referenced in the per-cycle combined total energy consumption as section 4.7. DOE proposed in the January 2013 NOPR to correct this section number reference. 78 FR 152, 174 (Jan. 2, 2013). DOE did not receive any comments on this topic in response to the January 2013 NOPR. In today's final rule, DOE adopts this amendment to its clothes dryer test procedure in appendix D1, and includes the correct calculation in newly adopted appendix D2.

#### *F. Clarifications to Test Conditions*

DOE noted in both the January 2013 NOPR and the February 2013 SNOPR that it had received a number of inquiries requesting clarification on testing according to the DOE clothes dryer test procedure in 10 CFR part 430, subpart B, appendix D. 78 FR 152, 174 (Jan. 2, 2013); 78 FR 8992 (Feb. 7, 2013). As discussed in the following sections, based on these inquiries, DOE is adopting amendments in today's final rule to clarify certain provisions in the DOE clothes dryer test procedure.

##### *1. Cycle Settings*

Section 3.3 in 10 CFR part 430, subpart B, appendix D specifies that the maximum temperature setting and, if a tested unit is equipped with a timer, the maximum time setting must be used for

the drying test cycle. DOE noted in the January 2013 NOPR that it received an inquiry regarding how to test a clothes dryer that has timed dry cycle length settings, but no temperature settings on the control panel. DOE proposed in the January 2013 NOPR to clarify in 10 CFR part 430, subpart B, appendix D, section 3.3, that if the clothes dryer does not have a separate temperature setting selection on the control panel, the maximum time setting should be used for the drying test cycle. DOE also proposed in the January 2013 NOPR to include the clarification discussed above in section 3.3.1 of 10 CFR part 430, subpart B, appendix D1, for the timer dryer test method. 78 FR 152, 174 (Jan. 2, 2013).

AHAM commented that it does not oppose these clarifications for the cycle settings, nor does it oppose these changes becoming effective prior to the January 1, 2015 standards compliance date. (AHAM, No. 17 at p. 17) Because DOE did not receive any comments objecting to this proposal in response to the January 2013 NOPR and for the reasons discussed above, DOE adopts this clarification to its clothes dryer test procedure in appendix D and appendix D1 in today's final rule. Because DOE is amending the clothes dryer test procedure in today's final rule to create a new appendix D2 for informational purposes only that includes the methods for more accurately measuring the effects of automatic cycle termination, which includes a separate method for timer dryers, DOE is also including the same cycle settings clarification in section 3.3.1 of 10 CFR part 430, subpart B, appendix D2, for the timer dryer test method.

In the January 2013 NOPR, DOE noted that it also received an inquiry regarding how to test a clothes dryer that has an optional cycle setting, other than the temperature and time settings, that is activated by default in the condition as shipped by the manufacturer. DOE proposed to clarify in both 10 CFR part 430, subpart B, appendix D, section 3.3, and appendix D1, section 3.3.1, that the test procedures specify requirements only for the temperature setting and time setting, and do not specify modifications to any other optional settings that do not alter the temperature setting and time setting. Similarly, in 10 CFR part 430, subpart B, appendix D1, section 3.3.2, DOE proposed to clarify for automatic termination control dryers that any other optional cycle settings that do not affect the automatic termination cycle program, temperature setting, or dryness setting shall be tested in the as-shipped position. 78 FR 152, 174 (Jan. 2, 2013).

AHAM commented that it does not oppose the clarifications for the optional cycle settings because they are consistent with its position that units should be tested in the as-shipped condition. AHAM stated that if other settings are activated by default when the appropriate temperature and time settings are selected, the unit should be tested with those settings activated. AHAM noted, however, that because it opposes the amendments related to automatic termination controls at this time, it supports incorporating these clarifications in the current appendix D and appendix D1. Should DOE finalize the automatic termination control methodology and related amendments, but make them mandatory for compliance with some future standard (beyond 2015), AHAM stated it would support these clarifications in that test procedure as well. (AHAM, No. 17 at pp. 17–18)

For the reasons discussed above, DOE amends section 3.3 in 10 CFR part 430, subpart B, appendix D and D1 and section 3.3.1 in 10 CFR part 430 subpart B, appendix D2, to clarify that any other optional cycle settings that do not affect the temperature or time settings shall be tested in the as-shipped position. In addition, DOE amends section 3.3.2 of 10 CFR part 430, subpart B, appendix D2, which will not be required to demonstrate compliance with the 2015 standards, to clarify for automatic termination control dryers that any other optional cycle settings that do not affect the automatic termination cycle program, temperature setting, or dryness setting shall be tested in the as-shipped position.

## 2. Gas Supply Requirements

Section 2.3.2 in 10 CFR part 430, subpart B, appendix D and appendix D1, specifies that gas supply to the clothes dryer should be maintained at a normal inlet test pressure at 7 to 10 inches of water column, and that the hourly British thermal unit (Btu) rating of the burner shall be maintained within  $\pm 5$  percent of the rating specified by the manufacturer. DOE discussed in the January 2013 NOPR that it received an inquiry noting that during testing of a gas clothes dryer, the unit under test did not meet the requirement to maintain the Btu rating within 5 percent of the rating specified by the manufacturer under the allowable range in gas inlet test pressure. DOE proposed in the January 2013 NOPR to add a clarification in both 10 CFR part 430, subpart B, appendix D and appendix D1 that if the requirement to maintain the hourly Btu rating of the burner within  $\pm 5$  percent of the rating specified by the

manufacturer cannot be achieved under the allowable range in gas inlet test pressure, the orifice of the gas burner should be modified as necessary to achieve the required Btu rating. 78 FR 152, 174–175 (Jan. 2, 2013).

AHAM and ALS opposed the proposal to change the orifice of the gas burner or any other hardware to meet the  $\pm 5$  percent requirement. AHAM added that the burner Btu rating is based on a test gas value intended to ensure product safety and that the average heating value and typical heating value during consumer use may be lower than the heating value of the test gas. AHAM commented that because the intent of the test procedure is to be representative of actual consumer use, DOE should not go forward with this proposal because the consumer would never and should never modify the orifice. (AHAM, No. 17 at p. 18; ALS, No. 16 at pp. 4–5)

DOE notes that the proposed requirement to modify the gas burner orifice if the hourly Btu rating specified by the manufacturer cannot be achieved under the allowable range in gas inlet pressure ensures that the burner output is reproducible from lab to lab for testing purposes. DOE notes that removing the gas supply requirements specified in the test procedure and allowing a wider range in the burner output could affect the measured efficiency and reproducibility of results because of the resulting variation in the heat input into the air entering the clothes dryer drum. In addition, DOE notes that the test procedure for gas water heaters similarly specifies that the burner should be adjusted as necessary to achieve the hourly Btu rating specified by the manufacturer. (10 CFR part 430, subpart B, appendix E, section 5.1.3) To ensure that test results are repeatable and reproducible, in today's final rule, DOE amends the clothes dryer test procedure in section 2.3.2 in 10 CFR part 430, subpart B, appendix D and appendix D1 to include this clarification for the gas supply requirements. In addition, because DOE is also amending the clothes dryer test procedure to include a new appendix D2, DOE is also including this clarification for the gas supply requirements in 10 CFR part 430, subpart B, appendix D2, section 2.3.2.

Section 2.3.2 in 10 CFR part 430, subpart B, appendix D and appendix D1 specifies that if a clothes dryer is equipped with a gas appliance pressure regulator, the regulator outlet pressure at the normal test pressure shall be approximately that recommended by the manufacturer. DOE noted in the January 2013 NOPR that the test procedures for

similar gas heating products, such as gas water heaters, specify that the regulator outlet pressure must be within  $\pm 10$  percent of the value specified by the manufacturer. DOE proposed to clarify the term “approximately” by specifying that the regulator outlet pressure shall be within  $\pm 10$  percent of the value specified by the manufacturer. 78 FR 152, 175 (Jan. 2, 2013).

ALS supported DOE's proposal to clarify the outlet pressure range for the gas regulator. (ALS, No. 16, at p. 5) AHAM commented that the regulator outlet pressure should be as close as possible to that specified by the manufacturer. AHAM stated that this manufacturer recommendation helps ensure the safety of the product and, thus, the outlet pressure should not be altered. (AHAM, No. 17 at p. 18) Because DOE did not receive any comments objecting to this proposal in response to the January 2013 NOPR and for the reasons discussed above, DOE amends section 2.3.2 in 10 CFR part 430, subpart B, appendix D and appendix D1 in today's final rule to include the clarification that the regulator outlet pressure shall be within  $\pm 10$  percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model. In addition, because DOE is also amending the clothes dryer test procedure to include a new appendix D2, DOE is also including this clarification in 10 CFR part 430, subpart B, appendix D2, section 2.3.2.

## 3. Console Lights

In the February 2013 SNOPR, DOE noted that it received an inquiry requesting clarification on section 2.1 in 10 CFR part 430, subpart B, appendix D and appendix D1, which specifies for the installation conditions that all console lights or other lighting systems that do not consume more than 10 watts shall be disconnected during the clothes dryer active mode test cycle. 78 FR 8992, 8993 (Feb. 7, 2013). DOE noted that this provision was originally adopted in the September 1977 Final Rule. 42 FR 46145, 46146, 46150. DOE intended this provision to apply to an older generation of clothes dryers existing at the time of the September 1977 Final Rule that used task lights to illuminate the area of the clothes dryer for consumers doing the laundry that did not provide any function related to the drying process during the drying cycle. Newer-generation clothes dryers equipped with electronic controls may have control setting indicators such as indicator lights showing the cycle

progression, temperature or dryness settings, or other cycle functions. In contrast to the task lighting of older-generation clothes dryers, these indicator lights associated with cycle settings or the drying operation are fully integrated into the clothes dryer control printed circuit boards (PCBs). Disconnecting such lights would require extracting the control PCB from the clothes dryer and either physically cutting off the indicator lights or destroying their electrical signal traces etched on the PCB.

As a result of these differences, DOE proposed in the February 2013 SNOPR to clarify in section 2.1 in both appendix D and appendix D1 that “console lights or other lighting systems” refers to task lights that do not provide any function during the drying cycle related to the drying process, rather than the control setting indicators in newer-generation clothes dryers with electronic controls. DOE also proposed to clarify that control setting indicators such as indicator lights showing the cycle progression, temperature or dryness settings, or other cycle functions should not be disconnected during the active mode test cycle. 78 FR 8992, 8993 (Feb. 7, 2013).

AHAM and ALS commented that they do not oppose the proposed clarification for the installation conditions of console lights. AHAM added that because this is not different than current industry practice, this proposal would not impact measured efficiency. (AHAM, No. 17 at p. 18; ALS, No. 16 at p. 5) Because DOE did not receive any comments objecting to this proposal and for the reasons discussed above, DOE amends the section 2.1 in 10 CFR part 430, subpart B, appendix D and appendix D1 in today’s final rule to include this clarification to the installation requirements for console lights or other lighting systems. In addition, because DOE is also amending the clothes dryer test procedure to include a new appendix D2, DOE is also including this clarification in 10 CFR part 430, subpart B, appendix D2, section 2.1.

#### 4. Drum Capacity Measurements

Section 3.1 in 10 CFR part 430, subpart B, appendix D and appendix D1 specifies that when measuring drum capacity, the drum shall be filled with water to a level determined by the intersection of the door plane and the loading port. In addition, section 3.1 specifies that volume should be added or subtracted as appropriate depending on whether the plastic bag used for the measurement protrudes into the drum interior. DOE noted in the February 2013 SNOPR that it received an inquiry

requesting clarification of this requirement. DOE proposed to amend section 3.1 to clarify that, for the measurement of the drum capacity, the intersection of the door plane and the loading port refers to the uppermost edge of the drum that is in contact with the door seal and that volume should be added or subtracted from the measured water fill volume to account for any space in the drum interior not measured by water fill (*e.g.*, space occupied by the door protruding into the drum interior). 78 FR 8992, 8993 (Feb. 7, 2013).

ALS supported DOE’s proposal to clarify the drum capacity measurement. (ALS, No. 16 at p. 5) AHAM commented that it opposes the change for the drum capacity measurements in appendix D due to a lack of information and data on the impact, if any, on measured energy efficiency. AHAM stated that it does not have such data. AHAM also commented that the proposed amendments could impact manufacturers’ reported capacities and that it would be burdensome to require such a change during the transition to the January 1, 2015 standards. AHAM suggested that DOE make this change only to appendix D1, and only if DOE determines that there would be no impact on measured energy efficiency. Otherwise, AHAM requested that any changes DOE made not be mandatory for compliance with the January 1, 2015 standards. According to AHAM, this would allow any impact on measured energy efficiency to be evaluated in the future. AHAM commented that it is possible that manufacturers have information on whether there is an impact on measured energy efficiency, and, thus, AHAM suggested that DOE contact manufacturers to understand the potential impact. (AHAM, No. 17 at pp. 18–19)

DOE notes that the amendment for the drum capacity measurement proposed in the February 2013 SNOPR would clarify the measurement method (*i.e.*, the level to which water is filled in the drum and the amount of volume added or subtracted from the measurement), but not change the measurement results. Therefore, the amendments to clarify the drum capacity measurement would not affect the measured drum volume or energy efficiency. In today’s final rule, DOE amends section 3.1 in 10 CFR part 430, subpart B, appendix D and appendix D1 to include this clarification to the drum capacity measurement. In addition, because DOE is also amending the clothes dryer test procedure to include a new appendix D2, DOE is also including this clarification in 10 CFR part 430, subpart B, appendix D2, section 3.1.

The California IOUs commented that the current method for measuring drum capacity requires a technician to line the clothes dryer drum with a plastic bag and then fill the lined drum with water while the clothes dryer rests on its side on a scale. The California IOUs stated that this procedure is burdensome, presents a risk of very large water spills, and can introduce measurement errors because it is often difficult for technicians to ensure that the plastic bag has completely filled every extrusion inside the drum, particularly those just inside the drum opening. The California IOUs stated that DOE should consider the IEC method for drum volume measurement. (California IOUs, No. 22 at p. 24)

DOE notes that the drum volume measurement method in annex E of IEC Standard 61121 requires that the clothes dryer be placed on its side with the door leveled horizontally. The drum is then filled with specifically-sized table tennis balls without preventing the door closing. In addition, the table tennis balls are stirred occasionally to achieve the closest packing of balls possible and to eliminate void spaces. The number of table tennis balls are then counted and used to calculate the drum volume. DOE notes that this method could result in variation due to test technicians stirring the table tennis balls differently, and thus ending up with a different number of total balls in the drum. DOE also notes that counting the table tennis balls may be burdensome depending on the size of the drum. DOE notes that, if conducted properly, the drum capacity measurement using water is not significantly more burdensome than the drum volume measurement method in IEC Standard 61121. As a result, DOE is not considering such amendments to the drum capacity measurement method in today’s final rule.

#### 5. Maximum Allowable Scale Range

Section 2.4.1 in appendix D and appendix D1 specifies that the weighing scale for the test cloth shall have a range of 0 to a maximum of 30 lb with a resolution of at least 0.2 ounces and a maximum error no greater than 0.3 percent of any measured value within the range of 3 to 15 lb. Similarly, section 2.4.1.2 in appendix D and appendix D1 specifies that the weighing scale for drum capacity measurements should have a range of 0 to a maximum of 500 lb with resolution of 0.50 lb and a maximum error no greater than 0.5 percent of the measured value. DOE noted in the February 2013 SNOPR that it received an inquiry requesting clarification of this requirement. DOE recognizes that scales for weighing the

test cloth may have maximum capacity higher than 30 lb, but still meet the requirements for resolution and maximum error within the range of 3 to 15 lb, as specified in the test procedure. DOE also recognizes that a clothes dryer, when filled with water for the drum capacity measurement, could exceed 500 lb. As a result, DOE proposed in February 2013 SNOPR to allow a higher maximum scale range, 60 lb for weighing the test cloth and 600 lb for drum capacity measurements. DOE also noted that the resolution and maximum error requirements would remain unchanged. 78 FR 8992, 8993–8994 (Feb. 7, 2013).

AHAM stated that it did not oppose the proposal to increase the maximum allowable scale range while retaining the resolution and maximum error requirements. (AHAM, No. 17 at p. 19) ALS opposed DOE's proposal for the weighing scales, especially for the 600 lb maximum range for the weighing scale used for drum capacity measurements. ALS commented that a larger maximum range would be acceptable provided that the scale's accuracy in the range where the measurement is being made is calibrated to ISO 17025. (ALS, No. 16 at pp. 5–6) As discussed above, DOE is maintaining the resolution and accuracy requirements in the range where the measurement is being made that are specified in the current test procedure. DOE does not believe it is necessary to require a calibration to a specific standard as long as the resolution and accuracy requirements have been properly certified. For the reasons discussed above, in today's final rule, DOE adopts the amendments to sections 2.4.1 and 2.4.1.2 in 10 CFR part 430, subpart B, appendix D and appendix D1 to allow a higher maximum scale range, 60 lb for weighing the test cloth and 600 lb for drum capacity measurements, while maintaining the current resolution and maximum error requirements. In addition, because DOE is also amending the clothes dryer test procedure to include a new appendix D2, DOE is also incorporating these provisions for the weighing scale in 10 CFR part 430, subpart B, appendix D2, sections 2.4.1 and 2.4.1.2.

## 6. Relative Humidity Meter

Section 2.4.4 in appendix D and appendix D1 specifies that the dry and wet bulb psychrometer used for measuring the ambient humidity shall have an error no greater than  $\pm 1$  degree Fahrenheit ( $^{\circ}\text{F}$ ). DOE noted in the February 2013 SNOPR that it received an inquiry requesting clarification of this provision. DOE recognizes that

relative humidity meters may be an acceptable means to measure the ambient humidity. DOE also recognizes that some humidity meters may express error tolerances in terms of the dry and wet bulb temperatures, while others express error tolerances in terms of percent relative humidity. As a result, DOE evaluated how the  $\pm 1$   $^{\circ}\text{F}$  tolerance for the dry and wet bulb temperatures translates to relative humidity. DOE determined in the February 2013 SNOPR, based on the allowable range in ambient temperature (72 to 78  $^{\circ}\text{F}$ ) and ambient humidity (40 to 60 percent relative humidity) specified in the DOE test procedure, that a  $\pm 1$   $^{\circ}\text{F}$  tolerance for the dry and wet bulb temperatures would translate to a tolerance between  $\pm 2$  percent and  $\pm 4$  percent relative humidity. As a result, DOE proposed that a relative humidity meter with a maximum error tolerance expressed in  $^{\circ}\text{F}$  equivalent to the requirements for the dry and wet bulb psychrometer or with a maximum error tolerance of  $\pm 2$  percent relative humidity would be acceptable for testing. 78 FR 8992, 8993–8994 (Feb. 7, 2013).

ALS supported DOE's proposed requirements for the relative humidity meter. (ALS, No. 16 at p. 6) Because DOE did not receive any comments objecting to this proposal in response to the February 2013 SNOPR and for the reasons discussed above, DOE adopts in today's final rule the amendments to section 2.4.4 in 10 CFR part 430, subpart B, appendix D and appendix D1 specifying that a relative humidity meter with a maximum error tolerance expressed in  $^{\circ}\text{F}$  equivalent to the requirements for the dry and wet bulb psychrometer or with a maximum error tolerance of  $\pm 2$  percent relative humidity would be acceptable for testing. In addition, because DOE is also amending the clothes dryer test procedure to include a new appendix D2, DOE is also including this clarification in 10 CFR part 430, subpart B, appendix D2, section 2.4.4.

## G. Additional Test Procedure Issues

DOE received comments in response to the January 2013 NOPR and February 2013 SNOPR regarding a number of additional issues related to the clothes dryer test procedure. These issues are discussed in the following sections.

### 1. Consumer Usage Patterns and Capabilities

DOE received a number of comments regarding changes to reflect current consumer usage patterns and capabilities. NEEA and the California IOUs commented that based on the NEEA field use data, the drying energy

consumption per-cycle in the field is different than what is measured in the DOE test procedure. NEEA stated that real-world drying times are longer and the energy used per load is greater. According to NEEA, their field use data indicates that the average annual energy use is 1134 kWh/year, which is nearly double what the DOE test procedure produces. According to the California IOUs, the typical annual energy use using DOE's proposed amendments to appendix D1 is 30 percent lower than values observed in the NEEA field study, which ranged from approximately 830 to 1,100 kWh/year. The California IOUs stated that the estimated clothes dryer energy use is 967 kWh/year when using the appendix D test procedure, which closely approximates the trends observed in the field data. The California IOUs stated that the proposed number of clothes dryer loads per year reduces the estimated annual energy use to 641 kWh/year, which is too low. (NEEA, Public Meeting Transcript, No. 10 at pp. 15–16, 17, 18; California IOUs, No. 22 at pp. 1–2)

The California IOUs commented that in terms of load size, typical drying times, and the measurement of automatic termination, NEEA's field study and the proposed test procedure in the January 2013 NOPR are in fairly close agreement. However, the California IOUs stated that the initial RMC, number of annual use cycles, field use factor, temperature settings, load composition, and duct restriction are substantively different, and as a result, a number of values derived from these parameters (*i.e.*, the adjusted per-cycle energy use, energy factor, and estimated annual energy use) are significantly different as well. The California IOUs commented that changes to the initial RMC, field use factor, and number of annual use cycles are feasible to include in the current test procedure rulemaking. (California IOUs, No. 22 at p. 6)

NRDC also commented that there are several aspects of the test procedure that remain inconsistent with real-world use, including the number of annual clothes dryer use cycles and the initial RMC, as demonstrated by the recent NEEA field study, testing by Ecos for NRDC, and more recent testing by Ecova. NRDC commented that, while these issues are beyond the scope of the current rulemaking, DOE should conduct a new rulemaking as soon as possible to address these issues to better represent real world energy use. (NRDC, No. 20 at p. 2) NEEA & NPCC similarly commented that if DOE is unable to make appropriate changes to the



proposed test procedures in the current rulemaking that would bring tested energy use in closer agreement with a more representative average use cycle as indicated by the NEEA field data, DOE should initiate another round of test procedure and standards rulemaking as soon as possible. (NEEA & NPCC, No. 21 at p. 4)

The following sections discuss the specific issues related to consumer use.

**a. Annual Clothes Dryer Use Cycles**

The DOE test procedure in 10 CFR part 430, subpart B, appendix D1, section 4.5, specifies that the representative number of clothes dryer average-use cycles is 283 cycles per year. NEEA presented data at the February 2013 public meeting from a field study that it conducted in the Pacific Northwest for a four- to five-week period during the winter of 2012 indicating that the number of clothes dryer annual use cycles is 428, and that the amendment in the January 2011 Final Rule to change the number of cycles per year to 283 is not representative. (NEEA, Public Meeting Transcript, No. 10 at pp. 17–18, 194–195) The California IOUs also commented that the number of loads being dried per year is greater than specified in appendix D1. The California IOUs commented that, as a result, real-world energy consumption is higher, with a greater potential for absolute energy savings. (California IOUs, Public Meeting Transcript, No. 10 at pp. 196–198) NEEA & NPCC and the California IOUs commented that the clothes dryer annual use cycles should be adjusted upward to 337 based on the NEEA field study data. (NEEA & NPCC, No. 21 at p. 13; California IOUs, No. 22 at pp. 6, 10) NEEA & NPCC and the California IOUs commented that the RECS data alone are not precise enough to use as the basis for the annual use cycles of clothes dryers. NEEA & NPCC and the California IOUs commented that RECS data are based on self-reporting of survey participants, who were asked to recall and report on their typical laundry habits, rather than relying on precisely metered laundry loads. NEEA & NPCC and the California IOUs also stated that the ranges allowed for the responses are too wide to produce accurate data on average use, and that the clothes dryer data are qualitative and categorical in nature, further introducing room for interpretation. NEEA & NPCC and the California IOUs commented that the estimate of the fraction of clothes washer loads that are dried is 124 percent based on NEEA data and not the 84 percent or 91 percent that DOE estimated. NEEA &

NPCC stated that the matching process between the monitored clothes dryer cycles and the hand-written log entries for each load can lead to ambiguity in the results of their analysis of the field data, but that the NEEA data also show that people are often splitting loads that come out of the clothes washer into two or more clothes dryer loads. (NEEA & NPCC, No. 21 at p. 13; California IOUs, No. 22 at pp. 6, 7–8)

The California IOUs stated that they conducted a sensitivity analysis on the RECS data to establish high, intermediate, and low estimates of annual clothes dryer usage, using the distribution of responses for each question to establish weighted averages of clothes washer and clothes dryer use. The California IOUs commented that their analysis showed that the RECS data could yield values as high as 363 and as low as 199 clothes dryer loads per year. The California IOUs commented that DOE should consider existing field measurements of residential laundry behavior to determine an appropriate estimate for the number of annual clothes dryer use cycles, noting a number of surveys with estimates for the average annual use cycles ranging from 224 loads per year to 545 loads per year. (California IOUs, No. 22 at p. 9) The California IOUs stated that the NEEA field study, which estimated 338 annual use cycles, is more reflective of the average U.S. homeowner usage than the RECS data are for several reasons: (1) The 50 participants were metered for a longer period than other field studies (including a total of 903 valid clothes dryer runs); (2) the NEEA study was specifically designed to examine the energy use and behaviors associated with laundry care in the Northwest region, including written logs of clothes washer and clothes dryer use to corroborate metered clothes dryer data; (3) NEEA captured a diverse sample of homes in its study, whereas one earlier study was dominated by homes already participating in energy efficiency programs that show a tendency to use equipment less frequently; and (4) the estimates of annual clothes dryer loads per year from the NEEA study fall in the middle of the range of possible clothes dryer use estimates resulting from analysis of RECS data. (California IOUs, No. 22 at p. 10) The California IOUs commented that although a comprehensive study of typical U.S. residential laundry behavior does not yet exist, the existing studies provide a sounder basis for calculating clothes dryer cycles per year than RECS survey data. The California IOUs requested that

DOE adjust its current assumption of 283 clothes dryer loads per year up to 336 clothes dryer loads per year, which both reflects findings of the NEEA study and serves as a compromise point between current and pre-2011 DOE duty cycle values. (California IOUs, No. 22 at pp. 10–11)

AHAM opposed a change to the number of clothes dryer annual use cycles. AHAM stated that DOE just completed a rulemaking in which it determined that it was appropriate to decrease the number of annual use cycles. AHAM commented that DOE should not reverse that determination now, at least, not without further study and the opportunity for full notice and comment rulemaking on the issue. In addition, AHAM stated that it is not appropriate to make this change at this time given that it will impact test results, thus necessitating an adjustment to the standard, which should not be done during the 3-year lead time to the January 1, 2015 standards. (AHAM, No. 17 at p. 16)

DOE notes that the 283 clothes dryer annual use cycles specified in appendix D1 was based on data from the 2005 RECS, which is a national sample survey of housing units that collects statistical information on the consumption of, and expenditures for, energy in housing units along with data on energy-related characteristics of the housing units and occupants. In the January 2011 Final Rule, DOE estimated that the fraction of clothes washer loads that go into the clothes dryer is 91 percent (not the 84 percent suggested by NEEA & NPCC). In addition, DOE noted in the January 2011 Final Rule that the 283 annual use cycles is fairly consistent with data provided by AHAM that referenced a study conducted by Procter & Gamble (which estimated 279 annual use cycles), as well as data from Whirlpool (which estimated 288 annual use cycles). 76 FR 972, 1010 (Jan. 6, 2011). DOE also notes that the NEEA field study does not appear to take into account users that may line-dry certain laundry loads, which could potentially be due to the timing (winter) and location (Pacific Northwest) of the survey. DOE recognizes interested parties' concerns regarding the number of annual use cycles based on the available field use data. However, DOE does not have sufficient information at this time to make a definitive conclusion regarding the number of clothes dryer annual use cycles. As a result, DOE is not amending the number of clothes dryer annual use cycles at this time in the limited scope of this test procedure rulemaking. DOE may continue collecting and considering



available data on clothes dryer use and may consider amendments to the number of annual use cycles in a future rulemaking.

**b. Initial Remaining Moisture Content and Moisture Removed During Test Cycle**

The DOE test procedure in appendix D1 specifies that the initial RMC of the test load shall be 57.5 percent. (10 CFR part 430, subpart B, appendix D1, section 2.7) NEEA presented data at the February 2013 public meeting from a field study that it conducted showing that real-world initial RMC is 80 percent. In addition, NEEA commented that based on its field use data, the drying cycle times in the field are different than what is measured in the DOE test procedure. (NEEA, Public Meeting Transcript, No. 10 at pp. 15, 16, 194–195) The California IOUs also commented that, based on the NEEA field data, clothes are wetter when they come out of the clothes washer than DOE estimates. (California IOUs, Public Meeting Transcript, No. 10 at pp. 196–197)

NEEA & NPCC and the California IOUs commented that, based on the NEEA field study data, initial RMC values below 60 percent are not being realized in the field, and that their average (from a sample of 50 households that comprised 30-percent top-loaders and 70-percent front-loaders) is estimated to be 62 percent. NEEA & NPCC stated that this results in greater energy use and longer cycle times in the field than is produced using the DOE test procedure. NEEA & NPCC added that the initial RMC is largely independent of the dry weight of the test load because: (1) Clothes washer users are not always selecting the cycles that utilize the highest spin speeds available on their equipment; and (2) if consumers do select those cycles, the clothes washers are not always successfully balancing the loads sufficiently to actually spin at the highest speeds. NEEA & NPCC commented that in many cases, the machine is unable to balance the load after a long period and simply spins at the highest speed that the suspension allows, and they believe that this speed may decrease over time as the drum suspension components wear. (NEEA & NPCC, No. 21 at pp. 3–4, 7–8, NPCC, Public Meeting Transcript, No. 10 at p. 114) NEEA & NPCC stated that the RMC values seen in the field result in more time and energy to dry a typical load than DOE's current test procedures would suggest. According to NEEA & NPCC, the estimated average drying cycle time from the field testing was 58

minutes. NEEA & NPCC also stated that there is a positive linear trend between average drying time versus average total moisture removed. Based on field data, NEEA & NPCC and the California IOUs recommended that DOE change the initial RMC value to 62 percent  $\pm$  0.33 percent. (NEEA & NPCC, No. 21 at pp. 8–10; California IOUs, No. 22 at pp. 6–7)

AHAM opposed a change to the initial RMC currently specified in the DOE test procedure at appendix D1. AHAM stated that DOE just completed a rulemaking in which it determined that it was appropriate to decrease the initial RMC. AHAM commented that DOE should not now reverse that determination, at least not without further study and the opportunity for full notice and comment rulemaking on the issue. In addition, AHAM stated that it is not appropriate to make this change at this time given that it will impact test results, thus necessitating an adjustment to the standard, which should not be done during the 3-year lead time to the January 1, 2015 standards. (AHAM, No. 17 at pp. 12–13)

DOE noted in the January 2011 Final Rule that the 57.5-percent initial RMC was based on AHAM shipment-weighted clothes washer RMC data, which was representative of all products on the market. In addition, DOE notes that there is uncertainty in the initial RMC estimates from the NEEA field study data because each laundry load was not dried to determine the bone-dry weight, which is then used to calculate the RMC of the test load. Instead, a fixed correction was used to estimate the RMC of laundry loads from the NEEA field study. DOE also notes that NEEA & NPCC's comment that initial RMCs below 60 percent are not being realized in the field appears to be contrary to the data presented in their comments, which show that a large number of laundry loads metered in the NEEA field study had initial RMCs of 60 percent or less (NEEA & NPCC, No. 21 at p. 7). After considering this information, DOE determined it is not sufficient at this time to make a definitive conclusion regarding the value of the initial RMC of the test load. As a result, DOE is not amending the initial RMC in this test procedure rulemaking. DOE may continue collecting and considering available data on clothes dryer use and may consider amendments to the initial RMC in a future rulemaking.

The California IOUs stated that the amount of moisture being removed better describes the work being done by a clothes dryer than the dry weight of clothing in the load, and that the

proposed test procedure does not require the clothes dryer under test to remove as much moisture as the field data suggests is typical. The California IOUs stated that, as a result, the DOE test procedure underestimates field clothes dryer energy use by 30 percent. The California IOUs presented data showing that the amount of water removed during the proposed automatic cycle termination test procedure is 4.6 lb, whereas the NEEA field study data show an average of 4.5 lb of water removed during the drying cycle. The California IOUs stated that the test procedure will not be representative of field conditions unless the total moisture being removed per load is greater, as suggested by the field data. (California IOUs, No. 22 at pp. 6, 18–19)

DOE notes that the amount of moisture removed is controlled by the weight, initial RMC, and final RMC of the test load. For the reasons discussed in this section, DOE is not considering changes to the test load weight and initial RMC in today's final rule. In addition, as discussed in section III.B.3, the 2-percent final RMC threshold for the automatic cycle termination test method was based on the data presented in the Joint Petitioners' comment regarding RMC levels acceptable to consumers. DOE also notes that the amount of water removed during the proposed automatic termination test cycle for standard-size clothes dryers must be at a minimum 4.7 lb to dry the load to just 2-percent RMC (not 4.6 lb as suggested by the California IOUs), and thus most clothes dryers will dry more than 4.7 lb of water during the test cycle. DOE also notes that the data from the NEEA field study cited by the California IOUs showing that on average 4.5 lb of water was removed during the drying cycle appears to be contrary to the California IOUs' comment that the total moisture being removed per load should be greater. For these reasons, DOE is not considering changes to these values that would revise the amount of moisture removed during the test cycle.

**c. Test Load Weight**

The DOE test procedure at appendix D1 specifies test load bone-dry weights of 8.45 lb and 3.00 lb for standard-size and compact-size clothes dryers, respectively. As part of the test procedure amendments in the January 2011 Final Rule, DOE changed the load bone-dry weights for standard-size dryers from 7.00 lb to 8.45 lb based on the historical trends of clothes washer tub volumes and the corresponding percentage increase in clothes washer test load sizes (as specified by the DOE

clothes washer test procedure). 76 FR 972, 977 (Jan. 6, 2011).

NEEA commented that the dry weight of real-world test loads, as determined from its field study, is on average 7.4 lb. (NEEA, Public Meeting Transcript, No. 10 at p. 17) As discussed above, DOE notes that there is uncertainty in the test load bone-dry weight estimates from the NEEA field study data because each laundry load was not dried to determine the bone-dry weight. Instead, a fixed correction was used to estimate the dry weight of laundry loads based on the weight measurements after the drying cycle from the NEEA field study. In addition, it is unclear whether the NEEA field study included both standard-size and compact-size clothes dryers and whether the capacities of the clothes dryer models in the 50 households selected in the survey are representative of all U.S. clothes dryer shipments. DOE recognizes NEEA's concerns regarding the test load bone-dry weight based on the available field use data. However, DOE does not have sufficient information at this time to make a definitive conclusion regarding the test load bone-dry weight. As a result, DOE is not amending the test load bone-dry weight at this time in this test procedure rulemaking. DOE may continue collecting and considering available data on clothes dryer use and may consider amendments to the test load bone-dry weight in a future rulemaking.

#### d. Exhaust Conditions

The DOE test procedure specifies in 10 CFR part 430, subpart B, appendix D and appendix D1, section 2.1, that the clothes dryer exhaust shall be restricted by adding the AHAM exhaust simulator described in section 3.3.5.1 of AHAM HLD-1-2009.

The California IOUs commented that DOE should update the test procedure in a new rulemaking to modify the exhaust cap diameter to better reflect the duct restriction and airflow from recent NEEA field measurements. According to the California IOUs, typical clothes dryers operate with less-than-ideal venting and have greater duct blockage, lower airflow, and correspondingly longer drying times than those measured under DOE test conditions. The California IOUs stated that this is due to lint accumulation in ducts, failure of users to clean lint filters routinely, unsecured ducting, and long venting distances in older homes. The California IOUs stated that NEEA's field study confirms a wide range of air flow rates from clothes dryers, representing various levels of duct restriction. The California IOUs noted that air flow rates

at the output of the vent were found to be as low as 6 cubic feet per minute (CFM) and as high as 146 CFM, with an average of 79 CFM. The California IOUs stated that this is significantly lower than air flow rates of approximately 96 CFM that they measured in the laboratory when a set of clothes dryers similar to those metered in the field were tested under the current DOE test procedure. The California IOUs developed a correlation of air flow rate with the size of hole in an end cap, as allowed by the 2010 AHAM procedure, and found that the NEEA field study average air flow rate was reproduced for the average of four representative clothes dryers in the laboratory with a hole diameter of  $2^{1\frac{1}{16}}$  inches versus the current DOE value of  $2\frac{7}{8}$  inch diameter. The California IOUs stated that DOE should update its airflow restriction in a new rulemaking to better reflect conditions documented in the field. (California IOUs, No. 22 at pp. 17, 19–20, 21)

DOE first notes that the exhaust simulator specified in section 3.3.5.1 of AHAM HLD-1-2009, which is required for use in the DOE test procedure, requires a hole diameter of  $2\frac{9}{16}$  inches, not the  $2\frac{7}{8}$ -inch diameter referenced by the California IOUs. As a result, DOE notes that it is unclear whether the correlation between air flow rates with the size of the hole was developed correctly to take into consideration the  $2\frac{9}{16}$ -hole diameter required in the DOE test procedure. In addition, drum volume and shipments information were not made available for the four clothes dryers used in the limited testing conducted by the California IOUs, to determine whether airflow rates would be representative of all clothes dryer shipments and household venting configurations. Therefore, DOE does not have sufficient information at this time to make a definitive conclusion regarding the exhaust conditions. As a result, DOE is not amending the exhaust conditions at this time in this test procedure rulemaking. DOE may continue collecting and considering available data on clothes dryer use and may consider amendments to the exhaust conditions in a future rulemaking.

#### 2. Test Load Bone-Dry Weight Measurement

DOE notes that 10 CFR part 430, subpart B, appendix D, section 1.2 and appendix D1, section 1.5 specify that the bone-dry weight means the condition of a load of test clothes which has been dried in a clothes dryer at maximum temperature for a minimum of 10 minutes, removed and weighed

before cool down, and then dried again for 10-minute periods until the final weight change of the load is 1 percent or less.

The California IOUs commented that DOE should clarify its requirements for bone-dry weight measurements. The California IOUs stated that the process for obtaining bone-dry weight is considerably labor intensive, requiring technicians to iteratively dry test cloths until their run-to-run weight variation is less than a particular percentage. The California IOUs added that for a laboratory conducting large numbers of clothes dryer measurements, the repeated bone drying of test cloths can be burdensome. The California IOUs commented that the current wording of the test procedure appears to require that testers obtain new bone-dry cloth measurements for every clothes dryer test. According to the California IOUs, test cloths shed very little mass through the drying process (about 0.01 lb for every 10 drying cycles) and so they question whether it may be acceptable for bone drying to occur at a less frequent interval as long as the same test cloths are used for every drying cycle. (California IOUs, No. 22 at p. 24)

DOE notes that if a commercial clothes dryer is used, bone-drying test loads should only take two to three 10-minute drying cycles to achieve a bone-dry state. In addition, DOE notes that the current DOE clothes dryer test procedure does not require multiple test runs. As a result, DOE does not consider the bone-drying process to be unduly burdensome to conduct and, therefore, is not amending the bone-drying process in today's final rule.

#### Ventless Clothes Dryer Preconditioning

DOE notes that the current clothes dryer test procedure in 10 CFR part 430, subpart B, appendix D1, section 2.8.2, specifies that for ventless clothes dryers, before any test cycle, the steady-state machine temperature must be equal to the room ambient temperature. Section 2.8.2 also specifies that this may be done by leaving the machine at ambient room conditions for at least 12 hours between tests.

The California IOUs commented that for testing laboratories conducting a high volume of testing with limited test stations, the requirement for ventless clothes dryers to leave the machine at ambient conditions for 12 hours between tests when conducting repeated tests can be burdensome and effectively means that only one test may be performed per day. The California IOUs requested that DOE consider alternate language that might enable shorter turnaround times when testing ventless

clothes dryers. The California IOUs stated that, for example, drum or cabinet air temperature measurements could be conducted after an initial 6-hour period to determine whether a clothes dryer's internal temperature is within  $\pm 5$  °F of ambient conditions. If internal temperatures are within the given range of ambient conditions, testing would proceed. Otherwise, test technicians would need to wait the full 12 hours until conducting another test. The California IOUs stated that such provisions would greatly reduce the testing burden for ventless clothes dryers. (California IOUs, No. 22 at p. 24)

As discussed above, the provisions specify that the steady-state temperature may be achieved by leaving the machine at ambient room conditions for at least 12 hours between tests. DOE notes, however, that a 12-hour period is not required and, as discussed in the January 2011 Final Rule, other means used to achieve a steady-state machine temperature would be acceptable under the test procedure provisions. 76 FR 972, 1007 (Jan. 6, 2011). As a result, DOE is not changing the pre-conditioning requirements for ventless clothes dryers in today's final rule.

#### Room Ambient Humidity Requirements

The DOE test procedures specify in 10 CFR part 430, subpart B, appendix D, section 2.2 and appendix D1, section 2.2.1, that the room relative humidity must be maintained at  $50 \pm 10$  percent relative humidity.

The California IOUs also commented that the lab-to-lab variation from DOE's testing with the DOE and IEC/AHAM test loads may be largely attributed to the variation in ambient humidity. The California IOUs commented that if the DOE were to change the test load composition such that reproducibility and repeatability were lessened, DOE could change other conditions in the test procedure to compensate, such as specifying a tighter tolerance for the allowable humidity. The California IOUs noted that it is relatively harder for the air coming in to the clothes dryer to evaporate the moisture in the load if the air has more water in it. (California IOUs, Public Meeting Transcript, No. 10 at pp. 70–72)

The California IOUs commented that they tested one clothes dryer with moisture sensors near the extremes of environmental conditions for temperature and humidity. The California IOUs stated that the high-temperature, low-relative humidity scenario was only 1-percent more efficient than the low-temperature, high-relative humidity scenario. The California IOUs noted that other studies,

such as data provided by Whirlpool in chapter 5 of the 2011 DOE Final Rule Technical Support Document, have shown the measured efficiency has a greater sensitivity to ambient temperature and relative humidity. The California IOUs stated their limited data to date on this topic do not suggest that the range of allowable environmental conditions needs to be narrowed, but they encouraged DOE to investigate this issue more thoroughly in a new rulemaking as it seeks ways of minimizing run-to-run variability while increasing the representativeness of the test procedure. (California IOUs, No. 22 at pp. 22–23)

DOE notes that, in its tests, it did not require the ambient conditions to be controlled any more tightly than required by the current test procedure and that variations in the ambient humidity would also have been present from test to test within a given test lab. As a result, the effects of variations in the ambient humidity would be equally present in both the test-to-test and lab-to-lab variation. As a result, DOE considers the difference in lab-to-lab reproducibility for the DOE test load (3.0 percent) and the IEC/AHAM test load (4.7 percent) to be primarily attributable to the variation in test loads from lot to lot. DOE notes that further tightening the room temperature and humidity conditions may require testing to be conducted in an environmental chamber to maintain the required conditions, which would significantly increase testing burden. Based on the information and test data available regarding the effects of the ambient humidity on the measured efficiency, DOE is not amending the room relative humidity requirements in today's final rule.

#### Measurement of Drying Cycle Time

The California IOUs commented that DOE should include a measurement of drying time in its test procedure. The California IOUs indicated that test labs can already determine drying time for timed dry and automatic termination cycles from their data logs of power consumption over time, but the DOE test procedure does not require it to be reported. The California IOUs stated that various U.S. clothes dryer manufacturers currently make widely different claims about drying times for various models, each employing different assumptions about the size and composition of the load being dried and the initial RMC. According to the California IOUs, some manufacturers have made claims that particular clothes dryer models can achieve energy savings of 40 percent or more, or can

dry laundry in as little as 14 minutes, but these results may not have been achieved under representative conditions. The California IOUs stated that in the absence of standardized guidelines for how to report drying times and energy savings, manufacturers developed their own guidelines for marketing purposes. (California IOUs, No. 22 at pp. 11–12)

The California IOUs further stated that the link between energy efficiency and drying times in clothes dryers has already been established in laboratory testing. The California IOUs stated that, all else being equal, a clothes dryer that reduces the heating element temperature and modestly extends average drying times can save energy, which is the basis for the optional “eco-modes” now being offered in many new clothes dryers. The California IOUs stated that this will not affect consumer satisfaction for loads that are not time-critical, but that it may be an unacceptable tradeoff to many consumers. The California IOUs stated that having an accurate measure of drying times will help users purchase those models that can achieve energy savings without sacrificing performance, and will help programs such as ENERGYSTAR establish a reasonable upper bound for allowable drying times for labeled products. (California IOUs, No. 22 at p. 12)

The California IOUs stated that recording and reporting drying time will also encourage manufacturers to automatically terminate the drying cycle promptly and as close as possible to 2-percent RMC, since any additional over-drying would take more time and produce no consumer benefit. (California IOUs, No. 22 at p. 12)

DOE notes that requiring the measurement of the drying time is inconsistent with the EPCA requirement that a test procedure measure the energy efficiency, energy use, or estimated annual operating cost of a covered product. (42 U.S.C. 6293(b)(3)) As a result, DOE is not adopting amendments to require the measurement and reporting of the clothes dryer cycle time in today's final rule.

#### *Effects of Proposed Test Procedure Revisions on Compliance With Standards*

In any rulemaking to amend a test procedure, DOE must 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, DOE must amend the applicable energy conservation standard accordingly. (42 U.S.C. 6293(e)(2)) In determining the amended energy conservation standard, the Secretary shall measure, pursuant to the amended test procedure, the energy efficiency, energy use, or water use of a representative sample of covered products that minimally comply with the existing standard. The average of such energy efficiency, energy use, or water use levels determined under the amended test procedure shall constitute the amended energy conservation standard for the applicable covered products. (42 U.S.C. 6293(e)(2)) If DOE were to amend an energy conservation standard under 42 U.S.C. 6293(e)(2), models of covered products in use before the date on which the amended energy conservation standard becomes effective (or revisions of such models that come into use after such date and have the same energy efficiency, energy use or water use characteristics) that comply with the energy conservation standard applicable to such covered products on the day before such date shall be deemed to comply with the amended energy conservation standard. (42 U.S.C. 6293(e)(3)) DOE's authority to amend energy conservation standards does not affect DOE's obligation to issue any final standards as described in 42 U.S.C. 6295. (42 U.S.C. 6293(e)(4))

#### Active Mode

As discussed in section III.F, DOE is amending 10 CFR part 430 subpart B, appendix D in today's final only to clarify the cycle settings used for testing, the requirements for the gas supply, the installation conditions for console lights, the method for measuring the drum capacity, the maximum allowable scale range, and the allowable use of a relative humidity meter. Because the amendments to appendix D would not change the actual testing method, DOE determined that these amendments would not affect the measured efficiency according to appendix D and would not affect a manufacturer's ability to demonstrate compliance with the current energy conservation standards at 10 CFR 430.32(h)(2).

As part of the January 2013 NOPR, because the January 1, 2015 energy conservation standards for clothes dryers are based on CEF as measured according to 10 CFR part 430 subpart B, appendix D1, DOE investigated how the proposed amendments for automatic cycle termination would affect the measured CEF. For the January 2013 NOPR, DOE conducted testing on 20

clothes dryers according to the DOE clothes dryer test procedure in existing appendix D1 and then according to the proposed automatic cycle termination test procedure.<sup>13</sup> The results of this testing showed that specific models resulted in either a lower or higher measured CEF as compared to the measured CEF using the existing test procedure, ranging from a 27.4-percent decrease to a 20.4-percent increase in CEF with an average of a 3.8-percent increase. DOE also evaluated the effects of the proposed amendments for the products in DOE's test sample that minimally comply with the existing energy conservation standards (based on rated EF). The results for the 10 minimally compliant units in DOE's test sample showed a 27.4-percent decrease to a 16.9-percent increase in CEF as compared to the CEF using the existing test procedure, with an average of a 4.1-percent increase. 78 FR 152, 175–176 (Jan. 2, 2013).

Based on these results and consistent with 42 U.S.C. 6293(e)(1) and (2), DOE tentatively concluded in the January 2013 NOPR that the proposed amendments to the active mode test procedure will on average not impact the measured efficiency as compared to the current test procedure for models currently available on the market. As a result, DOE did not consider amendments to the energy conservation standards that will be required on January 1, 2015. 78 FR 152, 176 (Jan. 2, 2013).

AHAM disagreed with DOE's determination that the proposed test procedure's impact on measured efficiency is *de minimus* and that an adjustment to the standards is unnecessary. AHAM stated that DOE's data shows that the impact of the proposed test procedure amendments is significant enough that it would be inappropriate for DOE to make the proposed test procedure amendments effective until a future standards change (*i.e.*, subsequent to the January 1, 2015 standards). (AHAM, No. 17 at pp. 2–3, 11; AHAM, Public Meeting Transcript, No. 10 at pp. 172–173)

AHAM commented that DOE's approach does not meet either the test procedure "crosswalk" and lead time requirements for amended standards or the procedural and substantive requirements and criteria under 42 U.S.C. 6295. AHAM stated that the provisions in 42 U.S.C. 6293(e) do not contain the same rigorous economic and

technical criteria as in the standards provisions because changes in standards stringency are intended to occur in a standards rulemaking only, not in a stand-alone test procedure rulemaking. AHAM stated that in a future joint standards and test procedure rulemaking, the basic criteria of technical feasibility and economic justification, and the many sub-economic and technical considerations, can be reviewed fully. (AHAM, No. 17 at p. 3)

AHAM commented that test procedures should not be used to tighten or loosen standards. AHAM stated that DOE must comply with 42 U.S.C. 6293(e), and if that would result in unlawful attenuating of lead time and lock-in periods, then DOE should wait until a future standards rulemaking is complete and integrate the regulatory processes. AHAM stated that, should DOE proceed as proposed in the January 2013 NOPR despite AHAM's opposition, AHAM would prefer that DOE include the 0.80 field use factor rather than exclude it because it would mitigate the burden to manufacturers. (AHAM, No. 17 at p. 5)

AHAM commented that DOE's evaluation of the impacts of the proposed test procedure revisions on the measured efficiency was not conducted pursuant to any formal policy or guidance on how the evaluation under 42 U.S.C. 6293(e) is to be conducted. AHAM commented that without some establishment of these policies and procedures, it is difficult to evaluate whether the analysis was conducted properly or to determine how to interpret its results. (AHAM, No. 17 at p. 5)

AHAM members conducted testing on vented electric standard, vented electric compact (240V), vented gas, and ventless electric compact (240V) clothes dryers under existing appendix D1 and the proposed appendix D1. AHAM stated that its test data, applying the 0.80 field use factor, showed similar results to DOE's testing. In particular, AHAM's testing under the proposed test procedure showed a 28.1-percent decrease to a 13.1-percent increase in CEF as compared to the CEF using appendix D1, with an average 0.63-percent increase in CEF. However, AHAM stated that without a protocol for choosing which models to test, a focus on individual product classes rather than clothes dryers as a whole, and criteria for what is significant versus *de minimus*, the DOE and the AHAM processes are both arbitrary. (AHAM, No. 17 at pp. 5–6)

AHAM disagreed with DOE's determination that an average 3.8-

<sup>13</sup> As discussed in section III.B.III.B.3, the proposed amendments in the January 2013 NOPR included the 0.80 field use factor for automatic termination control dryers.

percent (based on all tested models) or an average 4.1-percent (based on minimally compliant models only) increase in CEF is *de minimus*, and, thus, does not constitute an “impact” on measured efficiency. AHAM stated that 42 U.S.C. 6293(e)(1)–(2) requires DOE to determine to what extent, if any, the proposed test procedure would alter the measured energy efficiency and it does not say “significantly alter.” AHAM noted that 42 U.S.C. 6293(e)(2) specifies that if DOE determines that the amended test procedure will alter the measured efficiency, the Secretary shall (not “may” or “shall under certain circumstances”) amend the applicable energy conservation standard during the rulemaking carried out with respect to such test procedure. AHAM noted that the statute provides for an averaging process—which DOE has failed to further define or clarify—that is required to determine the amended standard. AHAM stated that there is no process to determine when not to change the standard and that even if such *de minimus* determinations are statutorily permitted, these data—even if accepted as an appropriate sampling—do not support a *de minimus* determination. (AHAM, No. 17 at p. 7)

AHAM commented that because the January 1, 2015 standards are 5 percent more stringent than the existing standard, it is not reasonable to conclude that a 3.8–4.1 percent change in measured efficiency will on average not impact the measured efficiency. AHAM and ALS commented that the field use factor seems to have been selected to allow DOE to meet what it considers a *de minimus* threshold. (AHAM, No. 17 at p. 7; ALS, No. 16 at p. 3)

AHAM stated that it is improper to consider just an average impact on measured efficiency, across all product classes combined, and that DOE should instead assess the range of impacts. AHAM commented that every clothes dryer, not just the average clothes dryer, must comply with the standards and, thus, ranges of impact must not be ignored as DOE assesses whether there is an impact on measured efficiency under 42 U.S.C. 6293(e)(1). AHAM commented that DOE and AHAM data under the proposed test procedure show a wide range of effects on the measured CEF as compared to the appendix D1 test results. AHAM commented that even if DOE determined that the proposed test procedure changes impact measured efficiency, it is unclear whether DOE should adopt test procedure changes that would have this range of impacts during a 3-year lead time or any time other than coincident

with a standards rulemaking. In this particular case, AHAM stated that it does not believe it is appropriate to make such a standards change. (AHAM, No. 17 at pp. 7–8) According to ALS, it is unacceptable to have certain models that cannot be certified or sold after January 1, 2015 because Congress intended under 42 U.S.C. 6293(e)(3) that every model that is compliant before a test procedure change would be compliant after the test procedure change. (ALS, No. 16 at p. 3) The California IOUs also commented that there is a wide range in measured efficiency under the proposed test procedure, and that although the effects on the measured efficiency on average may be small, clothes dryers must qualify individually. (California IOUs, Public Meeting Transcript, No. 10 at pp. 169–171)

AHAM commented that DOE should assess the impact on measured efficiency by product class. AHAM stated that product classes exist for energy conservation standards because of important design, use, and utility differences between products that impact energy use, and those differences should not be ignored when assessing the impact a test procedure change will have on measured energy efficiency. AHAM commented that based on DOE’s data, there are certain product classes for which the *de minimus* argument does not hold, even if such determinations are permitted and even if the field use factor is applied (e.g., vented electric compact (120V) clothes dryers). Furthermore, comparing the DOE and AHAM data by product class, AHAM noted that the product class average impacts differ. For example, DOE’s test data show a 7.4-percent change for vented gas clothes dryers, whereas AHAM’s data show a 2.5-percent change in average CEF under the proposed test procedure as compared to appendix D1 results. Thus, AHAM stated that the overall averages are not comparable. (AHAM, No. 17 at p. 8)

AHAM and ALS opposed the 0.80 field use factor for automatic termination control dryers and noted that without that field use factor applied, the data show that an adjustment under 42 U.S.C. 6293(e) is necessary. AHAM noted that DOE and AHAM’s data, when the field use factor is removed, show an average impact on measured energy efficiency of –16.9 percent and –19.5 percent, respectively, for the proposed test procedure as compared to the appendix D1 test results. In addition, AHAM again noted that for certain product classes, the average impact is even more

significant. AHAM noted that, for example, the impact on measured efficiency for vented electric compact (120V) clothes dryers in DOE’s sample (of which there is only one) without the field use factor applied is –42.0 percent as compared to the appendix D1 test results. In addition, according to AHAM’s data, without the field use factor applied, the average impact on measured efficiency for vented electric standard clothes dryers is –20.0 percent and the average impact on measured efficiency for vented gas clothes dryers is –18.0 percent as compared to the appendix D1 test results. Furthermore, AHAM stated that though the overall average impact on measured efficiency is similar between the DOE data (–16.9 percent) and AHAM data (–19.5 percent), AHAM believes this is coincidental because the individual product class averages which factor in to the overall average are quite different. AHAM noted, for example, that the percent change for vented gas clothes dryers is –14.0 percent based on DOE’s data, whereas AHAM’s data show a –18.0-percent change as compared to appendix D1. (AHAM, No. 17 at pp. 8–10; ALS, No. 16 at p. 3)

Samsung stated that it conducted testing on units to evaluate the effects of the proposed test procedure change on the measured efficiency. Samsung stated that, in general, its test results are within the data range of the DOE tests. (Samsung, No. 13 at p. 4)

AHAM commented that DOE does not have sufficient data or a transparent model selection process upon which to base either: 1) A determination as to whether the proposed test procedure amendments impact measured efficiency, or 2) a standards adjustment under 42 U.S.C. 6293(e)(2). AHAM stated that the basic models on the market today are not necessarily the basic models that will be on the market when compliance with the January 1, 2015 standards is required. According to AHAM, many of those models are still in the design phase and may have different platforms than those in current production. AHAM stated, however, that its own data are similarly limited and did not suggest how DOE could adjust the standard. As a result, AHAM recommended that DOE work together with stakeholders to develop a process for that adjustment. (AHAM, No. 17 at p. 11)

AHAM and NEEA & NPCC commented that the anti-backsliding provision in EPCA (42 U.S.C. 6295(o)(1)) is not intended to apply to standards adjustments done per 42 U.S.C. 6293(e). AHAM stated that, otherwise, DOE could never address the

consequences of test procedure changes between standards changes. AHAM also stated that if DOE does not apply these test procedure amendments until the underlying standards changes in the future, this would no longer be an issue. (AHAM, No. 17 at p. 11; NEEA & NPCC, No. 21 at p. 15) NEEA & NPCC and Earthjustice added that if DOE chooses not to adjust the January 1, 2015 standards based on the proposed changes to the test procedure, not only will it violate the provisions in section 42 U.S.C. 6293(e)(1), but also the 5-percent energy savings estimated for the January 1, 2015 standards could largely be lost. NEEA & NPCC and Earthjustice stated that the 4-percent difference in energy use when applying the proposed test procedure might be enough to allow most of the models now in production to meet the standards and would be a *de facto* weakening of the January 1, 2015 standards. (NEEA & NPCC, No. 21 at p. 15; Earthjustice, No. 15 at p. 3) ASAP also commented that a 4-percent increase in CEF is not insignificant considering that the January 1, 2015 standards will reduce energy use by about 5 percent compared to the current standards. (ASAP, Public Meeting Transcript, No. 10 at p. 169) NEEA & NPCC commented that it is not clear whether or not the testing conducted by DOE required under 42 U.S.C. 6293(e) is sufficient to properly calculate an appropriate adjustment to the standard. NEEA & NPCC disagreed with DOE's determination that no adjustment is needed. (NEEA & NPCC, No. 21 at p. 15)

Earthjustice commented that the January 2013 NOPR asserts that the proposed test procedure amendments will not alter the measured energy efficiency of clothes dryers, but this conclusion is contrary to DOE's own findings that the proposed amended test procedure resulted in an average increase in CEF of 3.8 percent and a 4.1-percent increase when only considering the minimally compliant clothes dryers in DOE's sample. Earthjustice stated that because DOE's testing confirms that the amendments to the test procedures will alter the measured energy efficiency of clothes dryers, EPCA requires that DOE adjust the standards for these products. Earthjustice stated that nothing in 42 U.S.C. 6293(e)(1) suggests that DOE is authorized to determine that the extent of any such alteration is insufficient to trigger the obligation to adjust the standards and that the "extent" of any such alteration determines the amount of adjustment required under 42 U.S.C. 6293(e)(2). Earthjustice noted that a final rule published on October 17, 1990 (55 FR 42162) reduced the required

energy factor levels for electric storage water heaters by 0.02 to account for the impact of revisions to the water heater test procedure. (Earthjustice, No. 15 at pp. 3–4)

Earthjustice commented that the need to adjust the standards might be different if adjusting the standards under 42 U.S.C. 6293(e) would have no impact on covered products. Earthjustice noted examples of the dishwasher, boiler, and refrigerator test procedure amendments where the change in the measured energy efficiency is so small that any adjustment to the standard would not impact the compliance of any covered products. Earthjustice commented that DOE has not suggested that a 4-percent change in the level of the clothes dryer standards would have no impact on the compliance status of covered models. Earthjustice stated that DOE cannot conclude that a 4-percent reduction in the stringency of the clothes dryer standards would have a *de minimus* impact, given that DOE determined in the final rule adopting the January 1, 2015 standards that a significant share of the clothes dryers currently on the market perform just below the adopted standards. Earthjustice stated that adding 4-percent to the January 1, 2015 standard for electric standard-size clothes dryers would enable many of the clothes dryers meeting the efficiency level below the standards to then comply with the standards, reducing the energy savings that the January 1, 2015 standards would otherwise have delivered. To avoid this weakening of the standards, Earthjustice stated that DOE must adjust them as 42 U.S.C. 6293(e) requires. (Earthjustice, No. 15 at pp. 4–5)

NEEA & NPCC and Earthjustice commented that anti-backsliding provisions would not preclude amending the energy conservation standards based on the proposed test procedure amendments for automatic cycle termination. Earthjustice added that such an adjustment is required to avoid backsliding. Earthjustice also noted that 42 U.S.C. 6293(e)(4) provides that DOE's authority to adjust energy conservation standards under this subsection shall not affect the Secretary's obligation to issue final rules as described in 42 U.S.C. 6295. According to Earthjustice, this provision means that any adjustments to standards that DOE makes under 42 U.S.C. 6293(e) do not count as amendments to the standards that satisfy DOE's rulemaking obligations under 42 U.S.C. 6295. Earthjustice stated that the adjustment process established under 42 U.S.C. 6293(e) is designed to avoid *de facto*

reductions (or increases) in the stringency of standards by ensuring that the impacts of test procedure amendments on measured energy efficiency are reflected in the level of the standard and that application of section 42 U.S.C. 6293(e) preserves the integrity of the standards, consistent with 42 U.S.C. 6295(o)(1). (NEEA & NPCC, No. 21 at pp. 14–15; Earthjustice, No. 15 at pp. 2–3)

NPCC commented that if the automatic termination field use factor is not applied, more units in DOE's test sample would fail to meet the January 1, 2015 standard than would pass. (NPCC, Public Meeting Transcript, No. 10 at pp. 166–167) ASAP questioned whether, if DOE did not adopt the field use factor, the standards would be adjusted so that, on average, a clothes dryer that just complies with the January 1, 2015 standards under the current test procedure would still comply with those standards under the new test procedure. (ASAP, Public Meeting Transcript, No. 10 at p. 168)

As discussed in section III.B.3 and section III.I.3, DOE is amending the clothes dryer test procedure in 10 CFR part 430, subpart B to create a new appendix D2 that includes the testing methods for more accurately measuring the effects of automatic cycle termination. As discussed in section III.I.3, the newly created appendix D2 will not be required for use to determine compliance with the January 1, 2015 energy conservation standards for clothes dryers. DOE is not amending appendix D1 in today's final rule to include these amendments for automatic cycle termination. As a result, DOE determined that the amendments for automatic cycle termination adopted in today's final rule would not affect a manufacturer's ability to comply with the January 1, 2015 energy conservation standards for clothes dryers in 10 CFR 430.32(h)(3).

DOE is only amending the active mode test procedures in 10 CFR part 430 subpart B, appendix D1 in today's final to correct the calculation of the per-cycle combined total energy consumption and to clarify the cycle settings used for testing, the requirements for the gas supply, the installation conditions for console lights, the method for measuring the drum capacity, the maximum allowable scale range, and the allowable use of a relative humidity meter. Because these amendments to appendix D1 do not change the actual testing method, DOE has determined that these amendments will not affect the measured efficiency according to appendix D1 and will not affect a manufacturer's ability to

demonstrate compliance with the January 1, 2015 energy conservation standards at 10 CFR 430.32(h)(3).

## 2. Standby Mode and Off Mode

In the January 2013 NOPR, DOE also investigated how the proposed amendments for standby mode and off mode would affect the measured efficiency. DOE stated that because the proposed amendments to the DOE clothes dryer test procedure in 10 CFR part 430 subpart B, appendix D1 for measuring standby mode and off mode energy consumption would not alter the existing measure of energy consumption for clothes dryers (EF), the proposed amendments would not affect a manufacturer's ability to comply with the current energy conservation standards. 78 FR 152, 176 (Jan. 2, 2013).

DOE's amendments in the January 2011 Final Rule specified that manufacturers will not be required to use the test procedure provisions for standby mode and off mode until the mandatory January 1, 2015 compliance date of the amended clothes dryer energy conservation standards. (10 CFR 430.32(h)(3)) The January 1, 2015 amended energy conservation standards are based on CEF, which accounts for standby mode and off mode energy consumption. In the January 2013 NOPR, DOE investigated how the proposed test procedure amendments for standby mode and off mode would affect the amended energy conservation standards at 10 CFR 430.32(h)(3). DOE stated that the proposed changes to the testing methods for measuring standby mode and off mode energy consumption do not vary significantly from the methods in the amended DOE clothes dryer test procedure in appendix D1 for measuring standby power and would not alter the measured efficiency. To confirm this assertion, DOE conducted testing on four clothes dryers (three of which minimally comply with the existing energy conservation standards) according to both the existing appendix D1 and the proposed amendments to appendix D1 for standby mode and off mode that are based IEC Standard 62301 (Second Edition). The results showed that the measured standby power was the same using both methods. Based on these test results, DOE stated that the proposed amendments to the clothes dryer test procedure for standby mode and off mode would not alter the measured CEF. DOE, therefore, did not consider amendments to the energy conservation standards at 10 CFR 430.32(h)(3) that must be met on January 1, 2015. 78 FR 152, 176–177 (Jan. 2, 2013). DOE did not receive any comments on this issue. In the absence

of comments, and for the reasons discussed above, DOE concludes that the amendments to the clothes dryer test procedure for standby mode and off mode adopted in today's final rule will not alter the measured CEF.

DOE's amendments continue to clarify that manufacturers are not required to use the provisions relating to standby mode and off mode energy use in appendix D1 to determine compliance with the energy conservation standard until the compliance date of the amended energy conservation standards for clothes dryers addressing standby mode and off mode energy use on January 1, 2015. As a result, the test procedure amendments for standby mode and off mode will not affect a manufacturer's ability to demonstrate compliance with the current energy conservation standards.

In addition, as discussed in section III.D and section III.I.3, DOE is amending the clothes dryer test procedure in 10 CFR part 430, subpart B to create a new appendix D2 that includes the amendments for standby mode and off mode. For the reasons discussed in section III.I.3, the newly created appendix D2 will not be required for use to determine compliance with the January 1, 2015 energy conservation standards for clothes dryers. As a result, DOE determined that the amendments to appendix D2 for standby mode and off mode adopted in today's final rule will not affect a manufacturer's ability to comply with the current energy conservation standards for clothes dryers.

## *I. Compliance With Other EPCA Requirements*

### 1. Test Burden

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

DOE noted in the January 2013 NOPR that the proposed amendments for automatic cycle termination would change the test cycle for automatic termination control dryers to require that a programmed automatic termination cycle be used for the test instead of using the maximum timed dry setting. DOE stated that the proposed provision to include the cool-down period and to allow the clothes dryer to run until the completion of the

programmed dry cycle would likely be less burdensome than the existing test procedure in which the tester is required to monitor or make estimates about the RMC of the test load and potentially run multiple test cycles to determine when to stop the test to achieve the desired final RMC. For timer dryers, DOE stated that the proposed amendments would use the same basic test method that is currently specified in the DOE test procedure in 10 CFR part 430, subpart B, appendix D1, except that the test cycle would be stopped when the final RMC is between 1.0 percent and 2.5 percent instead of between 2.5 percent and 5.0 percent. DOE noted that this would result in a slightly longer cycle time, but the additional time would be minimal compared to the overall time to set up and conduct the test. For these reasons, DOE stated in the January 2013 NOPR that the proposed amendments to more accurately account for automatic cycle termination would not be unduly burdensome to conduct. DOE also noted that the revised test cycle for automatic termination control dryers would produce a measured energy use that is more representative of consumer use because it directly measures the energy consumption of the programmed automatic termination cycle. 78 FR 152, 177 (Jan. 2, 2013).

AHAM commented that the proposed changes to the test procedure regarding automatic cycle termination controls would add significant burden to manufacturers if implemented prior to the January 1, 2015 standards. AHAM indicated that manufacturers have already begun designing products to comply with the January 1, 2015 standards using the existing appendix D1 and that many manufacturers would have to redesign their models in order to meet the standards using the proposed test procedure, which would add an unreasonable burden on manufacturers during the 3-year lead time. Thus, AHAM urged DOE not to make the test procedure changes associated with automatic cycle termination controls effective until compliance with future standards (beyond 2015) is required so that the impacts on measured energy efficiency can be fully considered. (AHAM, No. 17 at p. 16)

The California IOUs commented that the burden for clothes washers is greater than for clothes dryers. The California IOUs stated that, in the past, clothes washers used significantly more energy than clothes dryers and, thus, more testing to determine the energy use was justified. The California IOUs commented that clothes washers have



improved significantly and that clothes dryers now use roughly three times as much energy as clothes washers use on average, based on the total average annual energy consumption in the field. The California IOUs commented that greater test burden would be justified to determine clothes dryer energy use because the clothes washer test burden has been justified in the past and accepted by industry for what is now a much smaller potential energy savings. (California IOUs, Public Meeting Transcript, No. 10 at pp. 176–179) In response, AHAM commented that the test burden of two completely different products (clothes washers and clothes dryers) cannot be compared. AHAM stated that although clothes washers and clothes dryers are linked products from a consumer and product planning perspective, they are not similar products. Thus, AHAM did not agree that because the clothes washer test procedure takes longer to conduct, it would be acceptable for the clothes dryer test procedure to take just as long. AHAM stated that increasing the testing time for clothes dryers would increase testing burden on manufacturers, irrespective of what the burden is for testing a different product. (AHAM, No. 17 at pp. 16–17)

As discussed in section III.I.3, DOE is amending the clothes dryer test procedure in 10 CFR part 430, subpart B to create a new appendix D2 that includes the testing methods for more accurately measuring the effects of automatic cycle termination. The newly created appendix D2 will not be required for use to determine compliance with the January 1, 2015 energy conservation standards for clothes dryers. DOE is not amending appendix D1 in today's final rule to include these amendments for automatic cycle termination. As a result, DOE concludes that the test procedure amendments and the compliance date for the January 1, 2015 energy conservation standards and corresponding use of the appendix D1 test procedure will not be unduly burdensome. DOE is not considering additional test procedure amendments that would increase testing burden for the reasons discussed in sections III.B and III.G.

As discussed in section III.F, DOE is amending 10 CFR part 430 subpart B, appendix D and appendix D1 in today's final rule to clarify the cycle settings used for testing, the requirements for the gas supply, the installation conditions for console lights, the method for measuring the drum capacity, the maximum allowable scale range, and the allowable use of a relative humidity

meter. Because the amendments to clarify the test procedures would not change the actual testing method and provide additional options for instrumentations while requiring the same resolution and accuracy, DOE has determined that these amendments will not result in any added test burden on manufacturers as compared to the existing DOE clothes dryer test procedures in 10 CFR part 430, subpart B, appendix D and appendix D1. In addition, DOE is adopting these same provisions in newly created appendix D2. As discussed above, the newly created appendix D2 will not be required for use to determine compliance with the January 1, 2015 energy conservation standards for clothes dryers. For the same reasons discussed above, DOE has determined that amendments to clarify the cycle settings used for testing, the requirements for the gas supply, the installation conditions for console lights, the method for measuring the drum capacity, the maximum allowable scale range, and the allowable use of a relative humidity meter, will not result in any added test burden on manufacturers.

With regards to the amendments for standby and off mode power consumption, DOE concluded in the January 2011 Final Rule that the amended test procedure would produce test results that measure the standby mode and off mode power consumption of covered products during a representative average use cycle as well as annual energy consumption, and that the test procedure would not be unduly burdensome to conduct. 76 FR 972, 1020 (Jan. 6, 2011). The amendments to the DOE clothes dryer test procedure for standby mode and off mode are based on an updated version of IEC Standard 62301, IEC Standard 62301 (Second Edition), which has been the subject of significant review and input from interested parties and, thus, continues to be an internationally accepted test standard for measuring standby mode and off mode power consumption. In the January 2013 NOPR, DOE stated that the provisions of IEC Standard 62301 (Second Edition) that it proposed to incorporate by reference provide a means to measure power consumption with greater accuracy and repeatability than the provisions from IEC Standard 62301 (First Edition) that were adopted in the January 2011 Final Rule. DOE tentatively concluded in the January 2013 NOPR that the proposed amendments would also provide measurements representative of average consumer use of the product under test.

78 FR 152, 177 (Jan. 2, 2013). DOE also noted that interested parties have commented that the testing methods in IEC Standard 62301 (Second Edition) would not be unduly burdensome to conduct. 77 FR 28805, 28812 (May 16, 2012); 76 FR 58346, 58350 (Sept. 20, 2011); 77 FR 13888, 13893 (March 7, 2012). The potential for increased test burden for certain power consumption measurements is also offset by more reasonable requirements for testing equipment, while maintaining measurement accuracy deemed acceptable and practical by voting members for IEC Standard 62301 (Second Edition). For these reasons, DOE tentatively concluded in the January 2013 NOPR that the proposed amendments would produce test results that measure the standby mode and off mode power consumption during representative use, and that the test procedures would not be unduly burdensome to conduct. 78 FR 152, 177 (Jan. 2, 2013).

AHAM commented that incorporating by reference IEC Standard 62301 (Second Edition) will allow for optimal international harmonization and will reduce testing burden. (AHAM, No. 17 at p. 14) DOE concludes, based on this comment and the discussion above, that the amendments for standby mode and off mode adopted in today's final rule produce test results that measure the standby mode and off mode power consumption during representative use, and that the test procedures will not be unduly burdensome to conduct.

#### Certification Requirements

DOE is authorized under 42 U.S.C. 6299 *et seq.* to enforce compliance with the energy and water conservation standards established for certain consumer products. On March 7, 2011, the Department revised, consolidated, and streamlined its existing certification, compliance, and enforcement regulations for certain consumer products and commercial and industrial equipment covered under EPCA, including clothes dryers. 76 FR 12422. The certification regulations are codified in 10 CFR 429.12 and 429.21 (residential clothes dryers).

The certification and compliance requirements for residential clothes dryers consist of a sampling plan for the selection of units for testing, calculation procedures for determining a basic model's certified rating, and requirements for the submittal of certification reports. Because DOE introduced a new metric (CEF) in the January 2011 Final Rule, DOE proposed in the January 2013 NOPR to amend the sampling provisions in 10 CFR



429.21(a)(2) to include CEF, along with the existing measure of EF, in the list of metrics for which consumers would favor higher values. DOE also proposed to amend the dryer-specific certification requirements in 10 CFR 429.21(b)(2) to require manufacturers, when using either appendix D or appendix D1, to provide an indication if the clothes dryer has automatic termination controls and also to report the hourly Btu rating of the burner for gas clothes dryers. DOE also proposed to amend 10 CFR 429.21(b)(2) to require manufacturers, when using appendix D1, to include the CEF and to list the cycle setting selections for the energy test cycle as recorded in the proposed section 3.4.7 of appendix D1 for each basic model.

ALS supported DOE's proposal to update 10 CFR part 429 to include CEF. In addition ALS stated that it did not oppose reporting: (1) Whether the clothes dryer has automatic termination controls, (2) the hourly Btu rating of the burner, and (3) the cycle setting selections for the energy test cycle. (ALS, No. 16 at p. 5) For the reasons discussed above, and because DOE did not receive any comments objecting to this proposal, DOE is adopting in today's final rule the amendments to 10 CFR 429.21 for the additional certification and reporting requirements presented above. Even though appendix D2 is not required for compliance and representation purposes for the 2015 energy conservation standards, DOE is adopting the methodology and allowing for its voluntary use early at the discretion of the manufacturer. Consequently, DOE is also adopting amendments to 10 CFR 429.21(b)(2) to require manufacturers, when using appendix D2, to list the cycle setting selections for the energy test cycle.

In addition, DOE is clarifying in 10 CFR 429.21(a)(3) that the certified capacity of any clothes dryer basic model should be the mean of the capacities of the units in the sample for the basic model. While DOE believes this is current practice since the existing test procedure and sampling plan require testing at least two units and measuring the drum capacity individually for each, DOE is adopting this provision in the final rule for clarity.

#### Compliance date of final amended test procedures

DOE noted in the January 2013 NOPR that it proposed amendments to the test procedures for clothes dryers in appendix D and appendix D1 in 10 CFR part 430 subpart B. Pursuant to 42 U.S.C. 6293(c)(2), effective 180 days

after DOE prescribes or establishes a new or amended test procedure, manufacturers must make representations of energy efficiency using that new or amended test procedure. DOE stated in the January 2013 NOPR that, therefore, effective 180 days after the promulgation of any final amendments to the test procedure based on the proposal, manufacturers must make representations of energy efficiency, including certifications of compliance, using either appendix D or appendix D1. Manufacturers must use a single appendix for all representations, including certifications of compliance, and may not use appendix D for certain representations and appendix D1 for other representations. 78 FR 152, 177–178 (Jan. 2, 2013). See DOE's existing guidance on this topic for additional information, available at: [http://www1.eere.energy.gov/buildings/appliance\\_standards/pdfs/tp\\_faq\\_2012-06-29.pdf](http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/tp_faq_2012-06-29.pdf).

DOE stated that compliance with DOE's amended standards for clothes dryers, and the corresponding use of the test procedures at appendix D1 for all representations, including certifications of compliance, is required as of January 1, 2015. (76 FR 52852 (Aug. 24, 2011), 76 FR 52854 (Aug. 24, 2011))

AHAM, Whirlpool, and ALS opposed the January 1, 2015 compliance date based on the proposed test procedure amendments for automatic cycle termination. AHAM, Whirlpool, and ALS stated that a January 1, 2015 compliance date significantly undercuts the statutory 3-year lead time provided to manufacturers for compliance with a revised standards (42 U.S.C. 6295(m)(4)(A)(i)). AHAM, Whirlpool, and ALS commented that manufacturers would not have enough time to prepare for the upcoming January 1, 2015 standards compliance date using a proposed revised appendix D1 (except for the minor technical corrections), especially because the proposed test procedure amendments for automatic cycle termination effectively constitutes a new, revised standard due to its significant impact on measured efficiency. (AHAM, No. 17 at p. 3; Whirlpool, No. 18 at pp. 1–2; ALS, No. 16 at p. 2; AHAM, Public Meeting Transcript, No. 10 at pp. 172–173)

AHAM commented that requiring the test procedure amendments for automatic cycle termination for the January 1, 2015 compliance date is problematic because EPCA ensures that compliant models in use prior to the test procedure change and accompanying standards adjustment remain in compliance after the change. (42 U.S.C. 6293(e)(3)) AHAM stated that during the 3-year lead time to an amended

standard, manufacturers may have many basic models in the design phase that are not yet “in use,” and thus, may not be afforded the protections the statute was designed to provide. According to AHAM, this will result in stranded investments for manufacturers and could require manufacturers to redesign some, many, or even all of the basic models that were already being redesigned to comply with the January 1, 2015 standards using the existing appendix D1. AHAM stated that the design process takes time, and DOE cannot truncate that lead time provided by EPCA by effectively engaging in a standards revision through the test procedure rulemaking process. AHAM stated that DOE should not make standards changes that impact measured energy as significantly as the proposed automatic termination control amendments would during a lead time to amended or new standards. (AHAM, No. 17 at pp. 3–4)

ALS commented that it has implemented significant design construction changes to its products towards compliance with the January 1, 2015 standards based on the current test procedure in appendix D1. ALS stated that the proposed test procedure for automatic cycle termination will require it to make significant new design changes to its clothes dryers, which cannot be completed in the remaining time before the January 1, 2015 compliance date. ALS identified numerous preparatory steps that it must take to meet the January 1, 2015 standards under the proposed test procedure.<sup>14</sup> ALS further stated that the investment it has already made may become stranded because its designs

<sup>14</sup> These preparatory steps include, but are not limited to: (1) Generate ideas and concepts to meet the minimum standard with the new measurement method; (2) create prototypes for feasibility testing; (3) conduct an initial design review to select the best design path to pursue; (4) secure input from all cross-functional areas (e.g., consumer marketing, sales, manufacturing, etc.); (5) create the planned timeline with critical paths identified; (6) create the output specifications (e.g., drawings, bill of material, quality and manufacturing plan documents, etc.); (7) identify and qualify suppliers for new parts; (8) procure prototype parts for a assembling multiple prototypes of the full dryer for in-house lab tests to confirm performance and reliability requirements can be met; (9) conduct full reliability and performance tests in-house (9 months); (10) conduct field tests with consumers, to learn of any unknown deficiencies; (11) conduct a validation and verification design review for commitment to procure production tooling & equipment; (12) procure production tooling and equipment (usually takes 1 year); (13) react to any unanticipated issues learned from continued testing; (14) secure all agency approvals; (15) qualify production tooling and equipment; (16) conduct factory pilot runs using new tooling and equipment; (17) conduct final design and safety review; and (18) commit to starting production. (ALS, No. 16 at pp. 1–2)

will not allow compliance under DOE's new proposed test procedure. ALS commented that it is the low-volume manufacturer of residential clothes dryers, and as such, any investment for DOE minimum standard compliance normally impacts ALS disproportionately compared to the larger market share manufacturers. (ALS, No. 16 at pp. 1–2)

Whirlpool commented that, based on the data presented in the January 2013 NOPR, the proposed test procedure amendments for automatic cycle termination will likely require a major switch from electromechanical to electronic controls for some basic models. Whirlpool indicated that this is not a simple or low-cost change, and that even with this significant change in technology, it would not necessarily ensure that a product would be compliant. Whirlpool stated that such an upgrade is a complete redesign, in many cases requiring manufacturers to engage in every phase of the design process. (Whirlpool, No. 18 at pp. 1–2)

AHAM commented that DOE should not proceed with the proposed test procedure amendments on the proposed timeline. AHAM commented that if DOE moves forward with the proposed automatic termination control amendments, the changes to appendix D1 must not be required for compliance with the January 1, 2015 standards. Instead, AHAM urged that the proposed amendments not be required until a future standards revision, during which the impact on measured efficiency can be more fully analyzed in an integrated analysis of the effects of both standards and test procedure changes under 42 U.S.C. 6295(m)(4)(B). AHAM commented that, given the significant impact on measured efficiency, compounded by the disparate impact on individual basic models and product classes as demonstrated by the range of impacts on measured efficiency, DOE should not require the use of the automatic termination control test procedure for compliance with the January 1, 2015 standards. Even if DOE were to adjust the standards pursuant to EPCA (42 U.S.C. 6293(e)), AHAM stated that the statutory 3-year lead-time would be undercut. (AHAM, No. 17 at pp. 4, 10–11)

Samsung suggested that if DOE determines that manufacturers of units that tested with a lower final RMC and consumed more energy would require more time to make the required refinements to the drying algorithm, such units should be covered under the EPCA grandfathering provision (42 U.S.C. 6293(e)(3)). Samsung stated that DOE should not delay the proposed automatic cycle termination test

procedure until the next standard change, which could be 2020, thereby potentially delaying the possible energy savings by 5 years or more. Samsung supported the compliance date of January 1, 2015, noting that the proposed test procedure would reflect the real-world energy use of clothes dryers having automatic cycle termination. (Samsung, No. 13 at p. 3)

The Joint Efficiency Advocates, NRDC, and SEDI urged DOE to publish a final rule for this rulemaking as soon as possible so that manufacturers have adequate lead time before the January 1, 2015 standards. (Joint Efficiency Advocates, No. 19 at p. 3; NRDC, No. 20 at p. 2; SEDI, No. 14 at p. 3) The Joint Efficiency Advocates added that the consensus standards for clothes dryers were based on the assumption that significant additional energy savings would be achieved through a change to the test procedure to capture the effectiveness of automatic termination controls. The Joint Efficiency Advocates stated that it is important that the proposed test procedure amendments take effect with the January 1, 2015 standards to realize these additional energy savings. (Joint Efficiency Advocates, No. 19 at p. 3)

DOE is not amending appendix D1 in today's final rule to include the amendments for measuring the effects of automatic cycle termination. DOE is amending the clothes dryer test procedure in appendix D1 to include the amendments for standby mode and off mode, the technical correction to the per-cycle combined total energy consumption, the clarifications to the test conditions, and the amendments to address the additional test procedure issues, as discussed in section III.D through section III.G. As discussed in section III.H, these amendments to appendix D1 will not affect a manufacturer's ability to comply with the January 1, 2015 standards. As discussed above, compliance with DOE's amended standards for clothes dryers, and corresponding use of the test procedures at appendix D1 for all representations, including certifications of compliance, is required as of January 1, 2015.

However, DOE is amending the clothes dryer test procedure in 10 CFR part 430, subpart B to create a new appendix D2 that includes the testing methods for more accurately measuring the effects of automatic cycle termination. The newly created appendix D2 will not be required for use to determine compliance with the January 1, 2015 energy conservation standards for clothes dryers. DOE will continue to evaluate products on the

market and collect data on clothes dryer automatic cycle termination. However, manufacturers may elect to use appendix D2 early to show compliance with the January 1, 2015 energy conservation standards.

#### 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 (IRFA) for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, "Proper Consideration of Small Entities in Agency Rulemaking," 67 FR 53461 (Aug. 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's Web site: <http://energy.gov/gc/office-general-counsel>.

In conducting this review, DOE first determined the potential number of affected small entities. The Small Business Administration (SBA) considers an entity to be a small business if, together with its affiliates, it employs fewer than the threshold number of workers specified in 13 CFR part 121 according to the North American Industry Classification System (NAICS) codes. The SBA's Table of Size Standards is available at: [http://www.sba.gov/idc/groups/public/documents/sba\\_homepage/serv\\_sstd\\_tablepdf.pdf](http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_sstd_tablepdf.pdf). The threshold number for NAICS classification 335224, *Household Laundry Equipment Manufacturing*, which includes clothes dryer manufacturers, is 1,000 employees.

DOE determined that most of the manufacturers supplying clothes dryers

are large multinational corporations. As part of the most recent energy conservation standards rulemaking for residential clothes dryers, DOE requested comment on whether there are any manufacturer subgroups, including potential small businesses, that it should consider for its analyses. DOE received a comment from one business stating that it should be considered a small business. 77 FR 22454, 22521 (April 21, 2011).

DOE then conducted a market survey in which it reviewed the AHAM membership directory, product databases (the Air-Conditioning, Heating, and Refrigeration Institute; AHAM; California Energy Commission; and ENERGY STAR databases), individual company Web sites, and the SBA dynamic small business search<sup>15</sup> to find potential small business manufacturers. During manufacturer interviews and at DOE public meetings for the energy conservation standards rulemaking, DOE asked interested parties and industry representatives if they were aware of any other small business manufacturers. DOE also contacted various companies, as necessary, to determine whether they met the SBA's definition of a small business manufacturer of covered residential clothes dryers. DOE screened out companies that did not offer products covered by this rulemaking, did not meet the definition of a "small business," or are foreign-owned and operated.

DOE initially identified at least 14 manufacturers of residential clothes dryers that sold products in the United States. DOE determined that 13 of these companies exceeded the SBA's maximum number of employees. Thus, DOE identified only one small business manufacturer of residential clothes dryers. This small business has developed a drying technology that it installs on existing clothes dryers. DOE notes that this small business currently offers for sale two clothes dryer models with its drying technology installed. Accordingly, DOE considered the economic impacts of the proposed test procedure amendments on this one small business manufacturer.

For active mode, as discussed in section III.F, DOE is amending 10 CFR part 430 subpart B, appendix D and appendix D1 to clarify: (1) The cycle settings used for the test cycle, (2) the requirements for the gas supply for gas clothes dryers, (3) the installation conditions for console lights, (4) the

method for measuring the drum capacity, (5) the maximum allowable scale range, and (6) the allowable use of a relative humidity meter. DOE determined that because these test procedure amendments do not change the actual testing method or time required for testing and provide additional options for instrumentation while requiring the same resolution and accuracy, these amendments will not result in any added test burden on manufacturers as compared to the existing DOE clothes dryer test procedures in 10 CFR part 430, subpart B, appendix D and appendix D1.

For standby mode and off mode, DOE has determined that the test procedure amendments adopted in today's final rule, presented in section III.D, will not represent a significant economic impact. DOE notes that industry-standard instruments, such as the Yokogawa WT210/WT230 digital power meter, that meet the standby mode and off mode requirements of the current DOE clothes dryer test procedure in 10 CFR part 430, subpart B, appendix D1, also meet the requirements of the amendments for standby mode and off mode adopted in today's final rule. DOE also notes that these tests can be conducted in the same facilities used for the current standby mode and off mode testing of these products, so it is anticipated that manufacturers would not incur any additional facilities costs as a result of the test procedure amendments. As a result, DOE does not expect any increase in testing equipment costs based on the standby mode and off mode test procedure amendments. DOE also notes that the duration of a standby mode or off mode test period using the current test procedure in appendix D1 is 40 to 50 minutes. As discussed in section III.D, DOE recognizes that the test duration using the standby and off mode test procedure adopted in today's final rule may range from 15 minutes to 3 hours depending on the stability of the measured power consumption. However, based on DOE's testing of four clothes dryers from four different manufacturers comprising over 78 percent of the total clothes dryer market share, DOE expects the test duration using the standby and off mode test procedure adopted in today's final rule to be approximately 30 to 45 minutes for the majority of clothes dryers currently available on the market. DOE also notes that most third party testing laboratories already use these or similar industry-standard power meters for clothes dryer testing. As a result, if the small manufacturer decides to use a third party testing laboratory, DOE does not

expect there to be an increase in cost for standby mode and off mode testing. In addition, as discussed in section III.I.1, interested parties have commented that incorporating by reference IEC Standard 62301 (Second Edition) will allow for optimal international harmonization and will reduce testing burden.

For these reasons, DOE concludes and certifies that this final rule will 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 clothes dryers 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 clothes dryers, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including clothes dryers. (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*

In this final rule, DOE amends its test procedure for residential clothes dryers. 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

<sup>15</sup> A searchable database of certified small businesses is available online at: [http://dsbs.sba.gov/dsbs/search/dsp\\_dsbs.cfm](http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm).

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 for energy conservation for the products that are the subject of today's 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 today's 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. Today's final rule will not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

#### *I. Review Under Executive Order 12630*

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

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

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

#### *K. Review Under Executive Order 13211*

Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any significant energy action. A "significant energy action" is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that: (1) Is a significant regulatory action under Executive Order 12866, or any successor order; and (2)

is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

Today's regulatory action is not a significant regulatory action under Executive Order 12866. Moreover, it will 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.

Today's final rule incorporates testing methods contained in the commercial standard, IEC Standard 62301, "Household electrical appliances—Measurement of standby power," Edition 2.0, 2011–01. DOE has evaluated this standard and is unable to conclude whether it fully complies with the requirements of section 32(b) of the FEAA, *i.e.*, whether it was developed in a manner that fully provides for public participation, comment, and review. DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

#### *M. Congressional Notification*

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of today's 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).

#### *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*

Energy conservation, Household appliances, Reporting and recordkeeping requirements.

##### *10 CFR Part 430*

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

Issued in Washington, DC, on July 31, 2013.

**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 429.21 is amended by:

■ a. Revising paragraph (a)(2)(ii) introductory text;

■ b. Adding paragraph (a)(3); and

■ c. Revising paragraph (b)(2).

The revisions and addition read as follows:

##### **§ 429.21 Residential clothes dryers.**

\* \* \* \* \*

(a) \* \* \*

(2) \* \* \*

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

\* \* \* \* \*

(3) The capacity of a basic model reported in accordance with paragraph

(b)(2) of this section shall be the mean of the capacities measured for each tested unit of the basic model.

(b) \* \* \*

(2) Pursuant to § 429.12(b)(13), a certification report shall include the following public product-specific information: When using appendix D, the energy factor in pounds per kilowatt hours (lb/kWh), the capacity in cubic feet (cu ft), the voltage in volts (V) (for electric dryers only), an indication if the dryer has automatic termination controls, and the hourly British thermal unit (Btu) rating of the burner (for gas dryers only); when using appendix D1, the combined energy factor in pounds per kilowatt hours (lb/kWh), the capacity in cubic feet (cu ft), the voltage in volts (V) (for electric dryers only), an indication if the dryer has automatic termination controls, and the hourly Btu rating of the burner (for gas dryers only); when using appendix D2, the combined energy factor in pounds per kilowatt hours (lb/kWh), the capacity in cubic feet (cu ft), the voltage in volts (V) (for electric dryers only), an indication if the dryer has automatic termination controls, the hourly Btu rating of the burner (for gas dryers only), and a list of the cycle setting selections for the energy test cycle as recorded in section 3.4.7 of appendix D2 to Subpart B of Part 430.

#### **PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS**

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

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

##### **§ 430.3 [Amended]**

■ 4. Section 430.3 is amended by:

■ a. Adding "and D2" after "appendix D1" in paragraph (h)(4).

■ b. Removing "appendix D1," from paragraph (m)(1); and

■ c. Adding "D1," and "D2," after "appendices C1," in (m)(2).

■ 5. Appendix D to Subpart B of Part 430 is amended by:

■ a. Revising the Note after the appendix heading;

■ b. Revising sections 2.1, 2.3.2.1, 2.3.2.2, 2.4.1, 2.4.1.2, and 2.4.4 in section 2. *Test Conditions*; and

■ c. Revising sections 3.1 and 3.3 in section 3. *Test Methods and Measurements*.

The revisions read as follows:

## Appendix D to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Clothes Dryers

**Note:** Effective February 10, 2014, manufacturers must make representations of energy efficiency, including certifications of compliance, using appendix D. Compliance with DOE's amended standards for clothes dryers, and corresponding use of the test procedures at appendix D1 for all representations, including certifications of compliance, is required as of January 1, 2015. Manufacturers must use a single appendix for all representations, including certifications of compliance, and may not use appendix D for certain representations and appendix D1 for other representations. The procedures in appendix D2 need not be performed to determine compliance with energy conservation standards for clothes dryers at this time. However, manufacturers may elect to use the amended appendix D, D1 or D2 early.

\* \* \* \* \*

### 2. Testing Conditions

**2.1 Installation.** Install the clothes dryer in accordance with manufacturer's instructions as shipped with the unit. If the manufacturer's instructions do not specify the installation requirements for a certain component, it shall be tested in the as-shipped condition. The dryer exhaust shall be restricted by adding the AHAM exhaust simulator described in 3.3.5 of HLD-1. All external joints should be taped to avoid air leakage. Disconnect all lights, such as task lights, that do not provide any information related to the drying process on the clothes dryer and that do not consume more than 10 watts during the clothes dryer test cycle. Control setting indicator lights showing the cycle progression, temperature or dryness settings, or other cycle functions that cannot be turned off during the test cycle shall not be disconnected during the active mode test cycle.

\* \* \* \* \*

#### 2.3.2 Gas supply.

**2.3.2.1 Natural gas.** Maintain the gas supply to the clothes dryer at a normal inlet test pressure immediately ahead of all controls at 7 to 10 inches of water column. If the clothes dryer is equipped with a gas appliance pressure regulator, the regulator outlet pressure at the normal test pressure shall be within  $\pm 10$  percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model. The hourly Btu rating of the burner shall be maintained within  $\pm 5$  percent of the rating specified by the manufacturer. If the requirement to maintain the hourly Btu rating of the burner within  $\pm 5$  percent of the rating specified by the manufacturer cannot be achieved under the allowable range in gas inlet test pressure, the orifice of the gas burner should be modified as necessary to achieve the required Btu rating. The natural gas supplied should have a heating value of approximately 1,025 Btus per standard cubic foot. The actual heating value,  $H_{n2}$ , in Btus

per standard cubic foot, for the natural gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using a standard continuous flow calorimeter as described in section 2.4.6 or by the purchase of bottled natural gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurements with a standard continuous flow calorimeter as described in section 2.4.6.

**2.3.2.2 Propane gas.** Maintain the gas supply to the clothes dryer at a normal inlet test pressure immediately ahead of all controls at 11 to 13 inches of water column. If the clothes dryer is equipped with a gas appliance pressure regulator, the regulator outlet pressure at the normal test pressure shall be within  $\pm 10$  percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model. The hourly Btu rating of the burner shall be maintained within  $\pm 5$  percent of the rating specified by the manufacturer. If the requirement to maintain the hourly Btu rating of the burner within  $\pm 5$  percent of the rating specified by the manufacturer cannot be achieved under the allowable range in gas inlet test pressure, the orifice of the gas burner should be modified as necessary to achieve the required Btu rating. The propane gas supplied should have a heating value of approximately 2,500 Btus per standard cubic foot. The actual heating value,  $H_p$ , in Btus per standard cubic foot, for the propane gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using a standard continuous flow calorimeter as described in section 2.4.6 or by the purchase of bottled gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurement with a standard continuous calorimeter as described in section 2.4.6.

\* \* \* \* \*

**2.4.1 Weighing scale for test cloth.** The scale shall have a range of 0 to a maximum of 60 pounds with a resolution of at least 0.2 ounces and a maximum error no greater than 0.3 percent of any measured value within the range of 3 to 15 pounds.

**2.4.1.2 Weighing scale for drum capacity measurements.** The scale should have a range of 0 to a maximum of 600 pounds with resolution of 0.50 pounds and a maximum error no greater than 0.5 percent of the measured value.

\* \* \* \* \*

**2.4.4 Dry and wet bulb psychrometer.** The dry and wet bulb psychrometer shall have an error no greater than  $\pm 1$  °F. A relative humidity meter with a maximum error tolerance expressed in °F equivalent to the requirements for the dry and wet bulb psychrometer or with a maximum error tolerance of  $\pm 2$  percent relative humidity would be acceptable for measuring the ambient humidity.

\* \* \* \* \*

### 3. Test Procedures and Measurements

**3.1 Drum Capacity.** Measure the drum capacity by sealing all openings in the drum

except the loading port with a plastic bag, and ensure that all corners and depressions are filled and that there are no extrusions of the plastic bag through any openings in the interior of the drum. Support the dryer's rear drum surface on a platform scale to prevent deflection of the dryer, and record the weight of the empty dryer. Fill the drum with water to a level determined by the intersection of the door plane and the loading port (*i.e.*, the uppermost edge of the drum that is in contact with the door seal). Record the temperature of the water and then the weight of the dryer with the added water and then determine the mass of the water in pounds. Add the appropriate volume to account for any space in the drum interior not measured by water fill (e.g., the space above the uppermost edge of the drum within a curved door) and subtract the appropriate volume to account for space that is measured by water fill but cannot be used when the door is closed (e.g., space occupied by the door when closed). The drum capacity is calculated as follows:  
 $C = w/d + \text{volume adjustment}$   
 $C$  = capacity in cubic feet.  
 $w$  = mass of water in pounds.  
 $d$  = density of water at the measured temperature in pounds per cubic foot.

\* \* \* \* \*

**3.3 Test cycle.** Operate the clothes dryer at the maximum temperature setting and, if equipped with a timer, at the maximum time setting. Any other optional cycle settings that do not affect the temperature or time settings shall be tested in the as-shipped position. If the clothes dryer does not have a separate temperature setting selection on the control panel, the maximum time setting should be used for the drying test cycle. Dry the test load until the moisture content of the test load is between 2.5 percent and 5.0 percent of the bone-dry weight of the test load, but do not permit the dryer to advance into cool down. If required, reset the timer or automatic dry control.

\* \* \* \* \*

■ 6. Appendix D1 to Subpart B of Part 430 is amended:

- a. By revising the Note after the appendix heading;
- b. In section 1. *Definitions*, by revising section 1.11;
- c. In section 2. *Test Conditions*, by:
  - 1. Revising sections 2.1, 2.2.2, 2.3.1.1, 2.3.2.1, 2.3.2.2, 2.4.1, 2.4.1.2, 2.4.4, and 2.4.7;
  - 2. Adding sections 2.1.1, 2.1.2, and 2.1.3;
  - d. In section 3. *Test Methods and Measurements*, by revising sections 3.1, 3.3, and 3.6; and
  - e. In section 4. *Calculation of Derived Results From Test Measurements*, by revising section 4.6.

The additions and revisions read as follows:

## Appendix D1 to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Clothes Dryers

**Note:** Effective February 10, 2014, manufacturers must make representations of

energy efficiency, including certifications of compliance, using appendix D. Compliance with DOE's amended standards for clothes dryers, and corresponding use of the test procedures at appendix D1 for all representations, including certifications of compliance, is required as of January 1, 2015. Manufacturers must use a single appendix for all representations, including certifications of compliance, and may not use appendix D for certain representations and appendix D1 for other representations. The procedures in appendix D2 need not be performed to determine compliance with energy conservation standards for clothes dryers at this time. However, manufacturers may elect to use the amended appendix D, D1, or D2 early.

## 1. Definitions

\* \* \* \* \*

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

\* \* \* \* \*

## 2. Testing Conditions

### 2.1 Installation.

2.1.1 *All clothes dryers.* For both conventional clothes dryers and ventless clothes dryers, as defined in sections 1.7 and 1.19 of this appendix, install the clothes dryer in accordance with manufacturer's instructions as shipped with the unit. If the manufacturer's instructions do not specify the installation requirements for a certain component, it shall be tested in the as-shipped condition. Where the manufacturer gives the option to use the dryer both with and without a duct, the dryer shall be tested without the exhaust simulator described in section 3.3.5.1 of AHAM HLD–1 (incorporated by reference; see § 430.3). All external joints should be taped to avoid air leakage. For drying testing, disconnect all lights, such as task lights, that do not provide any information related to the drying process on the clothes dryer and that do not consume more than 10 watts during the clothes dryer test cycle. Control setting indicator lights showing the cycle progression, temperature or dryness settings, or other cycle functions that cannot be turned off during the test cycle shall not be disconnected during the active mode test cycle. For standby and off mode testing, the clothes dryer shall also be installed in accordance with section 5, paragraph 5.2 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3), disregarding the provisions regarding batteries and the

determination, classification, and testing of relevant modes. For standby and off mode testing, all lighting systems shall remain connected.

2.1.2 *Conventional clothes dryers.* For conventional clothes dryers, as defined in section 1.7 of this appendix, the dryer exhaust shall be restricted by adding the AHAM exhaust simulator described in section 3.3.5.1 of AHAM HLD–1 (incorporated by reference; see § 430.3).

2.1.3 *Ventless clothes dryers.* For ventless clothes dryers, as defined in section 1.19, the dryer shall be tested without the AHAM exhaust simulator. If the manufacturer gives the option to use a ventless clothes dryer, with or without a condensation box, the dryer shall be tested with the condensation box installed. For ventless clothes dryers, the condenser unit of the dryer must remain in place and not be taken out of the dryer for any reason between tests.

\* \* \* \* \*

2.2.2 For standby and off mode testing, maintain room ambient air temperature conditions as specified in section 4, paragraph 4.2 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3)

\* \* \* \* \*

2.3.1.1 *Supply voltage waveform.* For the clothes dryer standby mode and off mode testing, maintain the electrical supply voltage waveform indicated in section 4, paragraph 4.3.2 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3). If the power measuring instrument used for testing is unable to measure and record the total harmonic content during the test measurement period, it is acceptable to measure and record the total harmonic content immediately before and after the test measurement period.

### 2.3.2 Gas supply.

2.3.2.1 *Natural gas.* Maintain the gas supply to the clothes dryer immediately ahead of all controls at a pressure of 7 to 10 inches of water column. If the clothes dryer is equipped with a gas appliance pressure regulator for which the manufacturer specifies an outlet pressure, the regulator outlet pressure shall be within  $\pm 10$  percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model. The hourly Btu rating of the burner shall be maintained within  $\pm 5$  percent of the rating specified by the manufacturer. If the requirement to maintain the hourly Btu rating of the burner within  $\pm 5$  percent of the rating specified by the manufacturer cannot be achieved under

the allowable range in gas inlet test pressure, the orifice of the gas burner should be modified as necessary to achieve the required Btu rating. The natural gas supplied should have a heating value of approximately 1,025 Btus per standard cubic foot. The actual heating value,  $H_n$ , in Btus per standard cubic foot, for the natural gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using a standard continuous flow calorimeter as described in section 2.4.6 or by the purchase of bottled natural gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurements with a standard continuous flow calorimeter as described in section 2.4.6.

2.3.2.2 *Propane gas.* Maintain the gas supply to the clothes dryer immediately ahead of all controls at a pressure of 11 to 13 inches of water column. If the clothes dryer is equipped with a gas appliance pressure regulator for which the manufacturer specifies an outlet pressure, the regulator outlet pressure shall be within  $\pm 10$  percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model. The hourly Btu rating of the burner shall be maintained within  $\pm 5$  percent of the rating specified by the manufacturer. If the requirement to maintain the hourly Btu rating of the burner within  $\pm 5$  percent of the rating specified by the manufacturer cannot be achieved under the allowable range in gas inlet test pressure, the orifice of the gas burner should be modified as necessary to achieve the required Btu rating. The propane gas supplied should have a heating value of approximately 2,500 Btus per standard cubic foot. The actual heating value,  $H_p$ , in Btus per standard cubic foot, for the propane gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using a standard continuous flow calorimeter as described in section 2.4.6 or by the purchase of bottled gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurement with a standard continuous calorimeter as described in section 2.4.6.

\* \* \* \* \*

2.4.1 *Weighing scale for test cloth.* The scale shall have a range of 0 to a maximum of 60 pounds with a resolution of at least 0.2 ounces and a maximum error no greater than 0.3



percent of any measured value within the range of 3 to 15 pounds.

2.4.1.2 *Weighing scale for drum capacity measurements.* The scale should have a range of 0 to a maximum of 600 pounds with resolution of 0.50 pounds and a maximum error no greater than 0.5 percent of the measured value.

\* \* \* \* \*

2.4.4 *Dry and wet bulb psychrometer.* The dry and wet bulb psychrometer shall have an error no greater than  $\pm 1$  °F. A relative humidity meter with a maximum error tolerance expressed in °F equivalent to the requirements for the dry and wet bulb psychrometer or with a maximum error tolerance of  $\pm 2$  percent relative humidity would be acceptable for measuring the ambient humidity.

\* \* \* \* \*

2.4.7 *Standby mode and off mode watt meter.* The watt meter used to measure standby mode and off mode power consumption shall meet the requirements specified in section 4, paragraph 4.4 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3). If the power measuring instrument used for testing is unable to measure and record the crest factor, power factor, or maximum current ratio during the test measurement period, it is acceptable to measure the crest factor, power factor, and maximum current ratio immediately before and after the test measurement period.

\* \* \* \* \*

### 3. Test Procedures and Measurements

3.1 *Drum Capacity.* Measure the drum capacity by sealing all openings in the drum except the loading port with a plastic bag, and ensuring that all corners and depressions are filled and that there are no extrusions of the plastic bag through any openings in the interior of the drum. Support the dryer's rear drum surface on a platform scale to prevent deflection of the drum surface, and record the weight of the empty dryer. Fill the drum with water to a level determined by the intersection of the door plane and the loading port (*i.e.*, the uppermost edge of the drum that is in contact with the door seal). Record the temperature of the water and then the weight of the dryer with the added water and then determine the mass of the water in pounds. Add the appropriate volume to account for any space in the drum interior not measured by water fill (e.g., the space above the uppermost edge of the drum within a curved door) and subtract the appropriate volume to account for space that is measured by water fill but cannot be used when the door is closed (e.g., space occupied by the door when

closed). The drum capacity is calculated as follows:

$C = w/d \div \text{volume adjustment}$

$C$  = capacity in cubic feet.

$w$  = mass of water in pounds.

$d$  = density of water at the measured temperature in pounds per cubic foot.

\* \* \* \* \*

3.3 *Test cycle.* Operate the clothes dryer at the maximum temperature setting and, if equipped with a timer, at the maximum time setting. Any other optional cycle settings that do not affect the temperature or time settings shall be tested in the as-shipped position. If the clothes dryer does not have a separate temperature setting selection on the control panel, the maximum time setting should be used for the drying test cycle. Dry the load until the moisture content of the test load is between 2.5 and 5.0 percent of the bone-dry weight of the test load, at which point the test cycle is stopped, but do not permit the dryer to advance into cool down. If required, reset the timer to increase the length of the drying cycle. After stopping the test cycle, remove and weigh the test load. The clothes dryer shall not be stopped intermittently in the middle of the test cycle for any reason. Record the data specified by section 3.4 of this appendix. If the dryer automatically stops during a cycle because the condensation box is full of water, the test is stopped, and the test run is invalid, in which case the condensation box shall be emptied and the test re-run from the beginning. For ventless dryers, as defined in section 1.19 of this appendix, during the time between two cycles, the door of the dryer shall be closed except for loading (and unloading).

\* \* \* \* \*

3.6 *Standby mode and off mode power.* Establish the testing conditions set forth in Section 2 "Testing Conditions" of this appendix. For clothes dryers that take some time to enter a stable state from a higher power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3), allow sufficient time for the clothes dryer to reach the lower power state before proceeding with the test measurement. Follow the test procedure specified in section 5, paragraph 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as described in sections 3.6.1 and 3.6.2 of this appendix.

\* \* \* \* \*

### 4. Calculation of Derived Results From Test Measurements

\* \* \* \* \*

4.6 *Per-cycle combined total energy consumption expressed in kilowatt-hours.* Calculate the per-cycle combined total energy consumption,  $E_{CC}$ , expressed in kilowatt-hours per cycle and defined for an electric clothes dryer as:

$$E_{CC} = E_{ce} + E_{TSO}$$

Where:

$E_{ce}$  = the energy recorded in section 4.1 of this appendix, and

$E_{TSO}$  = the energy recorded in section 4.5 of this appendix, and defined for a gas clothes dryer as:

$$E_{CC} = E_{cg} + E_{TSO}$$

Where:

$E_{cg}$  = the energy recorded in section 4.4 of this appendix, and

$E_{TSO}$  = the energy recorded in section 4.5 of this appendix.

\* \* \* \* \*

■ 7. Appendix D2 is added to Subpart B of Part 430 to read as follows:

### Appendix D2 to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Clothes Dryers

**Note:** The procedures in appendix D2 need not be performed to determine compliance with energy conservation standards for clothes dryers at this time. Manufacturers may elect to use the amended appendix D2 early to show compliance with the January 1, 2015 energy conservation standards. Manufacturers must use a single appendix for all representations, including certifications of compliance, and may not use appendix D1 for certain representations and appendix D2 for other representations.

#### 1. Definitions

1.1 "Active mode" means a mode in which the clothes dryer is connected to a main power source, has been activated and is performing the main function of tumbling the clothing with or without heated or unheated forced air circulation to remove moisture from the clothing, remove wrinkles or prevent wrinkling of the clothing, or both.

1.2 "AHAM" means the Association of Home Appliance Manufacturers.

1.3 "AHAM HLD-1" means the test standard published by the Association of Home Appliance Manufacturers, titled "Household Tumble Type Clothes Dryers," (2009), AHAM HLD-1-2009 (incorporated by reference; see § 430.3).

1.4 "Automatic termination control" means a dryer control system with a sensor which monitors either the dryer load temperature or its moisture content and with a controller which automatically terminates the drying process. A mark, detent, or other visual indicator or detent which indicates a preferred automatic termination control setting must be present if the dryer is to be classified as having an "automatic



termination control.” A mark is a visible single control setting on one or more dryer controls.

1.5 “Automatic termination control dryer” means a clothes dryer which can be preset to carry out at least one sequence of operations to be terminated by means of a system assessing, directly or indirectly, the moisture content of the load. An automatic termination control dryer with supplementary timer or that may also be manually controlled shall be tested as an automatic termination control dryer.

1.6 “Bone dry” means a condition of a load of test clothes which has been dried in a dryer at maximum temperature for a minimum of 10 minutes, removed, and weighed before cool down, and then dried again for 10-minute periods until the final weight change of the load is 1 percent or less.

1.7 “Compact” or “compact size” means a clothes dryer with a drum capacity of less than 4.4 cubic feet.

1.8 “Conventional clothes dryer” means a clothes dryer that exhausts the evaporated moisture from the cabinet.

1.9 “Cool down” means that portion of the clothes drying cycle when the added gas or electric heat is terminated and the clothes continue to tumble and dry within the drum.

1.10 “Cycle” means a sequence of operation of a clothes dryer which performs a clothes drying operation, and may include variations or combinations of the functions of heating, tumbling, and drying.

1.11 “Drum capacity” means the volume of the drying drum in cubic feet.

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

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

1.14 “Moisture content” means the ratio of the weight of water contained by the test load to the bone-dry weight of the test load, expressed as a percent.

1.15 “Moisture sensing control” means a system which utilizes a moisture sensing element within the dryer drum that monitors the amount of moisture in the clothes and automatically terminates the dryer cycle.

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

1.17 “Standard size” means a clothes dryer with a drum capacity of 4.4 cubic feet or greater.

1.18 “Standby mode” means any product modes where the energy using product is connected to a mains power source and offers one or more of the following user-oriented or protective functions which may persist for an indefinite time:

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

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

1.19 “Temperature sensing control” means a system which monitors dryer exhaust air temperature and automatically terminates the dryer cycle.

1.20 “Timer dryer” means a clothes dryer that can be preset to carry out at least one operation to be terminated by a timer, but may also be manually controlled, and does not include any automatic termination function.

1.21 “Ventless clothes dryer” means a clothes dryer that uses a closed-loop system with an internal condenser to remove the evaporated moisture from the heated air. The moist air is not discharged from the cabinet.

## 2. Testing Conditions

### 2.1 Installation.

2.1.1 *All clothes dryers.* For both conventional clothes dryers and ventless clothes dryers, as defined in sections 1.8 and 1.21 of this appendix, install the clothes dryer in accordance with manufacturer’s instructions as shipped with the unit. If the manufacturer’s instructions do not specify the installation requirements for a certain component, it shall be tested in the as-shipped condition. Where the manufacturer gives the option to use the dryer both with and without a duct, the dryer shall be tested without the exhaust simulator described in section 3.3.5.1 of AHAM HLD–1 (incorporated by reference; see § 430.3). All external joints should be taped to avoid air leakage. For drying testing, disconnect all lights, such as task lights, that do not provide any information related to the drying process on the clothes dryer and that do not consume more than 10 watts during the clothes dryer test cycle. Control setting indicator lights showing the cycle progression, temperature or dryness settings, or other cycle functions that cannot be turned off during the test cycle shall not be disconnected during the active mode test cycle. For standby and off mode testing, the clothes dryer shall also be installed in accordance with section 5, paragraph 5.2 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3), disregarding the provisions regarding batteries and the determination, classification, and testing of relevant modes. For standby and off mode testing, all lighting systems shall remain connected.

2.1.2 *Conventional clothes dryers.* For conventional clothes dryers, as defined in section 1.8 of this appendix, the dryer exhaust shall be restricted by adding the AHAM exhaust simulator described in section 3.3.5.1 of AHAM HLD–1 (incorporated by reference; see § 430.3).

2.1.3 *Ventless clothes dryers.* For ventless clothes dryers, as defined in section 1.21, the dryer shall be tested without the AHAM

exhaust simulator. If the manufacturer gives the option to use a ventless clothes dryer, with or without a condensation box, the dryer shall be tested with the condensation box installed. For ventless clothes dryers, the condenser unit of the dryer must remain in place and not be taken out of the dryer for any reason between tests.

### 2.2 Ambient temperature and humidity.

2.2.1 For drying testing, maintain the room ambient air temperature at  $75 \pm 3$  °F and the room relative humidity at  $50 \pm 10$  percent relative humidity.

2.2.2 For standby and off mode testing, maintain room ambient air temperature conditions as specified in section 4, paragraph 4.2 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3).

### 2.3 Energy supply.

2.3.1 *Electrical supply.* Maintain the electrical supply at the clothes dryer terminal block within 1 percent of 120/240 or 120/208Y or 120 volts as applicable to the particular terminal block wiring system and within 1 percent of the nameplate frequency as specified by the manufacturer. If the dryer has a dual voltage conversion capability, conduct the test at the highest voltage specified by the manufacturer.

2.3.1.1 *Supply voltage waveform.* For the clothes dryer standby mode and off mode testing, maintain the electrical supply voltage waveform indicated in section 4, paragraph 4.3.2 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3). If the power measuring instrument used for testing is unable to measure and record the total harmonic content during the test measurement period, it is acceptable to measure and record the total harmonic content immediately before and after the test measurement period.

### 2.3.2 Gas supply.

2.3.2.1 *Natural gas.* Maintain the gas supply to the clothes dryer immediately ahead of all controls at a pressure of 7 to 10 inches of water column. If the clothes dryer is equipped with a gas appliance pressure regulator for which the manufacturer specifies an outlet pressure, the regulator outlet pressure shall be within  $\pm 10$  percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model. The hourly Btu rating of the burner shall be maintained within  $\pm 5$  percent of the rating specified by the manufacturer. If the requirement to maintain the hourly Btu rating of the burner within  $\pm 5$  percent of the rating specified by the manufacturer cannot be achieved under the allowable range in gas inlet test pressure, the orifice of the gas burner should be modified as necessary to achieve the required Btu rating. The natural gas supplied should have a heating value of approximately 1,025 Btus per standard cubic foot. The actual heating value,  $H_{n2}$ , in Btus per standard cubic foot, for the natural gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using a standard continuous flow calorimeter as described in section 2.4.6 or by the purchase of bottled natural gas whose Btu rating is certified to be at least as accurate a rating as

could be obtained from measurements with a standard continuous flow calorimeter as described in section 2.4.6.

**2.3.2.2 Propane gas.** Maintain the gas supply to the clothes dryer immediately ahead of all controls at a pressure of 11 to 13 inches of water column. If the clothes dryer is equipped with a gas appliance pressure regulator for which the manufacturer specifies an outlet pressure, the regulator outlet pressure shall be within  $\pm 10$  percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model. The hourly Btu rating of the burner shall be maintained within  $\pm 5$  percent of the rating specified by the manufacturer. If the requirement to maintain the hourly Btu rating of the burner within  $\pm 5$  percent of the rating specified by the manufacturer cannot be achieved under the allowable range in gas inlet test pressure, the orifice of the gas burner should be modified as necessary to achieve the required Btu rating. The propane gas supplied should have a heating value of approximately 2,500 Btus per standard cubic foot. The actual heating value,  $H_p$ , in Btus per standard cubic foot, for the propane gas to be used in the test shall be obtained either from measurements made by the manufacturer conducting the test using a standard continuous flow calorimeter as described in section 2.4.6 or by the purchase of bottled gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurement with a standard continuous calorimeter as described in section 2.4.6.

**2.4 Instrumentation.** Perform all test measurements using the following instruments as appropriate.

**2.4.1 Weighing scale for test cloth.** The scale shall have a range of 0 to a maximum of 60 pounds with a resolution of at least 0.2 ounces and a maximum error no greater than 0.3 percent of any measured value within the range of 3 to 15 pounds.

**2.4.1.2 Weighing scale for drum capacity measurements.** The scale should have a range of 0 to a maximum of 600 pounds with resolution of 0.50 pounds and a maximum error no greater than 0.5 percent of the measured value.

**2.4.2 Kilowatt-hour meter.** The kilowatt-hour meter shall have a resolution of 0.001 kilowatt-hours and a maximum error no greater than 0.5 percent of the measured value.

**2.4.3 Gas meter.** The gas meter shall have a resolution of 0.001 cubic feet and a maximum error no greater than 0.5 percent of the measured value.

**2.4.4 Dry and wet bulb psychrometer.** The dry and wet bulb psychrometer shall have an error no greater than  $\pm 1^\circ\text{F}$ . A relative humidity meter with a maximum error tolerance expressed in  $^\circ\text{F}$  equivalent to the requirements for the dry and wet bulb psychrometer or with a maximum error tolerance of  $\pm 2$  percent relative humidity would be acceptable for measuring the ambient humidity.

**2.4.5 Temperature.** The temperature sensor shall have an error no greater than  $\pm 1^\circ\text{F}$ .

**2.4.6 Standard Continuous Flow Calorimeter.** The calorimeter shall have an operating range of 750 to 3,500 Btu per cubic foot. The maximum error of the basic calorimeter shall be no greater than 0.2 percent of the actual heating value of the gas used in the test. The indicator readout shall have a maximum error no greater than 0.5 percent of the measured value within the operating range and a resolution of 0.2 percent of the full-scale reading of the indicator instrument.

**2.4.7 Standby mode and off mode watt meter.** The watt meter used to measure standby mode and off mode power consumption shall meet the requirements specified in section 4, paragraph 4.4 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3). If the power measuring instrument used for testing is unable to measure and record the crest factor, power factor, or maximum current ratio during the test measurement period, it is acceptable to measure the crest factor, power factor, and maximum current ratio immediately before and after the test measurement period.

**2.5 Lint trap.** Clean the lint trap thoroughly before each test run.

**2.6 Test Cloths.**

**2.6.1 Energy test cloth.** The energy test cloth shall be clean and consist of the following:

(a) Pure finished bleached cloth, made with a momie or granite weave, which is a blended fabric of 50-percent cotton and 50-percent polyester and weighs within  $\pm 10$  percent of 5.75 ounces per square yard after test cloth preconditioning, and has 65 ends on the warp and 57 picks on the fill. The individual warp and fill yarns are a blend of 50-percent cotton and 50-percent polyester fibers.

(b) Cloth material that is 24 inches by 36 inches and has been hemmed to 22 inches by 34 inches before washing. The maximum shrinkage after five washes shall not be more than 4 percent on the length and width.

(c) The number of test runs on the same energy test cloth shall not exceed 25 runs.

**2.6.2 Energy stuffer cloths.** The energy stuffer cloths shall be made from energy test cloth material, and shall consist of pieces of material that are 12 inches by 12 inches and have been hemmed to 10 inches by 10 inches before washing. The maximum shrinkage after five washes shall not be more than 4 percent on the length and width. The number of test runs on the same energy stuffer cloth shall not exceed 25 runs after test cloth preconditioning.

**2.6.3 Test Cloth Preconditioning.**

A new test cloth load and energy stuffer cloths shall be treated as follows:

(1) Bone dry the load to a weight change of  $\pm 1$  percent, or less, as prescribed in section 1.6 of this appendix.

(2) Place the test cloth load in a standard clothes washer set at the maximum water fill level. Wash the load for 10 minutes in soft water (17 parts per million hardness or less), using 60.8 grams of AHAM standard test detergent Formula 3. Wash water temperature should be maintained at  $140^\circ\text{F}$   $\pm 5^\circ\text{F}$  ( $60^\circ\text{C}$   $\pm 2.7^\circ\text{C}$ ). Rinse water temperature is to be controlled at  $100^\circ\text{F}$   $\pm 5^\circ\text{F}$  ( $37.7^\circ\text{C}$   $\pm 2.7^\circ\text{C}$ ).

(3) Rinse the load again at the same water temperature.

(4) Bone dry the load as prescribed in section 1.6 of this appendix and weigh the load.

(5) This procedure is repeated until there is a weight change of 1 percent or less.

(6) A final cycle is to be a hot water wash with no detergent, followed by two warm water rinses.

**2.7 Test loads.**

**2.7.1 Compact size dryer load.** Prepare a bone-dry test load of energy cloths that weighs 3.00 pounds  $\pm .03$  pounds. The test load can be adjusted to achieve proper weight by adding energy stuffer cloths, but no more than five stuffer cloths may be added per load. Dampen the load by agitating it in water whose temperature is  $60^\circ\text{F}$   $\pm 5^\circ\text{F}$  and consists of 0 to 17 parts per million hardness for approximately 2 minutes to saturate the fabric. Then, extract water from the wet test load by spinning the load until the moisture content of the load is between 52.5 and 57.5 percent of the bone-dry weight of the test load. Make a final mass adjustment, such that the moisture content is 57.5 percent  $\pm 0.33$  percent by adding water uniformly distributed among all of the test clothes in a very fine spray using a spray bottle.

**2.7.2 Standard size dryer load.** Prepare a bone-dry test load of energy cloths that weighs 8.45 pounds  $\pm .085$  pounds. The test load can be adjusted to achieve proper weight by adding stuffer cloths, but no more than five stuffer cloths may be added per load. Dampen the load by agitating it in water whose temperature is  $60^\circ\text{F}$   $\pm 5^\circ\text{F}$  and consists of 0 to 17 parts per million hardness for approximately 2 minutes to saturate the fabric. Then, extract water from the wet test load by spinning the load until the moisture content of the load is between 52.5 and 57.5 percent of the bone-dry weight of the test load. Make a final mass adjustment, such that the moisture content is 57.5 percent  $\pm 0.33$  percent by adding water uniformly distributed among all of the test clothes in a very fine spray using a spray bottle.

**2.7.3 Method of loading.** Load the energy test cloths by grasping them in the center, shaking them to hang loosely, and then dropping them in the dryer at random.

**2.8 Clothes dryer preconditioning.**

**2.8.1 Conventional clothes dryers.** For conventional clothes dryers, before any test cycle, operate the dryer without a test load in the non-heat mode for 15 minutes or until the discharge air temperature is varying less than  $1^\circ\text{F}$  for 10 minutes—whichever is longer—in the test installation location with the ambient conditions within the specified test condition tolerances of 2.2.

**2.8.2 Ventless clothes dryers.** For ventless clothes dryers, before any test cycle, the steady-state machine temperature must be equal to ambient room temperature described in 2.2.1. This may be done by leaving the machine at ambient room conditions for at least 12 hours between tests.

### 3. Test Procedures and Measurements

**3.1 Drum Capacity.** Measure the drum capacity by sealing all openings in the drum except the loading port with a plastic bag,

and ensuring that all corners and depressions are filled and that there are no extrusions of the plastic bag through any openings in the interior of the drum. Support the dryer's rear drum surface on a platform scale to prevent deflection of the drum surface, and record the weight of the empty dryer. Fill the drum with water to a level determined by the intersection of the door plane and the loading port (*i.e.*, the uppermost edge of the drum that is in contact with the door seal). Record the temperature of the water and then the weight of the dryer with the added water and then determine the mass of the water in pounds. Add the appropriate volume to account for any space in the drum interior not measured by water fill (*e.g.*, the space above the uppermost edge of the drum within a curved door) and subtract the appropriate volume to account for the space that is measured by water fill but cannot be used when the door is closed (*e.g.*, space occupied by the door when closed). The drum capacity is calculated as follows:

$C = w/d \pm \text{volume adjustment}$

$C$  = capacity in cubic feet.

$w$  = mass of water in pounds.

$d$  = density of water at the measured temperature in pounds per cubic foot.

3.2 *Dryer Loading.* Load the dryer as specified in 2.7.

### 3.3 Test cycle.

3.3.1 *Timer dryers.* For timer dryers, as defined in section 1.20 of this appendix, operate the clothes dryer at the maximum temperature setting and, if equipped with a timer, at the maximum time setting. Any other optional cycle settings that do not affect the temperature or time settings shall be tested in the as-shipped position. If the clothes dryer does not have a separate temperature setting selection on the control panel, the maximum time setting should be used for the drying test cycle. Dry the load until the moisture content of the test load is between 1 and 2.5 percent of the bone-dry weight of the test load, at which point the test cycle is stopped, but do not permit the dryer to advance into cool down. If required, reset the timer to increase the length of the drying cycle. After stopping the test cycle, remove and weigh the test load. The clothes dryer shall not be stopped intermittently in the middle of the test cycle for any reason. Record the data specified by section 3.4 of this appendix. If the dryer automatically stops during a cycle because the condensation box is full of water, the test is stopped, and the test run is invalid, in which case the condensation box shall be emptied and the test re-run from the beginning. For ventless dryers, as defined in section 1.21 of this appendix, during the time between two cycles, the door of the dryer shall be closed except for loading (and unloading).

3.3.2 *Automatic termination control dryers.* For automatic termination control dryers, as defined in section 1.5 of this appendix, a "normal" program shall be selected for the test cycle. For dryers that do not have a "normal" program, the cycle recommended by the manufacturer for drying cotton or linen clothes shall be selected. Where the drying temperature setting can be chosen independently of the program, it shall be set to the maximum. Where the dryness

level setting can be chosen independently of the program, it shall be set to the "normal" or "medium" dryness level setting. If such designation is not provided, then the dryness level shall be set at the mid-point between the minimum and maximum settings. Any other optional cycle settings that do not affect the program, temperature or dryness settings shall be tested in the as-shipped position. Operate the clothes dryer until the completion of the programmed cycle, including the cool down period. The cycle shall be considered complete when the dryer indicates to the user that the cycle has finished (by means of a display, indicator light, audible signal, or other signal) and the heater and drum/fan motor shuts off for the final time. If the clothes dryer is equipped with a wrinkle prevention mode (*i.e.*, that continuously or intermittently tumbles the clothes dryer drum after the clothes dryer indicates to the user that the cycle has finished) that is activated by default in the as-shipped position or if manufacturers' instructions specify that the feature is recommended to be activated for normal use, the cycle shall be considered complete after the end of the wrinkle prevention mode. After the completion of the test cycle, remove and weigh the test load. Record the data specified in section 3.4 of this appendix. If the final moisture content is greater than 2 percent, the test shall be invalid and a new run shall be conducted using the highest dryness level setting. If the dryer automatically stops during a cycle because the condensation box is full of water, the test is stopped, and the test run is invalid, in which case the condensation box shall be emptied and the test re-run from the beginning. For ventless dryers, during the time between two cycles, the door of the dryer shall be closed except for loading (and unloading).

3.4 *Data recording.* Record for each test cycle:

3.4.1 Bone-dry weight of the test load described in 2.7.

3.4.2 Moisture content of the wet test load before the test, as described in 2.7.

3.4.3 Moisture content of the dry test load obtained after the test described in 3.3.

3.4.4 Test room conditions, temperature, and percent relative humidity described in 2.2.1.

3.4.5 For electric dryers—the total kilowatt-hours of electric energy,  $E_t$ , consumed during the test described in 3.3.

3.4.6 For gas dryers:

3.4.6.1 Total kilowatt-hours of electrical energy,  $E_{te}$ , consumed during the test described in 3.3.

3.4.6.2 Cubic feet of gas per cycle,  $E_{tg}$ , consumed during the test described in 3.3.

3.4.6.3 Correct the gas heating value, GEF, as measured in 2.3.2.1 and 2.3.2.2, to standard pressure and temperature conditions in accordance with U.S. Bureau of Standards, circular C417, 1938.

3.4.7 The cycle settings selected, in accordance with section 3.3.2 of this appendix, for the automatic termination control dryer test.

3.5 *Test for automatic termination field use factor.* The field use factor for automatic termination can be claimed for those dryers

which meet the requirements for automatic termination control, defined in 1.4.

3.6 *Standby mode and off mode power.* Establish the testing conditions set forth in Section 2 "Testing Conditions" of this appendix. For clothes dryers that take some time to enter a stable state from a higher power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301 (Second Edition) (incorporated by reference; see § 430.3), allow sufficient time for the clothes dryer to reach the lower power state before proceeding with the test measurement. Follow the test procedure specified in section 5, paragraph 5.3.2 of IEC 62301 (Second Edition) for testing in each possible mode as described in sections 3.6.1 and 3.6.2 of this appendix.

3.6.1 If a clothes dryer has an inactive mode, as defined in section 1.13 of this appendix, measure and record the average inactive mode power of the clothes dryer,  $P_{IA}$ , in watts.

3.6.2 If a clothes dryer has an off mode, as defined in section 1.16 of this appendix, measure and record the average off mode power of the clothes dryer,  $P_{OFF}$ , in watts.

## 4. Calculation of Derived Results From Test Measurements

4.1 *Total per-cycle electric dryer energy consumption.* Calculate the total electric dryer energy consumption per cycle,  $E_{cc}$ , expressed in kilowatt-hours per cycle and defined as:

$E_{cc} = E_t$ ,  
for automatic termination control dryers,  
and,

$E_{cc} = [55.5/(W_w - W_d)] \times E_t \times \text{field use}$ ,  
for timer dryers

Where:

55.5 = an experimentally established value for the percent reduction in the moisture content of the test load during a laboratory test cycle expressed as a percent.

$E_t$  = the energy recorded in section 3.4.5 of this appendix

field use = 1.18, the field use factor for clothes dryers with time termination control systems only without any automatic termination control functions.

$W_w$  = the moisture content of the wet test load as recorded in section 3.4.2 of this appendix.

$W_d$  = the moisture content of the dry test load as recorded in section 3.4.3 of this appendix.

4.2 *Per-cycle gas dryer electrical energy consumption.* Calculate the gas dryer electrical energy consumption per cycle,  $E_{gc}$ , expressed in kilowatt-hours per cycle and defined as:

$E_{gc} = E_{te}$ ,  
for automatic termination control dryers,  
and,

$E_{gc} = [55.5/(W_w - W_d)] \times E_{te} \times \text{field use}$ ,  
for timer dryers

Where:

$E_{te}$  = the energy recorded in section 3.4.6.1 of this appendix.

field use, 55.5,  $W_w$ ,  $W_d$  as defined in section 4.1 of this appendix.

4.3 *Per-cycle gas dryer gas energy consumption.* Calculate the gas dryer gas

energy consumption per cycle,  $E_{gc}$ , expressed in Btus per cycle and defined as:

$$E_{gg} = E_{tg} \times GEF$$

for automatic termination control dryers, and,

$$E_{gg} = [55.5 / (W_w - W_d)] \times E_{tg} \times \text{field use} \times GEF$$

for timer dryers

Where:

$E_{tg}$  = the energy recorded in section 3.4.6.2 of this appendix.

GEF = corrected gas heat value (Btu per cubic foot) as defined in section 3.4.6.3 of this appendix,

field use, 55.5,  $W_w$ ,  $W_d$  as defined in section 4.1 of this appendix.

**4.4 Total per-cycle gas dryer energy consumption expressed in kilowatt-hours.**

Calculate the total gas dryer energy consumption per cycle,  $E_{cg}$ , expressed in kilowatt-hours per cycle and defined as:

$$E_{cg} = E_{gc} + (E_{gg} / 3412 \text{ Btu/kWh})$$

Where:

$E_{gc}$  = the energy calculated in section 4.2 of this appendix

$E_{gg}$  = the energy calculated in section 4.3 of this appendix

**4.5 Per-cycle standby mode and off mode energy consumption.** Calculate the dryer inactive mode and off mode energy consumption per cycle,  $E_{TSO}$ , expressed in kWh per cycle and defined as:

$$E_{TSO} = [(P_{IA} \times S_{IA}) + (P_{OFF} \times S_{OFF})] \times K / 283$$

Where:

$P_{IA}$  = dryer inactive mode power, in watts, as measured in section 3.6.1;

$P_{OFF}$  = dryer off mode power, in watts, as measured in section 3.6.2.

If the clothes dryer has both inactive mode and off mode,  $S_{IA}$  and  $S_{OFF}$  both equal  $8,620 \div 2 = 4,310$ , where 8,620 is the total inactive and off mode annual hours;

If the clothes dryer has an inactive mode but no off mode, the inactive mode annual hours,  $S_{IA}$ , is equal to 8,620 and the off mode annual hours,  $S_{OFF}$ , is equal to 0;

If the clothes dryer has an off mode but no inactive mode,  $S_{IA}$  is equal to 0 and  $S_{OFF}$  is equal to 8,620

Where:

$K = 0.001 \text{ kWh/Wh}$  conversion factor for watt-hours to kilowatt-hours; and

283 = representative average number of clothes dryer cycles in a year.

**4.6 Per-cycle combined total energy consumption expressed in kilowatt-hours.**

Calculate the per-cycle combined total energy consumption,  $E_{CC}$ , expressed in kilowatt-hours per cycle and defined for an electric clothes dryer as:

$$E_{CC} = E_{cg} + E_{TSO}$$

Where:

$E_{cg}$  = the energy calculated in section 4.1 of this appendix, and

$E_{TSO}$  = the energy calculated in section 4.5 of this appendix, and defined for a gas clothes dryer as:

$$E_{CC} = E_{cg} + E_{TSO}$$

Where:

$E_{cg}$  = the energy calculated in section 4.4 of this appendix, and

$E_{TSO}$  = the energy calculated in section 4.5 of this appendix.

**4.7 Energy Factor in pounds per kilowatt-hour.** Calculate the energy factor, EF, expressed in pounds per kilowatt-hour and defined for an electric clothes dryer as:

$$EF = W_{\text{bonedry}} / E_{cc}$$

Where:

$W_{\text{bonedry}}$  = the bone dry test load weight recorded in section 3.4.1 of this appendix, and

$E_{cc}$  = the energy calculated in section 4.1 of this appendix, and defined for a gas clothes dryer as:

$$EF = W_{\text{bonedry}} / E_{cg}$$

Where:

$W_{\text{bonedry}}$  = the bone dry test load weight recorded in section 3.4.1 of this appendix, and

$E_{cg}$  = the energy calculated in section 4.4 of this appendix,

**4.8 Combined Energy Factor in pounds per kilowatt-hour.** Calculate the combined energy factor, CEF, expressed in pounds per kilowatt-hour and defined as:

$$CEF = W_{\text{bonedry}} / E_{CC}$$

Where:

$W_{\text{bonedry}}$  = the bone dry test load weight recorded in section 3.4.1 of this appendix, and

$E_{CC}$  = the energy calculated in section 4.6 of this appendix.

[FR Doc. 2013-18931 Filed 8-13-13; 8:45 a.m.]

**BILLING CODE 6450-01-P**