[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[Docket No. EERE-2015-BT-TP-0014]

RIN: 1904-AC74

Energy Conservation Program: Test Procedures for Compact Fluorescent Lamps

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

ACTION: Notice of proposed rulemaking and announcement of public meeting.

SUMMARY: The U.S. Department of Energy (DOE) proposes to amend and expand its test procedures for medium base compact fluorescent lamps (MBCFLs). DOE proposes to replace references to ENERGY STAR requirements with references to the latest versions of industry standard test methods, which, with certain modifications, would replace the existing MBCFL test procedures. DOE is proposing to make these amendments in the existing appendix W to subpart B (Appendix W), renamed as "Uniform Test Method for Measuring the Energy Consumption of Compact Fluorescent

Lamps." In addition, DOE proposes to establish test procedures that would support the ongoing energy conservation standards rulemaking for general service lamps (GSLs) (GSL standards rulemaking), including test methods for new performance metrics and for additional compact fluorescent lamp (CFL) categories, including non-integrated CFLs and integrated CFLs that are not MBCFLs. DOE also proposes to revise its sampling plan for manufacturers to certify that their CFLs comply with the applicable energy conservation standards. DOE proposes to incorporate measures of standby mode power consumption in its test procedures. DOE also proposes various other conforming amendments. DOE also announces a public meeting to receive comments on these proposed amendments to the test procedures.

DATES: DOE will hold a public meeting on Monday, August 31, 2015, from 9 a.m. to 4 p.m., in Washington, DC. The meeting will also be broadcast as a webinar. See section V, "Public Participation," for webinar registration information, participant instructions, and information about the capabilities available to webinar participants.

DOE will accept comments, data, and information regarding this Notice of Proposed Rulemaking (NOPR) before and after the public meeting, but no later than **[INSERT DATE 75 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. See section V, "Public Participation," for details.

ADDRESSES: The public meeting will be held at the U.S. Department of Energy, Forrestal Building, Room 8E-089, 1000 Independence Avenue, SW, Washington, DC 20585.

Any comments submitted must identify the NOPR for Test Procedures for Compact Fluorescent Lamps, and provide docket number EERE-2015-BT-TP-0014 and/or regulatory information number (RIN) 1904-AC74. Comments may be submitted using any of the following methods:

1. Federal eRulemaking Portal: www.regulations.gov. Follow the instructions for submitting comments.
2. Email: CFL2015TP0014@ee.doe.gov. Include the docket number EERE-2015-BT-TP-0014 and/or RIN 1904-AC74 in the subject line of the message.
3. Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, Mailstop EE-2J, 1000 Independence Avenue, SW, Washington, DC, 20585-0121. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.
4. Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW, Suite 600, Washington, DC, 20024. Telephone: (202) 586-2945. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

For detailed instructions on submitting comments and additional information on the rulemaking process, see section V of this notice, "Public Participation."

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

A link to the docket webpage can be found at www.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/28. This webpage will link to the docket for this notice on the www.regulations.gov site. The www.regulations.gov site will contain simple instructions on how to access all documents, including public comments, in the docket. See section V, "Public Participation," for information on how to submit comments through www.regulations.gov.

FOR FURTHER INFORMATION CONTACT:

Ms. Lucy deButts, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-2J, 1000 Independence Avenue, SW, Washington, DC, 20585-0121. Telephone: (202) 287-1604. Email: Lucy.deButts@ee.doe.gov.

Ms. Celia Sher, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW, Washington, DC, 20585-0121. Telephone: (202) 287-6122. Email: celia.sher@hq.doe.gov.

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

SUPPLEMENTARY INFORMATION: DOE intends to incorporate by reference the following industry standards into 10 CFR part 430:

(1) ANSI_IEC C78.901-2014, "American National Standard for Electric Lamps—Single-Based Fluorescent Lamps—Dimensional and Electrical Characteristics."

Copies of ANSI_IEC C78.901-2014 can be obtained from ANSI Attn: Customer Service Department, 25 W 43rd Street, 4th Floor, New York, NY, 10036, or by going to http://webstore.ansi.org/.

(2) IES LM-54-12, "IES Guide to Lamp Seasoning."

(3) IES LM-65-14, "IES Approved Method for Life Testing of Single-Based Fluorescent Lamps."

(4) IES LM-66-14, "IES Approved Method for the Electrical and Photometric Measurements of Single-Based Fluorescent Lamps."

(5) IESNA LM-78-07, "IESNA Approved Method for Total Luminous Flux Measurement of Lamps Using an Integrating Sphere Photometer."

Copies of IES LM-54-12, IES LM-65-14, IES LM-66-14, and IES LM-78-07 can be obtained from IES, 120 Wall Street, Floor 17, New York, NY 10005-4001, or by going to www.ies.org/store.

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I. Authority and Background

Title III of the Energy Policy and Conservation Act of 1975 (42 U.S.C. 6291, et seq.; "EPCA" or, "the Act") sets forth a variety of provisions designed to improve energy efficiency. All references to EPCA refer to the statute as amended through the Energy Efficiency Improvement Act of 2015 (EEIA 2015), Pub. L. 114-11 (April 30, 2015). 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 CFLs, the subject of this NOPR.

Under EPCA, the energy conservation program consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. The testing requirements consist of test procedures that

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

The Energy Policy Act of 2005 (Pub. L. 109-58) amended EPCA to require that MBCFL test procedures be based on the August 2001 version of the "ENERGY STAR® Program Requirements for CFLs."[1] (42 U.S.C. 6293(b)(12)) Consistent with this requirement, DOE published a final rule in December 2006 (December 2006 final rule) and established DOE's current test procedures for MBCFLs under 10 CFR part 430, subpart B, appendix W. 71 FR 71340 (Dec. 8, 2006).[2]

Additionally, EPCA requires that at least once every 7 years, DOE must conduct an evaluation of all covered products and either amend the test procedures or publish a determination in the Federal Register not to amend them. (42 U.S.C. 6293(b)(1)(A)) DOE is undertaking this rulemaking, including the publication of this NOPR, to meet this EPCA requirement. As discussed in section III.B.1 of this NOPR, DOE is proposing to

[1] ENERGY STAR® Program Requirements for CFLs Partner Commitments, Version 2.0. August 9, 2001. Washington, DC. www.energystar.gov/ia/partners/product_specs/program_reqs/archive/CFLs_Program_RequirementsV2.0.pdf

[2] On December 8, 2006, DOE incorporated by reference the ENERGY STAR® Program Requirements for CFLs, ENERGY STAR Eligibility Criteria, Energy-Efficiency Specification, Version 2.0 as the Department's test procedures for measuring the energy performance of MBCFLs. Information on the ENERGY STAR program is available at www.energystar.gov.

replace the existing references to ENERGY STAR program requirements with direct references to the latest versions of the appropriate industry test methods from IES. Directly referencing the latest industry standards will allow DOE to adopt current best practices and technological developments in its test procedures.

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. (42 U.S.C. 6293(b)) EPCA provides, in relevant part, that any test procedures prescribed or amended under this section shall be reasonably designed to produce test results that 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)) Pursuant to this authority, DOE proposes to amend the test procedures currently applicable to MBCFLs to include additional CFL categories in support of the ongoing GSL standards rulemaking.

If DOE determines that a test procedure amendment is warranted, it must publish the proposed test procedure and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6293(b)(2)) In any rulemaking to amend test procedures, DOE must determine to what extent, if any, the proposed test procedures would alter the measured energy efficiency of any covered products as determined under the existing test procedures. (42 U.S.C. 6293(e)(1))

Finally, EPCA directs DOE to amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption, if technically

feasible. (42 U.S.C. 6295(gg)(2)(A)) Standby mode and off mode energy must be incorporated into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product unless the current test procedures already account for and incorporate standby and off mode energy consumption or such integration is technically infeasible. If an integrated test procedure is technically infeasible, DOE must prescribe a separate standby mode and off mode energy use test procedure for the covered product. Id. Any such amendment must consider the most current versions of the IEC Standard 62301[3] and IEC Standard 62087[4] as applicable. DOE has tentatively determined that CFLs operate under standby mode but not under off mode. Consistent with EPCA's relevant requirement, DOE proposes to address measurement of standby mode power in Appendix W, as detailed in section III.B.6 of this NOPR.

II. Synopsis of the Notice of Proposed Rulemaking

In this NOPR, DOE proposes to amend DOE's current test procedures for MBCFLs contained in Appendix W. These amendments include (1) replacing references to ENERGY STAR requirements with references to the latest versions of industry standards; (2) revising certain definitions; (3) providing further instruction on test setup, test methods, and sampling requirements; and (4) removing testing specific language from the existing MBCFL energy conservation standards contained in 10 CFR 430.32(u). DOE has tentatively concluded that these proposed amendments will not affect any

[3] Household electrical appliances—Measurement of standby power (Edition 2.0, 2011-01).
[4] Methods of measurement for the power consumption of audio, video, and related equipment (Edition 3.0, 2011-04).

measurements required to comply with existing standards, as detailed in the discussion of each proposed amendment.

DOE also proposes to (1) adopt test procedures for additional CFL categories in support of the ongoing GSL standards rulemaking, (2) adopt test procedures for additional CFL metrics in support of the ongoing GSL standards rulemaking, (3) adopt a test procedure for measuring standby mode power consumption for MBCFLs and all other CFL categories covered by the ongoing GSL standards rulemaking, as appropriate, and (4) adopt a revised sampling plan for MBCFLs and all other CFL categories covered by the ongoing GSL standards rulemaking.

In order to support the ongoing GSL standards rulemaking, DOE is proposing to expand the existing MBCFL test procedures to include additional CFL categories. DOE's existing energy conservation standards and test procedures apply only to integrated (also referred to as self-ballasted or integrally ballasted) MBCFLs. The ongoing GSL standards rulemaking addresses CFLs, including non-integrated CFLs and integrated CFLs. Similarly, additional CFL metrics may be necessary to support potential standards from the ongoing GSL standards rulemaking.[5] Therefore, in this NOPR, DOE proposes to establish test procedures for additional CFL categories and CFL metrics in Appendix W. Additionally, DOE proposes to establish a test procedure for CFL standby mode power consumption, as directed by EPCA; this test procedure would only apply to integrated CFLs because non-integrated CFLs are not capable of standby mode operation. DOE also

[5] Information regarding the General Service Lamps Rulemaking can be found on regulations.gov, docket number EERE-2013-BT-STD-0051 at www.regulations.gov/#!docketDetail;D=EERE-2013-BT-STD-0051.

proposes to revise the current sampling plan in 10 CFR 429.35 to ensure more representative and accurate values of the existing metrics and to address the proposed new metrics in Appendix W.

DOE is also proposing a revised sampling plan that is consistent with "ENERGY STAR® Program Requirements Product Specification for Lamps (Light Bulbs), Eligibility Criteria, Version 1.1" (effective September 30, 2014)[6] (hereafter "ENERGY STAR Lamps Specification v1.1"), as detailed in section III.I. Further, the metrics required in the proposed test procedures are also required by ENERGY STAR Lamps Specification v1.1. Therefore, the proposed test procedures in Appendix W can be conducted concurrently with ENERGY STAR certification without significant additional burden.

III. Discussion

A. Seven-Year Test Procedure Review

In undertaking this rulemaking, DOE is fulfilling its statutory obligation under EPCA to review its test procedures for all covered products, including MBCFLs, at least once every 7 years. (42 U.S.C. 6293(b)(1)(A)) Within this period, DOE must either: (1) amend the test procedure to improve its measurement representativeness or accuracy or reduce its burden, or (2) determine that such amendments are unnecessary. Id. Although

[6] ENERGY STAR® Program Requirements Product Specification for Lamps (Light Bulbs), Eligibility Criteria, Version 1.1. August 28, 2014. Washington, DC. www.energystar.gov/sites/default/files/ENERGY%20STAR%20Lamps%20V1%201_Specification.pdf

DOE is proposing revisions only to certain parts of the existing test procedures, DOE requests comment on all aspects of DOE's test procedures, including those provisions appearing at 10 CFR 429.35, 10 CFR 430.23, and Appendix W, as well as comments on current best practices and technological developments that may warrant additional amendments.

B. Amendments to Appendix W to Subpart B of 10 CFR Part 430

In this NOPR, DOE proposes several updates to the existing test procedures for MBCFLs as specified in Appendix W. Specifically, DOE proposes to (1) replace references to ENERGY STAR requirements with references to the latest versions of industry standards, (2) revise certain definitions, and (3) provide further instruction on test setup and test methods. DOE has tentatively concluded that since these changes mainly provide clarifications to the existing test procedures for MBCFLs, these amendments would not significantly alter measured values requiring compliance for existing standards for MBCFLs, nor would they pose an increased test burden to manufacturers.

This NOPR also proposes to expand the existing test procedures to additional CFL categories (i.e., non-MBCFL integrated, non-integrated, and hybrid CFLs), include test procedures for additional CFL metrics, and include a test procedure to measure standby mode power consumption of CFLs where applicable.

DOE is proposing the inclusion of additional CFL categories and metrics in support of the ongoing GSL standards rulemaking. In the ongoing GSL standards rulemaking, DOE is considering revising and/or developing standards for integrated and non-integrated CFLs, as well as requiring additional CFL metrics, including correlated color temperature (CCT), color rendering index (CRI), start time, and power factor. Should DOE establish energy conservation standards for these additional CFL categories and require additional metrics in the ongoing GSL standards rulemaking, DOE must first prescribe test procedures for these products, as required by EPCA. (42 U.S.C. 6295(o)(3)(A)) Therefore, DOE is proposing test procedures for additional CFL categories and metrics in this NOPR. DOE also proposes to delete the text "medium base" from the title of Appendix W to reflect the proposed inclusion of additional CFL categories.

Further, DOE is proposing a test procedure for measuring standby mode power consumption of CFLs, where applicable, according to the EPCA requirement that test procedures for all covered products must integrate measures of standby mode and off mode energy consumption, if technically feasible. (42 U.S.C. 6295(gg)(2)(A))

DOE has tentatively concluded that test procedures proposed in Appendix W do not pose an undue burden to manufacturers. The additional metrics of CCT, CRI, start time, and power factor would require equipment that is considered standard laboratory equipment or already used for the measurement of existing metrics. The measurements of these metrics would likely not require considerable time. Additionally, DOE is proposing

to require the same sample of units to be used for initial lamp efficacy, lifetime, lumen maintenance values, CRI, CCT, power factor, start time, and standby mode power.

In the sections that follow, DOE discusses the proposed test procedures for CFLs in Appendix W including (1) industry standard test procedures incorporated by reference; (2) definitions; (3) general instructions; (4) test procedures for existing and new metrics (i.e., CCT, CRI, power factor, and start time); (5) test procedures for additional CFL categories (i.e., non-MBCFL integrated, non-integrated, and hybrid CFLs); (6) a test procedure for measuring standby mode power consumption; and (7) rounding requirements.

1. Updates to Industry Test Methods

DOE's existing MBCFL test procedures contained in Appendix W are based on the August 2001 version of the "ENERGY STAR® Program Requirements for CFLs,"[7] which has since been updated several times. DOE is proposing to replace the existing references to ENERGY STAR program requirements with direct references to the latest versions of the appropriate industry test methods from IES. Directly referencing the latest industry standards will allow DOE to adopt current best practices and technological developments in its test procedures. Test procedures for all additional CFL categories and new CFL metrics proposed in this NOPR would also reference these latest versions of relevant industry standards.

[7] ENERGY STAR® Program Requirements for CFLs Partner Commitments, Version 2.0. August 9, 2001. Washington, DC. www.energystar.gov/ia/partners/product_specs/program_reqs/archive/CFLs_Program_RequirementsV2.0.pdf

More specifically, the ENERGY STAR program requirements referenced IES LM-66-1991[8] for photometric measurements and IES LM-65-1991[9] for lifetime testing measurements.[10] IES LM-66-1991 in turn referenced IES LM-54-1991[11] for lamp seasoning guidance. Therefore, DOE proposes to directly incorporate by reference in Appendix W the latest versions of these industry test procedures: IES LM-66-14,[12] IES LM-65-14,[13] and IES LM-54-12.[14] Accordingly, DOE proposes to no longer incorporate by reference the August 2001 version of the ENERGY STAR Program Requirements for CFLs, previously approved for Appendix W.[15]

Industry periodically updates its test procedure standards to account for changes in product lines and/or developments in test methodology and equipment. In considering whether to incorporate an updated industry standard, DOE must ensure that any amended test procedure would not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) DOE has preliminarily determined that the changes associated with adoption of the updated versions of industry standards would not be unduly burdensome for manufacturers of CFLs for which DOE is proposing test procedures in this NOPR.

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[8] Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps (approved June 1991).
[9] Life Testing of Single-Ended Compact Fluorescent Lamps (approved June 1991).
[10] Until recently, the Illuminating Engineering Society of North America used the acronym "IESNA." For simplicity, this NOPR applies the currently used "IES" acronym to all IES publications.
[11] Lamp Seasoning (approved June 1991).
[12] IES Approved Method for the Electrical and Photometric Measurements of Single-Based Fluorescent Lamps (approved December 30, 2014).
[13] IES Approved Method for Life Testing of Single-Based Fluorescent Lamps (approved December 30, 2014).
[14] IES Guide to Lamp Seasoning (approved October 22, 2012).
[15] Incorporation by reference located at 10 CFR 430.3.

When DOE modifies test procedures, EPCA requires that DOE determine to what extent, if any, the new test procedure would alter the measured energy use of covered products. (42 U.S.C. 6293(e)(1)) DOE compared the currently referenced versions and the proposed updated versions of the relevant industry standards to determine, as directed by EPCA, whether adopting the latest industry standards would alter measured energy efficiency for MBCFLs, which are currently regulated and are subject to existing DOE test procedures. In its review of the updated versions of industry standards, DOE identified some provisions in the revised industry test procedures that could potentially result in small changes in measured values of MBCFLs (e.g., modifications to impedance thresholds, preburning ambient conditions). DOE has tentatively determined that these changes would have no more than a de minimis effect on measured values and test burden.[16] Thus, DOE tentatively concludes that these amendments in the NOPR do not affect reported efficacy values to the extent that would warrant modifications to energy conservation standards. DOE requests comment on its proposed incorporation of updated versions of industry standards and its tentative conclusion that the updates would not have a significant impact on measured values for MBCFLs or test burden for CFL manufacturers. The following sections discuss in more detail each of the updated industry standards and impacts on measured values of MBCFLs and test burden.

[16] In this notice, changes in efficacy that are described as "de minimis" are considered to be within measurement error or variation.

a. IES LM-66-14 "IES Approved Method for the Electrical and Photometric Measurements of Single-Based Fluorescent Lamps"

IES LM-66-1991 specified procedures for taking electrical and photometric measurements of CFLs (including MBCFLs). As discussed in section III.B.1, this industry standard has been updated with a 2014 edition. DOE is proposing to directly incorporate by reference IES LM-66-14, and to no longer incorporate by reference the August 2001 version of the ENERGY STAR Program Requirements for CFLs, which referenced the 1991 version of LM-66. A review indicates that incorporating the 2014 edition of IES LM-66 would provide further clarification of the test procedures and improve the test methodology.

DOE has identified the following eight key updates in the 2014 edition of IES LM-66 (IES LM-66-14) and discusses their impact on MBCFLs in greater detail in this section. Specifically, IES LM-66-14:

1) adds lamp vibration requirements,
2) removes the quantitative airflow recommendation from ambient conditions,
3) modifies the lamp orientation requirements,
4) clarifies the voltage waveshape requirements for the power supply,
5) modifies the type of instrument used for measuring power, voltage, and current,
6) modifies electrical instrumentation requirements related to frequency response, impedance, tolerance, and power factor
7) modifies the lamp handling requirements, and

8) modifies the lamp stabilization methodology.

One of the key updates in IES LM-66-14 is the addition of vibration requirements. Section 4.2 of IES LM-66-14 states that lamps should not be subjected to excessive vibration or shock during testing, storage, or handling. Section 7.2 of IES LM-66-1991 stated that care must be taken to avoid shaking or bumping the lamp during transfer as this could cause mercury to dislodge from the cool zones. DOE has determined that this update only rephrases the requirement that lamps should not be subjected to excessive vibration or shock, during testing, storage, or handling without changing the substantive meaning. For this reason, DOE has tentatively concluded that the revised vibration requirements would not impact measured values or increase test burden.

IES LM-66-14 does not include a quantitative airflow recommendation that was included in the 1991 edition. Section 4.4 of IES LM-66-14 states that air movement can substantially alter measured values and that no discernable airflow, other than that from the tested device, is allowed; it also specifies that discernable airflow can be tested by hanging a single ply tissue paper in place of the lamp. Section 3.3 of IES LM-66-1991 had recommended that the airflow not exceed 5 meters per minute. Upon review, DOE has tentatively concluded that because the quantitative airflow specification in IES LM-66-1991 was only a recommendation and the guidelines of the procedure remain the same, the changes would have no more than a de minimis effect on measured values and test burden.

IES LM-66-14 also modifies the lamp orientation (i.e., position) requirements during testing. Section 4.5 of IES LM-66-14 states that the operating orientation of the lamps under test should be as specified by the manufacturer, and that when an orientation is not specified, or where more than one orientation is specified, the lamp should be tested in the orientation that will be used in the application and shall be reported in the test report; it also states that seasoning, preburning, and photometric measurements shall all be done with the lamp in the same orientation. Sections 7.1, 7.2, 7.6, and 11.2 of IES LM-66-1991 required testing in a base up position. However, 10 CFR 429.35 specifies the operating orientation for MBCFLs. The modification to the lamp orientation in IES LM-66-14 will not impact measured values as the requirements currently in 10 CFR 429.35, and as proposed in Appendix W, dictate orientation. For these reasons, DOE has tentatively concluded that the revised lamp orientation requirement in IES LM-66-14 would not impact measured values or increase test burden.

IES LM-66-14 also clarifies the voltage waveshape requirements of the power supply. Section 5.1.1 of IES LM-66-14 states that the power supply shall have a sinusoidal voltage waveshape such that the total harmonic distortion (THD) does not exceed 3 percent of the fundamental frequency when operating a purely resistive load. Section 2.1 of IES LM-66-1991 stated that the AC power supply, while operating the test lamp, should have a voltage waveshape such that the root mean square (RMS) summation of the harmonic components does not exceed 3 percent of the fundamental. DOE understands that alternating current (AC) power supplies are expected to provide a sinusoidal voltage waveshape, and that in practice industry may already use a purely

resistive load to determine power supply THD. For these reasons, DOE has tentatively concluded that the clarified voltage waveshape requirements in IES LM-66-14 would not impact measured values or increase test burden.

IES LM-66-14 also restricts the type of instrument used for measurement of power, voltage, and current. Section 5.2 of IES LM-66-14 requires the use of a multifunction instrument in the measurement circuit. Section 5 of IES LM-66-1991 permitted the use of multiple single-function instruments in lieu of a single multifunction instrument; however, it also stated that a single multifunction instrument offers the advantage of simplicity and in most cases eliminates the need for correction. DOE understands that in practice industry may already use a single multifunction instrument in lieu of multiple single-function instruments. DOE has tentatively concluded that the required use of a multifunction instrument would not impact measured values or increase test burden.

IES LM-66-14 also adds a requirement for frequency response of measurement instruments. Section 5.3.1 of IES LM-66-14 states that for high frequency measurements, instruments shall have minimum frequency response of 100 kilohertz (kHz). IES LM-66-1991 did not state a minimum frequency response for high frequency measurements. DOE understands that in practice industry may already use instruments with a minimum 100 kHz frequency response for high frequency measurements of MBCFLs that contain electronic ballasts. DOE has tentatively concluded that the added

requirement for minimum frequency response would not impact measured values or increase test burden.

IES LM-66-14 also modifies the impedance thresholds for electrical instrumentation. Section 5.3.2 of IES LM-66-14 states that voltage inputs of the multifunction meter must have input impedances greater than 1 megaohm (MΩ), and current inputs must have impedances less than 20 milliohms (mΩ). Accordingly, IES LM-66-14 also does not contain a section from IES LM-66-1991 addressing measurement corrections for using instruments with lower impendences (i.e., under 1 MΩ). Section 8.2 of IES LM-66-1991 had stated that instruments connected in parallel with the lamp may not draw more than 1 percent of the lamp rated current, and instruments in series should have an impedance such that the voltage across the instrument coil does not exceed 2 percent of the rated lamp voltage. The updated impedance thresholds in IES LM-66-14 should help reduce potential error by eliminating the need to correct measured values. Because the updates to impedance limitations mainly affect error correction and ensure accurate measurements, DOE has tentatively concluded that these changes would not affect measured values or pose additional test burden.

IES LM-66-14 also modifies electrical instrumentation requirements related to instrument tolerance and power factor. Section 5.3.3 of IES LM-66-14 states that instrument tolerance (i.e., accuracy) shall be ±0.5 percent or less for voltage and current, and ±0.75 percent or less for wattage. Section 8.1 of IES LM-66-1991 included these

same criteria as recommendations rather than requirements, and had limited their application to frequencies up to 2,000 hertz (Hz). Further, IES LM-66-14 does not contain a specification from IES LM-66-1991 that the power factor for ammeters and voltmeters not exceed 20 percent. Upon review, DOE has tentatively concluded that these modifications would ensure accurate and consistent measurements and would not have more than a de minimis impact on measured values and test burden.

IES LM-66-14 also modifies the handling requirements for CFLs, including MBCFLs. Section 6.1.1 of IES LM-66-14 references the description for handling in IES LM-54-12. Section 6.1.1 of IES LM-54-12 states that CFLs should cool for at least one hour prior to being disturbed. It also recommends that lamps removed for evaluation, handling, transporting, or storing should be maintained in the same orientation as during the seasoning to reduce lamp stabilization time. Section 7.2 of IES LM-66-1991 stated that the lamp will be less sensitive to movement if it is allowed to cool down for 15 minutes before being transferred to the photometric equipment. DOE understands that in practice industry may already be handling CFLs in this manner to maintain the consistency and integrity of the testing while evaluating, transporting, and/or storing lamps. Therefore, DOE has tentatively concluded that the modified handling requirements would not have a significant impact on measured values or increase test burden.

Section 6.2.1 of IES LM-66-14 also modifies the lamp stabilization methodology by now including a preferred four step method for determining if a CFL is stable. The

new methodology involves taking six consecutive lumen output measurements at 1-minute intervals, averaging these measurements, and then calculating the stability, as a percentage, by dividing the difference between the maximum and minimum measured values by the average value. If stability exceeds 1 percent for the period, lumen output measurements in 1-minute intervals must continue until stability over six consecutive lumen output measurements is achieved. When the 1 percent threshold is met, the lamp is considered stable. Section 1.2 of IES LM-66-1991 stated that stabilization refers to the burning of test lamps for a sufficient period of time such that electrical and photometric values are constant; section 7.3 further stated that 15 minutes is usually sufficient for stability, although periodically checking measured lumens, lamp volts, or both is preferred. Upon review, DOE has tentatively concluded that the new methodology provides more detailed instruction for determining when a lamp is stable and would have no more than a de minimis effect on measured values and test burden.

In addition to the previously mentioned updates, IES LM-66-14 provides recommendations and further guidance that remove a number of ambiguities in the previous version (e.g., updates to definitions, organization, and references). Because these proposed updates do not involve substantive changes to the test setup and methodology, but rather just clarifications, DOE has tentatively concluded they would not affect measured values or pose additional test burden.

DOE requests comments on its assessment of the updates in IES LM-66-14 and their impacts on measured values of MBCFLs and test burden.

b. IES LM-54-12 “IES Guide to Lamp Seasoning”

IES LM-54-1991 specified procedures for seasoning CFLs (including MBCFLs). As discussed in section III.B.1, IES LM-54-1991 has been updated with a 2012 edition, IES LM-54-12. Section 6.1.2 of IES LM-66-14, which DOE is proposing to directly incorporate by reference, states that all new single-based fluorescent lamps selected for test shall be seasoned per IES LM-54-12. DOE is proposing to directly incorporate by reference IES LM-54-12, and to no longer incorporate by reference the August 2001 version of the ENERGY STAR Program Requirements for CFLs, which referenced the 1991 version of LM-54. A review of the updated standard indicates that incorporating the 2012 edition of IES LM-54 would provide further clarification and improvements in the methodology for lamp seasoning.

DOE has identified the following six key updates to the seasoning procedures in the 2012 edition of IES LM-54 (IES LM-54-12) and discusses their impact on MBCFL testing and their measured values. Specifically, IES LM-54-12

1) specifies ambient temperature limits and clarifies general temperature conditions,
2) adds an airflow requirement,
3) modifies the lamp operating cycle,
4) adds several electrical conditions,
5) modifies the lamp operating orientation, and
6) modifies the lamp seasoning time.

The first key update in IES LM-54-12 is a specification of ambient temperature limits during seasoning. Section 4.3 of IES LM-54-12 allows ambient temperature to be within manufacturer specified limits and suggests that these limits are typically between 15 °C and 35 °C. IES LM-54-1991 did not specify ambient temperature requirements. However, IES LM-66-1991, indirectly referenced in DOE's existing test procedures for MBCFLs, contained ambient temperature requirements for preburning. Specifically, section 7.1 of IES LM-66-1991 stated that ambient temperature for preburning should not exceed 40 °C. While IES LM-54-12 does not contain this specification, it does state that seasoning should be suspended when the recommended testing temperature range is exceeded and notes that temperatures above 40 °C could be deleterious to the lamp and its components. The updated version also now requires maintaining critical lamp temperatures (e.g., bulb wall temperature or control point temperature) when specified by the manufacturer. Therefore, the changes in ambient temperature and general temperature requirements for seasoning from the adoption of IES LM-54-12 are not in conflict with the currently incorporated industry standards, but rather provide testing clarification and more substantial guidance. For these reasons, DOE has tentatively concluded that the updates in temperature conditions for seasoning adopted in IES LM-54-12 would not have more than a de minimis impact on measured values or test burden.

IES LM-54-12 also adds an airflow requirement for CFLs during seasoning. Section 4.4 of IES LM-54-12 states that airflow shall be minimized for proper lamp starting and operation, and notes that the lamps shall be spaced to allow airflow around

each lamp. IES LM-54-1991 did not address airflow during seasoning. It is DOE's understanding, however, that the airflow requirements of IES LM-54-12 were, in practice, already followed prior to their adoption. Therefore, DOE has tentatively concluded that the addition of a qualitative requirement for lamp spacing to ensure proper airflow during seasoning in IES LM-54-12 would not impact measured values. In addition, IES LM-54-12 modifies the lamp operating cycle requirements. Section 2.2 of IES LM-54-1991 required that all lamps be seasoned at a 3 hour on, 20 minute off cycle for 100 operating hours. Section 6.2.2.1 of IES LM-54-12 specifies that lamps that are to be lifetime tested shall be cycled during seasoning. However, IES LM-54-12 further states that lamps to be tested for other performance metrics can be continuously burned during seasoning to shorten the time required for seasoning. Nonetheless, both versions of the standard require seasoning the lamp for a certain period of time before taking photometric and electrical measurements; consequently, DOE believes that measured photometric and electrical values do not depend on the extent to which lamps are cycled during seasoning. Similarly, because lamps are still required to be seasoned prior to lifetime testing, DOE believes that no longer providing a specific operating cycle for this seasoning would not have a significant impact on the measured value of lifetime. Because these modifications do not remove the requirement of seasoning but only modify how it is conducted, DOE believes that they do not change the ultimate result of seasoning the lamp prior to measurements and subsequently do not have more than a de minimis impact on the measured values and test burden.

IES LM-54-12 specifies several electrical conditions that should be maintained during seasoning. Section 5.1.1 of IES LM-54-12 states that frequency of the power supply shall conform to the rated frequency of the ballast, while IES LM-54-1991 did not contain a requirement for frequency of the power supply. DOE does not anticipate measured values or test burden would be impacted by the added specification because this statement is simply a clarification and not a departure from existing test procedures.

Section 5.1.2 of IES LM-54-12 states that for AC power installations, the power supply shall have a voltage waveshape such that the total harmonic distortion does not exceed 3 percent of the fundamental frequency. IES LM-54-1991 did not contain a requirement for voltage waveshape, but this same requirement was given in section 2.1 of IES LM-66-1991 and is also given in section 5.1.1 of IES LM-66-14, as discussed in section III.B.1.a of this NOPR. DOE understands this is general practice in industry and is a clarifying statement only. For these reasons, DOE has tentatively concluded that the electrical conditions specified would not affect measured values or increase test burden.

In addition, section 5.1.3 of IES LM-54-12 adds an electrical condition for voltage regulation of integrated CFLs (including MBCFLs). IES LM-54-12 requires AC voltage to be monitored and regulated to within ±10 percent of the rated input voltage, or ±2 percent of the rated input voltage if the seasoning time includes the preburning time. Voltage regulation limits were not prescribed in LM-54-1991. However, DOE has tentatively concluded that requiring the rated input voltage to adhere to certain tolerances

during seasoning would not have a significant impact on measured values or test burden as it likely reflects current general industry practice.

As discussed in section III.B.1.a of this NOPR, IES LM-54-12 also modifies the lamp position and orientation requirements during seasoning. Section 6.2.2.1 of IES LM-54-12 states that CFLs shall be seasoned and measured in the same orientation. Section 2.2 of IES LM-54-1991 stated that non-linear lamps should be seasoned in their intended operating position or as recommended by the manufacturer. 10 CFR 429.35 specifies the operating orientation for MBCFLs. The modification to the lamp orientation in IES LM-54-12 will not impact measured values as the requirements currently in 10 CFR 429.35, and as proposed in Appendix W, dictate orientation. Further, section 7.2 of IES LM-66-1991, a currently incorporated industry standard through the reference of ENERGY STAR program requirements, contained guidance to maintain lamp position when transferring lamps from preburning to the location for testing. As detailed in section III.B.2.d, DOE is proposing to clarify within Appendix W that lamp orientation must remain unchanged during testing. For these reasons, DOE has tentatively concluded that the revised lamp orientation requirement in IES LM-54-12 would not impact measured values or increase test burden.

Lastly, IES LM-54-12 modifies the lamp seasoning time. Section 6.2.2.1 of IES LM-54-12 states that seasoning time shall be a minimum of 100 operating hours or as specified by the manufacturer so measurements can reliably establish initial lumen output values. Section 2.2 of IES LM-54-1991 stated that lamps are to be seasoned for 100

operating hours. In practice industry may already be using manufacturer specifications for certain lamp designs that may require a different seasoning time than the standard 100 operating hours. Therefore, DOE has tentatively concluded that the allowance of using manufacturer specifications would not have a significant impact on measured values or increase test burden.

In addition to the previously mentioned updates, IES LM-54-12 provides recommendations and further guidance that remove a number of ambiguities in the previous version (e.g., updates definitions, instrumentation, and references). Because these proposed updates do not involve substantive changes to the test setup and methodology, but rather just clarification, DOE has tentatively concluded they would not affect measured values or increase test burden.

DOE requests comments on its assessment of the updates in IES LM-54-12 and their impacts on measured values of MBCFLs and test burden.

c. IES LM-65-14 "IES Approved Method for Life Testing of Single-Based Fluorescent Lamps"

IES LM-65-1991 specified procedures for lifetime testing of CFLs (including MBCFLs). As discussed in section III.B.1, this industry standard has been updated with a 2014 edition. DOE is proposing to directly incorporate by reference IES LM-65-14 and to no longer incorporate by reference the August 2001 version of the ENERGY STAR Program Requirements for CFLs, which referenced the 1991 version of LM-65. A review

indicates that incorporating the 2014 edition of IES LM-65 would provide further clarification of the test procedures and improvements in test methodology. DOE has identified the following five key updates in the 2014 edition of IES LM-65 (IES LM-65-14) and discusses their impact on MBCFL testing and measured values. Specifically, IES LM-65-14

1) modifies ambient temperature conditions,
2) modifies the lamp spacing requirement,
3) clarifies the power supply voltage waveshape requirement,
4) modifies the lamp operating cycle requirement, and
5) specifies a methodology for the recording of lamp failures.

One of the key updates in IES LM-65-14 is the modification of the ambient temperature requirement for lifetime testing. Section 4.3 of IES LM-65-14 specifies that ambient temperature shall be controlled between 15 °C and 40 °C, and that lifetime testing shall be suspended when this range is exceeded. Section 6.3 of IES LM-65-1991 stated that the ambient temperature for CFL lifetime testing should be kept within the range of 25 °C ± 10 °C. Thus, the updated version only raises the maximum allowable ambient temperature by 5 °C. DOE has tentatively concluded that this change in allowable ambient temperature range would not have a significant impact on measured values of lifetime or increase test burden.

IES LM-65-14 also modifies the lamp spacing requirement of the lifetime testing rack. Section 4.5 of IES LM-65-14 states that lamps shall be spaced to allow airflow

around each lamp and notes that this is facilitated by designing open lifetime testing racks with minimal structural components to block airflow. Section 6.4 of IES LM-65-1991 had required spacing between lamps to be a minimum of 1 inch (25 millimeters) to minimize mutual heating effects. DOE has tentatively concluded that the IES LM-65-14 guideline is sufficient to ensure that there are minimal mutual heating effects. Therefore, DOE has determined that removing the specific spacing criterion would not have a significant impact on measured values or increase test burden.

IES LM-65-14 also clarifies the power supply voltage waveshape requirement. Section 5.1.2 of IES LM-65-14 states that the power supply shall have a sinusoidal voltage waveshape such that the total harmonic distortion does not exceed 3 percent of the fundamental frequency when operating a purely resistive load. Section 5.2 of IES LM-65-1991 stated that the type of the power supply used shall have a voltage wave shape such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental. DOE understands that power supplies are expected to provide a sinusoidal voltage waveshape, and that in practice industry may already use a purely resistive load to determine power supply THD. For these reasons, DOE has tentatively concluded that the clarified voltage waveshape requirement in IES LM-65-14 would not impact measured values or increase test burden.

In addition, section 6.4 of IES LM-65-14 revises the lamp operating cycle requirement to be used during CFL lifetime testing. Both versions of the standard prescribe an operating cycle of 180 minutes on and 20 minutes off; however, section 6.1

of IES LM-65-1991 provided an allowance for other cycles to be used if the manufacturer's recommendation or use in the field dictates. IES LM-65-14 does not contain this allowance, and effectively requires the operating cycle to be 180 minutes on and 20 minutes off. DOE believes that this cycle (180 minutes on and 20 minutes off) is industry standard and is already in use by manufacturers of MBCFLs and other CFLs. Therefore, DOE has tentatively concluded that removing the allowance of alternative operating cycles would not have a significant impact on the measured value of lifetime or increase test burden.

Lastly, IES LM-65-14 specifies a more detailed methodology for recording lamp failures. Section 6.5 of IES LM-65-14 requires checking for lamp failure by visual observation or automatic monitoring at an interval of no more than 1 percent of the rated lifetime; it also added that the recorded failure time shall be determined as the midpoint of the last monitored interval. Section 6.5 of IES LM-65-1991 had only included a qualitative methodology for checking for lamp failure that required monitoring lifetime test racks on a regular basis. DOE has tentatively concluded that providing a specific interval for monitoring and recording failure time would not have a significant impact on the overall measured value of lifetime or increase test burden.

In addition to the previously mentioned updates, IES LM-65-14 provides recommendations and further guidance that remove a number of ambiguities in the previous version (e.g., updates to scope, instrumentation, and references). Because these proposed updates do not involve substantive changes to the test setup and methodology,

but rather just clarification, DOE has tentatively concluded they would not affect lamp failure measurements or pose additional testing burden.

DOE requests comments on its assessment of the updates in IES LM-65-14 and their impacts on measured values of MBCFLs and test burden.

2. Clarifications to General Test Conditions and Setup

DOE proposes to provide further clarification on general instructions for (1) instrumentation, (2) ambient temperature, (3) input voltage, (4) lamp orientation, (5) lamp seasoning, (6) lamp stabilization, (7) lifetime testing, (8) treatment of ballasted adapters, and (9) test setup for dimmable or multi-level lamps. These are clarifications to existing test methods and setup in Appendix W, and DOE has tentatively concluded that they would not impact measured values or increase test burden. DOE requests comment on the proposed clarifications to test methods and setup and the tentative conclusion that they would not have a significant impact on measured values or increase test burden. These clarifications on general instructions are discussed in detail in the following sections.

a. Instrumentation

Section 6.3 of IES LM-66-14 (proposed for incorporation by reference in this NOPR) and section 11.0 of IES LM-66-1991 state that a goniophotometer or integrating sphere can be used to measure lumen output, CCT, and CRI. While DOE recognizes that the integrating sphere and goniophotometer (a goniometer fitted with a photometer as the

light detector) are both valid means of photometric measurement, DOE is concerned about the potential for a difference in the measured values. The DOE test procedure must yield repeatable and reproducible results. If different parties use different test methods, the measured values may not be comparable.

IES LM-66-14 also identifies several sources of measurement error related to the use of goniophotometers such as drafts introduced through goniophotometer movement and errors in the scan angles. Further, IES LM-66-14 does not explicitly specify the scanning resolution (i.e., quantity and location of measurements around the lamp), and instead provides general guidance to prevent inaccuracies from irregular distributions. In contrast, use of an integrating sphere enables photometric characteristics of the CFL to be determined with a single measurement. For these reasons, DOE is proposing to require all photometric measurements, including lumen output, CCT, and CRI, to be carried out in an integrating sphere, rather than a goniophotometer system. Additionally, for lumen output measurements, DOE is proposing to also reference IESNA LM-78-07, which is referenced by IES LM-66-14 and provides more specific guidance on measuring lumen output in an integrated sphere. DOE requests comment on the proposal to require that all photometric values be measured by an integrating sphere.

b. Ambient Temperature

Section 4.3 of IES LM-66-14 (proposed for incorporation by reference in this NOPR) states that the ambient temperature during photometric and electrical testing must be maintained at 25 °C ± 1 °C unless the CFL is designed to perform optimally under

non-standard conditions. One such example noted in IES LM-66-14 is a CFL that is used in special fixtures or locations and therefore is designed to produce maximum lumen output at elevated temperatures. IES LM-66-14 indicates that testing at non-standard conditions may be desirable to quantify performance of the CFL in its expected operating environment. Similar requirements and allowance were given in IES LM-66-1991. However, DOE analysis of manufacturer-published product literature suggests that photometric and electrical testing of MBCFLs is typically conducted at the standard 25 °C ± 1 °C temperature conditions. DOE believes that allowing testing to be conducted at non-standard temperature conditions can introduce inconsistencies between represented values. DOE proposes to clarify in Appendix W that photometric and electrical testing of CFLs must be conducted at an ambient temperature within the range of 25 °C ± 1 °C. DOE requests comment on its proposal for ambient temperature requirements for photometric and electrical testing.

c. Input Voltage

Section 5.1.1 of IES LM-65-14 (proposed for incorporation by reference in this NOPR) specifies that when the rated input voltage of a lamp or ballast is a range, a nominal value should be selected for lifetime testing and reported as a test condition. This allowance for selecting from a choice of input voltages, rather than requiring a specific input voltage, could result in testing variation. DOE is therefore proposing to require that if rated input voltage is a range that includes 120 volts, the CFL must be operated at 120 volts. If the CFL with multiple rated input voltages is not rated for 120 volts, the CFL must be operated at the highest rated input voltage. Specifying the input voltage to be

used for testing will ensure more accurate and consistent measurements of time to failure (see section III.B.3.a). DOE requests comment on the proposed input voltage requirements.

d. Lamp Orientation

As noted in section III.B.1.b, DOE proposes to clarify that lamp orientation must be maintained throughout all testing, including preparation (e.g., seasoning and preburning), storage, and handling between tests. This practice minimizes changes in lamp operating characteristics between various stages of testing and allows for more accurate and repeatable measurements. Further, maintaining lamp orientation can result in a shorter lamp stabilization period, thus reducing total testing time and subsequently testing burden. DOE requests comment on specifying that lamp orientation must be maintained throughout testing.

e. Lamp Seasoning

DOE proposes that the seasoning guidance in IES LM-54-12 (proposed for incorporation by reference in this NOPR) must be followed prior to the testing of all CFLs. DOE also proposes to clarify two provisions related to lamp seasoning. First, DOE is proposing to clarify in Appendix W that unit operating time during seasoning can be counted toward time to failure, lumen maintenance at 40 percent of lifetime, and lumen maintenance at 1,000 hours if the required operating cycle and test conditions are satisfied as stated in the test method for time to failure (section 3.3 of Appendix W). This clarification is consistent with the specification in section 6.2.2.1 of IES LM-54-12 that

lamps intended to be tested for lifetime must be cycled during seasoning (see section III.B.1.b). Further, the clarification would reduce testing burden by minimizing the overall testing time required for measuring time to failure and lumen maintenance values.

The second provision related to seasoning that DOE proposes to clarify is that, if a lamp breaks, becomes defective, fails to stabilize, exhibits abnormal behavior such as swirling prior to the end of the seasoning period, or stops producing light, the lamp must be replaced with a new unit. If a lamp fails after the seasoning period, the lamp's measurements must be included when calculating values submitted for compliance. The IES standards relevant to these test procedures do not provide specific guidance on lamp failure. However, section 6.1.2 of ANSI C78.5-2003,[17] which provides specifications on integrated CFLs and is referenced by IES LM-65-14 (proposed for incorporation by reference in this NOPR), states that "If a specimen breaks or becomes defective for reasons not as a result of the testing, the specimen shall be discarded. Similarly if a unit fails to stabilize or exhibits abnormal behavior, the lamp shall be discarded. Testing shall resume with a suitable replacement specimen procured and prepared in the same manner as the original specimen. The use of replacement specimens shall be documented in the test report." Therefore, based on this industry guidance, DOE proposes to clarify that test units must be replaced if deemed defective during the seasoning period (i.e., prior to measuring initial lumen output). DOE requests comment on the proposed clarifications to the lamp seasoning methods.

[17] American National Standard For Electric Lamps: Specifications for Performance of Self-Ballasted Compact Fluorescent lamps (approved 2003).

f. Lamp Stabilization

DOE proposes to disallow the "peak" method provided for reference in Annex B of IES LM-66-14 (proposed for incorporation by reference in this NOPR), which can serve as a time saving alternative to the stabilization method specified in section 6.2.1. This method was also included in section 7.4 of IES LM-66-1991. However, IES LM-66-14 states that the information in the Annex is not intended to be a specific recommended procedure, but is presented as reference information; it also notes that the stabilized method specified in section 6.2.1 is preferred since considerable testing and experience with a given lamp design may be required due to the number of lamp design and process variations that exist. Consequently, DOE believes that the peak method could cause inconsistent and potentially inaccurate results. DOE requests comment on disallowing use of the peak method provided for reference in Annex B of IES LM-66-14.

g. Fixtures

IES LM-65-14 (proposed for incorporation by reference in this NOPR) contains an allowance for fixtures to be used in CFL lifetime testing. Section 4.5 of IES LM-65-14 notes that fixtures used in applications can influence CFL lifetime, and thus allows simulated fixtures to be used in lifetime testing to approximate this effect. No such allowance was provided in IES LM-65-1991. DOE is proposing to clarify in Appendix W that the use of simulated fixtures during time to failure testing of CFLs is not allowed. Excluding this provision removes potential variation in the testing of CFLs and ensures that all CFLs are tested in a consistent manner. DOE requests comment on its proposal to disallow the time to failure testing of CFLs in a fixture.

h. Ballasted Adapters

DOE proposes to further clarify the proposed CFL test procedures by defining in Appendix W that the term "ballasted adapter" means a ballast that is not permanently attached to a CFL, has no consumer-replaceable components, and serves as an adapter by incorporating both a lamp socket and a lamp base. DOE proposes to specify in Appendix W that CFLs packaged with or designed exclusively for use with ballasted adapters must be tested as non-integrated CFLs, without the inclusion of the ballasted adapter. DOE requests comment on its proposed definition for the term "ballasted adapter," and on its proposed requirement that CFLs packaged with or designed exclusively for use with ballasted adapters must be tested as non-integrated CFLs.

i. Multi-Level CFLs and Dimmable CFLs

Footnote 2 to the energy conservation standards table at 10 CFR 430.32(u) includes the statement that for multi-level or dimmable systems, measurements shall be at the highest setting. To consolidate text pertaining to testing, DOE proposes to remove this text from §430.32(u), and address dimmable CFLs in the general instructions section of Appendix W. The lumen output level, and subsequently input power, can be adjusted for some CFLs (e.g., dimmable), and thus not clarifying the input power for testing these lamps can introduce testing variation. Therefore, to ensure consistent results, DOE also proposes to clarify in Appendix W that a dimmer cannot be used in the circuit. DOE requests comment on the clarification that all CFL testing must be conducted at labeled wattage, with no dimmer used in the circuit.

3. Clarifications to Definitions

DOE proposes to make the following changes to the definitions provided in Appendix W: (1) remove the existing term "average rated life" and add new terms "lifetime" and "time to failure"; (2) remove the existing terms "initial performance values" and "rated luminous flux or rated lumen output" and add new terms "initial lamp efficacy," "measured initial input power," and "measured initial lumen output"; (3) remove the existing term "rated wattage" and add the new term "labeled wattage"; (4) amend the existing definition for the term "lumen maintenance"; (5) delete the existing term "rated supply frequency"; and (6) remove the existing term "self-ballasted compact fluorescent lamp" and add new terms "integrated compact fluorescent lamp" and "non-integrated compact fluorescent lamp." Because the proposed changes are clarifications to existing definitions and only provide further guidance for existing test procedures and amended test procedures proposed in this NOPR, DOE has tentatively concluded that they would not impact measured values or increase test burden. DOE requests comment on the proposed changes to definitions in Appendix W and the tentative conclusion that they would not have a significant impact on measured values or test burden. These definitional clarifications are discussed in detail in the following sections.

DOE also proposes to add definitions that are discussed in later sections. Specifically, DOE proposes to add definitions in Appendix W for the terms "ballasted adapter," "hybrid compact fluorescent lamp," "percent variability," "power factor," "start plateau," and "start time." These definitions support the proposed test procedures

included in Appendix W for new CFL metrics and new CFL categories, and are addressed in sections III.B.2.h (ballasted adapter), III.B.4.a (power factor), III.B.4.c (percent variability, start plateau, and start time), and III.B.5.c (hybrid compact fluorescent lamp).

a. Average Rated Life

DOE proposes to remove the term "average rated life" and adopt the terms "lifetime of a compact fluorescent lamp" and "time to failure." Currently, "average rated life" is defined in Appendix W as the length of time declared by the manufacturer at which 50 percent of any large number of units of a lamp reaches the end of their individual lives.

The definition of "average rated life" makes only general reference to the sample size for time to failure testing (i.e., large number of units) when an actual minimum sample size of 10 units is prescribed in DOE's existing sampling plan at 10 CFR 429.35. Further, DOE believes the use of the word "average" in the term "average rated life" may be confusing because the definition describes the process by which lifetime is determined, i.e., lifetime is, by definition, a median value. DOE also notes that the term "average rated life," while defined in Appendix W, is not otherwise used in Appendix W or in specifications of existing MBCFL energy conservation standards. Further, the term "rated life" is used as a descriptor in Appendix W but is not defined.

Therefore, DOE proposes to remove the terms "average rated life" and "rated life" in Appendix W and add definitions for "lifetime of a compact fluorescent lamp" in 10 CFR 430.2 and "time to failure" in Appendix W. The term "lifetime of a compact fluorescent lamp" denotes a measured value based on a sample of lamps; this term would provide sampling requirements and specify that the median value must be used. The term "time to failure" would support the revised definition of lifetime.

In order to develop the definition for "lifetime of a compact fluorescent lamp," DOE reviewed the EPCA definition of lifetime in 42 U.S.C. 6291(30)(P). This statutory definition states that lifetime means the length of operating time of a statistically large group of lamps between first use and failure of 50 percent of the group in accordance with test procedures described in the IES Lighting Handbook–Reference Volume. Therefore, consistent with the statutory definition in EPCA, DOE proposes to define "lifetime of a compact fluorescent lamp" as the time to failure of 50 percent of the sample size (as defined and calculated in 10 CFR 429.35) in accordance with the test procedures described in of section 3.3 of Appendix W.

DOE also proposes to define "time to failure" in Appendix W to support the proposed definition of lifetime of a compact fluorescent lamp. "Time to failure" in the context of CFLs is the time elapsed between first use and the point at which the lamp fully extinguishes and no longer creates light. DOE proposes to define "time to failure" as the time elapsed between first use and the point at which the CFL stops operating. This

definition aligns with the definition of lamp failure in section 8.2 of ANSI/IES RP-16-14.[18]

As noted in section III.B.1.c, DOE proposes to reference IES LM-65-14 for lifetime testing of CFLs. Section 3.0 of IES LM-65-14 specifies the terms "lamp failure," "lamp life," and "rated lamp life." However, DOE is specifically proposing the above terms, "time to failure" and "lifetime of compact fluorescent lamp" to support its proposed lifetime testing of CFLs and align with terminology used in other lamp test procedures. While the definitions in section 3.0 of IES LM-65-14 are not incorrect, to avoid confusion regarding terminology when executing the lifetime test procedure for CFLs, DOE proposes that section 3.0 of IES LM-65-14 be disregarded and the above proposed definitions be used for lifetime testing of CFLs.

DOE requests comment on the proposal to remove the term "average rated life" and add definitions of "lifetime of a compact fluorescent lamp" and "time to failure."

b. Initial Performance Values

Currently, "initial performance values" is defined in Appendix W as the photometric and electrical characteristics of the lamp at the end of 100 hours of operation. Such values include the initial efficacy, the rated luminous flux, and the rated lumen output. This term is not used, and conflicts with elements of other terms defined in section 2 of the existing Appendix W. To resolve these issues, and to provide specific

[18] Nomenclature and Definitions for Illuminating Engineering (approved 2010).

guidance on calculations required in the test procedures, DOE proposes to (1) delete the term "initial performance values"; (2) add a definition for the term "initial lamp efficacy"; (3) add a definition for the term "measured initial input power"; (4) delete the term "rated luminous flux or rated lumen output"; and (5) add a definition for the term "measured initial lumen output."

DOE proposes that the "initial lamp efficacy" is the lamp efficacy at the end of the seasoning period, which is calculated by dividing the measured initial lumen output of a lamp by its measured initial input power. Initial lamp efficacy would be expressed in lumens per watt (lm/W). In addition, DOE proposes to define "measured initial input power" as the root mean square (RMS) input power to the lamp, measured at the end of the lamp seasoning period, and expressed in watts (W). These definitions provide further guidance on the calculation of initial lamp efficacy.

DOE proposes to delete the term "rated luminous flux or rated lumen output" in Appendix W. This term is defined in Appendix W as the initial lumen rating (100 hour) declared by the manufacturer, which consists of the lumen rating of a lamp at the end of 100 hours of operation. This term could be misinterpreted as a nominal rating, similar to other nominal ratings marked on a lamp and/or its packaging (e.g., wattage, voltage, or supply frequency). Therefore, to provide greater clarity in the definition and application of the term "lumen maintenance," DOE proposes to remove the term "rated luminous flux or rated lumen output" and add the term "measured initial lumen output" to more clearly distinguish measured initial values from nominal rated values.

DOE proposes to define "measured initial lumen output" in Appendix W as the lumen output of the lamp measured at the end of the lamp seasoning period, expressed in lumens (lm).

In summary, DOE proposes to no longer define the terms "initial performance values" and "rated luminous flux or rated lumen output," and proposes definitions for "initial lamp efficacy," "measured initial input power," and "measured initial lumen output." These terms clarify the measurements of CFL initial performance values, and eliminate the need for the terms "initial performance values" and "rated luminous flux or rated lumen output." DOE requests comment on deletion of the terms "initial performance values" and "rated luminous flux or rated lumen output," and addition of the terms "initial lamp efficacy," "measured initial input power," and "measured initial lumen output."

c. Lumen Maintenance

DOE proposes to amend the definition of the term "lumen maintenance" to clarify that calculated lumen maintenance values are based on measured lumen output. "Lumen maintenance" is defined in Appendix W as the luminous flux or lumen output at a given time in the life of the lamp and expressed as a percentage of the rated luminous flux or rated lumen output, respectively.

The term "lumen maintenance" does not clearly distinguish between rated and measured values. As noted in section III.B.3.b, DOE proposes to remove the term "rated luminous flux or rated lumen output" and add the term "measured initial lumen output," which clearly specifies these to be measured values. DOE proposes to implement this change in the term "lumen maintenance" to clarify the definition and application of the term "lumen maintenance."

In summary, DOE proposes to define "lumen maintenance" in Appendix W as the lumen output measured at a given time in the life of the lamp and expressed as a percentage of the measured initial lumen output, respectively. DOE requests comment on its proposed clarification of the definition for "lumen maintenance."

d. Rated Supply Frequency

DOE proposes to remove from Appendix W the definition of the term "rated supply frequency" because Appendix W does not use this term. DOE requests comment on the proposed removal of the definition of "rated supply frequency."

e. Rated Wattage

DOE proposes to change the term "rated wattage" to "labeled wattage" and amend the definition to clarify its applicability to multi-level (i.e., multi-power) and dimmable CFLs. Currently, in Appendix W "rated wattage" is defined as the wattage marked on the lamp. The term is intended to denote the wattage marked on the lamp that should be used to determine the applicable minimum efficacy requirement for existing

MBCFL energy conservation standards as specified in 10 CFR 430.32(u). To avoid confusion with different usage of the term "rated wattage" in ANSI standards for non-integrated CFLs, DOE proposes to use the term "labeled wattage" rather than "rated wattage" to denote the wattage marked on a CFL.

Further, as discussed in section III.B.2.i, multi-level and dimmable CFLs can operate over a range of wattages, and the existing MBCFL energy conservation standards at 10 CFR 430.32(u) as well as the test procedures proposed in this rule prescribe that measurements be conducted at the lamp's highest power setting. The current definition of "rated wattage" does not provide clear direction on how to measure multi-level and dimmable lamps. Therefore, DOE proposes to remove this definition and define "labeled wattage" as the highest wattage marked on the lamp and/or lamp packaging. DOE requests comment on the proposed clarification to the definition of "labeled wattage."

f. Self-Ballasted Compact Fluorescent Lamp

The term "self-ballasted compact fluorescent lamp" is defined in Appendix W as a CFL unit that incorporates, permanently enclosed, all elements that are necessary for the starting and stable operation of the lamp, and does not include any replaceable or interchangeable parts. The terms self-ballasted CFL, integrally ballasted CFL, and integrated CFL are used interchangeably in industry to identify a CFL in which all the elements for starting and stable operation are permanently enclosed within the lamp structure, enabling the lamp to be connected directly to a branch circuit through an ANSI base and socket.

DOE proposes to remove the definition of "self-ballasted compact fluorescent lamp" and add a new definition of "integrated compact fluorescent lamp" as an integrally ballasted CFL that contains all components necessary for the starting and stable operation of the lamp, does not include any replaceable or interchangeable parts, and is connected directly to a branch circuit through an ANSI base and corresponding ANSI standard lamp-holder (socket).

To support the proposed test procedures for additional categories of CFLs, DOE also proposes to define the term "non-integrated compact fluorescent lamp" in Appendix W as a CFL that is not integrated. DOE requests comment on the proposed removal of the term "self-ballasted compact fluorescent lamp" and addition of the new term "integrated compact fluorescent lamp," and on the proposed new definition of "non-integrated compact fluorescent lamp."

4. Test Procedures for Existing and New Metrics

The following sections detail proposed new and amended test procedures for new and existing metrics. In addition, as noted in sections III.I.1 through III.I.3, DOE proposes to move all lamp orientation specifications from 10 CFR 429.35 to Appendix W in order to consolidate test requirements.

a. Test Procedures for Initial Lamp Efficacy, Lumen Maintenance, CCT, CRI, and Power Factor

DOE proposes to continue to include test procedures for measuring initial lamp efficacy and lumen maintenance in Appendix W. In addition, DOE proposes to include test procedures for measuring CCT, CRI, and power factor in Appendix W. DOE proposes that test conditions and setup for measuring initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of lifetime, CCT, CRI, and power factor be as specified in IES LM-66-14 (proposed for incorporation by reference in this NOPR).

Appendix W currently does not explicitly state how initial lamp efficacy and lumen maintenance values should be measured and calculated. DOE proposes to clarify its existing method for measuring and calculating the initial lamp efficacy and lumen maintenance values in Appendix W. Specifically, DOE proposes to state in Appendix W that initial lamp efficacy must be the measured initial lumen output divided by the measured initial input power; lumen maintenance at 1,000 hours must be the measured lumen output at 1,000 hours divided by the measured initial lumen output; and lumen maintenance at 40 percent of lifetime must be the measured lumen output at 40 percent of lifetime of a compact fluorescent lamp divided by the measured initial lumen output. DOE requests comment on clarifications to measuring initial lamp efficacy and lumen maintenance values.

DOE proposes that the test procedures for initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of lifetime, CCT, and CRI apply to integrated and non-integrated lamps. DOE proposes that the test procedure for power factor only apply to integrated lamps. The following sections discuss in more detail the new metrics proposed to be measured in accordance with IES LM-66-14: CCT, CRI, and power factor.

Correlated Color Temperature (CCT)

DOE proposes to establish a test procedure for measuring CCT in Appendix W. The term correlated color temperature is defined in 10 CFR 430.2 as the absolute temperature of a blackbody whose chromaticity most nearly resembles that of the light source. DOE proposes to add the abbreviation "CCT" to this definition as explained in section III.C.2.

DOE proposes that CCT must be measured and calculated in accordance with IES LM-66-14, which references CIE 15:2004 (3rd edition), "Colorimetry." As noted, IES LM-66-14 is the industry reference test method for electrical and photometric measurements of CFLs. CIE 15:2004 is an internationally accepted industry standard that provides recommendations concerning basic colorimetry. CIE 15:2004 was previously incorporated by reference in a test procedure final rule published on July 6, 2009 for general service fluorescent lamps, incandescent reflector lamps, and general service incandescent lamps (hereafter "2009 GSFL, IRL, and GSIL Test Procedure"). 74 FR 31829, 31834 (July 6, 2009). DOE proposes in this NOPR to incorporate CIE

15:2004 by reference for Appendix W. DOE requests comment on its proposed test procedure for measuring CCT.

Color Rendering Index (CRI)

DOE proposes to establish a test procedure for measuring CRI in Appendix W. The term color rendering index or "CRI" is defined 10 CFR 430.2 as the measured degree of color shift objects undergo when illuminated by a light source as compared with the color of those same objects when illuminated by a reference source of comparable color temperature. DOE proposes that CRI must be measured and calculated in accordance with IES LM-66-14, which references CIE 13.3-1995, "Method of Measuring and Specifying Colour Rendering Properties of Light Sources." As noted, IES LM-66-14 is the industry reference test method for the electrical and photometric measurements of CFLs, and CIE 13.3-1995 is an internationally accepted industry standard that provides guidance on measuring CRI. CIE 13.3-1995 was previously incorporated by reference in the 2009 GSFL, IRL, and GSIL Test Procedure. 74 FR 31834 (July 6, 2009). DOE proposes in this NOPR to incorporate CIE 13.3-1995 by reference for Appendix W. DOE requests comment on the proposed test procedure for CRI.

Power Factor

DOE proposes to establish a test procedure for measuring power factor in Appendix W. Currently, DOE does not define power factor for CFLs. DOE proposes to define the term "power factor" in Appendix W as the measured RMS input power (watts) divided by the product of the measured RMS input voltage (volts) and the measured RMS

input current (amps). This proposed definition aligns with the definition for power factor in the industry reference for power quality requirements of lighting equipment, ANSI C82.77-10-2014.[19] Section 5 of the ANSI standard states that power factor is calculated by dividing input power (expressed in watts) by the product of the RMS input voltage and current.

DOE proposes that power factor be required only for integrated CFLs. Power factor is a metric directly related to the ballast component of the lamp. Non-integrated CFLs are tested on reference ballasts (see section III.B.5.b for further details) and can be paired with multiple ballasts of varying performance in practice, and therefore, a measurement of a power factor would not be an accurate representation of an non-integrated CFL. DOE proposes that the power factor of an integrated CFL be determined based on electrical measurements conducted in accordance with section 5.0 of IES LM-66-14. DOE requests comment on the proposed definition and test procedure for power factor.

b. Test Procedures for Time to Failure and Rapid Cycle Stress

DOE proposes to include test procedures for measuring time to failure and conducting rapid cycle stress testing in Appendix W for integrated and non-integrated CFLs. DOE proposes that test conditions, setup, measurement of time to failure, and rapid cycle stress testing be as specified in IES LM-65-14 (proposed for incorporation by reference in this NOPR). As noted in section III.G.4 and III.G.5, respectively, DOE

[19] American National Standard for Lighting Equipment - Harmonic Emission Limits - Related Power Quality Requirements (approved August 15, 2014)

proposes to move text relating to rapid cycle stress testing and measurement of lifetime from 10 CFR 430.32(u) into Appendix W. DOE proposes to retain its existing operating cycle for rapid cycle stress testing, i.e., that CFLs must be cycled continuously with each cycle consisting of one 5-minute on period followed by one 5-minute off period. DOE requests comment on the proposed test procedures for measuring time to failure and rapid cycle stress testing.

c. Test Procedure for Start Time

DOE proposes to establish a test procedure for measuring start time in Appendix W. Currently, DOE does not define start time for CFLs. In determining the definition and test procedure for start time of a CFL, DOE reviewed the August 2013 "ENERGY STAR® Program Requirements Product Specification for Lamps Version 1.0: Start Time Test Method"[20] (hereafter "ENERGY STAR Start Time Test Method"), which still applies to the current ENERGY STAR Lamps Specification v1.1. DOE found the definitions and test methods described to be valid and an accurate representation of the start time for a CFL. Based on this method, DOE proposes to define the term "start time" in Appendix W as the time, measured in milliseconds, between the application of power to the CFL and the point when the measured full-cycle lumen output (the average value of the sampled waveform over an interval corresponding to one full cycle of sinusoidal input voltage) reaches 98 percent of the average measured lumen output of the start plateau.

[20] ENERGY STAR® Program Requirements Product Specification for Lamps Version 1.0: Start Time Test Method, August 2013. www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Lamps%20V1%200%20Final%20Test%20Methods%20and%20Recommended%20Practices.pdf

IES LM-28-12,[21] the general guide to using electrical instruments in photometric laboratories, states that fluorescent lamps can oscillate at twice the fundamental frequency of the lamp input (i.e., line) voltage. IES LM-28-12 also recommends that a minimum of one complete cycle (not half cycle) of the line frequency be used because the waveform may not be exactly the same for the positive and negative phase of the line cycle. DOE understands that using shorter cycles such as half cycles in lamps with such asymmetry could result in inaccurate measurements.

To further clarify the definition of start time, DOE proposes to define the terms "start plateau" and "percent variability." in Appendix W. DOE proposes to define the term "start plateau" in Appendix W as the first 100 millisecond period of operation during which the percent variability does not exceed 5 percent and the average measured lumen output is at least 10 percent of the measured initial lumen output. Section 9.1 of the ENERGY STAR Start Time Test Method gives the starting profile for an example CFL. No sinusoidal oscillation is evident in the blue trace of light output for this example; consequently, DOE understands the diagram presents moving-average values, where each point along the trace is the average of sampled waveform values for some measurement interval. No scale is provided for the x-axis in the figure, but the period of the 50 Hz input voltage cycle is 20 milliseconds, and a start time of 18 milliseconds is also indicated at 98 percent of the "initial" plateau; although the plateau duration is not indicated, it can be seen to persist for at least three power cycles, or 60 milliseconds.

[21] IES Guide for Selection, Care and Use of Electrical Instruments in the Photometric Laboratory (approved December 5, 2012).

DOE proposes using a period of 100 milliseconds to calculate percent variability for determination of the start plateau; DOE selected this value to evenly capture either 5 or 6 full cycles of the sampled waveform (for 50 or 60 Hz input voltage, respectively). DOE additionally proposes using the term "start plateau" in lieu of the ENERGY STAR term "initial plateau" to avoid confusion between startup characteristics and initial performance characteristics.

DOE proposes to add the term "percent variability" in Appendix W, defined as the range (calculated by subtracting the minimum from the maximum) expressed as a percentage of the mean for the contiguous set of separate lumen output measurements spanning the specified time period, where each lumen output measurement is the average value of the sampled waveform over an interval corresponding to one full cycle of sinusoidal input voltage. For example, 5 measurements at 20 millisecond intervals would span the 100 millisecond period of the start plateau at 50 Hz input voltage; if the interval average was 10.0 lumens for each of the first four measurements and 12.0 lumens for the fifth measurement, then the percent variability would be 19 percent (not yet sufficiently stable) for the first 100 millisecond period of operation. In this way, definition of the term "percent variability" enables determination of the start plateau. The 5 percent and 10 percent thresholds proposed for percent variability in the proposed start time definition were determined based on start time testing conducted by DOE for a variety of CFLs; a summary of the testing and results can be found in the docket for this rulemaking.

DOE proposes that start time only be measured for integrated CFLs. Start time is a metric directly related to the ballast component of the lamp and therefore could vary depending on the ballast used in practice. For test setup and conditions for measuring start time, DOE proposes to reference IES LM-66-14. As noted, IES LM-66-14 is the industry reference test method for the electrical and photometric measurements of CFLs. DOE proposes to adopt the measurement circuit requirements specified in section 5.2 of IES LM-66-14 for start time testing of integrated CFLs. DOE proposes that after seasoning, units must be stored at 25 °C ± 5 °C ambient temperature for a minimum of 16 hours prior to testing, after which the ambient temperature must be 25 °C ± 1 °C for a minimum of 2 hours prior to testing. To further align with ENERGY STAR requirements, DOE also proposes that any units that have been off for more than 24 hours must be operated for 3 hours and then be turned off for 16 to 24 hours prior to testing.

DOE proposes that lumen output measurements be taken as specified in section 6.3.1 of IES LM-66-14. DOE proposes that a multichannel oscilloscope with data storage capability be connected to record the input voltage to the CFL and its lumen output. DOE proposes that the power supply must be set as proposed in section III.B.2.c, and the oscilloscope must be set to trigger at 10 volts lamp input voltage. DOE proposes that the oscilloscope vertical scale be set such that vertical resolution is 1 percent of measured initial lumen output or finer. Similarly, DOE proposes that the oscilloscope be set to sample the lumen output waveform at a minimum rate of 2 kHz. ENERGY STAR

requires a minimum 2 kHz sampling rate for flicker testing,[22] and DOE understands that this requirement would also provide sufficient horizontal resolution for start time testing. DOE proposes that upon trigger for start time testing, the sampled lumen output waveform must be recorded until the measured lumen output has reached the start plateau. In addition, DOE proposes that the trace of full-cycle lumen output be calculated as a moving average, whereby values are determined at least once every millisecond and each value represents the full-cycle interval in which it is centered.

As specified in the proposed definition, the start time is then determined as the time in milliseconds to reach 98 percent of the average measured lumen output of the start plateau. DOE requests comment on the proposed test procedure for start time and the proposed definitions for the terms "start time," "start plateau," and "percent variability." DOE also requests comment on the summary of start time testing and results that can be found in the docket for this rulemaking.

5. Test Procedures for New CFL Categories

a. Test Procedures for Integrated CFLs

DOE proposes to specify test procedures to measure the applicable metrics for integrated CFLs. As noted in section II, DOE is considering revising and/or developing standards in the ongoing GSL standards rulemaking for integrated CFLs including but not limited to MBCFLs. The definition of "integrated compact fluorescent lamp" that DOE is

[22] ENERGY STAR® Program Requirements Product Specification for Lamps Version 1.0—Light Source Flicker Recommended Practice. August 2013. Washington, DC. www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Lamps%20V1%200%20Final%20Test%20Methods%20and%20Recommended%20Practices.pdf

proposing in Appendix W (see section III.B.3.f) does not specify base type. Therefore, the test procedures proposed in Appendix W for integrated CFLs will apply to all integrated CFLs, including MBCFLs. DOE requests comment on its proposal that integrated CFLs with medium screw bases and other base types are to follow the same test procedures.

b. Test Procedures for Non-Integrated CFLs

DOE proposes to specify test procedures for metrics applicable to non-integrated CFLs in Appendix W. As noted in section III.B.4.a, DOE proposes to adopt the measurement circuit requirements specified in section 5.2 of IES LM-66-14 (proposed for incorporation by reference in this NOPR) for electrical and photometric testing of non-integrated CFLs. Further, DOE proposes that non-integrated CFLs must be tested using the appropriate reference ballasts as specified in section 5.2 of IES LM-66-14. Specifically, DOE proposes that reference ballasts specifications listed in ANSI_IEC C78.901-2014, "American National Standard for Electric Lamps—Single-Based Fluorescent Lamps—Dimensional and Electrical Characteristics," (hereafter "ANSI_IEC C78.901-2014") must be used. Therefore, DOE proposes to incorporate by reference ANSI_IEC C78.901-2014. DOE requests comment on its proposed requirement that non-integrated CFLs be tested using reference ballasts that meet ANSI_IEC C78.901-2014 specifications, except as noted.

DOE is aware that certain non-integrated CFL designs do not have reference ballast specifications listed in ANSI_IEC C78.901-2014. For these lamp designs, DOE

has provided reference ballast specifications in Appendix W to reduce testing variation. In cases where there are no reference ballast specifications for a lower wattage CFL, DOE specified the reference ballast specifications of the corresponding full wattage version, if they existed. For all other cases, DOE developed specifications by matching the shape, diameter, and base of the CFL without reference ballast specifications to the most similar CFL with specifications that also had the closest wattage. DOE also proposes that manufacturers employ these two principles to apply the appropriate reference ballast specifications where none are provided in ANSI_IEC C78.901-2014 or specified in Appendix W. DOE requests comment on its proposed requirement that if not listed in ANSI_IEC C78.901-2014 or Appendix W, reference ballast specifications must be based on existing reference ballast specifications for the most similar lamp in ANSI_IEC C78.901-2014 or for the higher wattage lamp it is intended to replace.

To reduce testing variation in Appendix W, DOE also proposes several clarifications and specifications. Some non-integrated CFLs can be operated on more than one type of circuit. DOE proposes to specify that when non-integrated CFLs can be operated on a low frequency or high frequency circuit, they are to be tested at low frequency. DOE has found that lamp efficacy can vary depending on if the lamp is operated at high frequency or low frequency. DOE therefore proposes that non-integrated CFLs are to be tested at low frequency to ensure consistency and comparability across testing results. DOE requests comment on the proposed requirement that non-integrated CFLs are to be tested at low frequency when a choice is available between low and high frequency reference ballast specifications.

In addition, DOE proposes that non-integrated CFLs rated for multiple circuit types (e.g., preheat or rapid start, instant start or rapid start) must be tested on rapid start circuits when possible to ensure consistent measurements. DOE has found that lamp efficacy can vary depending on the circuit type for testing. Therefore, DOE proposes that non-integrated CFLs that are rated for operation on a choice of preheat or rapid start circuits must be tested on rapid start circuits. Similarly, DOE proposes that non-integrated CFLs that are rated for operation on a choice of instant start or rapid start circuits must be tested on rapid start circuits. DOE requests comment on its proposal that non-integrated CFLs be tested on a rapid start circuit if rated for operation on (a) a choice of instant start or rapid start circuits, or (b) a choice of preheat or rapid start circuits.

c. Test Procedures for Hybrid CFLs

DOE proposes to establish a test procedure to measure the applicable metrics for hybrid CFLs in Appendix W. DOE considers hybrid CFLs to be CFLs with an additional light source of a different technology that is not the primary source of light. DOE proposes to define the term "hybrid compact fluorescent lamp" in Appendix W as a CFL that incorporates one or more supplemental light sources of different technology. While DOE has only identified hybrid CFLs that are integrated, based on this definition a hybrid CFL could be either an integrated or non-integrated CFL.

For hybrid CFLs capable of operation with both the fluorescent and supplemental light sources turned on, DOE considered proposing to apply a weighting of 7 percent to

the efficacy of the lamp with both light sources on, and a weighting of 93 percent to the efficacy of the lamp with only the fluorescent light source on. DOE developed this weighting using the estimated average daily operating hours estimated for CFLs in the residential sector (1.9 hours),[23] the estimated average number of times a CFL is turned on per day (4 times),[24] and an estimated operation period of the supplemental light source of certain hybrid CFLs each time the hybrid CFL is turned on (120 seconds). The efficacy of the hybrid CFL would then be the sum of the weighted efficacy measured with both the fluorescent and supplementary light sources on, and the weighted efficacy measured with only the fluorescent light source on. However, DOE believes some hybrid CFLs might not fully stabilize when both the fluorescent and supplementary light sources are on, possibly presenting challenges in terms of measurement repeatability. Additionally, DOE has found at least one configuration where it may not be possible to turn on only the fluorescent light source. Therefore, DOE determined that the approach described above may not produce accurate and repeatable measurements for a majority of hybrid CFLs, and decided not to propose this methodology for testing hybrid CFLs.

Instead, DOE proposes that hybrid CFLs must be tested with all supplemental light sources turned off, if possible, and that the lamp must be stabilized in the operating mode that corresponds to its labeled wattage, according to test procedures proposed for

[23] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, Solid-State Lighting Program. Residential Lighting End-Use Consumption Study: Estimation Framework and Initial Estimates. December 2012. Washington, D.C. http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2012_residential-lighting-study.pdf

[24] Jump, C. et al. Welcome to the Dark Side: The Effect of Switching on CFL Measure Life. ACEEE 2008 Summer Study on Energy Efficiency in Buildings. 2008. Asilomar, CA, August 17-22. American Council for an Energy-Efficient Economy. www.eceee.org/library/conference_proceedings/ACEEE_buildings/2008/Panel_2/2_111/paper

CFLs in Appendix W. DOE has tentatively determined that this is the most consistent manner in which the required metrics for hybrid CFLs can be measured. DOE requests comment on the proposed definition of hybrid CFLs and to test hybrid CFLs according to test procedures for non-hybrid CFLs.

6. Test Procedure for Standby Mode Power

DOE proposes to establish a test procedure to measure standby mode power for CFLs, where applicable, in Appendix W. EPCA directs DOE to amend its test procedures for all covered products to incorporate a measure of standby and off mode energy consumption in accordance with IEC 62301 and IEC 62087, if technically feasible. (42 U.S.C. 6295(gg)(2)) EPCA defines the three modes that consumer products can be in as: (1) active mode, (2) standby mode, and (3) off mode. (42 U.S.C. 6295(gg)(1)) DOE incorporated EPCA's definitions for active, standby, and off modes into 10 CFR 430.2.

Active mode is defined as the condition in which an energy-using product is connected to a main power source, has been activated, and provides one or more main functions. Standby mode is defined as the condition in which an energy using product is connected to a main power source and offers one or more of the following user-oriented or protective functions: (1) to facilitate the activation or deactivation of other functions (including active mode) by remote switch (including remote control), internal sensor, or timer; or (2) continuous functions, including information or status displays (including clocks) or sensor-based functions. Off mode is defined as the condition in which an

energy using product is connected to a main power source and is not providing any standby or active mode function.

DOE research indicates that there are integrated CFLs incorporating either wireless controls or photocells integral to integrated CFLs. DOE did not find non-integrated CFLs that are capable of standby mode operation. Certain ballasts associated with a non-integrated lamp may be capable of a standby mode. However, this proposed test procedure covers performance of the lamp and not the lamp-and-ballast system. In addition, the controls and power requirements associated with the standby mode would be found in the ballast and not the non-integrated lamp itself. In conclusion, DOE has tentatively determined that integrated CFLs can operate in standby mode but not off mode, and non-integrated CFLs cannot operate in either standby or off mode. Consistent with EPCA's requirements in 42 U.S.C. 6295(gg)(2), DOE proposes in this NOPR to include standby mode power in its test procedures for integrated CFLs.

DOE also proposes that standby mode power for integrated CFLs be measured in accordance with IEC 62301. Therefore, DOE proposes to approve IEC 62301, which is already incorporated by reference in 10 CFR 430.3, for Appendix W. DOE proposes that the test conditions and setup be as prescribed in IEC 62301, except for ambient temperature and ambient airflow. DOE proposes instead to prescribe the ambient temperature and ambient airflow requirements in IES LM-66-14 (proposed for incorporation by reference in this NOPR), to minimize differences between test procedures for active mode and standby mode. DOE also proposes to season lamps in the

same manner as for the other proposed test procedures, as described in section III.B.2.e. DOE notes that the method of measuring standby mode power consumption prescribed in section 5 of IEC 62301 is to be followed for the testing of standby mode power. Standby mode must be initiated when the CFL is connected to the power supply and lumen output is set to zero via remote or other wireless/sensor control, prior to taking measurements. DOE requests comment on its proposed test procedure for standby mode power of integrated CFLs, and on its proposal to season lamps according to requirements in the proposed active mode test procedures prior to taking measurements. DOE also requests comment on its assessment that integrated CFLs can operate in standby mode but not off mode, and that non-integrated CFLs cannot operate in either standby or off mode.

7. Rounding Values

DOE proposes to amend certain rounding requirements for existing metrics. Section 3 of the existing Appendix W specifies rounding of values; rounding requirements for individual units in a given test sample are inconsistent with rounding requirements for the test sample as a whole. Measurements are recorded at the resolution of the test instrumentation and calculations to the same number of significant digits as the previous step. While final values for initial efficacy must be rounded to one decimal place, final values for lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of rated life, rapid cycle stress test surviving units, and lifetime must be rounded to whole numbers. However, existing standards for lumen maintenance at 1,000 hours (90.0 percent) and lumen maintenance at 40 percent of lifetime (80.0 percent) are at one decimal place precision in 10 CFR 430.32(u).

DOE proposes to specify rounding requirements for represented values in 10 CFR 429.35. Further, DOE proposes to revise the rounding requirements for lumen maintenance at 1,000 hours and lumen maintenance at 40 percent of lifetime to be to the nearest tenth, and for rapid cycle stress test surviving units to be to the nearest whole number, to align with existing standards for these metrics. DOE proposes to specify that lifetime of a compact fluorescent lamp be rounded to the nearest hour.

Additionally, DOE proposes rounding requirements for new metrics, also to be specified in 10 CFR 429.35. Based on a review of manufacturer catalogs, DOE proposes that CRI be rounded to the nearest whole number, CCT to the nearest 100 kelvins (K), and power factor to the nearest hundredth. These rounding requirements are consistent with other lighting technologies. DOE also proposes that the represented value of start time be rounded to the nearest whole number in milliseconds based on the requirements specified in ENERGY STAR Lamps Specification v1.1 and the ENERGY STAR Start Time Test Method. DOE confirmed the rounding requirement for start time was reasonable based on the precision of commercially available equipment. For standby mode power, DOE proposes rounding to the nearest tenth of a watt, as it believes this to be an achievable level of accuracy.

DOE requests comment on its proposed rounding requirements for metrics.

C. Amendments to Definitions at 10 CFR 430.2

DOE proposes to revise the definition in 10 CFR 430.2 for the existing term "correlated color temperature," and to create a definition for the term "compact fluorescent lamp." The following sections detail these proposed changes. DOE is also proposing a definition for "lifetime of a compact fluorescent lamp" (see section III.B.3.a. for further details) in 10 CFR 430.2. DOE also expects to propose amendments to the term "basic model" to include CFLs, but has tentatively determined that these amendments should be proposed as part of the GSL standards rulemaking, to align the product-specific definition of "basic model" with any additional metrics proposed in that rulemaking.

1. Compact Fluorescent Lamp

DOE proposes to add the term "compact fluorescent lamp" at 10 CFR 430.2. While the term "compact fluorescent lamp" is currently referenced in the EPCA and DOE definitions of "general service lamp," "medium base compact fluorescent lamp," and "self-ballasted compact fluorescent lamp," compact fluorescent lamp is not itself defined either in EPCA or by DOE. As discussed in section III.B.5, DOE is proposing test procedures for CFLs including both non-integrated and integrated CFLs. Therefore, in this NOPR, DOE proposes a definition for "compact fluorescent lamp."

DOE reviewed its definitions for other lighting products and considered the existing definition of the term "fluorescent lamp" as a basis for its proposed definition of "compact fluorescent lamp." DOE defines a fluorescent lamp as a low pressure mercury

electric-discharge source in which a fluorescing coating transforms some of the ultraviolet energy generated by the mercury discharge into light, and explicitly limits the definition to six specific categories of double-based linear fluorescent lamps. 10 CFR 430.2 In comparison, DOE's existing definition of the term "medium base compact fluorescent lamp" does not describe the lamp's operating principles, but rather its physical characteristics (integrated, medium screw base), rated input voltage range (115−130 V), intended application, and lamp designs excluded from the definition. DOE believes a more general CFL definition, similar to DOE's definition of the term "fluorescent lamp," is the most suitable to support DOE's coverage of additional CFL categories.

DOE also considered current IES definitions of "compact fluorescent lamp" contained in ANSI/IES RP-16-14 and IES LM-66-14 (proposed for incorporation by reference in this NOPR). Section 6.5.6.1.4 of ANSI/IES RP-16-14 defines a CFL as a fluorescent lamp with a small diameter glass tube (T5 or less) that is folded, bent, or bridged to create a long discharge path in a small volume; it also states that CFL designs generally include an amalgam and a cold chamber, or a cold spot to control the mercury vapor pressure and light output. The introduction to IES LM-66-14 provides a similar definition, but clarifies that CFLs are single-based lamps, and excludes circline (circular-shaped) and U-bent (U-shaped) lamps (which are included in IES LM-9-09, "Electrical and Photometric Measurements of Fluorescent Lamps"). Unlike DOE's more general fluorescent lamp definition, the IES CFL definitions focus less on basic operational principles and more on specific physical characteristics.

DOE considered whether specific physical characteristics should be included in the definition of CFL. In addition to the lamp tube diameter and lamp geometry elements of the IES definitions, DOE also considered including a maximum overall lamp length of 21 inches, which was the greatest lamp length observed in DOE's review of commercially available non-integrated CFLs. A disadvantage to including detailed physical dimensions or descriptions of lamp geometry in a definition is that it may exclude future CFL form factors. However, DOE considers the single-based lamp construction specified in the IES LM-66-14 CFL definition to be a defining characteristic of common CFL designs. DOE therefore proposes to define a CFL as a single-based lamp.

DOE also considered whether U-shaped lamps and circline lamps should be included in the definition of CFL. As discussed, IES LM-66-14 specifically excludes U-shaped and circline fluorescent lamps from its CFL definition. The statutory and DOE definition for general service fluorescent lamp (GSFL) includes U-shaped lamps, and in the current energy conservation standards rulemaking for GSFLs, DOE considers circline lamps to be GSFLs as well.[25] Therefore, DOE proposes to explicitly exclude circline and U-shaped lamps from its proposed definition for CFL, as they are considered GSFLs.

Specifically, DOE proposes to define "compact fluorescent lamp" as an integrated or non-integrated single-base, low-pressure mercury, electric-discharge source in which a

[25] GSFL-IRL Preliminary Analysis, Technical Support Document, Chapter 2 – Analytical Framework, 2013-02-28 (http://eere.energy.gov/buildings/appliance_standards/rulemaking.aspx/ruleid/24)

fluorescing coating transforms some of the ultraviolet energy generated by the mercury discharge into light; however, the term does not include circline or U-shaped fluorescent lamps. DOE also proposes to clarify that the term may be abbreviated "CFL," thereby enabling use of this common initialism. The proposed definition of CFL aligns with the existing fluorescent lamp definition by describing the general lamp operating principles, and incorporates the salient feature of the IES definitions by describing the distinguishing physical characteristic of single-based lamp construction. It is able to encompass all categories of CFLs, including hybrid CFLs, while specifying the characteristics unique to a CFL. DOE requests comment on its proposed definition of the term "compact fluorescent lamp."

2. Correlated Color Temperature

DOE proposes to clarify the definition of "correlated color temperature" in 10 CFR 430.2 by adding the abbreviation "CCT," similar to the inclusion of "CRI" in the definition for "color rendering index." The initialism "CCT" is widely used in industry as well as by ENERGY STAR and in 10 CFR part 430, subpart B, appendix R. DOE proposes this change to support the inclusion of this metric in the proposed new and amended test procedures for CFLs. DOE requests comment on the proposed clarification of the term "correlated color temperature."

D. Amendments to Materials Incorporated by Reference at 10 CFR 430.3

As noted in preceding sections of this NOPR, DOE proposes to incorporate by reference portions of a number of industry test methods in support of the proposed new

and amended test procedures for CFLs. In section III.B.1, DOE proposed to incorporate by reference portions of IES LM-54-12, IES LM-65-14, and IES LM-66-14; none of these three test methods are presently listed in 10 CFR 430.3.

In section III.B.4.a, DOE proposed to incorporate by reference portions of CIE 13.3-1995 and CIE 15:2004. In section III.B.5.b, DOE proposed to incorporate by reference portions of ANSI_IEC C78.901-2014. In section III.B.6, DOE proposed to incorporate by reference portions of IEC 62301. All four of these test methods are presently listed in 10 CFR 430.3 but require reference to Appendix W. DOE requests comment on its proposed incorporation by reference of portions of these eight test methods in support of the proposed new and amended test procedures for CFLs.

E. Amendments to 10 CFR 430.23(y)

DOE proposes to revise and add text at 10 CFR 430.23(y) to reflect the proposed changes detailed in section III.B of this NOPR. The existing text at 10 CFR 430.23(y) indicates that for MBCFLs, the initial efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40-percent of rated life, and lamp life must be measured, and the rapid cycle stress test conducted, in accordance with section 4 of appendix W of this subpart. DOE proposes to delete the text medium base to reflect the inclusion of additional CFL categories.

DOE also proposes to require that specific sections of Appendix W be used as follows: initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at

40 percent of lifetime, CRI, CCT, and power factor must be measured in accordance with section 3.2; time to failure must be measured and rapid cycle stress test must be conducted in accordance with section 3.3; start time must be measured in accordance with section 3.4; and standby mode power must be measured in accordance with section 4. DOE requests comment on the proposed amendments to 10 CFR 430.23(y).

F. Amendments to Laboratory Accreditation Requirements at 10 CFR 430.25

DOE proposes to amend 10 CFR 430.25 to extend the laboratory accreditation requirements for MBCFL testing to additional CFL categories and metrics covered under its proposed new and amended test procedures. Specifically, DOE proposes to replace the text "medium base compact fluorescent lamps" with the text "compact fluorescent lamps" and also that if a manufacturer's or importer's laboratory is accredited it may conduct the applicable testing. DOE requests comment on the proposed amendments to 10 CFR 430.25.

G. Clarifications to Energy Conservation Standard Text at 10 CFR 430.32(u)

MBCFL energy conservation standards are codified in a table at 10 CFR 430.32(u). Certain language in the MBCFL energy conservation standards table provides clarification relevant to test procedures (e.g., sampling, test methods, and test calculations). While this clarifying language is not in conflict with the specifications in the test procedures for MBCFLs contained in Appendix W and in 10 CFR 429.35, DOE proposes to modify the text in the MBCFL energy conservation standards table to remove specific test procedure language and instead reference the relevant parts of the MBCFL

test procedures. In addition, in the introductory paragraph of 10 CFR 430.32(u), DOE proposes to replace the text bare lamp and covered lamp with the text bare or covered, to align with existing text in 10 CFR 429.35. DOE considers these revisions to be clarifications that do not modify the energy conservation standards. Revisions to specific metrics in the table at 10 CFR 430.32(u) are described in the sections that follow. DOE requests comment on the proposed amendments to the energy conservations standards for MBCFLs at 10 CFR 430.32(u) that remove test procedure specifications and align the language with existing and proposed terminology in Appendix W and 10 CFR 429.35.

1. Initial Lamp Efficacy

DOE proposes to amend the first column of the table in 10 CFR 430.32(u) by replacing the seven instances of the text "lamp power" with the text "labeled wattage." DOE also proposes to amend the last two sentences of footnote 1, which pertains to labeled wattage. DOE proposes to delete the current text in footnote 1 that indicates to use wattages placed on packaging to select proper specification efficacy in this table, not measured wattage, and that labeled wattages are for reference only. DOE proposes to replace this language with text indicating to use labeled wattage to determine the appropriate minimum efficacy requirements in this table, to not use measured wattage for this purpose. These revisions clarify that the labeled wattage must be used to determine the applicable standard (see section III.B.3.e regarding proposed definition of "labeled wattage").

DOE also proposes to remove the first two sentences from footnote 1, which currently indicate that performance and electrical requirements must be taken at the end of the 100-hour aging period according to ANSI Standard C78.5, and that the lamp efficacy shall be the average of the lesser of the lumens per watt measured in the base up and/or other specified positions. These are sampling and calculation specifications that are provided in more detail and clarity in Appendix W and 10 CFR 429.35.

Additionally, DOE proposes to correct initial lamp efficacy requirements for covered lamps with no reflector in the table in 10 CFR 430.32(u). Specifically DOE proposes to amend the first column of the table by replacing the greater than or equal to operators in the eighth and ninth rows (addressing lamps rated at least 15 W but less than 25 W) with less than or equal to operators. These changes would clarify the intended continuity from category to category (grouped by labeled wattage). DOE proposes replacing the text in the second row of the second column (which indicates that the six values in the next rows correspond to minimum efficacy and lumens/watt based upon initial lumen data) with text that indicates these six values correspond to minimum initial lamp efficacy, expressed in lumens per watt. The data upon which initial lamp efficacy must be based are specified in Appendix W.

In addition, as detailed in sections III.B.2.i and III.I.1, DOE proposes to remove the text from footnote 2 indicating that for multi-level or dimmable systems, measurements shall be at the highest setting, and acceptable measurement error is ±3%. DOE proposes to address dimmable systems and measurement error in Appendix W and

10 CFR 429.35, respectively, thereby clarifying the test procedures. DOE also proposes to remove footnote 2, which indicates that efficacies are based on measured values for lumens and wattages from pertinent test data, and that wattages and lumens placed on packages may not be used in calculation and are not governed by this specification.

DOE proposes to make these amendments in order to maintain Appendix W and 10 CFR 429.35 as the main references for test procedure requirements, thereby avoiding confusion and ambiguity regarding the source of pertinent test data. DOE considers these proposed revisions to the energy conservation standards requirements table to be clarifications that align with the existing test procedures and do not modify the energy conservation standards.

2. Lumen Maintenance at 1,000 Hours

DOE proposes to amend the text for 1,000-hour lumen maintenance in the second column of the table in 10 CFR 430.32(u), which indicates that the average of at least 5 lamps must be a minimum 90.0 percent of initial (100-hour) lumen output at 1,000 hours of rated life. DOE proposes to delete this text and to only state the standard (≥90.0 percent). Complete sampling requirements are provided in 10 CFR 429.35, and complete test procedures are provided in Appendix W. In addition, DOE proposes to replace the text in the first column of this row to read lumen maintenance at 1,000 hours. This provides a more specific label of the metric and corresponds with the terminology used in the test procedures. DOE considers these proposed revisions to the energy conservation standards table to be clarifications that do not modify the energy conservation standards.

3. Lumen Maintenance at 40 Percent of Lifetime

DOE proposes to amend the text for lumen maintenance in the second column of the table in 10 CFR 430.32(u), which indicates 80.0 percent of initial (100-hour) rating at 40 percent of rated life (per ANSI C78.5 Clause 4.10). DOE proposes to delete this text and state only the standard (≥80.0 percent). The reference to ANSI C78.5 Clause 4.10 only reiterates the requirement that lumen maintenance at 40 percent of lifetime shall not be less than 80 percent, and is therefore unnecessary. Further, the test procedures for lumen maintenance are provided in more detail and complete form in Appendix W. In addition, DOE proposes to replace the text in the first column of this row to read lumen maintenance at 40 percent of lifetime. This provides a more specific label of the metric and corresponds with the terminology used in the test procedures. DOE considers these proposed revisions to the energy conservation standards to be clarifications that do not modify the energy conservation standards.

4. Rapid Cycle Stress Test

DOE proposes to amend the text in the second column of the table for rapid cycle stress test in 10 CFR 430.32(u). DOE proposes to delete the first two sentences of this text, which indicate that testing must be conducted as per ANSI C78.5 and IESNA LM-65 (clauses 2,3,5, and 6) except cycle times must be 5 minutes on and 5 minutes off. DOE proposes to state that each lamp must be cycled once for every 2 hours of lifetime and at least 5 lamps must meet or exceed the minimum number of cycles. ANSI C78.5 does not address rapid cycle stress testing, and DOE proposes to incorporate by reference

IES LM-65 in the test procedures proposed in this NOPR. DOE proposes to address these test specifications in Appendix W instead, thereby avoiding confusion and ambiguity by maintaining Appendix W as the main reference for test procedures. DOE considers these proposed revisions to the energy conservation standards requirements table to be clarifications that do not modify the energy conservation standards.

5. Lifetime

As detailed in section III.B.3.a, DOE proposes to amend 10 CFR 430.32(u) by deleting the term "average rated lamp life" and replacing it with the term "lifetime." In addition, DOE proposes to amend the text in the second column of this row, which indicates that lifetime must be ≥6,000 hours as declared by the manufacturer on packaging, and that at 80 percent of rated life, statistical methods may be used to confirm lifetime claims based on sampling performance. DOE proposes to remove this text and state only the standard (≥6,000 hours). DOE proposes to no longer allow the use of statistical methods at 80 percent of rated life to determine the represented value of lifetime. DOE is proposing to allow manufacturers to submit annual certifications of lifetime based on an estimated value followed by full certification once lifetime testing is completed (see section III.H for details).

H. Amendments to Certification Report Requirements

DOE recognizes that testing of CFL lifetime and lumen maintenance at 40 percent of lifetime requires considerably more time than testing of other required CFL metrics. Currently, MBCFLs may be marketed before completion of testing for lifetime and

lumen maintenance at 40 percent of lifetime with supporting engineering predictions and analysis, pursuant to 42 U.S.C. 6293(b)(12)(C). DOE proposes to allow new basic models of CFLs to be distributed prior to completion of the full testing for lifetime and lumen maintenance at 40 percent of lifetime, as well as for the rapid cycle stress test because it is also dependent on lifetime. Similar to treatment of GSFLs and incandescent reflector lamps in 10 CFR 429.12(e)(2), DOE proposes that prior to distribution of the new basic model of CFL, manufacturers must submit an initial certification report. If testing for time to failure is not complete, manufacturers may include estimated values for lifetime, lumen maintenance at 40 percent of lifetime, and rapid cycle stress surviving units. If reporting estimated values, the certification report must state the description of the prediction method and the prediction method must be generally representative of the methods specified in appendix W. Manufacturers are also required to maintain records per 10 CFR 429.71 of the development of all estimated values and any associated initial test data. If reporting estimated values, the certification report must indicate that the values are estimated until testing for time to failure is complete. If, prior to completion of testing, a manufacturer ceases to distribute in commerce a basic model, the manufacturer must submit a full certification report and provide all of the information listed in 10 CFR 429.12(b), including the product-specific information required by 10 CFR 429.35(b)(2), as part of its notification to DOE that the model has been discontinued.

DOE requests comment on the proposed changes to the certification report requirements.

I. Amendments to 10 CFR 429.35

The text of the 10 CFR 429.35 title currently addresses bare or covered (no reflector) medium base compact fluorescent lamps. DOE proposes to remove this text and identical text found in §429.35(a)(1) and §429.35(a)(2), and replace it with the text "compact fluorescent lamps" to reflect the proposed inclusion of additional CFL categories.

In addition, to support the proposed new and amended test procedures in Appendix W, DOE proposes to clarify and amend the sampling requirements for existing and new metrics, including standby mode power, and to provide clarification on reuse of samples. DOE has tentatively concluded that these clarifications and amendments would not have a significant impact on measured values or test burden. DOE requests comment on the proposed clarifications to sampling requirements for initial lamp efficacy, lumen maintenance, rapid cycle stress test, and lifetime, and the tentative conclusion that they would not have a significant impact on measured values or test burden. These proposed changes to sampling requirements are discussed in detail in the following sections.

1. Initial Lamp Efficacy and Lumen Maintenance

Currently, in 10 CFR 429.35, sampling requirements are specified for efficacy, 1,000-hour lumen maintenance, and lumen maintenance. DOE proposes to replace the terms efficacy, 1,000-hour lumen maintenance, and lumen maintenance, respectively, with the terms initial lamp efficacy, lumen maintenance at 1,000 hours, and lumen maintenance at 40 percent of lifetime. Further, DOE proposes to include language that

specifies that for each sample unit, a measured value for each metric must be determined. This addition will clarify that the mean and lower confidence limit (LCL) calculations must be applied to measured values of each metric.

DOE also proposes to create a separate sampling requirement section for initial efficacy in order to include an allowance of 3 percent tolerance on the represented value of this metric until the compliance date of any amended energy conservation standards for MBCFLs.[26] MBCFL energy conservation standards are codified in 10 CFR 430.32(u) and include footnotes that provide clarification on test procedures. Footnote 2 includes the statement that acceptable measurement error is ±3%. Because this statement pertains to measurement of initial lamp efficacy, DOE proposes to remove this statement from the table in 10 CFR 430.32(u), as noted in section III.G.1, and to reflect this provision instead in an amendment to 10 CFR 429.35.

Specifically, DOE proposes to state that, to account for measurement error, the represented value for MBCFL initial lamp efficacy may include 3 percent added to the lower of a) the mean of the sample and b) the lower 97.5 percent LCL of the true mean divided by 0.95. For example, if the mean of the sample is the lower value at 60.0 lumens per watt, then the 1.03 multiplier could be applied to yield a represented value for initial lamp efficacy of 61.8 lumens per watt. DOE has tentatively concluded that this clarification will not result in a significant impact to measured values. In addition, DOE proposes to amend 10 CFR 429.35 to clarify that the 3 percent tolerance is only

[26] The provision would not be applicable for early certification to the proposed GSL standards.

applicable to MBCFLs, and only until the compliance date of any amended energy conservation standards for MBCFLs if adopted by the ongoing GSL standards rulemaking. DOE requests comment on its proposed amendments to 10 CFR 429.35 regarding the existing allowance for measurement error of initial lamp efficacy.

Additionally, DOE proposes to expand the sample size from a minimum of 5 units to a minimum of 10 units for initial lamp efficacy, 1,000 hour lumen maintenance, and lumen maintenance at 40 percent of lifetime. DOE also proposes to require that half of the units are tested base up and half of the units are tested base down, rather than testing all units base up as currently required. DOE further proposes to specify that if more than 10 units are tested as part of the sample for these three metrics, the total number of units must be a multiple of two so that an equal number of units can be tested base up and base down. Testing in both the base up and base down positions provides an accurate representation of performance under both orientations since the end-use orientation is unknown. Because the current sampling requirements already require at least 10 units for determining lifetime, and initial lamp efficacy and lumen maintenance values can be determined in the course of time to failure testing, DOE has tentatively concluded that the proposed sampling size would not be overly burdensome for manufacturers. Further, DOE is proposing to require the use of the same samples for representations of lifetime and lumen maintenance values (see section III.I.5 for details). Additionally, this sampling plan is consistent with the sampling requirements for these metrics in the current ENERGY STAR Lamps Specification v1.1.

As noted in section III.B.4, DOE proposes to move all lamp orientation text from §429.35 to Appendix W in order to consolidate test requirements. DOE therefore proposes to specify in section 3.2.1.1 of Appendix W that half of the units must be tested in the base up position, and half of the units must be tested in the base down position; if the position is restricted by the manufacturer, units must be tested in the manufacturer specified position. DOE also proposes to specify in 10 CFR 429.35 that any represented value of lumen maintenance at 40 percent of lifetime must be based on a lifetime value that is equal to or greater than the represented value of lifetime.

DOE also proposes to specify in 10 CFR 429.35 that any represented value of initial lamp efficacy be expressed in lumens per watt and rounded to the nearest tenth; any represented value of lumen maintenance at 1,000 hours be expressed as a percentage and rounded to the nearest tenth; and any represented value of lumen maintenance at 40 percent of lifetime be expressed as a percentage and rounded to the nearest tenth. DOE requests comment on its proposed rounding requirements.

2. Rapid Cycle Stress Testing

DOE proposes to restrict the sample size for rapid cycle stress testing to an exact number of units. Currently, the sampling size for rapid cycle stress testing is specified at 10 CFR 429.35(a)(2)(ii) as no less than 6 unique units. DOE proposes to specify that exactly 6 unique units must be tested per basic model for rapid cycle stress testing. This proposed specification will minimize confusion and improve consistency in the number of samples used for testing. This proposed sampling requirement would also align with

the sample size requirement for rapid cycle stress testing in the ENERGY STAR Lamps Specification v1.1. As noted in section III.B.4, DOE proposes to move all lamp orientation text from 10 CFR 429.35 to Appendix W in order to consolidate test requirements; the relevant text for rapid cycle stress testing currently indicates that each unit can be tested in the base up or base down position as stated by the manufacturer. To align with other test procedures, DOE proposes to specify in section 3.3.1.1 of Appendix W that half of the units must be tested in the base up position, and half of the units must be tested in the base down position; if the position is restricted by the manufacturer, units must be tested in the manufacturer-specified position. DOE also proposes to specify at a new paragraph in 10 CFR 429.35 that any represented value of rapid cycle stress test surviving units must be based on a lifetime value that is equal to or greater than the represented value of lifetime. DOE also proposes to specify in 10 CFR 429.35 that any represented value of the results of rapid cycle stress testing be expressed in the number of surviving units. DOE requests comment on its proposed rounding requirements.

3. Lifetime of a Compact Fluorescent Lamp

DOE proposes to clarify the sampling requirements for lifetime of a compact fluorescent lamp, including the position in which lamps are tested. Currently, 10 CFR 429.35(a)(2)(iii) states that no less than 10 units per basic model must be used when testing for the average rated lamp life, and that half the sample should be tested in the base up position and half of the sample should be tested in the base down position, unless specific use or position appears on the packaging of that particular unit.

As noted in section III.B.3.a, DOE proposes to replace the term "average rated lamp life" with the term "lifetime of a compact fluorescent lamp." In addition, DOE proposes amendments to align the sampling requirements for lifetime with the sampling requirements for initial lamp efficacy and lumen maintenance. DOE proposes to specify within the sampling requirements for lifetime, that if more than 10 units are tested as part of the sample, the total number of units must be a multiple of two. DOE also proposes to specify how the time to failure value determined per Appendix W must be used to determine the represented value of lifetime. Specifically, DOE proposes the lifetime of a compact fluorescent lamp must be calculated by determining the median time to failure of the sample (calculated as the arithmetic mean of the time to failure of the two middle sample units when the numbers are sorted in value order). DOE also proposes to reference section 3.3 of Appendix W in the sampling requirements for lifetime to clarify the use of the time to failure test procedure when determining lifetime. DOE also proposes to specify in 10 CFR 429.35 that any represented value of lifetime be expressed in hours and rounded to nearest whole number. DOE requests comment on its proposed rounding requirements.

As noted in section III.B.4, DOE proposes to move all lamp orientation text from §429.35 to Appendix W in order to consolidate test requirements. DOE therefore proposes to specify in section 3.3.1.1 of Appendix W that half of the units must be tested in the base up position and half of the units must be tested in the base down position, but that if the position is restricted by the manufacturer, units must be tested in the manufacturer-specified position.

4. New Metrics

As discussed in section III.B.4, DOE is proposing test procedures for measuring new metrics including CRI, power factor, CCT, start time, and standby mode power. For CRI, power factor, CCT, and standby mode power, DOE proposes to require a sample size of at least 10 (half base up and half base down). Testing in both the base up and base down positions provides an accurate representation of performance under both orientations since the end-use orientation is unknown. DOE also proposes to specify within the sampling requirements for CRI, power factor, CCT, and standby mode power, that, if more than 10 units are tested as part of the sample, the total number of units must be a multiple of two.

DOE proposes to specify the same sampling requirements for CRI and power factor as those specified for initial lamp efficacy, lumen maintenance at 1,000 hours, and lumen maintenance at 40 percent of lifetime in 10 CFR 429.35. Thus, for CRI and power factor, DOE proposes that representations of these metrics be equal to the lesser of the mean of the sample and the 97.5 percent LCL divided by 0.95. Since higher values are desirable for CRI and power factor, use of the lesser of the mean and LCL ensures that a representative value is reported.

Because there are no targeted upper or lower bound values for CCT, DOE proposes to specify in 10 CFR 429.35 that representations of CCT be the mean of the sample.

For the start time, DOE proposes a sample size of three units. DOE believes this is an appropriate sample size to determine an accurate value for the lamp start time. Further, DOE proposes that representations be equal to the greater of the mean of the sample and the 97.5 percent upper confidence limit (UCL) divided by 1.05, since lower values are desirable. DOE proposes to describe the sampling requirements for start time in 10 CFR 429.35.

For standby mode power, DOE proposes to specify in 10 CFR 429.35 a sample size of at least 10 units, consistent with that used for the active mode power metric, initial lamp efficacy. DOE proposes that representations be equal to the greater of the mean of the sample and the 97.5 percent UCL divided by1.05, since lower values are desirable.

DOE has tentatively concluded that the proposed sampling size for CRI, power factor, CCT, start time, and standby mode power would not increase test burden on manufacturers. The current sampling requirements already require 10 units for determining lifetime, and several of these metrics (e.g., CRI, CCT, and power factor values) can be determined in the course of time to failure testing. Additionally, this sampling plan is consistent with the sampling requirements for these metrics in the ENERGY STAR Lamps Specification v1.1. DOE requests comment on the proposed sampling requirements for CRI, power factor, CCT, start time, and standby mode power and the preliminary determination that these requirements do not increase test burden on manufacturers.

DOE proposes to specify in 10 CFR 429.35 that any represented value of CCT be expressed in kelvins (K) and rounded to the nearest 100; any represented value of standby mode power be expressed in watts and rounded to the nearest tenth; any represented value of CRI be rounded to the nearest whole number; and any represented value of power factor be rounded to the nearest hundredths place. Further DOE proposes to specify in 10 CFR 429.35 any represented value of start time be expressed in milliseconds and rounded to the nearest whole number. DOE requests comment on its proposed rounding requirements.

5. Reuse of Samples

DOE proposes to specify in 10 CFR 429.35 that the same sample of units must be used to determine initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of lifetime, lifetime, CRI, CCT, power factor, start time, and standby mode power. DOE believes that using the same sample units for all metrics reduces testing burden. For example, lifetime and lumen maintenance testing are inherently lengthy procedures, involving thousands of hours of lamp operation. Avoiding duplicate sets of long-term sample units could therefore reduce the effort and resources required for testing. DOE requests comment on its proposed clarifications and amendments to the reuse of samples.

J. Federal Trade Commission (FTC) Labeling Requirements

DOE is proposing to add provisions to 10 CFR 429 to support FTC's labeling program. DOE is including provisions for initial lumen output, input power, correlated color temperature, estimated annual energy cost, and life (in years) to enable FTC to allow manufacturers to submit data through DOE's Compliance Certification Management System (CCMS) for the FTC labeling requirements. The measurements required for these metrics are already described in Appendix W because they support other metrics described in this test procedure. For example, initial lumen output and input power (a standalone metric and also part of the calculation for estimated annual energy cost) are the two quantities required to calculate initial lamp efficacy. Furthermore, the life (expressed in years) is determined by dividing the lifetime by an average operating hour value specified by FTC. Both initial lamp efficacy and lifetime are metrics already required by DOE and described in detail throughout this test procedure. DOE proposes modifications to 10 CFR 429.35 to support the addition of provisions for initial lumen output, input power, correlated color temperature, estimated annual energy cost, and life (expressed in years).

K. Effective Date and Compliance Dates

If adopted, the effective date for the test procedures proposed in this NOPR would be 30 days after publication of the CFL test procedure final rule in the Federal Register. The compliance date for an amended or new test procedure is 180 days after publication of the final rule. (42 U.S.C. 6293(c)(2))

DOE proposes that after the effective date and prior to the compliance date of a CFL test procedure final rule, manufacturers may voluntarily begin to make representations with respect to the energy use or efficiency of CFLs (including but not limited to MBCFLs) using the results of testing pursuant to that final rule. On or after 180 days after publication of a final rule, any representations including certifications of compliance (if required), made with respect to the energy use or efficiency of CFLs (including but not limited to MBCFLs) must be made in accordance with the results of testing pursuant to the proposed new and amended test procedures.

DOE requests comment on the proposed effective date and compliance dates for the proposed new and amended CFL test procedures.

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 OMB.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 et seq.) requires preparation of an initial regulatory flexibility analysis (IRFA) for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, "Proper Consideration of Small Entities in Agency Rulemaking," 67 FR 53461 (Aug. 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website: http://energy.gov/gc/office-general-counsel.

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

1. Small Business Manufacturers of Covered Products

The Small Business Administration (SBA) has set a size threshold for electric lamp manufacturers to describe those entities that are classified as "small businesses" for the purposes of the Regulatory Flexibility Act. DOE used the SBA's small business size standards to determine whether any small manufacturers of CFLs would be subject to the

requirements of the rule. 65 FR 30836, 30849 (May 15, 2000), as amended at 65 FR 53533, 53545 (Sept. 5, 2000) and codified at 13 CFR part 121. The size standards are listed by North American Industry Classification System (NAICS) code and industry descriptions are available at www.sba.gov/content/small-business-size-standards.

In a final rule published in March 2011 for certification, compliance, and enforcement (2011 CCE final rule), DOE identified NAICS code 335110, "Electric Lamp Bulb and Part Manufacturing," for MBCFLs. 76 FR 12422, 12488 (March 7, 2011). Although the 2011 CCE final rule focused on MBCFLs, the NAICS code 335110 is applicable to all CFLs, including but not limited to MBCFLs. The SBA sets a threshold of 1,000 employees or less for an entity to be considered as a small business for NAICS code 335110.

DOE conducted a focused inquiry of manufacturers of products covered by this rulemaking. During its market survey, DOE used all available public information to identify potential small manufacturers. DOE's research involved the review of DOE's Compliance Certification Database, the ENERGY STAR databases, individual company websites, and marketing research tools (e.g., Hoovers.com, Manta.com) to create a list of companies that manufacture CFLs covered by this rulemaking. Using these sources, DOE identified 159 distinct manufacturers of CFLs (integrated and non-integrated lamps).

DOE then reviewed these data to determine whether the entities met the SBA's definition of a small business manufacturer of covered lighting products and screened out

companies that do not offer products covered by this rulemaking, do not meet the definition of a "small business," or are foreign owned and operated. Based on this review, DOE has identified 26 manufacturers that would be considered small businesses. Through this analysis, DOE determined the expected impacts of the rule on affected small businesses and whether an IRFA was needed (i.e., whether DOE could certify that this rulemaking would not have a significant economic impact on a substantial number of small entities).

Table IV.1 stratifies the small businesses according to their number of employees. The smallest company has 1 employee and the largest company 167 employees. Annual revenues associated with these small businesses were estimated at $269 million ($10.4 million average annual sales per small business). According to DOE's analysis, small businesses comprise 16 percent of the entire CFL manufacturing industry covered by the proposed rule.

Table IV.1 Small Business Size by Number of Employees

Number of Employees	Number of Small Businesses	Percentage of Small Businesses	Cumulative Percentage
1–10	9	34.6%	34.6%
11–20	4	15.4%	50.0%
21–30	2	7.7%	57.7%
31–40	4	15.4%	73.1%
41–50	1	3.8%	76.9%
51–60	2	7.7%	84.6%
61–70	0	0.0%	84.6%
71–80	1	3.8%	88.5%
81–90	1	3.8%	92.3%
91–100	0	0.0%	92.3%
101–150	1	3.8%	96.2%
151–200	1	3.8%	100.0%
201–300	0	0.0%	100.0%
301–400	0	0.0%	100.0%

Number of Employees	Number of Small Businesses	Percentage of Small Businesses	Cumulative Percentage
401–500	0	0.0%	100.0%
501–1,000	0	0.0%	100.0%
Total	**26**		

DOE assessed elements (testing methodology, testing times and sample size) in the proposed test procedure amendments that could affect costs associated with complying with this rule. The following is a synopsis of changes and analysis of costs associated with this proposed rulemaking.

2. Burden Related to Proposed Amendments to Appendix W

DOE's analysis of burden for Appendix W focused on updates to industry test methods, test procedures scope of coverage, proposed new test procedures, and sample size.

a. Updates to Industry Test Methods

DOE proposes in this NOPR to incorporate by reference the latest versions of industry test methods relevant to CFL performance measurements, which would collectively replace the test procedures adopted from the August 2001 version of the ENERGY STAR program requirements for CFLs that is incorporated by reference in DOE's existing MBCFL test procedures. DOE proposes to incorporate by reference the latest IES and CIE industry test methods contained in the current ENERGY STAR Lamps Specification v1.1. Further, DOE proposes to incorporate these latest industry test methods directly, instead of indirectly through an ENERGY STAR reference as in the existing test procedures. These updated test methods provide revised procedures and do

not require additional equipment. Therefore, updating the test methods should not increase the burden.

b. Test Procedures Scope of Coverage

This notice proposes test procedures that cover all CFLs and not just the MBCFLs currently covered by the existing test procedures. The additional scope of coverage will increase burden compared to the existing burden. DOE analyzes the cost of testing the additional CFL categories in the analysis of burden.

c. Proposed New Test Procedures

DOE's proposed amendments to Appendix W include additional elements not currently addressed in Appendix W. The additional testing for power factor, start time, and standby mode power will increase the labor and energy burden compared to the existing burden. DOE analyzes the costs of these additional metrics in the analysis of burden. As previously stated in this NOPR, DOE is also considering proposing test procedures for CCT and CRI in support of the ongoing GSL standards rule. DOE does not believe that the additional metrics of CCT or CRI will increase burden because the data to calculate the metrics can be measured at the same time and without additional setup and labor as the lumen output measurements. Further, most manufacturers already measure, calculate, and report these values as part of Lighting Facts labels and specification sheets and, in many cases, participation in the ENERGY STAR program.

d. Sample Size

In addition to the change in scope of coverage and the additional tests added to the proposed test procedures, Appendix W also proposes to increase the sample size of lamps being tested. Many of the sample sizes would increase from 5 to 10 which will increase burden. DOE analyzes the costs associated with increased sample size in the analysis of burden.

e. Analysis of Burden

To determine the costs, DOE analyzed the labor cost and the cost of electricity for the different measurements discussed in the proposed test procedure. To determine the cost of labor, DOE reviewed the 2012 median pay for electrical and electronic engineering technicians ($57,850), electrical and electronics engineers ($89,630) and electro-mechanical technicians ($51,820) based on data published by the U.S. Department of Labor Bureau of Labor Statistics.[27] The average annual salary of $66,433 was divided by 1,920 hours per year (40 hours per week for 48 weeks per year) to develop an hourly rate of $34.60. The hourly labor rate was increased 31.3 percent[28] to account for benefits,[29] yielding an estimated total hourly labor rate of $45.43. The cost of labor was then calculated by multiplying the estimated hours of labor by the total hourly labor rate.

[27] United States Department of Labor. Bureau of Labor Statistics Occupational Outlook Handbook. Washington, DC. (Last accessed February 25, 2015.) www.bls.gov/ooh/Architecture-and-Engineering/home.htm

[28] Obtained from the Bureau of Labor Statistics News Release: Employer Cost For Employee Compensation – December 2014, U.S. Department of Labor (December 2014) www.bls.gov/news.release/ecec.nr0.htm

[29] Additional benefits include paid leave, supplemental pay, insurance, retirement savings, Social Security, Medicare, unemployment insurance, and workers compensation.

To determine the cost of electricity, DOE used the labeled wattage of integrated lamps or referred to a ballast catalog for non-integrated lamps. The wattage value was multiplied by the estimated operating time needed to complete the required testing to determine the energy use of the lamp during testing. The energy use of the lamp during testing was then multiplied by an electricity rate of $0.1077 per kilowatt-hour (kWh) to determine the cost of electricity.[30]

DOE collected annual revenue estimates for 26 small businesses for CFLs using the Hoovers.com and Manta.com company profile databases. Hoovers.com and Manta.com report significantly different annual revenue for certain manufacturers; in these situations, DOE averaged the two datasets for each manufacturer. DOE determined that the mean revenue of the identified small businesses is $10,356,384. According to a combination of Hoovers.com and Manta.com, the smallest of the 26 small businesses had revenues of $0.29 million per year.

DOE analyzed the potential burden for 8 of the 26 small businesses identified, including the following: the manufacturer with the fewest employees, the manufacturer with the most employees, a manufacturer with a relatively high number of MBCFL basic models, a manufacturer with a relatively high number of CFL basic models (34 basic

[30] The electricity rate of $0.1077 per kWh is the average commercial rate year to date for 2014 from the U.S. Energy Information Administration's (EIA's) Electric Power Monthly, March 2014, Table 5.3, available at www.eia.gov/electricity/monthly/ (last accessed February 25, 2015).

models, 11 of which were MBCFLs), and 4 others that were near median for the 26-manufacturer dataset in terms of number of employees and basic models.

Table IV.2 compares the total number of basic models, the testing cost per basic model, and the testing costs as a portion of their revenues for both the existing Appendix W and the proposed amendments to Appendix W. The average cost of testing in accordance with the existing Appendix W is $1,180 per basic model, versus $2,602 for the proposed amended Appendix W. This is a 120 percent increase in testing costs per basic model. For the 8 small businesses analyzed, costs associated with testing in accordance with the proposed Appendix W represent on average 3 percent of their annual revenue. For one small business, the proposed testing in Appendix W could represent 7.6 percent of their annual revenue; however, this value is likely overstated since the analysis for each of these businesses assumes just one unique product configuration per basic model.

Table IV.2 Analysis of Small Businesses

	Small Business #							
	1	2	3	4	5	6	7	8
Existing Appendix W								
# of basic models	8	28	5	28	25	27	85	19
Testing cost / basic model	$1,154	$1,292	$1,186	$1,246	$1,187	$1,110	$1,187	$1,078
Testing cost portion of revenue	0.13%	3.12%	1.19%	0.17%	0.61%	1.58%	0.36%	1.08%
Proposed Amendments to Appendix W								
# of basic models	11	34	5	116	59	31	87	44
Testing cost / basic model	$2,708	$2,598	$2,500	$2,732	$2,585	$2,506	$2,657	$2,531
Testing cost portion of revenue	0.43%	7.62%	2.50%	1.57%	3.13%	4.09%	0.82%	5. 90%

f. Summary

The final cost per manufacturer primarily depends on the number of basic models the manufacturer sells. These are not annual costs because DOE does not require manufacturers to retest a basic model annually. The initial test results used to generate a certified rating for a basic model remain valid as long as the basic model has not been modified from the tested design in a way that makes it less efficient or more consumptive, which would require a change to the certified rating. If a manufacturer has modified a basic model in a way that makes it more efficient or less consumptive, new testing is required only if the manufacturer wishes to make representations of the new, more efficient rating.

DOE analyzed the industry for CFL manufacturing to determine all manufacturers of CFLs covered in this NOPR. Analysis of the industry determined that 16 percent of all CFL manufacturers could be classified as small businesses according to SBA classification guidelines. Although 16 percent of the market could be considered a significant portion of the overall industry, these manufacturers are not substantially affected by this proposed rule because the testing represents a small portion of annual revenue and does not need to be repeated annually. Further, 80 percent of the small businesses identified participate in ENERGY STAR. Therefore, a vast majority of small businesses are already testing these same quantities and metrics for ENERGY STAR certification.

Based on the criteria outlined earlier, DOE certifies that proposed testing procedure amendments would not have a "significant economic impact on a substantial number of small entities," and the preparation of an IRFA is not warranted. DOE will transmit the certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the SBA for review under 5 U.S.C. 605(b). DOE requests comment on its tentative conclusion that the proposed test procedure changes will not have a significant economic impact on a substantial number of small entities.

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of covered products 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 applicable DOE test procedure, including any amendments adopted for that test procedure. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including MBCFLs. 76 FR 12422 (March 7, 2011); 80 FR 5099 (January 30, 2015). 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 and includes an estimated public reporting burden for manufacturers of other CFL categories, in addition to MBCFLs, should DOE set any future energy conservation standards for these products. Public reporting burden for the certification is estimated to average 30 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 proposed rule, DOE proposes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for CFLs. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and DOE's implementing regulations at 10 CFR part 1021. Specifically, this proposed rule would amend the existing test procedures without affecting the amount, quality, or distribution of energy usage, and, therefore, would 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 (Aug. 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 has examined this proposed rule and has determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this proposed rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by 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, the proposed rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. No. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the

private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed "significant intergovernmental mandate," and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at http://energy.gov/gc/office-general-counsel. DOE examined this proposed rule according to UMRA and its statement of policy, and DOE determined that the rule contains neither an intergovernmental mandate nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

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

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

I. Review Under Executive Order 12630

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

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

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

K. Review Under Executive Order 13211

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

The proposed regulatory action to amend the test procedures for measuring the energy efficiency of CFLs is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

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

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

The proposed test procedures incorporate testing methods contained in the following commercial standards:

1) ANSI_IEC C78.901-2014, "American National Standard for Electric Lamps—Single-Based Fluorescent Lamps—Dimensional and Electrical Characteristics," 2014;
2) CIE 13.3-1995, "Technical Report: Method of Measuring and Specifying Colour Rendering Properties of Light Sources," 1995;
3) CIE 15:2004, "Technical Report: Colorimetry, 3rd edition," 2004;
4) IES LM-54-12, "IES Guide to Lamp Seasoning," 2012;
5) IES LM-65-14, "IES Approved Method for Life Testing of Single-Based Fluorescent Lamps," 2014;
6) IES LM-66-14, "IES Approved Method for the Electrical and Photometric Measurements of Single-Based Fluorescent Lamps," 2014; and
7) IEC Standard 62301 (Edition 2.0), "Household electrical appliances – Measurement of standby power," 2011.

DOE has evaluated these standards and is unable to conclude whether they fully comply with the requirements of section 32(b) of the FEAA (i.e., that they were developed in a manner that fully provides for public participation, comment, and review). DOE will consult with the Attorney General and the Chairman of the FTC concerning the impact of these test procedures on competition, prior to prescribing a final rule.

M. Description of Materials Proposed to be Incorporated by Reference

In this NOPR, DOE proposes to incorporate by reference the test standard published by ANSI, titled "American National Standard for Electric Lamps—Single-Based Fluorescent Lamps—Dimensional and Electrical Characteristics," ANSI_IEC C78.901-2014. ANSI_IEC C78.901-2014 is an industry accepted test standard that specifies physical and electrical characteristics of non-integrated CFLs and is applicable to products sold in North America. The test procedures proposed in this NOPR reference ANSI_IEC C78.901-2014 for characteristics of reference ballasts that must be used when testing non-integrated CFLs. ANSI_IEC C78.901-2014 is readily available on ANSI's website at http://webstore.ansi.org/.

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DOE also proposes to incorporate by reference the test standard published by IES, titled "IES Guide to Lamp Seasoning," IES LM-54-12. IES LM-54-12 is an industry accepted test standard that specifies a method for seasoning CFLs prior to testing and is applicable to products sold in North America. The test procedures proposed in this NOPR reference various sections of IES LM-54-12 that address seasoning of CFLs prior to testing. IES LM-54-12 is readily available on IES's website at www.ies.org/store.

DOE also proposes to incorporate by reference the test standard published by IES, titled "IES Approved Method for Life Testing of Single-Based Fluorescent Lamps," IES LM-65-14. IES LM-65-14 is an industry accepted test standard that specifies a method

for measuring the time to failure of CFLs and is applicable to products sold in North America. The test procedures proposed in this NOPR reference various sections of IES LM-65-14 that address test conditions and procedures for measuring time to failure and rapid cycle stress testing of CFLs. IES LM-65-14 is readily available on IES's website at www.ies.org/store.

DOE also proposes to incorporate by reference the test standard published by IES, titled "IESNA Approved Method for Total Luminous Flux Measurement of Lamps Using an Integrating Sphere Photometer," IESNA LM-78-07. IESNA LM-78-07 is an industry accepted test standard that specifies a method for measuring lumen output in an integrated sphere and is applicable to products sold in North America. The test procedures proposed in this NOPR reference sections of IESNA LM-78-07 that address measurements of lumen output. IESNA LM-78-07 is readily available on IES's website at www.ies.org/store.

DOE also proposes to incorporate by reference the test standard published by IES, titled "IES Approved Method for the Electrical and Photometric Measurements of Single-Based Fluorescent Lamps," IES LM-66-14. IES LM-66-14 is an industry accepted test standard that specifies methods for measuring the photometric and electrical characteristics of CFLs and is applicable to products sold in North America. The test procedures proposed in this NOPR reference various sections of IES LM-66-14 that address test conditions and procedures for measuring initial lamp efficacy, lumen

maintenance, CCT, CRI, power factor, start time, and standby mode power of CFLs. IES LM-66-14 is readily available on IES's website at www.ies.org/store.

V. Public Participation

A. Attendance at Public Meeting

The time, date, and location of the public meeting are listed in the DATES and ADDRESSES sections at the beginning of this notice. If you plan to attend the public meeting, please notify Ms. Brenda Edwards at (202) 586-2945 or Brenda.Edwards@ee.doe.gov.

Please note that foreign nationals visiting DOE Headquarters are subject to advance security screening procedures which require advance notice prior to attendance at the public meeting. If a foreign national wishes to participate in the public meeting, please inform DOE of this fact as soon as possible by contacting Ms. Regina Washington at (202) 586-1214 or by email: Regina.Washington@ee.doe.gov so that the necessary procedures can be completed.

DOE requires visitors to have laptops and other devices, such as tablets, checked upon entry into the building. Any person wishing to bring these devices into the Forrestal Building will be required to obtain a property pass. Visitors should avoid bringing these devices, or allow an extra 45 minutes to check in. Please report to the visitor's desk to have devices checked before proceeding through security.

Due to the REAL ID Act implemented by the Department of Homeland Security (DHS), there have been recent changes regarding ID requirements for individuals wishing to enter Federal buildings from specific states and U.S. territories. Driver's licenses from the following states or territory will not be accepted for building entry and one of the alternate forms of ID listed below will be required. DHS has determined that regular driver's licenses (and ID cards) from the following jurisdictions are not acceptable for entry into DOE facilities: Alaska, American Samoa, Arizona, Louisiana, Maine, Massachusetts, Minnesota, New York, Oklahoma, and Washington. Acceptable alternate forms of Photo-ID include: U.S. Passport or Passport Card; an Enhanced Driver's License or Enhanced ID-Card issued by the states of Minnesota, New York or Washington (Enhanced licenses issued by these states are clearly marked Enhanced or Enhanced Driver's License); a military ID or other Federal government issued Photo-ID card.

In addition, you can attend the public meeting via webinar. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website http://eere.energy.gov/buildings/appliance_standards/product.aspx/productid/28. Participants are responsible for ensuring that their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statement for Distribution

Any person who has plans to present a prepared general statement may request that copies of his or her statement be made available at the public meeting. Such persons may submit requests, along with an advance electronic copy of their statement in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format, to the appropriate address shown in the ADDRESSES section at the beginning of this notice. The request and advance copy of statements must be received at least one week before the public meeting and may be emailed, hand-delivered, or sent by mail. DOE prefers to receive requests and advance copies via email. Please include a telephone number to enable DOE staff to make a follow-up contact, if needed.

C. Conduct of Public Meeting

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

The public meeting will be conducted in an informal, conference style. DOE will present summaries of comments received before the public meeting, allow time for

prepared general statements by participants, and encourage all interested parties to share their views on issues affecting this rulemaking. Each participant will be allowed to make a general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will allow, as time permits, other participants to comment briefly on any general statements.

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

A transcript of the public meeting will be included in the docket, which can be viewed as described in the Docket section at the beginning of this notice. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule before or after the public meeting, but no later than the date provided in the DATES section at the beginning of this notice. Interested parties may submit comments, data, and

other information using any of the methods described in the ADDRESSES section at the beginning of this notice.

Submitting comments via regulations.gov. The regulations.gov web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to regulations.gov information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through regulations.gov cannot be claimed as CBI. Comments received through the website will

waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through regulations.gov before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that regulations.gov provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery, or mail. Comments and documents submitted via email, hand delivery, or mail also will be posted to regulations.gov. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via mail or hand delivery, please provide all items on a CD, if feasible. It is not necessary to submit printed copies. No facsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English and free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

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

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

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) a description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the

information is generally known by or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person which would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and (7) why disclosure of the information would be contrary to the public interest.

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

E. Issues on Which DOE Seeks Comment

Although comments are welcome on all aspects of this proposed rulemaking, DOE is particularly interested in comments on the following issues.

1) DOE requests comment on its proposed incorporation of updated versions of industry standards and its tentative conclusion that the updates would not have a significant impact on measured values for MBCFLs or pose additional test burden for CFL manufacturers. DOE specifically requests comments on its assessment of the updates to the following standards and their impacts on test burden and measured values of MBCFLs: (a) IES LM-66-14, (b) IES LM-54-12, and (c) IES LM-65-14.

2) DOE requests comment on the proposed clarifications to test methods and setup and the tentative conclusion that they would not have a significant impact on test burden and measured values. DOE specifically requests comment on the proposed (a) requirement that all photometric values be measured by an integrating sphere, (b) ambient temperature requirements for photometric and electrical testing, (c) input voltage requirements, (d) requirement that lamp orientation must be maintained throughout testing, (e) clarifications to the lamp seasoning methods, (f) disallowed use of the peak method as an alternative to the stabilization method, (g) disallowance of the time to failure testing of CFLs in a fixture, (h) definition for the term "ballasted adapter," and on its proposed requirement that CFLs packaged with or designed exclusively for use with ballasted adapters must be tested as non-integrated CFLs, and (i) clarification that all CFL testing must be conducted at labeled wattage, with no dimmer used in the circuit.

3) DOE requests comment on the proposed changes to definitions in 10 CFR 430.2 and Appendix W, and the tentative conclusion that they would not have a significant impact on test burden and measured values. DOE specifically requests comment on the proposed (a) removal of the term "average rated life" and addition of definitions of "lifetime of a compact fluorescent lamp" and "time to failure," (b) removal of the terms "initial performance values" and "rated luminous flux or rated lumen output," and addition of the terms "initial lamp efficacy," "measured initial input power," and "measured initial lumen output," (c) clarification to the definition of

"lumen maintenance," (d) removal of the term "rated supply frequency," (e) relabeling of the term "rated wattage" to "labeled wattage" and amendments to this definition, and (f) removal of the term "self-ballasted compact fluorescent lamp" and addition of definitions of "integrated compact fluorescent lamp" and "non-integrated compact fluorescent lamp."

4) DOE requests comment on the proposed clarifications to test procedures for measuring initial lamp efficacy and lumen maintenance values.
5) DOE requests comment on the proposed test procedures for measuring time to failure and for rapid cycle stress testing.
6) DOE requests comment on its proposed test procedures for measuring CCT, CRI, and power factor.
7) DOE requests comment on the proposed test procedure for start time and the proposed definitions for the terms "start time," "start plateau," and "percent variability." DOE also requests comment on the summary of start time testing and results that can be found in the docket for this rulemaking.
8) DOE requests comment on its proposal that integrated CFLs with medium screw bases and other base types are to follow the same test procedures.
9) DOE requests comment on the proposed (a) requirement that non-integrated CFLs be tested using reference ballasts that meet ANSI_IEC C78.901-2014 specifications, except as noted, (b) requirement that non-integrated CFLs are to be tested at low frequency when a choice is available between low and high frequency reference ballast specifications, (c) requirement that non-integrated CFLs are to be tested on a rapid start circuit when possible, and (d)

requirement that if not listed in ANSI_IEC C78.901-2014 or Appendix W, reference ballast specifications be based on existing reference ballast specifications of the most similar lamp in ANSI_IEC C78.901-2014 or for the higher wattage lamp it is intended to replace.

10) DOE requests comment on the proposed definition of and test procedure for hybrid CFLs.

11) DOE requests comment on its proposed test procedure for standby mode power of integrated CFLs, and on its proposal to season lamps according to requirements in the proposed active mode test procedures prior to measuring standby mode power. DOE also requests comment on its assessment that integrated CFLs can operate in standby mode but not off mode, and that non-integrated CFLs cannot operate in either standby mode or off mode.

12) DOE requests comment on the proposed amendments to 10 CFR 430.23(y).

13) DOE requests comment on its proposed rounding requirements for represented value of metrics.

14) DOE requests comment on its proposed definition of the term "compact fluorescent lamp." DOE also requests comment on the proposed clarification of the term "correlated color temperature."

15) DOE requests comment on its proposed incorporation by reference of eight test methods in support of the proposed new and amended test procedures for CFLs.

16) DOE requests comment on the proposed amendments to 10 CFR 430.25.

17) DOE requests comment on the proposed amendments to the energy conservations standards for MBCFLs at 10 CFR 430.32(u) that remove test procedures specifications and align the language with existing and proposed terminology in Appendix W and 10 CFR 429.35. DOE also requests comment on its proposed amendments to 10 CFR 429.35 regarding the existing allowance for measurement error of initial lamp efficacy for MBCFLs.
18) DOE requests comment on the proposed changes to the certification report requirements.
19) DOE requests comment on the proposed clarifications and amendments to sampling requirements for initial lamp efficacy, lumen maintenance, lifetime, and rapid cycle stress testing, and the tentative conclusion that they would not have a significant impact on measured values or manufacturer test burden.
20) DOE requests comment on the proposed sampling requirements for CRI, power factor, CCT, and standby mode power, and the determination that these requirements do not increase the test burden on manufacturers.
21) DOE requests comment on its proposed clarifications and amendments to the reuse of samples.
22) DOE requests comment on the proposed effective date and compliance dates for the proposed new and amended CFL test procedures.
23) DOE requests comment on its tentative conclusion that the proposed test procedure changes will not have a significant economic impact on a substantial number of small entities.

VI. Approval of the Office of the Secretary

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

List of Subjects

10 CFR Part 429

Confidential business information, Energy conservation, Household appliances, Imports, 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 9, 2015.

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Kathleen B. Hogan
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy

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

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

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

Authority: 42 U.S.C. 6291−6317.

2. Section 429.12 is amended by revising paragraph (f) to read as follows:

§429.12 General requirements applicable to certification reports.

* * * * *

(f) Discontinued model filing. When production of a basic model has ceased and it is no longer being sold or offered for sale by the manufacturer or private labeler, the manufacturer must report this discontinued status to DOE as part of the next annual certification report following such cessation. For each basic model, the report shall include the information specified in paragraphs (b)(1) through (b)(7) of this section, except that for compact fluorescent lamps, the manufacturer must submit a full certification report, including all of the information required by paragraph (b) of this section and the product-specific information required by §429.35(b)(2).

* * * * *

3. Section 429.35 is revised to read as follows:

§429.35 Compact fluorescent lamps.

(a) Determination of represented value. Manufacturers must determine represented values, which includes the certified ratings, for each basic model of compact fluorescent lamp by testing, in conjunction with the following sampling provisions:

(1) Units to be tested. (i) The requirements of §429.11(a) are applicable; and

(ii) For each basic model of CFL, the minimum number of units tested shall be no less than 10 units when testing for the initial lumen output, input power, initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of lifetime, lifetime, CCT, CRI, power factor, and standby mode power. If more than 10 units are tested as part of the sample, the total number of units must be a multiple of 2. The same sample of units must be used as the basis for representations for initial lumen output, input power, initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of lifetime, lifetime, CCT, CRI, power factor, and standby mode power. No less than three units from the same sample of units must be used when testing for the start time. Exactly six unique units (i.e., units that have not previously been tested under this paragraph but are representative of the same basic model tested under this paragraph) must be used for rapid cycle stress testing.

(iii) For each basic model, a sample of sufficient size shall be randomly selected and tested to ensure that:

(A) Represented values of initial lumen output, initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of lifetime, CRI, power factor, or other measure of energy consumption of a basic model for which consumers would favor higher values must be less than or equal to the lower of:

(*1*) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$\bar{x}$ is the sample mean,

n is the number of units in the sample, and

x_i is the i^{th} unit;

Or,

(*2*) The lower 97.5-percent confidence limit (LCL) of the true mean divided by 0.95, where:

$$LCL = \bar{x} - t_{0.975}\left(\frac{s}{\sqrt{n}}\right)$$

$\bar{x}$ is the sample mean of the characteristic value;

s is the sample standard deviation;

n is the number of units in the sample, and

$t_{0.975}$ is the t statistic for a 97.5% one-tailed confidence interval with n-1 degrees of freedom (from appendix A of this subpart).

(B) The represented value of CCT must be equal to the mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$\bar{x}$ is the sample mean,

n is the number of units in the sample, and

x_i is the i^{th} unit.

(C) Represented values of input power, standby mode power, start time or other measure of energy consumption of a basic model for which consumers would favor lower values must be greater than or equal to the higher of:

(*1*) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$\bar{x}$ is the sample mean,

n is the number of units in the sample, and

x_i is the i^{th} unit;

Or,

(*2*) The upper 97.5-percent confidence limit (UCL) of the true mean divided by 1.05, where:

$$UCL = \bar{x} + t_{0.975}\left(\frac{s}{\sqrt{n}}\right)$$

$\bar{x}$ is the sample mean of the characteristic value;

s is the sample standard deviation;

n is the number of units in the sample, and

$t_{0.975}$ is the t statistic for a 97.5% one-tailed confidence interval with n-1 degrees of freedom (from appendix A of this subpart).

(D) The represented value of lifetime is the median time to failure of the sample (calculated as the arithmetic mean of the time to failure of the two middle sample units when the numbers are sorted in value order).

(E) The represented value of the results of rapid cycle stress testing must be

(*1*) Expressed in the number of surviving units and

(*2*) Based on a lifetime value that is equal to or greater than the represented value of lifetime.

(2) The represented value of life (in years) of a compact fluorescent lamp must be calculated by dividing the lifetime of a compact fluorescent lamp by the estimated annual operating hours as specified in 16 CFR 305.15(b)(3)(iii).

(3) The represented value of the estimated annual energy cost for a compact fluorescent lamp, expressed in dollars per year, must be the product of the input power in kilowatts, an electricity cost rate as specified in 16 CFR 305.15(b)(1)(ii), and an estimated average annual use as specified in 16 CFR 305.15(b)(1)(ii).

(4) For compliance with standards specified in §430.32(u)(1) of this chapter, initial lamp efficacy may include a 3 percent tolerance added to the value determined in accordance with paragraph (a)(1)(iii)(A) of this section.

(5) The represented value of lumen maintenance at 40 percent of lifetime must be based on a lifetime value that is equal to or greater than the represented value of lifetime.

(b) Certification reports. (1) The requirements of §429.12 are applicable to bare or covered medium base compact fluorescent lamps; and

(2) Values reported in certification reports are represented values. Lifetime, lumen maintenance at 40 percent of lifetime, life, and rapid cycle stress test surviving units are estimated values until testing is complete. When reporting estimated values, the certification report must specifically describe the prediction method, which must be generally representative of the methods specified in appendix W. Manufacturers are required to maintain records per §429.71 of the development of all estimated values and any associated initial test data. Pursuant to §429.12(b)(13), a certification report shall include the following public product-specific information: The testing laboratory's NVLAP identification number or other NVLAP-approved accreditation identification, the seasoning time in hours (h), the initial lumen output in lumens (lm), the input power in watts (W), the initial lamp efficacy in lumens per watt (lm/W), the correlated color temperature in kelvin (K), the lumen maintenance at 1,000 hours in percent (%), the lumen maintenance at 40 percent of lifetime in percent (%), the results of rapid cycle stress testing in number of units passed, the lifetime in hours (h), and the life in years.

(c) Rounding requirements. For represented values,

(1) Round initial lamp efficacy to the nearest tenth of a lumen per watt.

(2) Round lumen maintenance at 1,000 hours to the nearest tenth of a percent.

(3) Round lumen maintenance at 40 percent of lifetime to the nearest tenth of a percent.

(4) Round CRI to the nearest whole number.

(5) Round power factor to the nearest hundredths place.

(6) Round lifetime to the nearest whole hour.

(7) Round CCT to the nearest 100 kelvin (K).

(8) Round standby mode power to the nearest tenth of a watt.

(9) Round start time to the nearest whole millisecond.

PART 430--ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

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

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

5. Section 430.2 is amended by:

   a. Revising the definition of "correlated color temperature"; and

   b. Adding in alphabetical order definitions of "compact fluorescent lamp" and "lifetime of a compact fluorescent lamp."

The revision and additions read as follows:

§430.2 Definitions.

* * * * *

Compact fluorescent lamp or CFL means an integrated or non-integrated single-base, low-pressure mercury, electric-discharge source in which a fluorescing coating transforms some of the ultraviolet energy generated by the mercury discharge into light; however, the term does not include circline or U-shaped fluorescent lamps.

* * * * *

Correlated color temperature or CCT means the absolute temperature of a blackbody whose chromaticity most nearly resembles that of the light source.

* * * * *

Lifetime of a compact fluorescent lamp means the length of operating time between first use and failure of 50 percent of the sample units (as defined in §429.35(a)(1)), in accordance with the test procedures described in section 3.3 of appendix W to subpart B of this part.

* * * * *

6. Section 430.3 is amended by:

    a. Redesignating paragraphs (d)(8) through (d)(19) as paragraphs (d)(9) through (d)(20), respectively, and adding paragraph (d)(8);

    b. Revising paragraph (l);

    c. Redesignating paragraph (o)(7) to be paragraph (o)(8) and adding paragraphs (o)(7), (o)(9), (o)(10), and (o)(11);

    d. Revising paragraph (p)(4); and

    e. Removing and reserving paragraph (v)(2).

    The revisions and additions read as follows:

§430.3 Materials incorporated by reference

* * * * *

(d) * * *

(8) ANSI_IEC C78.901-2014, Revision of ANSI C78.901-2005 ("ANSI_IEC C78.901-2014"), American National Standard for Electric Lamps—Single-Based Fluorescent Lamps—Dimensional and Electrical Characteristics, approved July 2, 2014; IBR approved for §430.2 and appendix W to subpart B.

* * * * *

(l) * * *

(1) CIE 13.3-1995 ("CIE 13.3"), Technical Report: Method of Measuring and Specifying Colour Rendering Properties of Light Sources, 1995, ISBN 3 900 734 57 7; IBR approved for §430.2 and appendices R and W to subpart B.

(2) CIE 15:2004 ("CIE 15"), Technical Report: Colorimetry, 3rd edition, 2004, ISBN 978 3 901906 33 6; IBR approved for appendices R and W to subpart B.

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(o) * * *

(7) IES LM-54-12, IES Guide to Lamp Seasoning, approved October 22, 2012; IBR approved for appendix W to subpart B.

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(9) IES LM-65-14, IES Approved Method for Life Testing of Single-Based Fluorescent Lamps, approved December 30, 2014; IBR approved for appendix W to subpart B.

(10) IES LM-66-14, IES Approved Method for the Electrical and Photometric Measurements of Single-Based Fluorescent Lamps, except Annexes A, B and C, approved December 30, 2014; IBR approved for appendix W to subpart B.

(11) IESNA LM-78-07, IESNA Approved Method for Total Luminous Flux Measurement of Lamps Using an Integrating Sphere Photometer, approved January 28, 2007; IBR approved for appendix W to subpart B.

* * * * *

(p) * * *

(4) IEC 62301 (“IEC 62301”), Household electrical appliances—Measurement of standby power, (Edition 2.0, 2011-01); IBR approved for appendices C1, D1, D2, G, H, I, J2, N, O, P, W, and X1 to subpart B.

* * * * *

(v) * * *

(2) [Reserved]

7. Section 430.23 is amended by revising paragraph (y) to read as follows:

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

* * * * *

(y) Compact fluorescent lamps. (1) Measure initial lumen output in accordance with section 3.2 of appendix W to this subpart.

(2) Measure input power in accordance with section 3.2 of appendix W to this subpart.

(3) Measure lamp initial lamp efficacy in accordance with section 3.2 of appendix W to this subpart.

(4) Measure lamp lumen maintenance at 1,000 hours in accordance with section 3.2 of appendix W to this subpart.

(5) Measure lamp lumen maintenance at 40 percent of lifetime of a compact fluorescent lamp (as defined in 10 CFR 430.2) in accordance with section 3.2 of appendix W to this subpart.

(6) Measure lamp color rendering index (CRI) in accordance with section 3.2 of appendix W to this subpart.

(7) Measure lamp correlated color temperature (CCT) in accordance with section 3.2 of appendix W to this subpart.

(8) Measure lamp power factor in accordance with section 3.2 of appendix W to this subpart.

(9) Measure lamp time to failure in accordance with section 3.3 of appendix W to this subpart, and express time to failure in hours.

(10) Conduct the rapid cycle stress test in accordance with section 3.3 of appendix W to this subpart.

(11) Measure lamp start time in accordance with section 3.4 of appendix W to this subpart.

(12) Measure lamp standby mode power in accordance with section 4 of appendix W to this subpart.

8. Section 430.25 is revised to read as follows:

§430.25 Laboratory Accreditation Program.

The testing for general service fluorescent lamps, general service incandescent lamps (with the exception of lifetime testing), incandescent reflector lamps, compact fluorescent lamps, and fluorescent lamp ballasts must be conducted by test laboratories accredited by

an Accreditation Body that is a signatory member to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). A manufacturer's or importer's own laboratory, if accredited, may conduct the applicable testing.

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

Appendix W to Subpart B of Part 430 – Uniform Test Method for Measuring the Energy Consumption of Compact Fluorescent Lamps

Note: Before [DATE 180 DAYS AFTER DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER], any representations, including certifications of compliance, made with respect to the energy use or efficiency of medium base compact fluorescent lamps must be made in accordance with the results of testing pursuant either to this appendix, or to the applicable test requirements set forth in 10 CFR parts 429 and 430 as they appeared in the 10 CFR parts 200 to 499 annual edition revised as of January 1, 2015.

On or after [DATE 180 DAYS AFTER DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER], any representations, including certifications of compliance (if required), made with respect to the energy use or efficiency of CFLs must be made in accordance with the results of testing pursuant to this appendix.

1. Scope:

1.1. This appendix specifies the test methods required to measure the initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of lifetime of a compact fluorescent lamp (as defined in 10 CFR 430.2), time to failure, power factor, correlated color temperature (CCT), color rendering index (CRI), and start time, and to conduct rapid cycle stress testing, of CFLs.

1.2. This appendix also provides test requirements applicable to integrated CFLs capable of operation in standby mode (as defined in §430.2), such as those that can be controlled wirelessly.

2. Definitions:

2.1. Ballasted adapter means a ballast that is not permanently attached to a CFL, has no consumer-replaceable components, and serves as an adapter by incorporating both a lamp socket and a lamp base.

2.2. Hybrid compact fluorescent lamp means a CFL that incorporates one or more supplemental light sources of different technology.

2.3. Initial lamp efficacy means the lamp efficacy (as defined in §430.2) at the end of the seasoning period, as calculated pursuant to section 3.2.2.9 of this appendix.

2.4. Integrated compact fluorescent lamp means an integrally ballasted CFL that contains all components necessary for the starting and stable operation of the lamp, contains an ANSI standard base, does not include any replaceable or interchangeable parts, and is capable of being connected directly to a branch circuit through a corresponding ANSI standard lamp-holder (socket).

2.5. Labeled wattage means the highest wattage marked on the lamp and/or lamp packaging.

2.6. Lumen maintenance means the lumen output measured at a given time in the life of the lamp and expressed as a percentage of the measured initial lumen output, respectively.

2.7. Measured initial input power means the root mean square (RMS) input power to the lamp, measured at the end of the lamp seasoning period, and expressed in watts (W).

2.8. Measured initial lumen output means the lumen output of the lamp measured at the end of the lamp seasoning period, expressed in lumens (lm).

2.9. Non-integrated compact fluorescent lamp means a CFL that is not an integrated CFL.

2.10. Percent variability means the range (calculated by subtracting the minimum from the maximum) expressed as a percentage of the mean for the contiguous set of separate lumen output measurements spanning the specified time period, where each measurement is the average value of the sampled waveform over an interval corresponding to one full cycle of sinusoidal input voltage.

2.11. Power factor means the measured RMS input power (watts) divided by the product of the measured RMS input voltage (volts) and the measured RMS input current (amps).

2.12. Start plateau means the first 100 millisecond period of operation during which the percent variability does not exceed 5 percent and the average measured lumen output is at least 10 percent of the measured initial lumen output.

2.13. Start time means the time, measured in milliseconds, between the application of power to the CFL and the point when the measured full-cycle lumen output (the

average value of the sampled waveform over an interval corresponding to one full cycle of sinusoidal input voltage) reaches 98 percent of the average measured lumen output of the start plateau.

2.14. Time to failure means the time elapsed between first use and the point at which the CFL ceases to produce measureable lumen output.

3. Active Mode Test Procedures

3.1. General Instructions.

3.1.1. Maintain lamp operating orientation throughout seasoning and testing, including storage and handling between tests.

3.1.2. Season CFLs prior to photometric and electrical testing in accordance with sections 4, 5, 6.1, and 6.2.2.1 of IES LM-54-12 (incorporated by reference, see §430.3).

3.1.2.1. Unit operating time during seasoning may be counted toward time to failure, lumen maintenance at 40 percent of lifetime of a compact fluorescent lamp (as defined in §430.2), and lumen maintenance at 1,000 hours if the required operating cycle and test conditions for time to failure testing per section 3.3 of this appendix are satisfied.

3.1.2.2. If a lamp breaks, becomes defective, fails to stabilize, exhibits abnormal behavior (such as swirling), or stops producing light prior to the end of the seasoning period, the lamp must be replaced with a new unit. If a lamp exhibits one of the conditions listed in the previous sentence after the seasoning period, the lamp's measurements must be included in the sample.

3.1.3. Conduct all testing with the lamp operating at labeled wattage and with no dimmer in the circuit. This requirement applies to all integrated CFLs, including those that are dimmable or multi-level.

3.1.4. Operate the CFL at the rated input voltage throughout testing. For a CFL with multiple rated input voltages including 120 volts, operate the CFL at 120 volts. If a CFL with multiple rated input voltages is not rated for 120 volts, operate the CFL at the highest rated input voltage.

3.1.5. Test CFLs packaged with ballasted adapters or designed exclusively for use with ballasted adapters as non-integrated CFLs, with no ballasted adapter in the circuit.

3.1.6. Conduct all testing of hybrid CFLs with all supplemental light sources in the lamp turned off, if possible. Before taking measurements, verify that the lamp has stabilized in the operating mode that corresponds to its labeled wattage.

3.2. Test Procedures for Determining Initial Lamp Efficacy, Lumen Maintenance, CCT, CRI, and Power Factor.

Use the test procedures specified in IES LM-66-14 (incorporated by reference; see §430.3) where those procedures do not conflict with the test procedures specified in this section. Determine initial lamp efficacy, lumen maintenance at 1,000 hours, lumen maintenance at 40 percent of lifetime of a compact fluorescent lamp (as defined in §430.2), CCT, and CRI for integrated and non-integrated CFLs. Determine power factor for integrated CFLs only.

3.2.1. Test Conditions and Setup

3.2.1.1. Test half of the units in the sample in the base-up position, and half of the units in the base-down position; if the position is restricted by the manufacturer, test the units in the manufacturer-specified position.

3.2.1.2. Establish the ambient conditions, power supply, auxiliary equipment, circuit setup, lamp connections, and instrumentation in accordance with the specifications in sections (and corresponding subsections) 4.0, 5.0 and 6.0 of IES LM-66-14 (incorporated by reference; see §430.3). The following exceptions apply:

3.2.1.2.1. Maintain ambient temperature at 25 °C ± 1 °C (77 °F ± 1.8 °F).

3.2.1.3. Non-integrated CFLs must adhere to the ballast requirements in section 5.2 of IES LM-66-14 (incorporated by reference; see §430.3).

3.2.1.3.1. Test non-integrated lamps rated for operation on a choice of low frequency or high frequency circuits (e.g., many preheat lamps) at low frequency.

3.2.1.3.2. Test non-integrated lamps rated for operation on a choice of preheat (starter) or rapid start (no starter) circuits on rapid start.

3.2.1.3.3. Test non-integrated lamps rated for operation on a choice of instant start (shunted) or rapid start (non-shunted) circuits on rapid start.

3.2.1.3.4. Operate non-integrated CFLs not listed in ANSI_IEC C78.901-2014 (incorporated by reference; see §430.3) using the following reference ballast settings:

3.2.1.3.4.1. Operate 25-28 W, T5 twin 2G11-based lamps that are lower wattage replacements of the 40 W, T5 twin 2G11-based lamps using the following reference ballast settings: 400 volts, 0.270 amps, and 1240 ohms.

3.2.1.3.4.2. Operate 14-15 W, T4 quad G24q-2-based lamps using the following reference ballast settings: 220 volts, 0.220 amps, and 815 ohms.

3.2.1.3.4.3. Operate 21 W, T4 quad G24q-3-based lamps using the following reference ballast settings: 220 volts, 0.315 amps, and 546 ohms.

3.2.1.3.4.4. Operate 21 W, T4 quad G24d-3-based lamps using the following reference ballast settings: 220 volts, 0.315 amps, and 546 ohms.

3.2.1.3.4.5. Operate 21 W, T4 multi (6) GX24q-3-based lamps using the following reference ballast settings: 220 volts, 0.315 amps, and 546 ohms.

3.2.1.3.4.6. Operate 27-28 W, T4 multi (6) GX24q-3-based lamps using the following reference ballast settings: 200 volts, 0.320 amps, and 315 ohms.

3.2.1.3.4.7. Operate 33-38 W, T4 multi (6) GX24q-4-based lamps using the following reference ballast settings: 270 volts, 0.320 amps, and 420 ohms.

3.2.1.3.4.8. Operate 10 W, T4 square GR10q-4-based lamps using the following reference ballast settings: 236 volts, 0.165 amps, and 1,200 ohms.

3.2.1.3.4.9. Operate 16 W, T4 square GR10q-4-based lamps using the following reference ballast settings: 220 volts, 0.195 amps, and 878 ohms.

3.2.1.3.4.10. Operate 21 W, T4 square GR10q-4-based lamps using the following reference ballast settings: 220 volts, 0.260 amps, and 684 ohms.

3.2.1.3.4.11. Operate 28 W, T6 square GR10q-4-based lamps using the following reference ballast settings: 236 volts, 0.320 amps, and 578 ohms.

3.2.1.3.4.12. Operate 38 W, T6 square GR10q-4-based lamps using the following reference ballast settings: 236 volts, 0.430 amps, and 439 ohms.

3.2.1.3.4.13. Operate 55 W, T6 square GRY10q-3-based lamps using the following reference ballast settings: 236 volts, 0.430 amps, and 439 ohms.

3.2.1.3.4.14. For all other lamp designs not listed in ANSI_IEC C78.901-2014 or in section 3.2.1.3.4 of this appendix:

3.2.1.3.4.14.1. If the lamp is a lower wattage replacement of a lamp with specifications in ANSI_IEC C78.901-2014, use the reference ballast specifications of the

corresponding higher wattage lamp replacement in ANSI_IEC C78.901-2014.

3.2.1.3.4.14.2. For all other lamps, use the reference ballast specifications in ANSI_IEC C78.901-2014 for a lamp with the most similar shape, diameter, and base specifications, and next closest wattage.

3.2.2. Test Methods, Measurements, and Calculations

3.2.2.1. Season CFLs as specified in section 3.1.2 of this appendix.

3.2.2.2. Stabilize CFLs as specified in section 6.2.1 of IES LM-66-14 (incorporated by reference; see §430.3).

3.2.2.3. Measure the input power (in watts), the input voltage (in volts), and the input current (in amps) as specified in section 5.2 of IES LM-66-14 (incorporated by reference; see §430.3).

3.2.2.4. Measure initial lumen output as specified in section 6.3.1 of IES LM-66-14 (incorporated by reference; see §430.3) and in accordance with IESNA LM-78-07 (incorporated by reference; see §430.3).

3.2.2.5. Measure lumen output at 1,000 hours as specified in section 6.3.1 of IES LM-66-14 (incorporated by reference; see §430.3) and in accordance with IESNA LM-78-07 (incorporated by reference; see §430.3).

3.2.2.6. Measure lumen output at 40 percent of lifetime of a compact fluorescent lamp (as defined in 10 CFR 430.2) as specified in section 6.3.1 of IES LM-66-14 (incorporated by reference; see §430.3) and

in accordance with IESNA LM-78-07 (incorporated by reference; see §430.3).

3.2.2.7. Measure CCT as specified in section 6.4 of IES LM-66-14 (incorporated by reference; see §430.3) and in accordance with CIE 15:2004 (incorporated by reference; see §430.3).

3.2.2.8. Measure CRI as specified in section 6.4 of IES LM-66-14 (incorporated by reference; see §430.3) and in accordance with CIE 13.3-1995 (incorporated by reference; see §430.3).

3.2.2.9. Determine initial lamp efficacy by dividing measured initial lumen output by the measured initial input power.

3.2.2.10. Determine lumen maintenance at 1,000 hours by dividing measured lumen output at 1,000 hours by the measured initial lumen output.

3.2.2.11. Determine lumen maintenance at 40 percent of lifetime of a compact fluorescent lamp (as defined in §430.2) by dividing measured lumen output at 40 percent of lifetime of a compact fluorescent lamp (as defined in §430.2) by the measured initial lumen output.

3.2.2.12. Determine power factor by dividing the measured RMS input power (watts) by the product of measured RMS input voltage (volts) and measured RMS input current (amps).

3.3. Test Method for Time to Failure and Rapid Cycle Stress Test.

Use the test procedures specified in IES LM-65-14 (incorporated by reference; see §430.3) where those procedures do not conflict with the test procedures specified in this section. Disregard section 3 of IES LM-65-14. Determine time

to failure and conduct rapid cycle stress testing for integrated and non-integrated CFLs.

3.3.1. Test Conditions and Setup

3.3.1.1. Test half of the units in the base up position and half of the units in the base down position; if the position is restricted by the manufacturer, test in the manufacturer specified position.

3.3.1.2. Establish the ambient and physical conditions and electrical conditions in accordance with the specifications in sections 4.0 and 5.0 of IES LM-65-14 (incorporated by reference; see §430.3). The following exceptions apply:

3.3.1.2.1. Do not test lamps in fixtures or luminaires.

3.3.1.3. Non-integrated CFLs must adhere to ballast requirements as specified in section 3.2.1.3 of this appendix.

3.3.2. Test Methods and Measurements

3.3.2.1. Season CFLs as specified in section 3.1.2 of this appendix.

3.3.2.2. Measure time to failure of CFLs as specified in section 6.0 of IES LM-65-14 (incorporated by reference; see §430.3).

3.3.2.3. Conduct rapid cycle stress testing of CFLs as specified in section 6.0 of IES LM-65-14 (incorporated by reference; see §430.3), except cycle the lamp continuously with each cycle consisting of one 5-minute ON period followed by one 5-minute OFF period.

3.4. Test Method for Start Time.

Use the test procedures specified in IES LM-66-14 (incorporated by reference; see §430.3) where those procedures do not conflict with the test procedures specified in this section. Determine start time for integrated CFLs only.

3.4.1. Test Conditions and Setup

3.4.1.1. Test all units in the base up position; if the position is restricted by the manufacturer, test units in the manufacturer specified position.

3.4.1.2. Establish the ambient conditions, power supply, auxiliary equipment, circuit setup, lamp connections, and instrumentation in accordance with the specifications in sections 4.0, 5.0 and 6.0 of IES LM-66-14 (incorporated by reference; see §430.3). The following exceptions apply:

3.4.1.2.1. Maintain ambient temperature at 25 °C ± 1 °C (77 °F ± 1.8 °F).

3.4.2. Test Methods and Measurement

3.4.2.1. Season CFLs as specified in section 3.1.2 of this appendix.

3.4.2.2. After seasoning, store units at 25 °C ± 5 °C ambient temperature for a minimum of 16 hours prior to the test, after which the ambient temperature must be 25 °C ± 1 °C for a minimum of 2 hours immediately prior to the test. Any units that have been off for more than 24 hours must be operated for 3 hours and then be turned off for 16 to 24 hours prior to testing.

3.4.2.3. Measure lumen output as specified in section 3.2.2.4 of this appendix.

3.4.2.4. Connect multichannel oscilloscope with data storage capability to record input voltage to CFL and lumen output. Set oscilloscope to trigger at 10 V lamp input voltage. Set oscilloscope vertical scale such that vertical resolution is 1 percent of measured initial lumen output or finer. Set oscilloscope to sample the lumen output waveform at a minimum rate of 2 kHz.

3.4.2.5. Apply rated voltage and frequency to CFL.

3.4.2.6. Upon trigger for start time testing, record sampled lumen output waveform until the measured full-cycle lumen output has reached the start plateau. Determine the start plateau as defined in this appendix.

3.4.2.7. Calculate the measured full-cycle lumen output as a moving average, whereby values are determined at least once every millisecond and each value represents the full-cycle interval in which it is centered. Measure input voltage and start time.

4. Standby Mode Test Procedure

Use the test procedures specified in IEC 62301 (incorporated by reference; see §430.3) where those procedures do not conflict with the test procedures specified in this section. Measure standby mode power only for integrated CFLs that are capable of standby mode operation.

4.1. Test Conditions and Setup

4.1.1. Test half of the units in the sample in the base up position and half of the units in the base down position; if the position is restricted by the manufacturer, test units in the manufacturer specified position.

4.1.2. Maintain ambient temperature at 25 °C ± 1 °C (77 °F ± 1.8 °F).

4.1.3. Ambient airflow must be maintained in accordance with section 4.4 of IES LM-66-14 (incorporated by reference, see §430.3).

4.2. Test Methods and Measurements

4.2.1. Season CFLs as specified in section 3.1.2 of this appendix.

4.2.2. Utilize the methodology for measuring power consumption specified in section 5 of IEC 62301 (incorporated by reference; see §430.3) for the testing of standby mode power.

4.2.3. Standby mode is initiated when the CFL is connected to the power supply and lumen output is zero.

10. Section 430.32 is amended by revising paragraph (u) to read as follows:

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

* * * * *

(u) Compact fluorescent lamps — (1) Medium base compact fluorescent lamps. A bare or covered (no reflector) medium base compact fluorescent lamp manufactured on or after January 1, 2006, must meet the following requirements:

Factor	**Requirements**
Labeled Wattage (Watts) & Configuration *	Measured initial lamp efficacy (lumens per watt) must be at least:
Bare Lamp:	
Labeled Wattage < 15	45.0
Labeled Wattage ≥ 15	60.0
Covered Lamp (no reflector):	
Labeled Wattage < 15	40.0
15 ≤ Labeled Wattage < 19	48.0
19 ≤ Labeled Wattage < 25	50.0
Labeled Wattage ≥ 25	55.0

Lumen Maintenance at 1,000 Hours	≥90.0%
Lumen Maintenance at 40 Percent of Lifetime	≥80.0%
Rapid Cycle Stress Test	Each lamp must be cycled once for every 2 hours of lifetime of compact fluorescent lamp as defined in §430.2. At least 5 lamps must meet or exceed the minimum number of cycles.
Lifetime	≥6,000 hours

* Use labeled wattage to determine the appropriate efficacy requirements in this table; do not use measured wattage for this purpose.

(2) [Reserved]

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