[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[EERE-2017-BT-TP-0005]

RIN 1904-AD67

Energy Conservation Program: Test Procedures for Fluorescent Lamp Ballasts

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

ACTION: Notice of proposed rulemaking and request for comment.

SUMMARY: The U.S. Department of Energy (DOE) proposes to revise its test procedures for fluorescent lamp ballasts. DOE proposes to update references to industry standards; clarify the selection of reference lamps; provide a second stabilization option for measuring ballast luminous efficiency; provide a test procedure for measuring the performance of ballasts at light outputs less than full light output; and revise the test procedure for measuring standby mode energy consumption. DOE is seeking comment from interested parties on the proposal.

DATES: DOE will accept comments, data, and information regarding this notice of proposed rulemaking (NOPR) no later than [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***]. See section V, "Public Participation," for details.

ADDRESSES: Any comments submitted must identify the Test Procedure NOPR for Fluorescent Lamp Ballasts, and provide docket number EERE-2017-BT-TP-0005 and/or regulatory information number (RIN) number 1904-AD67. Comments may be submitted using any of the following methods:

1) *Federal eRulemaking Portal*: *http://www.regulations.gov*. Follow the instructions for submitting comments.
2) *E-mail*: *FLB2017TP0005@ee.doe.gov*. Include the docket number and/or RIN in the subject line of the message.
3) *Postal Mail*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-6636. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.
4) *Hand Delivery/Courier*: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., 6th Floor, Washington, DC, 20024. Telephone: (202) 586-6636. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

No telefacsimilies (faxes) will be accepted. For detailed instructions on submitting comments and additional information on the rulemaking process, see section V of this document (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 *http://www.regulations.gov*. All documents in the docket are listed in the *http://www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket web page can be found at *https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=3*. The docket web page contains simple instructions on how to access all documents, including public comments, in the docket. See section V for information on how to submit comments through *http://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-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 287-1604. E-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

Ms. Sarah Butler, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-1777. E-mail: *sarah.butler@hq.doe.gov*.

For further information on how to submit a comment and review other public comments and the docket, contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by email: *Appliance_Standards_Public_Meetings@ee.doe.gov*.

SUPPLEMENTARY INFORMATION: DOE proposes to incorporate by reference specific sections of the following industry standards into 10 CFR part 430:

(1) ANSI Standard C78.81, ("ANSI C78.81-2016"), "American National Standard for Electric Lamps – Double-Capped Fluorescent Lamps – Dimensional and Electrical Characteristics," approved June 29, 2016.

(2) ANSI Standard C78.375A, ("ANSI C78.375A"), "American National Standard for Electric Lamps - Fluorescent Lamps – Guide for Electrical Measures," approved August 28, 2014.

(3) ANSI Standard C78.901, "American National Standard for Electric Lamps – Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics," approved August 23, 2016.

(4) ANSI Standard C82.1, ("ANSI C82.1") "American National Standard for Lamp Ballasts—Line Frequency Fluorescent Lamp Ballast," approved November, 20, 2015.

(5) ANSI Standard C82.2, ("ANSI C82.2") "American National Standard for Lamp Ballasts—Method of Measurement of Fluorescent Lamp Ballasts," approved July 12, 2016.

(6) ANSI Standard C82.3, ("ANSI C82.3") "American National Standard for Lamp Ballasts – Reference Ballasts for Fluorescent Lamps," approved April 8, 2016.

(7) ANSI_ANSLG Standard C82.11, ("ANSI C82.11"), "American National Standard for Lamp Ballasts – High Frequency Fluorescent Lamp Ballasts – Supplements," approved January 23, 2017.

(8) ANSI Standard C82.77, ("ANSI C82.77") "American National Standard—Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment," approved January 17, 2002.

Copies of ANSI C78.81-2016, ANSI C78.375A-2014, ANSI C78.901-2016, ANSI C82.1-2015, ANSI C82.2-2016, ANSI C82.3-2016, ANSI C82.11-2017, and ANSI C82.77-2002, are available at *www.ansi.org* or *www.nema.org*.

1) International Electrotechnical Commission (IEC) Standard 60081, ("IEC 60081"), "Double Capped Fluorescent Lamps – Performance specifications (Amendment 6, Edition 5.0, August 2017)."

2) International Electrotechnical Commission (IEC) Standard 62301, ("IEC 62301"), "Household electrical appliances – Measurement of standby power (Edition 2.0, 2011-01)."

Copies of IEC Standard 60081 (Edition 5.0) and IEC Standard 62301 (Edition 2.0) are available on IEC's website at *https://webstore.iec.ch/home*.

For a further discussion of these standards, see section IV.N.

Table of Contents

I. Authority and Background

Fluorescent lamp ballasts are "covered products" for which the U.S. Department of Energy (DOE) is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6292(a)(13), 6295(a)) DOE's energy conservation standards and test procedures for fluorescent lamp ballasts are currently prescribed at 10 CFR 430.32(m) and 10 CFR 430.23(q), respectively. The following sections discuss DOE's authority to establish test procedures for fluorescent lamp ballasts and relevant background information regarding DOE's consideration of test procedures for this product.

A. Authority

The Energy Policy and Conservation Act of 1975, as amended ("EPCA" or "the Act"),[1] among other things, authorizes DOE to regulate the energy efficiency of a number of consumer products and industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B[2] established the "Energy Conservation Program for Consumer Products Other Than Automobiles," which sets forth a variety of provisions designed to improve energy efficiency. These consumer products include fluorescent lamp ballasts, the subject of this document. (42 U.S.C. 6292(a)(13))

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. Relevant provisions of the Act include definitions (42 U.S.C. 6291), energy conservation standards (42 U.S.C. 6295), test procedures (42 U.S.C. 6293), labeling

[1] All references to EPCA in this document refer to the statute as amended through the EPS Improvement Act of 2017, Public Law 115–115 (January 12, 2018).
[2] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

provisions (42 U.S.C. 6294), and the authority to require information and reports from manufacturers (42 U.S.C. 6296). The testing requirements consist of test procedures that manufacturers of covered products must use as the basis for (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA, and (2) making representations about the efficiency of those products. (42 U.S.C. 6295(s) and 6293(c)) Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA. (42 U.S.C. 6295(s))

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

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

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

incorporated into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product unless the current test procedures already account for and incorporate standby and off mode energy consumption or such integration is technically infeasible. If an integrated test procedure is technically infeasible, DOE must prescribe a separate standby mode and off mode energy use test procedure for the covered product, if technically feasible. (U.S.C. 6295(gg)(2)(A)(ii)) Any such amendment must consider the most current versions of the International Electrotechnical Commission (IEC) Standard 62301[3] and IEC Standard 62087[4] as applicable. (42 U.S.C. 6295(gg)(2)(A))

If DOE determines that a test procedure amendment is warranted, it must publish proposed test procedures and offer the public an opportunity to present oral and written comments on them. (42 U.S.C. 6293(b)(2)) EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including fluorescent lamp ballasts, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A)) If the Secretary determines, on his own behalf or in response to a petition by any interested person, that a test procedure should be prescribed or amended, the Secretary shall promptly publish in the *Federal Register* proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such

[3] IEC 62301, *Household electrical appliances—Measurement of standby power* (Edition 2.0, 2011-01).
[4] IEC 62087, *Methods of measurement for the power consumption of audio, video, and related equipment* (Edition 3.0, 2011-04).

procedures. The comment period on a proposed rule to amend a test procedure shall be at least 60 days and may not exceed 270 days. In prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved. (42 U.S.C. 6293(b)(2)) If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedure. (42 U.S.C. 6293(b)(1)(A))

DOE is publishing this NOPR towards satisfying the 7-year review requirement within EPCA for both the active mode and standby mode test procedures for all categories of fluorescent lamp ballasts. DOE has tentatively determined that a fluorescent lamp ballast does not have an "off mode," as defined by EPCA (see section I.B for further details.)

B. Background

DOE's existing test procedures for fluorescent lamp ballasts for active mode and standby mode operation appear at title 10 of the Code of Federal Regulations (CFR) part 430, subpart B, appendix Q ("Uniform Test Method for Measuring the Energy Consumption of Fluorescent Lamp Ballasts").

DOE published a final rule establishing active mode test procedures for fluorescent lamp ballasts on April 24, 1991. 56 FR 18677. DOE last completed a full review of the active mode test procedures for fluorescent lamp ballasts on May 4, 2011. 76 FR 25211. Some of the key amendments in that test procedure final rule included updates to industry standards, adopting

ballast luminous efficiency (BLE) as the metric for measuring the energy efficiency of fluorescent lamp ballasts, and expanding the test procedure to apply to additional products.

DOE published a final rule establishing standby mode energy consumption test procedures for fluorescent lamp ballasts on October 22, 2009. 74 FR 54445. DOE determined that, according to EPCA's definition of standby mode,[5] fluorescent lamp ballasts capable of standby mode operation are designed to operate in, or function as, a lighting control system where auxiliary control devices send signals to the ballast; and at zero light output, the ballast is standing by, connected to a main power source without being disconnected by an on-off switch or other type of relay. Further, DOE determined that it is not possible for fluorescent lamp ballasts to meet EPCA's definition of "off mode,"[6] because there is no condition in which the ballast is connected to the main power source and is not in a mode already accounted for in either active mode or standby mode. 74 FR 54445, 54448.

DOE published final rules establishing and amending energy conservation standards for fluorescent lamp ballasts on September 19, 2000, and November 14, 2011, respectively. 65 FR 56740; 76 FR 70547. DOE also published final rules on February 4, 2015, June 5, 2015, and April 29, 2016, to correct and clarify certain requirements and specifications in the CFR relating to energy conservation standards and test procedures. 80 FR 5896; 80 FR 31971; 81 FR 25595.

[5] EPCA defines "standby mode" as "the condition in which an energy-using product—(I) is connected to a main power source; and (II) offers 1 or more of the following user-oriented or protective functions: (aa) To facilitate the activation or deactivation of other functions (including active mode) by remote switch (including remote control), internal sensor, or timer. (bb) Continuous functions, including information or status displays (including clocks) or sensor-based functions." (42 U.S.C. 6295(gg)(1)(A)(iii))

[6] EPCA defines "off mode" as "the condition in which an energy-using product—(I) is connected to a main power source; and (II) is not providing any standby or active mode function." (42 U.S.C. 6295(gg)(1)(A)(ii))

In this rulemaking, DOE is reviewing the existing active mode and standby mode test procedures for fluorescent lamp ballasts to determine appropriate amendments to update and clarify the test procedure as well as to support the consideration of energy conservation standards for fluorescent lamp ballasts. DOE initiated a data gathering process for the test procedure and energy conservation standards for fluorescent lamp ballasts (hereafter FL Ballast ECS rulemaking)[7] by publishing a *Federal Register* document announcing a public meeting and availability of the framework document on June 23, 2015. 80 FR 35886.

II. Synopsis of the Notice of Proposed Rulemaking

In this notice of proposed rulemaking (NOPR), DOE proposes to update the fluorescent lamp ballast test procedure as follows: 1) update references to industry standards; 2) clarify the selection of reference lamps; 3) provide a second stabilization option for measuring ballast luminous efficiency; 4) provide a test procedure for measuring the performance of dimming ballasts at light outputs less than full light output; and 5) revise the test procedure for measuring standby mode energy consumption. DOE has tentatively determined that any change in measured values due to the proposed updates would be de minimis and the proposed test procedure would not be unduly burdensome. DOE's proposed actions are summarized in Table II.1 and addressed in detail in section III of this document.

Table II.1 Summary of Changes in Proposed TP Relative to Current TP

Current DOE TP	Proposed TP	Attribution
References the 2002 version of ANSI C82.11 for testing high frequency ballasts	Adds checks on inrush current and references lamp datasheets in ANSI C78.81 and ANSI C78.901 for appropriate maximum glow current.	Industry TP Update to ANSI 82.11
References lamp datasheets in ANSI	The 2016 version of ANSI C78.81 updates the	Industry TP Update

[7] Information regarding the Fluorescent Lamp Ballast Rulemaking can be found on regulations.gov, docket number EERE-2015-BT-STD-0006 at *https://www.regulations.gov/docket?D=EERE-2015-BT-STD-0006*

Current DOE TP	Proposed TP	Attribution
C78.81 to specify the appropriate reference lamp to use when testing a particular ballast.	high frequency characteristics of three lamps currently referenced in Table A.	to ANSI C78.81
References lamp datasheets in IEC 60081 Amendment 4 to specify the appropriate reference lamp to use when testing a particular ballast.	Amendment 6 of IEC 60081 updates the high frequency characteristics of two lamps currently referenced in Table A.	Industry TP Update to IEC 60081
Does not provide detail to determine which lamp to use for testing when ballasts can operate lamps of more than one base type.	Adds direction for how to select a reference lamp to use for testing fluorescent lamp ballasts designed and marketed to operate lamps of multiple base types.	Direction added by DOE
Measures lamp arc voltage, current, and power once per second during stabilization.	Measures lamp arc voltage, current, and power once per minute during stabilization.	Direction added by DOE in response to industry comments
Operates ballast for no longer than one hour until stable operating conditions are met.	No maximum operating time until stable operating conditions are met.	Direction added by DOE
Has one method of stabilization where lamp arc voltage, current, and power are measured once per second until the difference between the maximum and minimum values do not exceed one percent over a four minute moving window.	Allows a second stabilization option where an oven is used to heat the ballasts prior to testing and quantities are measured once per minute.	Method added by DOE in response to industry comments
Does not have a method to measure ballast performance at less than full light output.	Adds a method to measure ballast efficiency, a new metric, at less than full light output.	Method added by DOE in response to industry comments
Measures standby mode power by referencing ANSI C82.2.	References IEC 62301 to measure standby mode power.	Method changed by DOE per EPCA requirements.
Ballast connects to reference lamp while measuring standby mode power.	Reference lamps are not required when measuring standby mode power.	Direction added by DOE
No input voltage is specified when measuring standby mode power.	Includes specifications for which input voltage to operate ballasts designed and marketed to operate at multiple input voltages.	Direction added by DOE in response to industry comments

III. Discussion

A. Scope of Applicability

This rulemaking applies to fluorescent lamp ballasts, which are devices that can start and operate fluorescent lamps by providing a starting voltage and current and limiting the current during normal operation. 10 CFR 430.2. DOE defines a fluorescent lamp as a lamp of certain

shapes, lengths, bases, and wattages[8] that is 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. 10 CFR 430.2.

In response to the framework document, Northwest Energy Efficiency Alliance (NEEA) stated that before DOE decides whether to establish standards for additional dimming fluorescent lamp ballasts, it should examine the test procedure. (NEEA, Public Meeting Transcript, No. 5 at p. 68)[9] Pacific Gas and Electric Company, Southern California Gas Company, San Diego Gas and Electric Company, and Southern California Edison, collectively referred to herein as the California investor-owned utilities (CA IOUs) recommended that DOE start a new rulemaking to update DOE's test procedure for fluorescent lamp ballasts if dimming ballasts will be considered in the FL Ballast ECS rulemaking. (CA IOUs, No. 10 at p. 3)

After reviewing the test procedure for fluorescent lamp ballasts, DOE is proposing updates and revisions that will accommodate the testing of all fluorescent lamp ballasts that meet the definition. This includes a test method for ballasts that can be dimmed to make representations about performance at lower light output levels. These proposals are discussed in detail in the following sections of this document.

[8] See definition of "fluorescent lamps" in 10 CFR 430.2 for the specific lamps defined as fluorescent lamps.
[9] A notation in this form provides a reference for information that is in the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006). This notation indicates that the statement preceding the reference is included in document number 5 in the docket for the fluorescent lamp ballasts energy conservation standards rulemaking, at page 68.

B. Updates to Industry Standards

The fluorescent lamp ballast test procedure currently references several industry standards. Industry periodically updates its testing method to account for changes in ballast technology and/or developments in test methodology and/or test instruments. In its review of the current test procedure, DOE noted that updated versions of referenced industry standards are available. DOE compared updated and current versions to determine, as directed by EPCA, whether incorporating by reference the latest industry standards would alter measured energy efficiency. (42 U.S.C. 6293(e)(1)) After reviewing the industry standards incorporated by reference, DOE is proposing, as shown in Table III.1, to update the industry standard references in appendix Q:

Table III.1 Industry Standards Referenced in Appendix Q and the Updated Versions Available

Industry Standard Currently Referenced in Appendix Q*	**Updated Version**
ANSI C82.11[10] version 2002 (sections 2.1 and 2.4.1 of appendix Q)	ANSI C82.11[11] version 2017
ANSI C82.1[12] version 2004 (sections 2.1, 2.3.1, and 2.4.1 of appendix Q)	ANSI C82.1[13] version 2015
ANSI C82.2[14] version 2002 (sections 2.1, 2.2.1, 2.2.2, 2.2.3, 2.4.1, 2.4.3, 2.5.1.6, 2.5.1.7, 2.5.1.8, 3.2.1, 3.3.1,	ANSI C82.2[15] version 2016

[10] ANSI Standard ANSLG_C82.11, American National Standard For Lamp Ballasts—High-frequency Fluorescent Lamp Ballasts—Supplements (approved January 17, 2002).
[11] ANSI Standard C82.11, American National Standard For Lamp Ballasts—High-frequency Fluorescent Lamp Ballasts (approved January 23, 2017).
[12] ANSI Standard C82.1, American National Standard For Lamp Ballasts—Line Frequency Fluorescent Lamp Ballast (approved November, 19, 2004).
[13] ANSI Standard C82.1, American National Standard For Lamp Ballasts—Line Frequency Fluorescent Lamp Ballast (approved November, 20, 2015).
[14] ANSI Standard C82.2, American National Standard for Lamp Ballasts—Method of Measurement of Fluorescent Lamp Ballasts (approved June 6, 2002).
[15] ANSI Standard C82.2, American National Standard for Lamp Ballasts—Method of Measurement of Fluorescent Lamp Ballasts (approved July 12, 2016).

Industry Standard Currently Referenced in Appendix Q*	Updated Version
and 3.3.3 of appendix Q)	
ANSI C82.3[16] version 2002 (section 2.4.1 of appendix Q)	ANSI C82.3[17] version 2016
ANSI C78.375[18] version 1997 (section 2.4.2 of appendix Q)	ANSI C78.375A[19] version 2014
ANSI C78.901[20] version 2005 (Table A of appendix Q)	ANSI C78.901[21] version 2016
ANSI C78.81[22] version 2010 (sections 1.6, 1.7, 1.8, 2.1, 2.3.1, 2.4.1, and Table A of appendix Q)	ANSI C78.81[23] version 2016
IEC 60081 Amendment 4, Edition 5, 2010[24] (Table A of appendix Q)	IEC 60081 Amendment 6, Edition 5, 2017[25]

*Note: Additionally DOE is proposing to incorporate by reference ANSI C82.77-2002[26] and IEC 62301 Edition 2.0[27] in appendix Q.

The proposed updates to industry standard references do not involve substantive changes to the test setup and methodology, but rather clarifications. DOE is also proposing to incorporate by reference ANSI C82.77-2002 because ANSI C82.11-2017 references this standard when

[16] ANSI Standard C82.3, American National Standard for Lamp Ballasts – Reference Ballasts for Fluorescent Lamps (approved September 4, 2002).
[17] ANSI Standard C82.3, American National Standard for Lamp Ballasts – Reference Ballasts for Fluorescent Lamps (approved April 8, 2016).
[18] ANSI Standard C78.375, American National Standard For Fluorescent Lamps—Guide for Electrical Measures (approved September, 25, 1997).
[19] ANSI Standard C78.375A, American National Standard For Fluorescent Lamps—Guide for Electrical Measures (approved August, 28, 2014).
[20] ANSI Standard C78.901, American National Standards for Electric Lamps – Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics (approved March 23, 2005).
[21] ANSI Standard C78.901, American National Standards for Electric Lamps – Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics (approved August 23, 2016).
[22] ANSI Standard C78.81, American National Standard For Electric Lamps—Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics (approved January, 14, 2010).
[23] ANSI Standard C78.81, American National Standard For Electric Lamps—Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics (approved June 29, 2016).
[24] IEC Standard - Double-capped fluorescent lamps – Performance specifications, (Amendment 4, Edition 5.0) (approved February 2010).
[25] IEC Standard - Double Capped Fluorescent Lamps – Performance specifications, (Amendment 6, Edition 5.0) (approved August 2017)."
[26] ANSI Standard C82.77, American National Standard— Harmonic Emission Limits—Related Power Quality Requirements (approved January 17, 2002).
[27] IEC 62301, Household electrical appliances—Measurement of standby power (Edition 2.0, 2011-01).

specifying input current requirements. The following sections summarize updates relevant to DOE's test procedure for fluorescent lamp ballasts in each of the updated industry standards.

1. ANSI C82.2, ANSI C82.11, ANSI C82.77, ANSI C82.1, ANSI C82.3

DOE's current test procedure incorporates by reference ANSI C82.2-2002 for instruments, test conditions, and test measurements. DOE identified no changes in the 2016 version of C82.2 compared to the 2002 version.[28] DOE's review and information on the standard indicates that the revised 2016 version reaffirms the 2002 version. To align with the latest versions of industry standards, DOE proposes to update the incorporation by reference to the 2016 version of ANSI C82.2.

Currently, DOE's test procedure references sections 3.2.1 ("Operating Conditions"), 4 ("Electrical supply characteristics – test ballast measurement circuits"), 5 ("Electrical supply circuits – reference ballast measurement circuits"), 7 ("Test measurement circuits"), 8 ("Electrical Instruments"), and 13 ("Ballast efficacy factor") of ANSI C82.2-2002. In this NOPR, DOE proposes to reference only sections 3 ("Pertinent measurements"), 4, and 7 (disregarding Figure 1 and Figure 3) of ANSI C82.2-2016. DOE is proposing to no longer reference section 5 of ANSI C82.2 because it would be redundant and potentially confusing when read with other proposals in this NOPR. Section 5 of ANSI C82.2 states that reference ballasts must meet the electrical supply characteristics in ANSI C82.3 and ANSI C78.375. In this NOPR, DOE is proposing to explicitly state that reference ballasts must meet the requirements in ANSI C82.3, which also references ANSI C78.375 (see section III.D.1). To

[28] DOE notes the 2016 version of ANSI C82.2 contains a typographical error where the required ambient temperature is stated as 25OC ± 1OC instead of 25°C ± 1°C.

provide one set of direct and consistent industry references for reference ballasts, DOE is proposing to remove references to section 5 of ANSI C82.2. Section 8 of ANSI C82.2 only states instruments should meet the requirements outlined in ANSI C78.375. To streamline referenced in the DOE test procedure, DOE is proposing to directly reference ANSI C78.375 for specifications regarding instruments (see section III.D.1). DOE is proposing to not reference section 13 of ANSI C82.2 because it is not necessary. Section 13 specifies measurement of the ballast efficacy factor, a measurement that is not required by the DOE test procedure. As noted, the revised ANSI C82.2-2016 proposed for incorporation contains no changes compared to the currently referenced ANSI C82.2-2002. However, the latest versions of the industry standards, ANSI C82.1 and ANSI C82.11 cited in relevant sections of ANSI C82.2 have been modified.

DOE's current test procedure states that where ANSI C82.2-2002 references ANSI C82.1, the operator must use the 2004 version of ANSI C82.1 to test low-frequency ballasts, and the 2002 version of ANSI C82.11 to test high-frequency ballasts. DOE proposes to update these instructions (and the corresponding incorporations by reference in 10 CFR 430.3) to the 2017 version and 2015 version, respectively.

DOE identified the following seven changes in the 2017 version of ANSI C82.11 compared to the 2002 version:

- A small decrease in the range of ambient temperatures within which a ballast must operate to be within the stated scope of the standard. As discussed further below, this change has no effect on DOE's test procedure.

- Removal of the definition section. The 2017 version instead directly references ANSI C82.13 for definitions regarding fluorescent lamps and ballasts.

- Reference to lamp datasheets in ANSI C78.81 and ANSI C78.901 for thresholds of lamp current in reference lamps instead of specifying these thresholds within ANSI C82.11.

- Reference to ANSI C82.77 for limits on harmonic distortion of input currents instead of specifying these limits within ANSI C82.11.

- Addition of thresholds for aggregate peak inrush current amplitude and duration of steady state current.

- Reference to lamp datasheets in ANSI C78.81 and ANSI C78.901 instead of specifying the maximum glow current during ballast starting time within ANSI C82.11.

- Addition of Annex D, "Dimming Ballast Efficiency Test Method."

Below is more detailed discussion of each change.

First, the 2017 version of ANSI C82.11 describes the scope as ballast and lamp combinations normally intended for use in ambient temperatures 10 to 40 Celsius, which is a slight reduction from the stated scope of the 2002 version (10 to 41 Celsius). This change has no effect on DOE's test procedure because DOE's test procedure is applicable to any product that

meets the definition of a fluorescent lamp ballast and that definition does not specify an ambient temperature range.

Second, the 2017 version of ANSI C82.11 removed the definitions section and instead now references ANSI C82.13.[29] ANSI C82.13 is an industry standard for fluorescent lamp and ballast definitions and is also referenced by DOE's test procedure. DOE has tentatively determined this change has no effect on the DOE test procedure because the definitions are already explicitly defined in appendix Q. Therefore, this update to the referenced industry standard would not impact the current requirements of the DOE test procedure.

Third, the 2002 version of ANSI C82.11 states that the lamp current in a reference lamp shall not exceed 107.5 percent of the current delivered to the same lamp by a reference ballast at its rated value. The maximum threshold in the 2017 version instead is as specified in ANSI C78.81 and ANSI C78.901, with minimum limits specified in the specific lamp datasheet. DOE's test procedure already requires adhering to the 2017 limits; it requires following specifications in the applicable lamp datasheet in ANSI C78.81 and ANSI C78.901 for reference lamps (see section III.B.3). The specific lamp datasheet to use for a reference lamp is specified in Table A in appendix Q. Therefore, this update to the referenced industry standard would not impact the current requirements of the DOE test procedure.

Fourth, the 2017 version of ANSI C82.11 references ANSI C82.77-2002 for limits to the harmonic distortion of input currents. These limits are identical to those specified in ANSI

[29] ANSI Standard C82.13, *American National Standard For Lamp Ballast—Definitions for Fluorescent Lamps and Ballasts* (approved July 23, 2002).

C82.11-2002, and therefore, the update to the referenced industry standard would not change the current requirements of the DOE test procedure. Because ANSI C82.11-2017 explicitly references ANSI C82.77-2002 for harmonic distortion of input currents, DOE proposes to incorporate by reference ANSI C82.77-2002 into appendix Q.

Fifth, the 2017 version of ANSI C82.11 adds requirements on inrush currents in a ballast circuit, stating that the aggregate peak inrush current amplitude and duration for each value of steady state current must be less than a set of given values. These added instructions regarding inrush current, which is current drawn when the ballast is first turned on, aid in establishing stable operating conditions for the lamp and ballast system. DOE has tentatively determined that these straightforward checks on inrush current will aid in establishing final stable operating conditions. This update to the industry standard would have minimal impact on current requirements. Additionally, the 2017 version of ANSI C82.11 adds Annex C, "(Normative) Methods of Measurements." DOE has tentatively determined that the applicable parts of Annex C address test steps for which the DOE test procedure is already providing explicit instructions. Therefore, the inclusion of Annex C would not impact the current requirements of the DOE test procedure. The 2017 version of ANSI C82.11 also updates its normative references section to remove, add, and update versions of certain industry standards. DOE determined that of these changes only updated references to ANSI C82.2-2002 (R2007, R2016), ANSI C82.3-2016 and ANSI C78.81-2010 were relevant to the DOE test procedure. Versions of these industry standards are already incorporated by reference in 10 CFR 430.3 for appendix Q and therefore, would be referenced to execute the DOE test procedure. DOE is retaining the currently incorporated 2010 version of ANSI C78.81 for compliance purposes (see section III.B.3). DOE is proposing to update to the 2016 versions of ANSI C82.2 and ANSI C82.3 and as discussed in

this section has tentatively determined that the updates in these versions would not impact the current DOE test procedure. Therefore, DOE has tentatively determined that this update to references in ANSI C82.11-2017 has no impact on the current DOE test procedure requirements.

Sixth, instead of stating that maximum glow current during ballast starting time is not to exceed 25 milliamps as in the 2002 version of ANSI C82.11, the 2017 version references the appropriate thresholds in the lamp datasheets in ANSI C78.81 and ANSI C78.901. DOE tentatively determined the change in the maximum glow current requirement will result in a more precise threshold but minimal difference in each sample unit's starting characteristics. This update to the industry standard would have minimal impact on current requirements. In addition, the 2017 version of ANSI C82.11 removes thresholds for starting time that are based on supply frequency of commercially available magnetic ballasts, but retains the primary threshold criteria for starting time. DOE tentatively concluded this change is removing a description no longer necessary for the testing of electronic ballasts, the subject of ANSI C82.11. Hence this update to the industry standard would have no impact on the current requirements of the DOE test procedure.

Seventh, the 2017 version of ANSI C82.11 adds Annex D, "Dimming Ballast Efficiency Test Method." This test method describes how to measure ballast output power and input power at 50 to 100 percent of light output, specifically including cathode power in the ballast output power measurement. The test method also specifies a pre-stabilization procedure in which the ballast is preheated in an oven and the reference lamp pre-burned before the lamp-and-ballast system is connected for stabilization. The procedure is very similar to the test procedure proposed by Philips (see section III.D.3.a). In this NOPR, DOE is proposing the test procedure

described in Annex D of ANSI C82.11-2017 as a method to make representations of ballast performance at light output levels less than full light output. See section III.D.4 for further discussion.

Certain sections of ANSI C82.2-2016 that DOE proposes to incorporate by reference also reference ANSI C82.1 for the testing of low frequency ballasts. The DOE test procedure currently incorporates by reference the 2004 version of ANSI C82.1. As part of its review, DOE compared the 2015 and 2004 versions of ANSI C82.1 and identified no changes in the 2015 version of ANSI C82.1 compared to the 2004 version. To align, as much as possible, with the latest versions of industry standards, DOE proposes to update its incorporation by reference to the 2015 version of ANSI C82.1. Therefore, this update to the referenced industry standard would not impact the current requirements of the DOE test procedure.

DOE's current test procedure incorporates by reference the 2002 version of ANSI C82.3, which specifies the design features and operational requirements of reference ballasts when operating fluorescent lamps to determine the appropriate reference lamp. DOE proposes to update its test procedure by incorporating by reference the 2016 version instead of the 2002 version. DOE identified four changes in the 2016 version of ANSI C82.3 compared to the 2002 version: three related to tolerances (impedance, frequency, and voltage), and a clarification about instruments. First, for high frequency operation, the 2016 version of ANSI C82.3 removes the impedance tolerance of 1 percent for currents between 50 and 115 percent of the calibration current of the reference ballast. Second, the 2016 version of ANSI C82.3 removes frequency tolerances for different types of reference ballasts when operating with a lamp. Third, when operating a reference ballast with a lamp at high frequency, the 2016 version of ANSI C82.3

increases the power supply voltage tolerance from 0.2 percent to 1.0 percent. The 2016 version of ANSI C82.3 removes impedance tolerances at certain currents and the frequency tolerance and allows a wider range for power supply voltage tolerance, and therefore, could allow for minor changes in the measured value of current, frequency, or voltage. However, DOE's current test procedure requires that selected reference lamps meet specific current, frequency, and voltage requirements specified in the relevant lamp datasheets in ANSI C78.81 and ANSI C78.901. Therefore, even while applying updated tolerance requirements, the final measured current, frequency, and voltage must meet the existing requirements in the referenced lamp datasheets. Hence, if all requirements for reference lamps in DOE's test procedures are satisfied, DOE has tentatively determined that changes in impedance, frequency, and voltage tolerances in ANSI C82.3 will not affect the selection of the appropriate reference lamp. Fourth, the 2016 version of ANSI C82.3 has updated its instruments section to reference ANSI C82.11 instead of stating "details are under consideration." This update would not affect the current test procedure because these instrumentation requirements are already specified in section 2.2 of the test procedure.

In summary, DOE proposes to incorporate by reference the 2016 version of ANSI C82.2, the 2017 version of ANSI C82.11, the 2002 version of ANSI C82.77, the 2015 version of ANSI C82.1, and the 2016 version of ANSI C82.3 in appendix Q. DOE has tentatively determined that these updates would not result in changes to values of BLE measured at full light output because the differences do not result in substantive changes to test setup or methodology. Incorporation by reference of the latest versions of industry standards will also better align the DOE test procedures with test methods that industry considers to be improvements to previous methods. DOE tentatively finds that these industry updates further increase the clarity of the DOE's test

procedures. DOE requests comments on its proposal to incorporate by reference the 2016 version of ANSI C82.2, the 2017 version of ANSI C82.11, the 2002 version of ANSI C82.77, the 2015 version of ANSI C82.1, and the 2016 version of ANSI C82.3 in appendix Q.

2. ANSI C78.375A[30]

DOE's current test procedure incorporates by reference the 1997 version of ANSI C78.375 to specify requirements for temperature and air movement in the test facility. DOE's test procedure also references the 2002 version of ANSI C82.2, which references the 1997 version of ANSI C78.375 for specifications regarding electrical instruments and ambient conditions for lamp measurements. The 2014 version of ANSI C78.375A does not update specifications for ambient conditions, such as room temperature/air movement, for lamp measurements or electrical instruments. Although there are some changes in the normative references section to update to lamp datasheets in newer versions of ANSI C78.81 and ANSI C78.901 and to update to the referenced version of ANSI C82.3, these changes do not affect instructions for instrumentation and ambient conditions in DOE's test procedure. Hence these updates to the industry standard would have no impact on the current requirements of the DOE test procedure.

DOE proposes to incorporate by reference the 2014 version of ANSI C78.375A in appendix Q because DOE has tentatively determined that doing so would not make substantive changes to test setup and methodology. Incorporation by reference of this latest version will also better align DOE test procedures with updates to industry test methods. DOE tentatively finds

[30] Note that the 1997 version of this standard is titled ANSI C78.375 but the 2014 version is titled ANSI C78.375A.

that these industry updates further increase the clarity of the test methods. DOE requests comments on its proposal to incorporate by reference the 2014 version of ANSI C78.375A in appendix Q.

3. ANSI C78.81, ANSI C78.901, and IEC 60081 Amendment 6

Table A in DOE's current test procedure incorporates by reference lamp datasheets in ANSI C78.81-2010, ANSI C78.901-2005, and IEC 60081 Amendment 4 to specify the appropriate reference lamp to use when testing a particular ballast. DOE's current test procedure also incorporates by reference version 2002 of ANSI C82.2 for test measurements, which specifies operating the test ballast at the rated frequency and input voltages as specified in the ANSI C78 lamp datasheets. The 2016 version of ANSI C78.81 updates three of the lamp datasheets currently referenced in Table A: 1) 32 W 4-foot medium bipin T8 lamp (updated datasheet from version 1005-2 to version 1005-4), 2) 86 W 8-foot recessed double contact T8 lamp (updated datasheet from version 1501-1 to 1501-2) and, 3) 59 W 8-foot single pin T8 lamp (updated datasheet from version 1505-1 to version 1505-2). The 2016 version of ANSI C78.901 updates the lamp datasheet for the 32 W 2-foot U-shaped medium bipin T8 lamp referenced in Table A (datasheet from version 4027-1 to version 4027-2). Amendment 6 of IEC 60081 updates two other lamp datasheets referenced in Table A: 1) 54 W 4-foot miniature bipin T5 HO (datasheet 60081-IEC 6840-4 to 60081-IEC 6840-5) and 2) 28 W 4-foot miniature bipin T5 SO (datasheet 60081-IEC 6640-5 to 60081-IEC 6640-6). DOE also proposes to remove references to "rapid-start lamps" and "instant-start lamps" in the "Ballast Type" column in Table A. The starting method (*e.g.* rapid start, instant start) is dictated by the type of ballast and the lamp datasheet provides the appropriate reference lamp specifications for the applicable starting method. Hence including the lamps' associated starting method in this table is confusing and

unnecessary. Changes to the lamp datasheets in ANSI C78.81 and IEC 60081 will have minimal impact on current requirements.

Table III.2 is a summary of differences DOE identified between the updated lamp datasheets compared to the versions currently referenced in appendix Q.

Table III.2 Updated Lamp Datasheets Referenced in Appendix Q

Lamp type	Current Specifications Referenced in Appendix Q	Updated Specifications
32 W 4-foot medium bipin T8 lamp **Datasheet 7881-1005**	Provides low and high frequency specifications. HF Reference Arc Power: 29 W HF Operating Voltage: 136 V Datasheet Version 2 (7881-1005-2)	Removes low frequency specifications. HF Reference Arc Power: 29.2 W HF Operating Voltage: 137 V Datasheet Version 4 (7881-1005-4)
86 W 8-foot recessed double contact T8 lamp **Datasheet 7881-1501**	HF Reference Arc Power: 84.0 W HF Operating Voltage: 216 V Datasheet Version 1 (7881-1501-1)	HF Reference Arc Power: 85.0 W HF Operating Voltage: 216 V Datasheet Version 2 (7881-1501-2)
59 W 8-foot single pin T8 lamp **Datasheet 7881-1505**	Provides low and high frequency specifications. HF Reference Arc Power: 57 W HF Operating Voltage: 272 V Lamp Current: 0.213 A Datasheet Version 1 (7881-1505-1)	Removes low frequency specifications. HF Reference Arc Power: 57.1 W HF Operating Voltage: 270 V Lamp Current: 0.215 A Datasheet Version 2 (7881-1505-2)
32 W 2-foot U-shaped medium bipin T8 lamp **Datasheet 78901-4027**	Provides low frequency operation specifications Datasheet Version 1 (78901-4027-1)	Removes low frequency operation specifications Datasheet Version 2 (78901-4027-2)
54 W 4-foot miniature bipin T5 HO **Datasheet 60081-IEC 6840**	Maximum Operation Current: 0.625 A Maximum Current input to the cathode: 0.65 A Datasheet Version 4 (60081-IEC 6840-4)	Maximum Operation Current: 0.62 A Maximum Current input to the cathode: 0.67 A Datasheet Version 6 (60081-IEC 6840-6)

Lamp type	Current Specifications Referenced in Appendix Q	Updated Specifications
28 W 4-foot miniature bipin T5 SO **Datasheet 60081-IEC 6640**	Maximum Operation Current: 0.205 A Maximum Current input to the cathode: 0.220 A Datasheet Version 5 (60081-IEC 6640-5)	Maximum Operation Current: 0.210 A Maximum Current input to the cathode: 0.240 A Datasheet Version 7 (60081-IEC 6640-7)

Updates to the 2016 versions of ANSI C78.81 and ANSI C78.901 remove the low frequency specifications from lamp datasheets for the 32 W 4-foot medium bipin T8 lamp, 59 W 8-foot single pin T8 lamp, and 32 W 2-foot U-shaped medium bipin T8 lamp. Low frequency lamp characteristics and reference ballast characteristics are necessary to determine the appropriate reference lamp for testing low frequency ballasts. A part of the identification process of a reference lamp is testing it on a reference ballast. Therefore, DOE is proposing to provide low frequency lamp characteristics (i.e. arc wattage, approximate cathode wattage, total wattage, voltage, and current), reference ballast characteristics (i.e. rated input voltage, reference current, impedance) and cathode heating requirements for rapid start circuits in appendix Q for low frequency ballasts that operate 32 W 4-foot medium bipin T8 lamps, 59 W 8-foot single pin T8 lamps, and 32 W 2-foot U-shaped medium bipin T8 lamps. Hence these updates to the industry standard would not impact the current requirements of the DOE test procedure.

Further, DOE has tentatively determined that changes to the values of reference lamp characteristics from updating the reference of ANSI C78.81 to the 2016 version, ANSI C78.901 to the 2016 version, and IEC 60081 Amendment 4 to IEC 60081 Amendment 6 are within testing tolerances and therefore, minor. Incorporation of these latest versions would also better align DOE test procedures with updates to test specifications that industry considers to be

improvements to previous methods. Therefore, DOE proposes to incorporate by reference the 2016 version of ANSI C78.81, the 2016 version of ANSI C78.901, and Amendment 6 of IEC 60081 in appendix Q. DOE requests comments on its proposal to update ANSI C78.81 to the 2016 version, ANSI C78.901 to the 2016 version, and IEC 60081 Amendment 4 to IEC 60081 Amendment 6.

C. Definitions

Several definitions and directions in the current and proposed DOE test procedure for FLBs use the term "designed and marketed." Currently, "designed and marketed" means that the intended application of the lamp is clearly stated in all publicly available documents (e.g., product literature, catalogs, and packaging labels). (See 10 CFR 430.2 for full definition.) DOE proposes to specify that the term also refer to the intended application of the ballast as the latter part of the definition clearly states that the term is applicable to fluorescent lamp ballasts.

To streamline and simplify the test procedure, DOE proposes to remove the following terms that are currently defined but will no longer be used in the revised test procedure: AC control signal, cathode heating, DC control signal, F34T12 lamp, F96T12/ES lamp, F96T12HO/ES lamp, PLC control signal, and wireless control signal. Regarding the terms for control signals, DOE is proposing to use updated terminology reflective of the products currently available on the market. Regarding the other proposed deletions, the changes do not impact the current requirements of the DOE test procedure because they are not used in either the current or the proposed test procedure. DOE requests comments on its proposal to remove definitions.

D. Proposed Amendments to Active Mode Test Method

1. Instrumentation and Test Setup

In the instrumentation section, 2.2, of the active mode test procedure in appendix Q, DOE proposes to reference section 9 ("Electrical Instruments") of ANSI C78.375A-2014 instead of referencing ANSI C82.2 generally. Section 8 of ANSI C82.2 states that instruments used for measuring lamp and ballast systems shall meet requirements in ANSI C78.375. DOE notes that the currently incorporated ANSI C82.2-2002 and proposed for incorporation ANSI C82.2-2016 both reference the 1997 version of ANSI C78.375. DOE's proposal to incorporate by reference the 2014 version of ANSI C78.375 (referred to as ANSI C78.375A) in appendix Q does not change existing requirements because ANSI C78.375A-2014 makes no updates to its electrical instruments section compared to the 1997 version, ANSI C78.375 (see section III.B.2).

In addition, DOE proposes to amend the test setup section, 2.3, of the active mode test procedure to: 1) more precisely reference industry standards and 2) rename the "Power Analyzer" subsection to "Test Circuits" and clarify requirements for the power analyzer. DOE also proposes to add provisions for selecting reference lamps to increase clarity. These changes in appendix Q are discussed in further detail below.

Section 2.1 "Active Mode Procedure" of DOE's current test procedure requires that where ANSI C82.2 references ANSI C82.1, ANSI C82.1 must be used for testing low-frequency ballasts and ANSI C82.11 must be used for testing high-frequency ballasts. To clarify when to use which ANSI standard, DOE proposes to include specific references in test setup, section 2.3.1, which currently references ANSI C82.1 and ANSI C78.81 without specific instruction

regarding low- or high-frequency ballasts. In addition, DOE also proposes to add an instruction to disregard section 5.3 ("Ballast Output") of ANSI C82.1, which specifies minimum power factor requirements that may be confused with the minimum power factor requirements set forth in DOE's energy conservation standards for fluorescent lamp ballasts (see 10 CFR 430.32(m)). Further DOE proposes to disregard section 5.3.1 ("Ballast Factor") in ANSI C82.11 because the DOE test procedure does not specify determination of ballast factor. DOE also proposes to disregard Annex D ("Dimming Ballast Energy Efficiency Test Method") and 5.13 ("Ballast Efficiency") in ANSI C82.11 for the active mode test procedure of measuring BLE at full light output, a metric that is different from ballast efficiency described in these sections. Note that DOE is proposing a test method that references Annex D for the active mode test procedure to measure ballast efficiency at lower light output levels (see section III.D.4). DOE also proposes to remove the reference in section 2.3.1 to ANSI C78.81 for wiring instructions as this industry standard does not provide instructions on wiring a lamp and ballast circuit. Finally, DOE proposes to add the instruction that specifications in referenced industry standards that are recommended, stated as "shall" or "should" be met, or that are not clearly mandatory are, for purposes of the DOE test procedure, mandatory (unless they conflict with language in appendix Q) to ensure testing is conducted in a fair and uniform manner by different entities to yield consistent results.

In evaluating the test setup section in the active mode test procedure, DOE has tentatively determined that the "Power Analyzer" section, currently section 2.3.2, provides instructions not only for the power analyzer but also for connecting the power supply, ballast, and lamp in the appropriate circuit. Therefore, DOE proposes to rename this section as "Test Circuits." One of the current requirements in section 2.3.2 is that the power analyzer must have "n + 1" channels where "n" is the number of lamps the ballast can operate. However, to ensure that the power analyzer has enough channels, DOE proposes to clarify that "n" is the maximum number of lamps the ballast is designed and marketed to operate. DOE requests comment on its proposal to clarify that the power analyzer must have one more channel than the maximum number of lamps the ballast is designed and marketed to operate.

In addition, based on its review of the existing test procedure and products currently available on the market, DOE has tentatively determined that more information is needed in appendix Q to specify which lamps to use to test ballasts. The market now offers certain ballasts that each can operate lamps of more than one lamp base type – for example, T5 (miniature bipin), T8 (medium bipin), and T12 lamps (both recessed double contact and slimline). The existing test procedure does not provide enough detail to determine which lamp to use for testing these ballasts. Therefore, DOE proposes to amend the test procedure to clarify requirements for selecting the reference lamp to use for testing these ballasts. First, DOE proposes that a ballast designed and marketed to operate lamps of multiple base types, except for sign ballasts, must be tested with one base type in the following order of decreasing preference: medium bipin, miniature bipin, single pin, and recessed double contact. Second, DOE proposes to require, after selecting the base type, selecting lamp(s) of only one diameter, in the following order of

decreasing preference: T8, T5, or T12. The order of preferences specified for selecting base type and diameter is based on the most common products on the market. DOE has tentatively determined these proposed updates to appendix Q provide further clarification and do not impact the current requirements of the DOE test procedure. DOE requests comments on the proposed amendments for selecting the appropriate base type and diameter for reference lamps operated by ballasts that can operate lamps with multiple base types and diameters.

Finally, section 2.3.1.3 of appendix Q specifies that the fluorescent lamp used for testing must be a reference lamp as defined in ANSI C82.13 and be seasoned for at least 12 hours. ANSI C82.13 states that reference lamps are "seasoned lamps which under stable operating conditions and in conjunction with the specified reference ballast operate at" certain voltage, wattage, and current. DOE proposes updates to this section by requiring testing each reference lamp with a reference ballast that meets the criteria of the 2016 version of ANSI C82.3, the industry standard for reference ballasts of fluorescent lamps. Based on the definition of a reference lamp in ANSI C82.13 and industry practice, manufacturers should already be using an industry-approved reference ballast to select the reference lamp. This explicit instruction ensures that the correct procedures and requirements are followed when identifying a reference lamp. In addition, DOE proposes to include the stabilization criteria as specified in the proposed section 2.5.2.1 (see section III.D.3.a) for stabilizing reference lamps. ANSI C82.13 states that reference lamps must have certain values under stable operating conditions and the proposed stabilization criteria sets forth how to determine whether the conditions have stabilized. DOE has tentatively determined the proposed update to require testing each reference lamp with a reference ballast

that meets the criteria of the 2016 version of ANSI C82.3 provides further clarification and would not impact the current requirements of the DOE test procedure.

2. Test Conditions

DOE proposes to amend the test conditions section of the active mode test procedure to provide more specific references to sections of referenced industry standards. Instead of generally referencing all of ANSI C82.2 for test conditions, DOE proposes to specifically reference ANSI C82.2 sections 3 "Pertinent measurements" and 4 "Electrical supply characteristics - test ballast measurement circuits." After reviewing ANSI C82.2 DOE has tentatively determined that these sections provide applicable requirements for establishing the appropriate test conditions. Section 3 of ANSI C82.2 requires that ballast input and output measurements comply with specifications in ANSI C82.1 (as incorporated in the proposed appendix Q, this instruction applies to low-frequency ballasts; for high-frequency ballasts appendix Q requires the specifications in ANSI C82.11). Section 4 of ANSI C82.2 provides specifications regarding test voltage, frequency, line voltage wave shape, supply voltage, and supply-source impedance. Additionally, section 2.4.2 of appendix Q of DOE's current test procedure references ANSI C78.375 to specify requirements for temperature and air movement in the test facility. DOE proposes to specifically reference ANSI C78.375A section 4, "Ambient Conditions for Lamp Measurements," which contains the appropriate information for temperature and air movement requirements. DOE has tentatively determined that these updates would provide more direct references of how to take measurements. Hence, the proposed updates to appendix Q would only provide further clarification and would not impact the current requirements of the DOE test procedure.

DOE requests comments on the proposal to remove general references to ANSI C82.2 and ANSI C78.375 and instead specifically reference ANSI C82.2 sections 3 and 4 and ANSI C78.375A section 4 for test conditions in the active mode test procedure in appendix Q.

3. Test Method for BLE

DOE proposes to amend the test method section of the active mode test procedure to 1) revise the stabilization procedure, including adding a second stabilization option, and 2) require measuring lamp arc current and voltage as root mean square (RMS) values. The changes are discussed in further detail below.

a. Stabilization criteria

In the framework document for the FL Ballast ECS rulemaking, DOE received several comments regarding a second stabilization option when measuring BLE. The National Electrical Manufacturers Association (NEMA) and Philips Lighting (Philips) stated that although the current DOE test procedure provides consistent and repeatable results, some technical experts have been considering a second stabilization option that removes the need to acquire large amounts of data but yields comparable results to the current DOE test procedure. (Philips, No. 8 at p. 2; NEMA, No. 12 at p. 2) [31] NEMA noted that industry has been engaged with the ANSI Accredited Standards Committee examining a modified stabilization procedure and also encouraged DOE to review it to reduce testing time and costs. (NEMA, No. 12 at p. 2)

[31] These documents were submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).

Universal Lighting Technologies (ULT) agreed that DOE should review this stabilization procedure to remove the need to obtain large amounts of data. (ULT, No. 6 at p. 2)[32]

Philips explained that the second stabilization option would require preheating potted ballasts at 40 °C in an oven until they are stable, typically for three to four hours. In the meantime, the test lamp(s) should be pre-burned while connected to a ballast with similar output power, lamp current, and ballast factor as the ballast being tested. Specifically, four-foot T8 lamps should be pre-burned for 15 minutes and four-foot T5 lamps and eight-foot T8 and T12 should be pre-burned for at least two hours. The ballast should be kept in the oven until ready to be connected to the test lamp for stabilization. Philips stated that stabilization should be done according to IES LM-9[33] section 6.2.3. Accordingly, six measurements of parameters (*i.e.* input power, lamp power, lamp current, and lamp voltage) should be taken over five minutes and the difference between the minimum and maximum of each of lamp arc power, lamp current, and lamp voltage divided by the average value of the measurements should be less than or equal to 1 percent to be considered stable. Philips explained that upon completion of the test the ballast will remain on the test bench until the next ballast to be tested is ready to be removed from the oven. Philips asserted that this method would minimize the time the test lamps are off, thereby reducing the stabilization time and, subsequently, the overall testing time. (Philips, No. 8[34] at pp. 2-3)

[32] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).
[33] IES LM-9, Illuminating Engineering Society—Approved Method for the Electrical and Photometric Measurement of Fluorescent Lamps (approved January 31, 2009).
[34] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).

Philips provided BLE test data using the current DOE test procedure and the second stabilization option for T5 and T8 rapid start and T8 instant start ballasts. For each type of ballast Philips tested five units of four different models and provided an average BLE for each model at 120 V and 277 V. Philips asserted that their stabilization method provided consistent test results similar to the current DOE test procedure while reducing the amount of data that must be recorded. (Philips, No. 8[35] at pp. 2-5)

DOE considered the second stabilization option recommended by Philips in its evaluation of the test method for the active mode test procedure and reviewed the data Philips provided. The data showed slight differences in average BLEs based on whether DOE's test procedure or the second stabilization option was used. However, DOE found these differences to be de minimis. Based on this review, DOE agrees that the second stabilization option would save overall testing time, particularly when testing large numbers of ballasts (one after the other). Therefore, DOE is proposing to allow the stabilization method recommended by Philips as a second stabilization option when testing for BLE (see proposed appendix Q, section 2.5.2.2 "Option 2"). The Option 2 stabilization method is described in Annex D of ANSI C82.11. Specifically, DOE is proposing that stable operating conditions under this option be determined according to steps 1 through 6 of section D.2.1 in Annex D of ANSI C82.11. DOE has tentatively determined this proposed update to appendix Q would provide another method for stabilization and because it is optional would not impact the current requirements of the DOE test procedure unless a manufacturer voluntarily decides to use the optional method.

[35] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).

In addition to allowing a second stabilization option, DOE is proposing a few changes to the existing stabilization method (proposed in section 2.5.2.1 "Option 1" of appendix Q). DOE reviewed the stabilization criteria in IES LM-9 (proposed in the Option 2 stabilization method) and tentatively determined that taking measurements once per minute to determine if a fluorescent lamp has stabilized is sufficient to determine if a fluorescent lamp ballast has stabilized. Therefore, in addition to proposing this criteria in the Option 2 stabilization method, DOE proposes to modify the current requirement that lamp arc voltage, current, and power be measured once per second, to require instead that those factors be measured once per minute in the Option 1 stabilization method. DOE does not find a need to restrict the maximum time required to achieve stable operating conditions and therefore, proposes to remove the requirement that the ballast must be operated for no longer than one hour until stable operating conditions are met. DOE has tentatively determined that these changes to the sampling frequency would not impact final steady-state conditions reached. Therefore, these proposed updates to appendix Q would have minimal impact on the requirements of the current DOE test procedure. DOE requests comments on its proposal to include a second stabilization option, change the sampling frequency from one second to one minute in Option 1, and remove the restriction against operating a fluorescent lamp ballast for longer than one hour to determine stable operating conditions in Option 1.

b. Measurements

DOE's test procedure currently requires measurement of lamp arc current and lamp arc voltage but does not specify whether these are peak, average, or RMS values. Based on general industry practice of electrical circuit measurements, DOE has interpreted these measurements to be RMS values. For clarity, DOE proposes to require the measurement of lamp arc current and

voltage as RMS values. DOE has tentatively determined these proposed updates to appendix Q provide further clarification and would not impact the current requirements of the DOE test procedure. DOE requests comments on the specification that lamp arc current and lamp arc voltage be RMS values.

DOE's test procedure also currently references section 7 of ANSI C82.2 for measuring input power and sections 3.2.1 and 4 of ANSI C82.2 for measuring input voltage and current. Upon further review of these sections, DOE has tentatively determined that to measure input power, Figure 1 and Figure 3 referenced in section 7 of ANSI C82.2 are not relevant. Figure 1 is not relevant for input power measurements as it specifies a measurement circuit to determine lamp current, lamp voltage, and lamp power, which are output measurements of the ballast. Figure 3 is unnecessary as it specifies a circuit to measure current in rapid start ballasts. DOE's test procedure already provides a measurement circuit for rapid start ballasts. However, Figure 2 of section 7 of ANSI C82.2 demonstrates the setup to measure a ballast's input voltage and current. DOE is proposing to exclude section 3.2.1 of ANSI C82.2 as it only lists parameters to measure for ballast input operating conditions and no measurement specifications. DOE is proposing to reference section 4 of ANSI C82.2 only for test conditions (see section III.D.2) as it provides electrical supply specifications. DOE has tentatively determined that these sections are not pertinent to taking measurements of input voltage and input current. Therefore, for taking measurements DOE proposes to remove referenced sections 3.2.1 and 4 of ANSI C82.2 and reference section 7 of ANSI C82.2, adding instruction to disregard references to Figure 1 and Figure 3. DOE has tentatively determined these proposed updates to appendix Q provide further clarification and do not impact the current requirements of the DOE test procedure. DOE requests comments on its proposal to remove the ANSI C82.2 references of sections 3.2.1 and 4

from the steps to measure input voltage and current and to narrow the scope of section 7 of ANSI C82.2, for measuring input power, to exclude Figure 1 and Figure 3.

4. Measuring Ballast Performance at Less Than Full Light Output

In this NOPR, DOE proposes a test method to support industry in making representations of ballast performance at light output levels that are less than full light output. DOE received several comments on the framework document for the FL Ballast ECS rulemaking regarding measuring the performance of fluorescent lamp ballasts at dimmed light output levels. CA IOUs measured the performance of ballasts at 100 percent of full light output and at input powers decreased by 5 percent increments until zero light output using the DOE's current test procedure for BLE. Based on this data the CA IOUs noted that ballasts that have the same BLE at full light output may not perform the same at lower light output levels. Because of this difference of BLE at lower light outputs, the CA IOUs stated that California Energy Commission (CEC) has proposed standards for dimming fluorescent ballasts based on weighting the ballast efficiency measurements at 100 percent, 80 percent, and 50 percent of full light output in order to generate one BLE value.[36] CA IOUs stated that DOE should consider using measurements at the 80 percent and 50 percent points but supported additional test points below 50 percent of full light output and recommended DOE conduct further analysis on the feasibility of measurements at

[36] The CEC published a proposal for testing deep-dimming fluorescent lamp ballasts at total arc power tuned to 100, 80, and 50 percent of the measured maximum arc power, according to DOE's test procedure for fluorescent lamp ballasts. CEC proposed to define deep-dimming fluorescent ballasts as ballasts able to operate lamps in dimmed operating modes at any number of levels at or below 50 percent of full light output and include only ballasts that operate one, two, three, or four T5 or T8 4-foot linear or U-shape fluorescent lamps. Further CEC proposed to define arc power as the entire output power of the ballast and delivered to all attached lamps. CEC also proposed weighting the ballast efficiency measurements at 100 percent, 80 percent, and 50 percent of full light output in order to generate one BLE value. California Energy Commission, "Proposed Amendments to Appliance Efficiency Regulations," *Appliance Efficiency Rulemaking for Toilets, Urinals, Faucets, HVAC Air Filters, Fluorescent Dimming Ballasts, and Heat Pump Water Chilling Packages*, 15-AAER-01, February 20, 2015 (http://docketpublic.energy.ca.gov/PublicDocuments/15-AAER-01/TN203715_20150220T140835_Proposed_Amendments_to_Appliance_Efficiency_Regulations.pdf)

lower light output levels. (CA IOUs, No. 10 at p. 2-3; CA IOUs, Public Meeting Transcript, No. 5 at p. 17) The Appliance Standards Awareness Project (ASAP) agreed with CA IOUs that the test procedure and metric should be amended to measure BLE at partial light output, specifically testing at 80 and 50 percent of full light output in addition to 100 percent. (ASAP, No. 7 at pp. 2-3)

Philips commented that BLE is a logical method for measuring performance of fixed light output ballasts but that ballast efficiency should be used for measuring performance of ballasts at dimmed light output levels. (Philips, No. 8[37] at p. 16) Philips explained that to dim light output the lamp power and thereby cathode power is reduced, resulting in operation below the lamp's thermo-emissive operational point which could shorten lamp life, causing blackening at the ends of the lamp, and causing unstable lamp operation. Therefore, most ballasts provide added cathode power in dimming mode. As such, Philips recommended using a ballast efficiency metric that would include cathode power, unlike the BLE metric, which does not. Philips noted that because dimmable lamps have two pins on each side, three different measurements must be taken with the lamp to determine the lamp voltage, including cathode voltage. However, Philips stated that a multiport power analyzer can be used to measure the voltage of three pins in reference to another and thereby reduce the time needed to measure lamp power including cathode power. (Philips, No. 8[38] at pp. 21-29)

[37] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).
[38] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).

Philips also presented an example of a 2-lamp T8 MBP 32 W ballast showing that at full light output BLE and ballast efficiency are the same. However, at dimmed light output levels the ballast efficiency is higher than BLE because ballast efficiency uses total lamp output power including cathode power but BLE uses total lamp arc power. Philips concluded that using the BLE metric at dimmed output levels would underrepresent the efficiency of the ballast. (Philips, No. 8[39] at pp. 16-29) Therefore, Philips asserted and NEMA agreed that including cathode power in the metric used to evaluate ballast performance at lower light outputs is important because cathode power provides utility to dimming ballasts at dimmed light output levels. (Philips, No. 8[40] at pp. 16-29; NEMA, No. 12 at p. 7)

DOE is proposing amendments to the test method to address measuring ballasts at light outputs lower than full light output. DOE understands that cathode power is utilized, and even required, at certain dimmed light output levels. DOE also appreciates comments explaining that multiple measurements would be required for one measurement of cathode power, though the time required to do that could be minimized by using a multiport power analyzer. DOE is continuing to provide a method for measuring BLE at full light output for representations and for showing compliance with the current energy conservation standards, but DOE is also proposing a method to measure ballast efficiency at reduced light output levels for representations in the marketplace as reflected in the latest industry standard. DOE has tentatively determined that this proposed update to appendix Q provides a test method that may be needed for making certain representations but does not change current requirements of the DOE test procedure.

[39] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).
[40] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).

DOE notes that since the publication of the framework document for the FL Ballast ECS Rulemaking, ANSI C82.11 has been updated to include new Annex D, a test method to measure the ballast efficiency at light output levels less than 100 percent. Ballast efficiency (BE) is equal to the ballast output power divided by the ballast input power. Ballast output power includes not only the lamp arc power but also the filament power and power provided for other features such as networking and sensors. Thus, ballast efficiency is a different metric than BLE. DOE proposes to include in appendix Q an option to use the test procedure outlined in Annex D of ANSI C82.11-2017 if manufacturers want to make representations of ballast efficiency at light output levels less than 100 percent. Annex D states, and DOE's proposed test method will specify, that the test method contained within applies only to measuring light output levels down to 50 percent of full light output. Annex D requires using the Option 2 stabilization method, discussed in section III.D.3.a, which requires preheating ballasts at 40 °C in an oven until they are stable. DOE requests comment on the proposed method for measuring BE at light output levels less than full light output, specifically whether measurements for the BE metric could be taken when ballasts are operating at light output levels less than 50 percent of full output.

E. Proposed Amendments to Standby Mode Test Method

EPCA section 325(gg)(2)(A) directs DOE to establish test procedures to include standby mode, "taking into consideration the most current versions of Standards 62301 and 62087 of the International Electrotechnical Commission...." (42 U.S.C. 6295(gg)(2)(A)) IEC Standard 62087 applies only to audio, video, and related equipment, not to lighting products. Because IEC Standard 62087 does not apply to lighting products, DOE proposes to incorporate by reference IEC Standard 62301, which applies generally to household electrical appliances. The current test procedure requires measuring standby mode energy consumption following provisions of ANSI

C82.2, the same industry standard that is incorporated into DOE's current active mode test procedure. However, while ANSI C82.2 is not specific to standby mode energy consumption measurements, the IEC 62301 standard does provide requirements for measuring standby mode energy consumption. DOE proposes requiring similar test setup and conditions for both the standby mode and active mode test procedure for consistency. DOE also proposes requiring stabilization and subsequent measurement of standby mode energy consumption according to the measurements section of IEC 62301 (i.e., section 5), instead of ANSI C82.2. DOE has tentatively determined that the instructions and criteria specified in IEC 62301 for stabilization and subsequent measurement of standby mode power consumption is appropriate for fluorescent lamp ballasts. Therefore, DOE proposes to incorporate by reference IEC 62301 (edition 2.0) in appendix Q and reference section 5 for the standby mode test procedure of fluorescent lamp ballasts. DOE seeks comments on its proposal to incorporate IEC 62301 by reference and referencing section 5 of IEC 62301 for stabilization and subsequent standby mode energy consumption measurements.

In response to the framework document for the FL Ballast ECS rulemaking, the CA IOUs stated that ballasts operated with communication protocols such as Digital Addressable Lighting Interface (DALI) consume standby mode power. The CA IOUs noted that the CEC proposed a required test based on DOE's standby mode test procedure for measuring standby mode power consumption for ballasts operated with such controls. However, the CA IOUs recommended that DOE amend its standby mode test procedure to specify that a communications network (if applicable) should be connected to the ballast during testing to capture energy use in "network standby." The CA IOUs stated that this is important because ballasts will likely be consuming

additional energy while actively "listening" for commands when connected to a communications network. (CA IOUs, No. 10 at p. 3)

In response to these comments, DOE recently published an RFI on the emerging smart technology appliance and equipment market. 83 FR 46886 (Sept. 17, 2018). In that RFI, DOE sought information to better understand market trends and issues in the emerging market for appliances and commercial equipment that incorporate smart technology. DOE's intent in issuing the RFI was to ensure that DOE did not inadvertently impede such innovation in fulfilling its statutory obligations in setting efficiency standards for covered products and equipment. In this NOPR, DOE seeks comment on the same issues presented in the RFI as they may be applicable to fluorescent lamp ballasts.

Both the active mode and standby mode test procedures measure input power of the ballast. As such, for consistency within the test procedure and to reduce the test burden, DOE proposes requiring similar general test setup and conditions for both tests. To accomplish this, DOE proposes to add a test setup section in the standby mode test procedure with the following directions: 1) use instruments as specified in the active mode test procedure; and 2) operate each ballast with lamps as specified in active mode test procedure except that the use of reference lamps is not required. Because lamps are not turned on during the measurement of standby mode power consumption, DOE has tentatively determined that the specific lamps to which the ballast is connected do not affect standby mode energy consumption measurements. DOE requests comments on referencing the active mode test procedure sections pertaining to instrumentation and connection of lamps (with the exception of reference lamp specifications) in the standby mode portion of the DOE test procedure.

DOE's existing test conditions for the standby mode test procedure reference sections 5, 7, and 8 of ANSI C82.2. DOE is proposing to reference the active mode test conditions, which references section 9 of ANSI C78.375A regarding instrumentation (see section III.D.1) and sections 3 and 4 of ANSI C82.2, and section 4 of ANSI C78.375A (see section III.D.2), for the standby mode test conditions. Because both the active mode test procedure and standby mode test procedure measure input power of the ballast, DOE has tentatively determined that the same provisions of ANSI C78.375A for instrumentation and ANSI C82.2 for test conditions are also appropriate for the standby mode test procedure. As such, DOE proposes to reference the test conditions for the active mode test procedure instead of repeating those references to ANSI C78.375A and ANSI C82.2 in the standby mode test conditions. DOE requests comments on referencing the active mode test conditions for standby mode test conditions in the standby mode test procedure.

In the framework document for the FL Ballast ECS rulemaking, NEMA and Philips commented that ballasts installed in the U.S. can operate a wide range of input voltages (i.e. 120 V to 277 V) and this range should be considered before adopting other international standby power limits. For example, a typical DALI ballast has a different standby mode power consumption at 120 V than at 277 V. (Philips, No. 8[41] at p. 8; NEMA, No. 12 at p. 3) Philips stated that although IEC 62301 offers valuable information regarding instrumentation tolerances and uncertainty, it is unclear if it accounts for operation at this wide range of input voltages.

[41] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).

Philips recommended that DOE develop a standby mode power test method that accounts for the wide range of input voltages. (Philips, No. 8[42] at p. 8)

As noted above, DOE is proposing to reference the test conditions for the active mode test procedure for the standby mode test conditions in the standby mode procedure, which include specifications regarding testing ballasts designed and marketed to operate at multiple input voltages. Under these test conditions standby mode energy consumption for ballasts able to operate at input voltages of both 120 V and 277 V must be measured at 277 V for those that are not residential or sign ballasts and at 120 V for those that are residential or sign ballasts.

Regarding the standby mode test method and measurements section, DOE proposes the following modifications: 1) add instructions to turn on, at full light output, the lamps to which the ballast is connected to ensure the ballast is not defective; and 2) replace measurement references to ANSI C82.2 in the current section 3.3.1 of appendix Q, with instructions to stabilize and measure standby mode energy consumption according to section 5 of IEC 62301. DOE has tentatively determined that these proposed updates to appendix Q would have minimal impact on current requirements. DOE requests comments on these modifications and the requirement that lamps be turned on before taking standby mode measurements.

F. Proposed Amendments to 10 CFR 430.23(q)

For clarification, DOE proposes to remove paragraphs specifying the calculation of estimated annual energy consumption and estimated annual operating cost for fluorescent lamp

[42] This document was submitted to the docket of DOE's rulemaking to review energy conservation standards for fluorescent lamp ballasts (Docket No. EERE-2015-BT-STD-0006).

ballasts in 10 CFR 430.23(q) as these calculations are no longer required. DOE also proposes to add a paragraph in 10 CFR 430.23(q) to calculate power factor using appendix Q. DOE has tentatively determined that these proposed updates to 10 CFR 430.23(q) provide further clarification and would not impact current requirements of the DOE test procedure. DOE requests comment on the proposal to remove calculations for estimated annual energy consumption and estimated annual operating cost that are no longer required and to add an instruction for calculating power factor in 10 CFR 430.23(q).

G. Proposed Amendments to 10 CFR 429.26

DOE proposes to require reporting average total lamp arc power in certification reports for fluorescent lamp ballasts. Average total lamp arc power, a value that is already determined in appendix Q, is necessary to determine the required minimum BLE for a fluorescent lamp ballast model. Manufacturers are already reporting average total lamp arc power when certifying basic models, thus, DOE does not expect any changes in burden. DOE also proposes to require that average total lamp arc power be rounded to the nearest tenth of a watt. DOE proposes to specify that the represented value of average total lamp arc power must be equal to the mean of the sample. Finally, DOE proposes to remove "annual energy operating costs" in § 429.26(a)(2)(i) as this value is no longer required. DOE has tentatively determined that these proposed updates to 10 CFR 429.26 provide further clarification and would not impact current requirements of the DOE test procedure.

H. Compliance Dates and Waivers

EPCA prescribes that all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with an

amended test procedure, beginning 180 days after publication of such a test procedure final rule in the *Federal Register*. (42 U.S.C. 6293(c)(2)) If DOE were to publish an amended test procedure EPCA provides an allowance for individual manufacturers to petition DOE for an extension of the 180-day period, of not more than an additional 180 days, if the manufacturer would experience undue hardship in meeting the deadline. (42 U.S.C. 6293(c)(3)) To receive such an extension, petitions must be filed with DOE no later than the 60th day before the end of the 180-day period and must detail how the manufacturer will experience undue hardship. (*Id.*)

I. Test Procedure Costs, Harmonization, and Other Topics

1. Test Procedure Costs and Impact

EPCA requires that test procedures proposed by DOE not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) In this NOPR, DOE proposes to amend the existing test procedure for fluorescent lamp ballasts by 1) updating references to industry standards; 2) clarifying the selection of reference lamps; 3) adjusting time requirements in the current stabilization procedure; and 4) updating the industry standard in the test procedure for measuring standby mode energy consumption. Additionally, DOE is proposing a second stabilization option for measuring BLE. DOE has tentatively determined that these proposed amendments to the fluorescent lamp ballast procedure would not be unduly burdensome to conduct.

DOE's analysis indicates that, if finalized, the proposal to allow the Option 2 stabilization method (see Table III.3) it would result in a reduction of future testing. DOE has proposed an optional test procedure for measuring BE at light outputs less than full light output. Because this proposed test method is optional, it imposes no costs.

Table III.3 Summary of Cost Impacts for Fluorescent Lamp Ballasts

Category	Present Value (thousands 2016$)	Discount Rate (percent)
Cost Savings		
Reduction in Testing Costs	115.7	3
	47.7	7
Total Net Cost Impacts		
Total Net Cost Savings	(115.7)	3
	(47.7)	7

*Incorporates costs/(savings) for the Option 2 stabilization method.

Table III.4 Summary of Annualized Cost Impacts for Fluorescent Lamp Ballasts

Category	Annualized Value (2016$)	Discount Rate (percent)
Annualized Cost Savings		
Reduction in Testing Costs	3,470	3
	3,340	7
Total Net Annualized Cost Impacts		
Total Net Cost Savings	(3,470)	3
	(3,340)	7

*Incorporates costs/(savings) for the Option 2 stabilization method.

Further discussion of the cost impacts of the proposed test procedure amendments are presented in the following paragraphs.

The proposed amendments for taking active mode measurements to determine BLE would update the test procedure to incorporate by reference newer versions of already referenced industry standards. Based on DOE's review, these updates would not change measured values and do not add complexity to test conditions/setup or add test steps (see section III.B). DOE notes that the latest 2017 version of ANSI C82.11 adds a requirement for inrush current. Specifically, it requires that the aggregate peak inrush current amplitude and duration for each value of steady state current must be less than a set of given values. This specification does not require additional or new equipment and would be met by adjusting the current amplitude and/or

duration in the existing test setup. DOE has tentatively determined that compared to total test time, the time required to meet the inrush current requirements would be de minimis.

This NOPR also proposes clarifications on how to select reference lamps to address, in particular, new products on the market (i.e. ballasts that can operate multiple lamp types). The current DOE test procedure already requires that ballasts be tested with reference lamps. This selection criteria would only provide clarity in how to set up the tests and do not add extra steps or add burden.

This NOPR also proposes to remove a maximum operating time for stabilization. This proposed requirement is consistent with industry standards which do not impose a maximum stabilization time. Additionally, it proposes to change the requirement of taking measurements once per second to once per minute to establish stable operating conditions, thereby decreasing the amount of data collected. DOE does not expect either proposal to impact the costs of conducting the stabilization portion of the test procedure. The reduction in the frequency of measuring data will reduce the amount of data required to determine stabilization. However, this data is collected electronically. Therefore, there are no cost savings based on time and labor. Regarding the maximum operating time, the majority of ballasts stabilize within 20 to 45 minutes and would therefore not encounter this time limit. If ballasts do not currently stabilize within an hour, labs may choose to restart the stabilization procedure with the same unit or new unit. Therefore, there is no guaranteed increase or decrease in stabilization time.

Finally, the proposed revised test procedure for taking standby mode measurements changes the industry standard reference from ANSI C82.2 to IEC 62301 Section 5. IEC 62301 Section 5 provides more detailed instructions on how to determine the final power consumption value from power readings but the overall method of obtaining power measurements is the same and does not require different instrumentation. DOE also proposes to specify that use of reference lamps is not required when measuring standby mode power, as it has no impact on measurements. Additionally, the proposed amendments to the standby mode test procedure align the test setup and test conditions for taking active mode and standby mode measurements.

DOE has tentatively determined that the proposed amendments to DOE's test procedure for measuring BLE proposed in this NOPR will not require the purchase or use of new or additional equipment or require additional steps for testing measured values. Further, the proposed revisions are not expected to change measured values. Hence, DOE expects that manufacturers will be able to rely on data generated under the previous test procedure. While manufacturers must submit a report annually to certify a basic model's represented values, basic models do not need to be retested 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, the manufacturer may choose to conduct new testing in order to make claims of the new, more efficient rating.[43] Additionally, manufacturers do not make representations of BLE in manufacturer literature or on product packaging. Therefore,

[43] See guidance issued by DOE at *https://www.regulations.gov/document?D=EERE-2017-BT-TP-0005-0001*.

ballasts that are not required to comply with existing energy conservation standards are likely unaffected by the proposed revisions to DOE's test procedure for measuring BLE.

In this NOPR, DOE is proposing a second stabilization option (or "Option 2") when measuring BLE. As described in section III.D.3.a, the Option 2 stabilization method would minimize the time the test lamps are off, thereby reducing the stabilization time and, consequently, the overall testing time. DOE estimates the cost savings of the Option 2 stabilization method to be $3,574 annually. This estimate is based on a savings of 15 minutes per ballast test (due to reduced stabilization time). Based on a median hourly labor rate of $39.17[44] per electrical engineering technician (this includes an inflation factor of 31 percent to account for the cost of providing benefits), DOE estimates the savings to be $9.79 per ballast test, or $39.17 per basic model, assuming four ballast tests per basic model. DOE does not expect all manufacturers to choose to use the Option 2 stabilization method. DOE believes that only four manufacturers (comprising about 18 percent of fluorescent lamp ballast manufacturers) who already possess the necessary equipment (*i.e.*, an oven for ballasts) will choose to utilize the Option 2 stabilization method. DOE estimates that these manufacturers combined offer about 365 basic models of fluorescent lamp ballasts, comprising about 50 percent of all basic models certified in DOE's Compliance Certification Database. DOE believes that new basic models of fluorescent lamp ballasts are introduced and certified to DOE about once every four years. Thus DOE estimates overall annualized industry savings due to proposing the Option 2 stabilization method to be $3,470 at a 3 percent discount rate and $3,340 at a 7 percent discount rate.

[44] Bureau of Labor Statistics, Occupational Employment Statistics, available at: *https://www.bls.gov/oes/current/oes173023.htm*.

2. Harmonization with Industry Standards

The test procedure for fluorescent lamp ballasts at appendix Q to subpart B of part 430 incorporates by reference certain provisions of several industry standards. DOE incorporates and proposes to incorporate by reference ANSI C78.81-2016, ANSI C78.901-2016, ANSI C82.1-2015, ANSI C82.3-2016, ANSI/ANSLG C82.11-2017, ANSI C82.13-2002, ANSI C82.77-2002, and IEC 60081 Amendment 6 in their entirety. DOE is proposing to incorporate by reference only certain sections of ANSI C78.375A-2014, ANSI C82.2-2016, and IEC 62301 Edition 2.0 to ensure the repeatability of the test procedure. The industry standards DOE proposes to incorporate by reference via amendments described in this NOPR are discussed in further detail in section IV.N. DOE requests comments on the benefits and burdens of the proposed updates and additions to industry standards referenced in the test procedure for fluorescent lamp ballasts.

DOE seeks comment on the degree to which the DOE test procedure should consider and be harmonized further with the most recent relevant industry standards for fluorescent lamp ballasts. DOE also requests comment on the benefits and burdens of adopting any industry/voluntary consensus-based or other appropriate test procedure, without modification.

3. Other Test Procedure Topics

In addition to the issues identified earlier in this document, DOE welcomes comment on any other aspect of the existing test procedure for fluorescent lamp ballasts not already addressed by the specific areas identified in this document. DOE particularly seeks information that would improve the representativeness of the test procedure, as well as information that would help DOE create a procedure that would limit manufacturer test burden. Comments regarding repeatability and reproducibility are also welcome.

DOE also requests information that would help DOE create procedures that would limit manufacturer test burden through streamlining or simplifying testing requirements. In particular, DOE notes that under Executive Order 13771, "Reducing Regulation and Controlling Regulatory Costs," Executive Branch agencies such as DOE must manage the costs associated with the imposition of expenditures required to comply with Federal regulations. See 82 FR 9339 (Feb. 3, 2017). Consistent with that Executive Order, DOE encourages the public to provide input on measures DOE could take to lower the cost of its regulations applicable to fluorescent lamp ballasts consistent with the requirements of EPCA. DOE also recently published an RFI on the emerging smart technology appliance and equipment market. 83 FR 46886 (Sept. 17, 2018). In that RFI, DOE sought information to better understand market trends and issues in the emerging market for appliances and commercial equipment that incorporate smart technology. DOE's intent in issuing the RFI was to ensure that DOE did not inadvertently impede such innovation in fulfilling its statutory obligations in setting efficiency standards for covered products and equipment. In this NOPR, DOE seeks comment on the same issues presented in the RFI as they may be applicable to fluorescent lamp ballasts.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

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

B. Review Under Executive Orders 13771 and 13777

On January 30, 2017, the President issued Executive Order 13771, "Reducing Regulation and Controlling Regulatory Costs." That Order stated the policy of the executive branch is to be prudent and financially responsible in the expenditure of funds, from both public and private sources. The Order stated it is essential to manage the costs associated with the governmental imposition of private expenditures required to comply with Federal regulations. This rulemaking is expected to be an E.O. 13771 deregulatory action because it has total costs less than zero.

Additionally, on February 24, 2017, the President issued Executive Order 13777, "Enforcing the Regulatory Reform Agenda." The Order required the head of each agency designate an agency official as its Regulatory Reform Officer (RRO). Each RRO oversees the implementation of regulatory reform initiatives and policies to ensure that agencies effectively carry out regulatory reforms, consistent with applicable law. Further, E.O. 13777 requires the establishment of a regulatory task force at each agency. The regulatory task force is required to make recommendations to the agency head regarding the repeal, replacement, or modification of existing regulations, consistent with applicable law. At a minimum, each regulatory reform task force must attempt to identify regulations that:

(i) Eliminate jobs, or inhibit job creation;

(ii) Are outdated, unnecessary, or ineffective;

(iii) Impose costs that exceed benefits;

(iv) Create a serious inconsistency or otherwise interfere with regulatory reform initiatives and policies;

(v) Are inconsistent with the requirements of Information Quality Act, or the guidance issued pursuant to that Act, in particular those regulations that rely in whole or in part on data, information, or methods that are not publicly available or that are insufficiently transparent to meet the standard for reproducibility; or

(vi) Derive from or implement Executive Orders or other Presidential directives that have been subsequently rescinded or substantially modified.

DOE initially concludes that this rulemaking is consistent with the directives set forth in these executive orders. The proposed rule would yield annualized cost savings of approximately $3,340 (2016$), assuming a 7 percent discount rate, and $3,470 (2016$), assuming a 3 percent discount rate. Therefore, if finalized as proposed, this rule is expected to be an Executive Order 13771 deregulatory action.

C. Review Under the Regulatory Flexibility Act

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

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

The Small Business Administration (SBA) considers a business entity to be a small business, if, together, with its affiliates, it employs less than a threshold number of workers specified in 13 CFR part 121. These size standards and codes established by the North American Industry Classification System (NAICS) and are available at *https://www.sba.gov/document/support--table-size-standards*. Fluorescent lamp ballast manufacturing is classified under NAICS 335311, "*Power, Distribution, and Specialty Transformer Manufacturing*." The SBA sets a threshold of 750 employees or fewer for an entity to be considered as a small business for this category.

To estimate the number of companies that could be small businesses that manufacture these ballasts, DOE conducted a market survey using publicly available information. DOE's research involved reviewing information provided by trade associations (*e.g.*, the National Electrical Manufacturers' Association), information from individual company websites, market research tools (*i.e.*, Hoover's reports) and DOE's Certification Compliance Database. DOE screened out companies that do not meet the definition of a "small business" or are completely foreign owned and operated. DOE identified no small businesses that manufacture fluorescent lamp ballasts in the United States. DOE requests comments on its tentative determination that there are no small businesses that manufacture fluorescent lamp ballasts in the United States.

Because DOE identified no small businesses that manufacture fluorescent lamp ballasts in the United States and the proposed amendments to DOE's test procedure for measuring BLE proposed in this NOPR will not require the purchase or use of new or additional equipment or require additional steps for testing measured values, DOE tentatively concludes that the impacts of the test procedure amendments proposed in this NOPR would not have a "significant economic impact on a substantial number of small entities," and that 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 Small Business Administration for review under 5 U.S.C. 605(b).

D. Review Under the Paperwork Reduction Act of 1995

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

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

E. 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 make certifications and representations of certain quantities for fluorescent lamp ballasts. DOE is analyzing this proposed test procedure in accordance with the National Environmental Policy Act (NEPA) and DOE's NEPA implementing regulations (10 CFR part 1021). DOE's regulations include a categorical exclusion for rulemakings interpreting or amending an existing rule or regulation that does not change the environmental effect of the rule or regulation being amended. 10 CFR part 1021, subpart D, appendix A5. DOE anticipates that this rulemaking qualifies for categorical exclusion A5 because it is an interpretive rulemaking that does not change the environmental effect of the rule and otherwise meets the requirements for application of a categorical exclusion. See 10 CFR 1021.410. DOE will complete its NEPA review before issuing the final rule.

F. Review Under Executive Order 13132

Executive Order 13132, "Federalism," 64 FR 43255 (August 4, 1999) imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The

Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE 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.

G. 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.

H. 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 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.

I. 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.

J. 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.

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

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

L. 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 procedure for measuring the energy efficiency of fluorescent lamp ballasts 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.

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

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C.

788; FEAA) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (FTC) concerning the impact of the commercial or industry standards on competition.

The proposed modifications to the test procedure for fluorescent lamp ballasts adopted in this final rule incorporates testing methods contained in certain sections of the following commercial standards:

1) ANSI Standard C78.901, "American National Standard for Electric Lamps – Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics," 2016;
2) ANSI C78.81-2016, "American National Standard for Electric Lamps—Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics," 2016;
3) ANSI C78.375A, "American National Standard for Electric Lamps – Fluorescent Lamps – Guide for Electrical Measures," 2014;
4) ANSI_ANSLG Standard C82.11, "American National Standard for Lamp Ballasts – High Frequency Fluorescent Lamp Ballasts - Supplements," 2017;
5) ANSI Standard C82.77, "American National Standard for Lighting Equipment—Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment," 2002;
6) ANSI Standard C82.1, "American National Standard for Lamp Ballasts—Line Frequency Fluorescent Lamp Ballast," 2015;

7) ANSI Standard C82.2, "American National Standard for Lamp Ballasts—Method of Measurement of Fluorescent Lamp Ballasts," 2016;
8) IEC Standard 60081, "Double Capped Fluorescent Lamps – Performance specifications (Amendment 6, Edition 5.0, August 2017)," 2017; and
9) IEC Standard 62301, "Household electrical appliances – Measurement of standby power (Edition 2.0, January 2011)," 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., whether it was developed in a manner that fully provides for public participation, comment, and review.) DOE will consult with both the Attorney General and the Chairman of the FTC concerning the impact of these test procedures on competition, prior to prescribing a final rule.

N. Description of Materials 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—Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics," ANSI Standard C78.81-2016. ANSI C78.81-2016 is an industry accepted test standard that describes the physical and electrical characteristics of double-capped fluorescent lamps. The test procedure proposed in this NOPR references ANSI C78.81-2016 for characteristics of reference lamps that must be used when testing fluorescent lamp ballasts. ANSI C78.81-2016 is readily available on ANSI's website at *http://webstore.ansi.org/*.

In this NOPR, DOE proposes to incorporate by reference certain sections of the test standard published by ANSI, titled "American National Standard for Electric Lamps – Fluorescent Lamps – Guide for Electrical Measures," ANSI Standard C78.375A-2014. ANSI C78.375A-2014 is an industry accepted test standard that describes procedures for measuring the electrical characteristics of fluorescent lamps. The test procedure proposed in this NOPR references sections of ANSI C78.375A-2014 for testing performance of fluorescent lamp ballasts. ANSI C78.375A-2014 is readily available on ANSI's website at *http://webstore.ansi.org/*.

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 Standard C78.901-2016. ANSI C78.901-2016 is an industry accepted test standard that describes physical and electrical characteristics of single-based fluorescent lamps. The test procedure proposed in this NOPR references ANSI C78.901-2016 for characteristics of reference lamps that must be used when testing fluorescent lamp ballasts. ANSI C78.901-2016 is readily available on ANSI's website at *http://webstore.ansi.org/*.

In this NOPR, DOE proposes to incorporate by reference the test standard published by ANSI, titled "American National Standard for Lamp Ballasts—Line Frequency Fluorescent Lamp Ballast," ANSI Standard C82.1-2004 (R2008)(R2015). ANSI C82.1-2004 (R2008)(R2015) (also referred to in this NOPR as ANSI C82.1-2015) is an industry accepted test standard that describes characteristics and measurements of line frequency fluorescent lamp ballasts. The test procedure proposed in this NOPR references ANSI C82.1-2004

(R2008)(R2015) for testing performance of fluorescent lamp ballasts. ANSI C82.1-2004 (R2008)(R2015) is readily available on ANSI's website at http://webstore.ansi.org/.

In this NOPR, DOE proposes to incorporate by reference sections of the test standard published by ANSI, titled "American National Standard for Lamp Ballasts—Method of Measurement of Fluorescent Lamp Ballasts," ANSI Standard C82.2-2002 (R2016). ANSI C82.2-2002 (R2016) (also referred to in this NOPR as ANSI C82.2-2016) is an industry accepted standard for testing line frequency fluorescent lamp ballasts. The 2016 version is a reaffirmation of the 2002 version. ANSI C82.2-2002 (R2016) is readily available on ANSI's website at *http://webstore.ansi.org/*.

In this NOPR, DOE proposes to incorporate by reference the test standard published by ANSI, titled "American National Standard for Lamp Ballasts – Reference Ballasts for Fluorescent Lamps," ANSI Standard C82.3-2016. ANSI C82.3-2016 (also referred to in this NOPR as ANSI C82.3) is an industry accepted standard that describes characteristics and requirements of fluorescent lamp reference ballasts. The test procedure proposed in this NOPR references ANSI C82.3-2016 for determining a reference fluorescent lamp to use when testing the performance of fluorescent lamp ballasts. ANSI C82.3-2016 is readily available on ANSI's website at *http://webstore.ansi.org/*.

In this NOPR, DOE proposes to incorporate by reference the test standard published by ANSI, titled "American National Standard for Lamp Ballasts – High Frequency Fluorescent Lamp Ballasts - Supplements," ANSI_ANSLG Standard C82.11-2017. ANSI_ANSLG C82.11-2017 is an industry accepted test standard that describes characteristics and measurements of

high frequency fluorescent lamp ballasts. The test procedure proposed in this NOPR references ANSI_ANSLG C82.11-2017 for testing performance of fluorescent lamp ballasts. ANSI_ANSLG C82.11-2017 is readily available on ANSI's website at *http://webstore.ansi.org/*.

In this NOPR, DOE proposes to incorporate by reference the test standard published by ANSI, titled "American National Standard Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment," ANSI Standard C82.77-2002. ANSI C82.77-2002 is an industry accepted standard that describes maximum harmonic emission limits for lighting equipment. ANSI C82.11-2017, proposed for reference in this test procedure for testing high frequency fluorescent lamp ballasts, references ANSI C82.77-2002 to determine the maximum harmonic emission limits of the input current to the ballast. ANSI C82.77-2002 is readily available on ANSI's website at *http://webstore.ansi.org/*.

In this NOPR, DOE proposes to incorporate by reference the test standard published by IEC, titled, "Double Capped Fluorescent Lamps – Performance specifications (Amendment 6, Edition 5.0, July 2013)," IEC Standard 60081 Amendment 6. IEC Standard 60081 Amendment 6 is an industry accepted test standard that describes physical and electrical characteristics of double-capped fluorescent lamps. The test procedure proposed in this NOPR references IEC Standard 60081 Amendment 6 for characteristics of reference lamps that must be used when testing fluorescent lamp ballasts. IEC Standard 60081 Amendment 6 is readily available on IEC's website at *https://webstore.iec.ch/home*.

In this NOPR, DOE proposes to incorporate by reference the test standard published by IEC, titled "Household electrical appliances – Measurement of standby power (Edition 2.0,

January 2011)," IEC Standard 62301 (Edition 2.0). IEC Standard 62301 (Edition 2.0) is an industry accepted test standard that describes measurements of electrical power consumption in standby mode, off mode, and network mode. The test procedure proposed in this NOPR references sections of IEC Standard 62301 (Edition 2.0) for testing standby mode power consumption of fluorescent lamp ballasts. IEC Standard 62301 (Edition 2.0) is readily available on IEC's website at *https://webstore.iec.ch/home*.

V. Public Participation

A. Submission of Comments

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

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

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

Do not submit to *http://www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through *http://www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

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

Submitting comments via email, hand delivery, or postal mail. Comments and documents submitted via email, hand delivery, or mail also will be posted to *http://www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your first and last names, email address,

telephone number, and optional mailing address. 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).

B. Issues on Which DOE Seeks Comment

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

1) DOE requests comments on its proposal to incorporate by reference sections 3, 4, and 7 of the 2016 version of ANSI C82.2, the 2017 version of ANSI C82.11, the 2002 version of ANSI C82.77, the 2015 version of ANSI C82.1, the 2016 version of ANSI C82.3, sections 4 and 9 of the 2014 version of ANSI C78.375A, the 2016 version of

ANSI C78.81, the 2016 version of ANSI C78.901, Amendment 6 of EIC 60081, and section 5 of Edition 2.0 of IEC 62301 in appendix Q.

2) DOE requests comments on its proposal to remove definitions that will no longer be used: AC control signal, cathode heating, DC control signal, F34T12 lamp, F96T12/ES lamp, F96T12HO/ES lamp, PLC control signal, and wireless control signal.

3) DOE requests comments on the proposed guidance for selecting the appropriate base type and diameter for reference lamps operated by ballasts that can operate lamps with multiple base types.

4) DOE requests comments on its proposal to change the sampling frequency from one second to one minute for determining stabilization using the Option 1 stabilization method, including whether this change would impact the overall cost of the test procedure.

5) DOE requests comments on its proposal to remove the requirement that fluorescent lamp ballasts cannot be operated for longer than one hour to determine stable operating conditions, including whether this change would impact the overall cost of the test procedure.

6) DOE requests comments on its proposal to allow the Option 2 stabilization method for measuring the BLE of ballasts at full light output.

7) DOE requests comments on its proposal to provide a method for measuring ballast efficiency at light outputs less than the full light output, specifically light outputs less than full light output and greater than or equal to 50 percent of full light output.

8) DOE requests comments on its proposal to replace the existing ANSI C82.2 references to sections 3.2.1, 4, and 7 with only section 7 of ANSI C82.2 for measuring input power, voltage, and current, disregarding Figure 1 and Figure 3.
9) DOE seeks comments on its proposal to incorporate IEC 62301 by reference and reference section 5 of IEC 62301 for stabilization and standby mode energy consumption measurements.
10) DOE requests comments on its proposal to reference the active mode test procedure for instrumentation, test conditions and connection of lamps (with the exception of reference lamp specifications) in the standby mode test procedure.
11) DOE requests comments on its proposal to require that lamps be turned on before taking standby mode measurements.
12) DOE requests comment on the proposal to remove calculations for estimated annual energy consumption and estimated annual operating cost that will no longer be used and to include a description of power factor calculation in 10 CFR 430.23(q).
13) DOE requests comments, data, and information regarding the cost of taking measurements of BE at reduced light outputs, the cost of making BE representations, and what percent of industry may choose to make representations of this metric.
14) DOE requests comments on the benefits and burdens of the proposed updates and additions to industry standards referenced in the test procedure for fluorescent lamp ballasts.
15) DOE requests comments on its tentative determination that there are no small businesses that manufacture fluorescent lamp ballasts in the United States.

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, Incorporation by reference, 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.

Signed in Washington, DC, on March 6, 2019.

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Steven Chalk,
Acting Deputy Assistant Secretary for Energy Efficiency,
Energy Efficiency and Renewable Energy.

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

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

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

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

3. Section 429.26 is amended by:

   a. Revising the introductory text of paragraphs (a)(2)(i) and (ii);

   b. Adding paragraph (a)(2)(iii); and

   c. Revising paragraphs (b)(2) and (c).

The revisions and additions read as follows:

§429.26 Fluorescent lamp ballasts.

(a) * * *

(2) * * *

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

* * * * *

(ii) Any represented value of the ballast luminous efficiency, ballast efficiency, power factor, or other measure of the energy efficiency or energy consumption of a basic model for which consumers would favor a higher value must be less than or equal to the lower of:

* * * * *

(iii) The represented value of average total lamp arc power must equal the mean of the sample, where:

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

Where:

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

n is the number of units in the sample; and

x_i is the i^{th} unit.

(b) * * *

(2) Pursuant to §429.12(b)(13), a certification report must include the following public product-specific information: The ballast luminous efficiency, the average total lamp arc power, the power factor, the number of lamps operated by the ballast, and the type of lamps operated by the ballast (i.e., wattage, base, shape, diameter, and length).

(c) Rounding requirements. (1) Round ballast luminous efficiency to the nearest thousandths place.

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

(3) Round average total lamp arc power to the nearest tenth of a watt.

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 revising the definition of "Designed and marketed" to read as follows:

§430.2 Definitions.

* * * * *

Designed and marketed means that the intended application of the lamp or ballast is clearly stated in all publicly available documents (e.g., product literature, catalogs, and packaging labels). This definition is applicable to terms related to the following covered lighting products: Fluorescent lamp ballasts; fluorescent lamps; general service fluorescent lamps; general service incandescent lamps; general service lamps; incandescent lamps; incandescent reflector lamps; medium base compact fluorescent lamps; and specialty application mercury vapor lamp ballasts.

* * * * *

6. Section 430.3 is amended by:

   a. Removing "§430.2, §430.32, appendix Q," and add in its place "§§430.2 and 430.32" in paragraph (e)(5);

   b. Removing the words "appendix Q and" in paragraph (e)(6);

   c. Removing the words ", appendix Q," in paragraph (e)(7);

   d. Redesignating paragraphs (e)(17) through (21) as (e)(22) through (26);

   e. Redesignating paragraphs (e)(6) through (16) as follows:

Old paragraph	New paragraph

(e)(6)	(e)(7)
(e)(7)	(e)(9)
(e)(8)	(e)(10)
(e)(9)	(e)(12)
(e)(10)	(e)(13)
(e)(11)	(e)(14)
(e)(12)	(e)(15)
(e)(13)	(e)(16)
(e)(14)	(e)(17)
(e)(15)	(e)(19)
(e)(16)	(e)(20)

f. Adding new paragraphs (e)(6), (8), and (11);

g. Revising newly redesignated paragraphs (e)(15) and (16);

h. Removing the words "appendix Q and" in newly redesignated paragraph (e)(17);

i. Adding new paragraph (e)(18);

j. Revising newly redesignated paragraph (e)(19);

k. Adding new paragraph (e)(21);

l. Removing the words "Amendment 4, Edition 5.0, 2010-02" in paragraph (p)(2) and adding in its place the words "Amendment 6, Edition 5.0, August 2017";

m. Removing the words "appendices C1, D1, D2, G, H, I, J2, N, O, P, X, X1, Y, Z, BB, and CC to subpart B" in paragraph (p)(6) and adding in its place the words

"appendices C1, D1, D2, G, H, I, J2, N, O, P, Q, X, X1, Y, Z, BB, and CC to subpart B."

The revisions and additions read as follows:

§430.3 Materials incorporated by reference.

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(e) * * *

(6) ANSI C78.81-2016, Revision of ANSI_ANSLG C78.81-2010, ("ANSI C78.81-2016"), American National Standard for Electric Lamps—Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics, approved June 29, 2016, IBR approved for appendix Q to subpart B of this part.

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(8) ANSI C78.375A-2014, Revision of ANSI C78.375-1997, ("ANSI C78.375A"), American National Standard for Electric Lamps - Fluorescent Lamps—Guide for Electrical Measures, first edition, approved August 28, 2014, IBR approved for appendix Q to subpart B of this part.

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(11) ANSI C78.901-2016, American National Standard for Electric Lamps—Single-Based Fluorescent Lamps—Dimensional and Electrical Characteristics, ANSI approved August 23, 2016, IBR approved for appendix Q to subpart B of this part.

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(15) ANSI C82.1-2004 (R2008, R2015), Revision of ANSI C82.1-2004, ("ANSI C82.1"), American National Standard for Lamp Ballasts—Line Frequency Fluorescent Lamp Ballast, approved November 20, 2015, IBR approved for appendix Q to subpart B of this part.

(16) ANSI C82.2-2016, Revision of ANSI C82.2-2002, ("ANSI C82.2"), American National Standard for Lamp Ballasts—Method of Measurement of Fluorescent Ballasts, approved July 12, 2016, IBR approved for appendix Q to subpart B of this part.

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(18) ANSI C82.3-2016, Revision of ANSI C82.3-2002, ("ANSI C82.3-2016"), American National Standard for Reference Ballasts for Fluorescent Lamps, approved April 8, 2016, IBR approved for appendix Q to subpart B of this part.

(19) ANSI_ANSLG C82.11-2017, Revision of ANSI C82.11-2011, ("ANSI C82.11"), American National Standard for Lamp Ballasts—High-frequency Fluorescent Lamp Ballasts—Supplements, approved January 23, 2017, IBR approved for appendix Q to subpart B of this part.

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(21) ANSI C82.77, ("ANSI C82.77") American National Standard for Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment, approved January 17, 2002, IBR approved for appendix Q to subpart B of this part.

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7. Section 430.23(q) is revised to read as follows:

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

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(q) Fluorescent lamp ballasts. (1) Calculate ballast luminous efficiency (BLE) and ballast efficiency (BE) using appendix Q to this subpart.

(2) Calculate power factor using appendix Q to this subpart.

* * * * *

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

Appendix Q to Subpart B of Part 430 – Uniform Test Method for Measuring the Energy Consumption of Fluorescent Lamp Ballasts

Note: After [date 30 days after date of publication of the final rule in the Federal Register] and prior to [date 180 days after date of publication of the final rule in the Federal Register] any representations with respect to energy use or efficiency of fluorescent lamp ballasts must be in accordance with the results of testing pursuant to this appendix or the test procedures as they appeared in appendix Q to this subpart or this part revised as of January 1, 2018. On or after [date 180 days after date of publication of the final rule in the Federal Register], any representations, including certifications of compliance for ballasts subject to any energy conservation standard, made with respect to the energy use or efficiency of fluorescent lamp ballasts must be made in accordance with the results of testing pursuant to this appendix.

1. Definitions

1.1. Average total lamp arc power means the sample mean of the total lamp arc powers of the ballast units tested.

1.2 Dimming ballast means a ballast that is designed and marketed to vary its output and that can achieve an output less than or equal to 50 percent of its maximum electrical output.

1.3. High frequency ballast is as defined in ANSI C82.13 (incorporated by reference, see §430.3).

1.4. Instant-start is the starting method used in instant-start systems as defined in ANSI C82.13 (incorporated by reference, see §430.3), as typically indicated on publicly available documents of a fluorescent lamp ballast (e.g., product literature, catalogs, and packaging labels).

1.5. Low-frequency ballast is a fluorescent lamp ballast that operates at a supply frequency of 50 to 60 Hz and operates the lamp at the same frequency as the supply.

1.6. Programmed-start is the starting method used in a programmed-start type system as defined in ANSI C82.13 (incorporated by reference, see §430.3), as typically indicated on publicly available documents of a fluorescent lamp ballast (e.g., product literature, catalogs, and packaging labels).

1.7. Rapid-start is the starting method used in rapid-start type systems as defined in ANSI C82.13 (incorporated by reference, see §430.3), as typically indicated on publicly available documents of a fluorescent lamp ballast (e.g., product literature, catalogs, and packaging labels).

1.8. Reference lamp is a fluorescent lamp that meets the operating conditions of a reference lamp as defined by ANSI C82.13 (incorporated by reference, see §430.3).

1.9. Residential ballast means a fluorescent lamp ballast that meets Federal Communications Commission (FCC) consumer limits as set forth in 47 CFR part 18 and is designed and marketed for use only in residential applications.

1.10. RMS is the root mean square of a varying quantity.

1.11. Sign ballast means a ballast that has an Underwriters Laboratories Inc. Type 2 rating and is designed and marketed for use only in outdoor signs.

2. Active Mode Procedure for Measuring BLE at Full Light Output

2.1. Where ANSI C82.2 (incorporated by reference, see §430.3) references ANSI C82.1, use ANSI C82.1 (incorporated by reference, see §430.3) for testing low-frequency ballasts and use ANSI C82.11 (incorporated by reference, see §430.3) for testing high-frequency ballasts. In addition when applying ANSI C82.2, use the standards ANSI C78.375A, ANSI C78.81-2016, ANSI C82.1, ANSI C82.11, ANSI C82.13, ANSI C82.3-2016, ANSI C82.77, and ANSI C78.901-2016 as incorporated by reference in §430.3. Specifications in referenced standards that are recommended, that "shall" or "should" be met, or that are not clearly mandatory, are mandatory. In cases where there is a conflict between any industry standard(s) and this appendix, the language of the test procedure in this appendix takes precedence over the industry standard(s).

2.2. Instruments

2.2.1. All instruments must meet the specifications of section 9 of ANSI C78.375A (incorporated by reference, see §430.3).

2.2.2. Power Analyzer. In addition to the specifications in section 9 of ANSI C78.375A, the power analyzer must have a maximum 100 pF capacitance to ground and frequency response between 40 Hz and 1 MHz.

2.2.3. Current Probe. In addition to the specifications in section 9 of ANSI C78.375A, the current probe must be galvanically isolated and have frequency response between 40 Hz and 20 MHz.

2.3. Test Setup

2.3.1. Connect the ballast to a main power source and to the fluorescent lamp(s) as specified in this section. Ensure the ballast is connected to fluorescent lamp(s) according to any manufacturer's wiring instructions on or sold with each unit (including those provided online). To test a low-frequency ballast, follow ANSI C82.1 (incorporated by reference, see §430.3) but disregard section 5.3 of ANSI C82.1. To test a high-frequency ballast, follow ANSI C82.11 (incorporated by reference, see §430.3) but disregard sections 5.3.1, 5.13, and Annex D of ANSI C82.11.

2.3.2. In the test setup, all wires used in the apparatus, including any wires from the ballast to the lamps and from the lamps to the measuring devices, must meet the following specifications:

2.3.2.1. Use the wires provided by the ballast manufacturer and only the minimum wire length necessary to reach both ends of each lamp. If the wire lengths supplied with the ballast are too short to reach both ends of each lamp, add the minimum additional wire length necessary to reach both ends of each lamp, using wire of the same wire gauge(s) as the wire supplied with the ballast. If no wiring is provided with the ballast, use 18 gauge or thicker wire.

2.3.2.2. Keep wires loose. Do not shorten or allow bundling of any wires. Separate all wires from each other, and ground them to prevent parasitic capacitance.

2.3.3. Test each ballast with only one fluorescent lamp type. Select the one type of fluorescent lamp for testing as follows:

2.3.3.1. Each fluorescent lamp must meet the specifications of a reference lamp as defined by ANSI C82.13 (incorporated by reference, see §430.3), be seasoned at least 12 hours, and be stabilized as specified in section 2.5.2.1 of this appendix. Test each reference lamp with a reference ballast that meets the criteria of ANSI C82.3-2016 (incorporated by reference, see §430.3). For low frequency ballasts that operate:

(a) 32 W 4-foot medium bipin T8 lamps use the following reference lamp specifications: 30.8 W, arc wattage; 1.7 W, approximate cathode wattage (with 3.6 V on each cathode); 32.5 W, total wattage; 137 V, voltage; 0.265 A, current. Test the selected reference lamp with the following reference ballast specifications: 300 V, rated input voltage; 0.265 A, reference current; 910 ohms, impedance. Use the following cathode heat requirements for rapid start: 3.6 V nominal, voltage; 2.5 V min, 4.4 V max, limits during operation; 11.0 ohms +/- 0.1 ohms, dummy load resistor; 3.4 V min, 4.5 V max, voltage across dummy load.

(b) 59 W 8-foot single pin T8 lamps use the following reference lamp specifications: 60.1 W, arc wattage; 270.3 V, voltage; 0.262 A, current. Test the selected reference lamp with the following reference ballast specifications: 625 V, rated input voltage; 0.260 A, reference current; 1960 ohms, impedance.

(c) 32 W 2-foot U-shaped medium bipin T8 lamps use the following reference lamp specifications: 30.5 W, arc wattage; 1.7 W, approximate cathode wattage (with 3.6 V on each cathode); 32.2 W, total wattage; 137 V, voltage; 0.265 A, current. Test the selected reference lamp with the following reference ballast specifications: 300 V, rated input voltage; 0.265 A, reference current; 910 ohms, impedance. Use the following cathode heat requirements for rapid start: 3.6 V nominal, voltage; 2.5 V min, 4.4 V max, limits during operation; 11.0 ohms +/- 0.1 ohms, dummy load resistor; 3.4 V min, 4.5 V max, voltage across dummy load.

2.3.3.2 For any sign ballast designed and marketed to operate both T8 and T12 lamps, use a T12 lamp as specified in Table 1 of this appendix.

2.3.3.3. For any ballast designed and marketed to operate lamps of multiple base types, select lamp(s) of one base type, in the following order of decreasing preference: medium bipin, miniature bipin, single pin, or recessed double contact.

2.3.3.4. After selecting the base type (per section 2.3.5.3 of this appendix), select the diameter of the reference lamp. Any ballast designed and marketed to operate lamps of multiple diameters, except for any sign ballast capable of operating both T8 and T12 lamps, must be tested with lamps of one of those diameters, selected in the following order of decreasing preference: T8, T5, or T12.

2.3.3.5. Connect the ballast to the maximum number of lamps (lamp type as determined by sections 2.3.3.2, 2.3.3.3, and 2.3.3.4 of this section) the ballast is designed and marketed to operate simultaneously.

For any ballast designed and marketed to operate both 4-foot medium bipin lamps and 2-foot U-shaped lamps, test with the maximum number of 4-foot medium bipin lamp(s).

2.3.3.6. Test each ballast with the lamp type specified in Table 1 of this section that corresponds to the lamp diameter and base type the ballast is designed and marketed to operate.

TABLE 1 TO SECTION 2.3.3.6—LAMP-AND-BALLAST PAIRINGS AND FREQUENCY ADJUSTMENT FACTORS

	Lamp type		Frequency adjustment factor (β)	
Ballast type	**Lamp diameter and base**	**Nominal lamp wattage**	**Low-frequency**	**High-frequency**
Ballasts that operate straight-shaped lamps (commonly referred to as 4-foot medium bipin lamps) with medium bipin bases and a nominal overall length of 48 inches	T8 MBP (Data Sheet 7881-ANSI-1005-4)*	32	0.94	1.0
	T12 MBP (Data Sheet 7881-ANSI-1006-1)*	34	0.93	1.0
Ballasts that operate U-shaped lamps (commonly referred to as 2-foot U-shaped lamps) with medium bipin bases and a nominal overall length between 22 and 25 inches	T8 MBP (Data Sheet 78901-ANSI-4027-2)*	32	0.94	1.0
	T12 MBP**	34	0.93	1.0
Ballasts that operate lamps (commonly referred to as 8-foot-high output lamps) with recessed double contact bases and a nominal overall length of 96 inches	T8 HO RDC (Data Sheet 7881-ANSI-1501-2)*	86	0.92	1.0
	T12 HO RDC (Data Sheet 7881-ANSI-1017-1)*	95	0.94	1.0
Ballasts that operate lamps (commonly referred to as 8-foot slimline lamps) with single pin	T8 slimline SP (Data Sheet 7881-ANSI-1505-1)*	59	0.95	1.0

bases and a nominal overall length of 96 inches	T12 slimline SP (Data Sheet 7881-ANSI-3006-1)*	60	0.94	1.0
Ballasts that operate straight-shaped lamps (commonly referred to as 4-foot miniature bipin standard output lamps) with miniature bipin bases and a nominal length between 45 and 48 inches	T5 SO Mini-BP (Data Sheet 60081-IEC-6640-7)*	28	0.95	1.0
Ballasts that operate straight-shaped lamps (commonly referred to as 4-foot miniature bipin high output lamps) with miniature bipin bases and a nominal length between 45 and 48 inches	T5 HO Mini-BP (Data Sheet 60081-IEC-6840-6)*	54	0.95	1.0
Sign ballasts that operate lamps (commonly referred to as 8-foot high output lamps) with recessed double contact bases and a nominal overall length of 96 inches	T8 HO RDC (Data Sheet 7881-ANSI-1501-2)*	86	0.92	1.0
	T12 HO RDC (Data Sheet 7881-ANSI-1019-1)*	110†	0.94	1.0
MBP, Mini-BP, RDC, and SP represent medium bipin, miniature bipin, recessed double contact, and single pin, respectively. * Data Sheet corresponds to ANSI C78.81-2016, ANSI C78.901-2016, or IEC 60081 page number (incorporated by reference, see §430.3). ** No ANSI or IEC Data Sheet exists for 34 W T12 MBP U-shaped lamps. For ballasts designed and marketed to operate only T12 2-foot U-shaped lamps with MBP bases and a nominal overall length between 22 and 25 inches, select T12 U-shaped lamps designed and marketed as having a nominal wattage of 34 W. †This lamp type is commonly marketed as 110 W; however, the ANSI C78.81-2016 Data Sheet (incorporated by reference, see §430.3) lists nominal wattage of 113 W. Test with specifications for operation at 0.800 amperes (A).				

2.3.4. Test Circuits

2.3.4.1. The power analyzer test setup must have exactly n + 1 channels where n is the maximum number of lamps (lamp type as determined by sections 2.3.5.2, 2.3.5.3, and 2.3.5.4 of this appendix) a ballast is designed and marketed to operate. Use the minimum number of power

analyzers possible during testing. Synchronize all power analyzers. A system may be used to synchronize the power analyzers.

2.3.4.2. Lamp Arc Voltage. Attach leads from the power analyzer to each fluorescent lamp according to Figure 1 of this section for rapid- and programmed-start ballasts, Figure 2 of this section for instant-start ballasts operating single pin (SP) lamps, and Figure 3 of this section for instant-start ballasts operating medium bipin (MBP), miniature bipin (mini-BP), or recessed double contact (RDC) lamps. The programmed- and rapid-start ballast test setup includes two 1000 ohm resistors placed in parallel with the lamp pins to create a midpoint from which to measure lamp arc voltage.

2.3.4.3. Lamp Arc Current. Position a current probe on each fluorescent lamp according to Figure 1 of this section for rapid- and programmed-start ballasts, Figure 2 of this section for instant-start ballasts operating SP lamps, and Figure 3 of this section for instant-start ballasts operating MBP, mini-BP, and RDC lamps.

For the lamp arc current measurement, set the full transducer ratio in the power analyzer to match the current probe to the power analyzer.

$$Full\ Transducer\ Ratio = \frac{I_{in}}{V_{out}} \times \frac{R_{in}}{R_{in} + R_s}$$

Where: I_{in} is the current through the current transducer, V_{out} is the voltage out of the transducer, R_{in} is the power analyzer impedance, and R_s is the current probe output impedance.

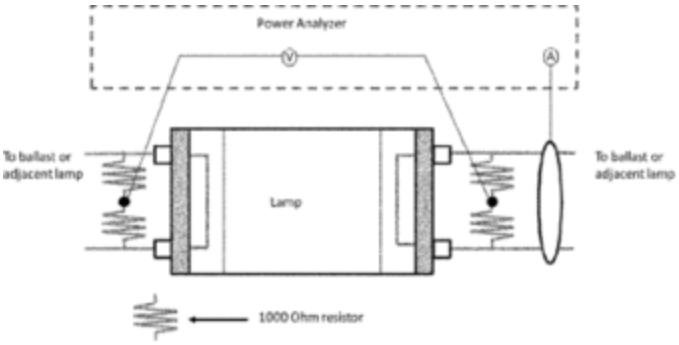

Figure 1: Programmed- and Rapid-Start Ballast Instrumentation Setup

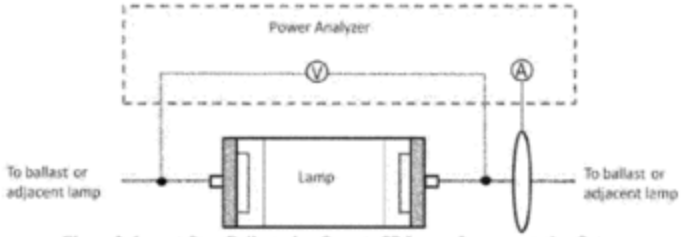

Figure 2: Instant-Start Ballasts that Operate SP Lamps Instrumentation Setup

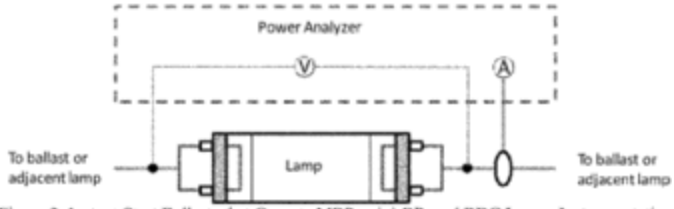

Figure 3: Instant-Start Ballasts that Operate MBP, mini-BP, and RDC Lamps Instrumentation Setup

2.4. Test Conditions

2.4.1. Establish and maintain test conditions for testing fluorescent lamp ballasts in accordance with sections 3 and 4 of ANSI C82.2 (incorporated by reference, see §430.3).

2.4.2. Room Temperature and Air Circulation. Maintain the test area at 25 ±1 °C, with minimal air movement as specified in section 4 of ANSI C78.375A (incorporated by reference, see §430.3).

2.4.3. Input Voltage. For any ballast designed and marketed for operation at only one input voltage, test at that specified voltage. For any ballast that is neither a residential ballast nor a sign

ballast but is designed and marketed for operation at multiple voltages, test the ballast at 277 V ±0.1%. For any residential ballast or sign ballast designed and marketed for operation at multiple voltages, test the ballast at 120 V ±0.1%.

2.5. Test Method

2.5.1. Connect the ballast to the selected fluorescent lamps (as determined in section 2.3.5 of this appendix) and to measurement instrumentation as specified in the Test Setup in section 2.3 of this appendix.

2.5.2. Determine stable operating conditions according to Option 1 or Option 2.

2.5.2.1. Option 1. Operate the ballast for at least 15 minutes before determining stable operating conditions. Determine stable operating conditions by measuring lamp arc voltage, current, and power once per minute in accordance with the setup described in section 2.3 of this appendix. The system is stable once the difference between the maximum and minimum for each value of lamp arc voltage, current, and power divided by the average value of the measurements do not exceed one percent over a four minute moving window. Once stable operating conditions are reached, measure each of the parameters described in sections 2.5.3 through 2.5.9 of this appendix.

2.5.2.2. Option 2. Determine stable operating conditions according to steps 1 through 6 of section D.2.1 in Annex D of ANSI C82.11. Once stable operating conditions are reached, measure each of the parameters described in sections 2.5.3 through 2.5.9 of this appendix.

2.5.3. Lamp Arc Voltage. Measure lamp arc voltage in volts (RMS) using the setup in section 2.3.6.2 of this appendix.

2.5.4. Lamp Arc Current. Measure lamp arc current in amps (RMS) using the setup in section 2.3.6.3 of this appendix.

2.5.5. Lamp Arc Power. The power analyzer must calculate output power by using the measurements from sections 2.5.3 and 2.5.4 of this section.

2.5.6. Input Power. Measure the input power in watts to the ballast in accordance with section 7 of ANSI C82.2 (disregard references to Figure 1 and Figure 3).

2.5.7. Input Voltage. Measure the input voltage in volts (RMS) to the ballast in accordance with section 7 of ANSI C82.2 (disregard references to Figure 1 and Figure 3).

2.5.8. Input Current. Measure the input current in amps (RMS) to the ballast in accordance with section 7 of ANSI C82.2 (disregard references to Figure 1 and Figure 3).

2.5.9. Lamp Operating Frequency. Measure the frequency of the waveform delivered from the ballast to any one lamp used in the test in accordance with the setup in section 2.3 of this appendix.

2.6. Calculations

2.6.1. Calculate ballast luminous efficiency (BLE) as follows (do not round values of total lamp arc power and input power prior to calculation):

$$Ballast\ Luminous\ Efficiency = \frac{Total\ Lamp\ Arc\ Power}{Input\ Power} \times \beta$$

Where: Total Lamp Arc Power is the sum of the lamp arc powers for all lamps operated by the ballast as measured in section 2.5.5 of this appendix, Input Power is as determined by section

2.5.6 of this appendix, and β is equal to the frequency adjustment factor in Table 1 of this appendix.

2.6.2. Calculate Power Factor (PF) as follows (do not round values of input power, input voltage, and input current prior to calculation):

$$PF = \frac{Input\ Power}{Input\ Voltage\ \times Input\ Current}$$

Where: Input Power is measured in accordance with section 2.5.6 of this appendix, Input Voltage is measured in accordance with section 2.5.7 of this appendix, and Input Current is measured in accordance with section 2.5.8 of this appendix.

3. Active Mode Procedure for Measuring Ballast Efficiency at Light Output Levels That Are Less Than 100 Percent But Greater Than or Equal to 50 Percent of Full Light Output

3.1. Follow the directions in section 2.1 to measure ballast efficiency.

3.2. Test Setup

3.2.1. Take all measurements with instruments as specified in section 2.2 of this appendix. A multichannel power analyzer may be used as described in Annex D of ANSI C82.11 (incorporated by reference, see §430.3).

3.2.2. Connect the ballast to a main power source and to the maximum number of lamp(s) as specified in Annex D of ANSI C82.11 and sections 2.3.2 and 2.3.3 of this appendix. Ensure the ballast is connected to fluorescent lamp(s) according to any manufacturer's wiring instructions on or sold with each unit (including those provided online). To test a low-frequency

ballast, follow ANSI C82.1 but disregard section 5.3 of ANSI C82.1. To test a high-frequency ballast, follow ANSI C82.11 but disregard section 5.3.1.

3.3. Test Conditions

3.3.1. Establish and maintain test conditions in accordance with section 2.4 of this appendix.

3.4. Test Method and Measurements

3.4.1. Determine stable operating conditions according to steps 1 through 6 of section D.2.1 in Annex D of ANSI C82.11.

3.4.2. Calculate ballast efficiency according to Annex D of ANSI C82.11. Ballast efficiency is equal to the ballast output power (a quantity that includes lamp arc power, the filament power, and power provided for other features such as networking and sensors) divided by the ballast input power (a quantity defined in section 2.5.6 of this appendix).

4. Standby Mode Procedure

4.1. Measure standby mode energy consumption only for any ballast that is capable of operating in standby mode. When there is a conflict, the language of the test procedure in this appendix takes precedence over IEC 62301 (incorporated by reference; see §430.3). Specifications in referenced standards that are not clearly mandatory are mandatory. Manufacturer's instructions, such as "instructions for use" referenced in IEC 62301 mean the manufacturer's instructions that come packaged with or appear on the unit, including on a label. It may include an online manual if specifically referenced (e.g., by date or version number) either on a label or in the packaged instructions. Instructions that appear on the unit take precedence over instructions available electronically, such as through the internet.

4.2. Test Setup

4.2.1. Take all measurements with instruments as specified in section 2.2 of this appendix. Fluorescent lamp ballasts that are designed and marketed for connection to control devices must be tested with all commercially available compatible control devices connected in all possible configurations. For each configuration, a separate measurement of standby power must be made in accordance with section 4.4 of this appendix.

4.2.2. Connect each ballast to the maximum number of lamp(s) as specified in section 2.3 (specifications in section 2.3.3.1 are optional) of this appendix. Note: ballast operation with reference lamp(s) is not required.

4.3. Test Conditions

4.3.1. Establish and maintain test conditions in accordance with section 2.4 of this appendix.

4.4. Test Method and Measurements

4.4.1. Turn on all of the lamps at full light output.

4.4.2. Send a signal to the ballast instructing it to have zero light output using the appropriate ballast communication protocol or system for the ballast being tested.

4.4.3. Stabilize the ballast prior to measurement using one of the methods as specified in section 5 of IEC 62301.

4.4.4. Measure the standby mode energy consumption in watts using one of the methods as specified in section 5 of IEC 62301.

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