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Test Procedures for General Service Fluorescent Lamps, Incandescent Reflector Lamps, and General Service Incandescent Lamps

NOPR Public Meeting

Building Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

March 10-11, 2008

http://www.eere.energy.gov/buildings/appliance_standards/residential/incandescent_lamps_nopr.html



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Introduction

Purpose of the Test Procedure NOPR Public Meeting


- Present the Department's proposed test procedures for fluorescent and incandescent lamps
- Seek comment from participants on the proposed test procedures
- Discuss specific issues or questions related to the proposal
- Discuss the next steps for the rulemaking

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Introduction

Steps in the Lamps Test Procedure Rulemaking



- **NOPR issued by DOE on February 21, 2008**
- **NOPR Public Meeting today, March 10, 2008**
- **Comments on NOPR from interested parties**
 - Transcript records oral comments from today's public meeting
 - Written comments (comment period closes 75 days after publication in the *Federal Register*)
- **DOE reviews and considers all comments**
- **Final Rule Publication**
 - Final Rule will be published before, or on the same day as, the NOPR for the energy conservation standards rulemaking (October 2008) ₃


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Introduction

Test Procedure Overview and Issues

1. **Updates to Test Procedure References**
2. **High-Frequency Fluorescent Ballast Testing**
3. **Rounding of Fluorescent Lamp Efficacy**
4. **Measurement and Calculation of Correlated Color Temperature**
5. **General Service Fluorescent Lamp Basic Model Definition**
6. **Reference Ballast Settings for Added Fluorescent Lamp Coverage**
7. **Test Procedures for General Service Incandescent Lamps**
8. **Off-Mode and Standby Mode Energy Consumption**

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Comments and Issues from Participants

- **Workshop participants are invited to provide summary comments or statements**
- **Participants are also invited to raise their issues on the Test Procedure NOPR for discussion today**

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Regulatory History

- **Energy Policy Act of 1992, Test Procedure Final Rule. 62 FR 29221, May 29, 1997.**
 - Established test procedures for incandescent and fluorescent lamps (including compact fluorescent lamps (CFLs))
 - Incorporated by reference several ANSI and IESNA industry standards
- **Energy Policy Act of 2005 (EPACT 2005), Test Procedure Final Rule. 71 FR 71340, December 8, 2006.**
 - Established test procedures for medium base CFLs based on Version 2.0 of the ENERGY STAR program requirements
- **Energy Independence and Security Act of 2007 (EISA 2007)**
 - Establishes energy conservation standards for general service incandescent lamps
 - Directs DOE to incorporate a measure of standby mode and off-mode energy consumption into its test procedures

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Updates to Test Procedure References


Updates to ANSI Standards

Outdated Referenced Standard(s)	Updated Standard(s)	Subject
ANSI C78.1-1991 ANSI C78.2-1991 ANSI C78.3-1991	ANSI C78.81-2005 ANSI C78.901-2005	Dimensional and electrical characteristics for fluorescent lamps
ANSI C78.375-1991	ANSI C78.375-1997	Guide for electrical measurements for fluorescent lamps
ANSI C82.3-1983	ANSI C82.3-2002	Reference ballasts for fluorescent lamps

■ **Impacts of ANSI updates on CFR:**

- Amends citations in definitions of “cold temperature fluorescent lamp,” and “fluorescent lamp.”
- The term “rated wattage” is also impacted, however because this change has the potential to modify the scope of coverage, it is discussed in Section II of the ANOPR.
- Amends 10 CFR 430.22 and 10 CFR Part 430, Subpart B, Appendix R.

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Updates to Test Procedure References

Updates to IESNA and CIE Standards

Outdated Referenced Standard(s)	Updated Standard(s)	Subject
LM-9-1988	LM-9-1999	Electrical and photometric characteristics for fluorescent lamps
LM-45-1991	LM-45-2000	Electrical and photometric characteristics for incandescent lamps
LM-16-1993	Withdrawn	Colorimetry of light sources
CIE 13.2-1974 (c.r. 1993)	CIE 13.3-1995	Color rendering properties of light sources

- **Impacts of IESNA and CIE updates on the CFR:**
 - Amends citations in the definition for “colored fluorescent lamp.”
 - Amends 10 CFR 430.22 and 10 CFR Part 430, Subpart B, Appendix R.

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Updates to Test Procedure References

Medium Base Compact Fluorescent Lamps

- **DOE’s May 29, 1997 Final Rule established test procedures for CFLs in 10 CFR 430.22 and 10 CFR Part 430, Subpart B, Appendix R.**
 - References the now outdated IESNA standard LM-66-1991.
- **EPACT 2005 directed DOE to establish test procedures for CFLs based on Version 2.0 of the ENERGY STAR program requirements for CFLs.**
 - DOE’s December 8, 2006 Final Rule incorporated this test procedure for CFLs in 10 CFR Part 430, Subpart B, Appendix W.
 - The ENERGY STAR requirements incorporate the current IESNA standard, LM-66-2000.
- **To prevent conflicting requirements, DOE is proposing to delete the CFL test procedures established by the May 29, 1997 Final Rule.**

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Updates to Test Procedure References

Request for Comment on Test Procedure Reference Updates

DOE seeks comment on the proposed test procedure reference updates, specifically, whether these updates to ANSI, IESNA, and CIE standards would introduce an additional testing burden or change the measurement of lamp efficacy. (Issue #1)


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High-Frequency Fluorescent Ballast Testing

High-Frequency Fluorescent Ballast Testing (Slide 1 of 2)

- DOE's test procedure requires that fluorescent lamps be tested at low frequency (*i.e.*, 60Hz) using a low-frequency reference ballast.
 - High-frequency reference ballasts are incorporated into the test procedure as part of the updated ANSI C82.3
- By continuing to test fluorescent lamps on low-frequency ballasts when possible, DOE ensures consistent and repeatable efficacy measurements.
- ANSI provides only high-frequency reference ballast settings for several lamps (*e.g.*, 59W/96T8/HF/IS and 86W/96T8/HO)
- DOE proposes that high-frequency testing only be used for covered lamps that cannot be rated on low-frequency ballasts.

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High-Frequency Fluorescent Ballast Testing

High-Frequency Fluorescent Ballast Testing (Slide 2 of 2)

- Fluorescent ballast market is shifting toward high-frequency (*i.e.*, electronic) ballasts.
- If future industry standards are amended so as to provide high-frequency testing specifications for a more complete set of covered lamps, DOE will consider reevaluating its test procedures.
- In such case, DOE may propose allowing manufacturers the option of choosing to rate their lamps using either a low-frequency or high-frequency reference ballast.
 - To accommodate this flexibility in the test procedure, DOE would likely scale its efficacy requirements for any given product class to reflect the efficacy requirements of a lamp on a low-frequency ballast to that same lamp's performance on a high-frequency ballast.

DOE seeks comment on whether it should limit fluorescent lamp testing to low-frequency ballasts. (Issue #2)


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Rounding of Fluorescent Lamp Efficacy

- **Lamp efficacy (for all lamps) is defined as: “the ratio of measured lamp lumen output in lumens to the measured lamp electrical power input in watts, rounded to the nearest whole number, in units of lumens per watt.” (10 CFR Part 430, Subpart B, Appendix R)**
 - For fluorescent lamps, lamp efficacy measurements shall be rounded to the nearest lumen per watt. (10 CFR 430.23(r)(2))
 - For incandescent reflector lamps, lamp efficacy measurements shall be rounded to the nearest tenth of a lumen per watt (10 CFR 430.23(r)(3)).
- **DOE is proposing to revise the fluorescent lamp test procedure such that all efficacy measurements for fluorescent lamps be rounded to the nearest tenth of a lumen per watt.**
- **DOE does not believe this requirement would not be unduly burdensome.**

DOE seeks comment on whether fluorescent lamp efficacy should be calculated to the nearest tenth of a lumen per watt. (Issue #3)

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Correlated Color Temperature

Correlated Color Temperature

- **Correlated Color Temperature (CCT) is used in DOE regulations for two purposes:**
 1. DOE uses CCT as a metric to define “colored fluorescent lamp” and “colored incandescent lamp,” lamps excluded from regulation.
 2. DOE is considering establishing product classes for fluorescent lamps in part around CCT in the energy conservation standards ANOPR.
 - In the ANOPR, DOE invites comment on the development of separate product classes and efficacy standards for fluorescent lamps based on CCT.

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CCT for Colored Fluorescent Lamps

- **DOE proposes to incorporate by reference IESNA LM-9-1999 to determine CCT for fluorescent lamps**
 - Involves measuring the spectral power distribution and calculating the chromaticity coordinates which correspond to a particular CCT.
- **DOE does not believe the adoption of this IESNA standard imposes excessive burden on manufacturers because they already calculate chromaticity coordinates to report on CCT for their product catalogs and marketing literature.**
- **DOE proposes to amend the definition of “colored fluorescent lamp” under 10 CFR 430.2 and in 10 CFR Part 430, Subpart B, Appendix R to include references to IESNA LM-9-1999.**

DOE seeks comment on the proposed incorporation by reference of the industry standard LM-9-1999 for measuring and determining CCT for fluorescent lamps. (Issue #4)


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CCT for Colored Incandescent Lamps

- **EISA 2007 introduces a new definition for “colored incandescent lamp”**
 - A colored incandescent lamp is, in part, an incandescent lamp with “a correlated color temperature less than 2,500K, or greater than 4,600K, where correlated temperature is computed according to the **Journal of Optical Society of America, Vol. 58, pages 1528-1595 (1986)**.” (EISA 2007, Section 321(a)(1)(B))
[Note: the EISA 2007 citation is 1986, but it should be 1968]
- **EISA 2007 gives a precise reference, which DOE proposes to incorporate into its incandescent lamp test procedure.**
- **DOE does not consider this action to be unduly burdensome, as no manufacturer is required to determine the CCT of their incandescent lamps.**
 - However, if a manufacturer wishes to be excluded from regulatory standards because an incandescent lamp has a CCT <2500K or >4600K, then they must use the method presented in the Journal of Optical Society of America paper.


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GSFL Basic Model

General Service Fluorescent Lamp Basic Model Definition

- In the energy conservation standards ANOPR, DOE is considering separate product classes for fluorescent lamps based on CCT.
- In order to demonstrate compliance with any future efficacy standard that was based around CCT, manufacturers would test and report on their 'basic model' for each product class.
 - A 'basic model' involves identifying a lamp or class of lamps which do not have any differentiating electrical, physical, or functional features that affect efficacy.
- In DOE's May 1997 Final Rule, 'basic model' was defined for GSFL as including all lamps with essentially identical light output, power input, and luminous efficacy, regardless of their CCT.
- DOE proposes to amend its definition of "basic model" for GSFL in 10 CFR 430.2 so as to require that the lamps have similar CCTs.

DOE seeks comment on its proposal that all GSFL that are considered to be in the same basic model must have similar CCTs. (Issue #5)


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Reference Ballast Settings

Reference Ballast Settings for Additional Fluorescent Lamp Coverage

- DOE proposes adopting additional reference ballast settings for regulated lamps that do not yet have ANSI approved reference ballast settings in ANSI C78.81-2005 and C78.901-2005
- These additional lamps are often lower-wattage replacements for lamps that already exist in the ANSI standards
- DOE derived these additional reference ballast settings based on the settings for lamps included in the ANSI standards
 - (e.g., for 4-foot T8 lamps, reference ballast settings are derived from 32W/48T8/RS)

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Reference Ballast Settings for Additional Fluorescent Lamp Coverage

- **These additional lamps that require reference ballast settings include:**
 - Several 4-foot medium bipin and 2-foot U-shaped lamps that have been introduced into the market (e.g., 28W 4-foot T8 MBP)
 - Lamps to which DOE is considering expanding its fluorescent lamp coverage in the ANOPR preliminary determination
 - Several lamps to which DOE does not currently plan on extending coverage in the energy conservation standards rulemaking (i.e., VHO fluorescent lamps and T5). DOE proposes settings for these lamps to avoid needing to re-open the test procedure should DOE decide to extend coverage to these lamp types in the future.


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Proposed Reference Ballast Settings (Slide 1 of 2)

- **4-Foot Medium Bipin Lamps not listed in ANSI C78.81-2005:**
 - T10 and T12 lamps: 236 volts, 0.430 amps, 439 ohms
 - T8 lamps: 300 volts, 0.265 amps, 910 ohms
- **2-Foot U-shaped Lamps not listed in ANSI C78.901-2005:**
 - T12 lamps: 236 volts, 0.430 amps, 439 ohms
 - T8 lamps: 300 volts, 0.265 amps, 910 ohms
- **8-Foot Single Pin Slimline Lamps not listed in ANSI C78.81-2005:**
 - T12 lamps: 625 volts, 0.425 amps, 1280 ohms
 - T8 lamps: 625 volts, 0.260 amps, 1960 ohms
- **8-Foot RDC HO Lamps not listed in ANSI C78.81-2005:**
 - T12 lamps: 400 volts, 0.800 amps, 415 ohms
 - T8 lamps: 450 volts, 0.395 amps, 595 ohms

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Reference Ballast Settings

Proposed Reference Ballast Settings (Slide 2 of 2)

- **8-Foot Very High Output Lamps not listed in ANSI C78.81-2005:**
 - T12 lamps: 400 volts, 1.500 amps, 215 ohms
- **Normal or High Output T5 lamp with a nominal length of four feet not listed in ANSI C78.81-2005:**
 - Normal Output T5: 329 volts, 0.170 amps, 950 ohms
 - High Output T5: 235 volts, 0.460 amps, 255 ohms

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Reference Ballast Settings

Reference Ballast Settings for T5 Fluorescent Lamps

- **Should DOE extend coverage to other T5 lamps (with other lengths than 4 foot nominal), DOE would establish reference ballast settings by deriving the reference ballast settings from International Electrotechnical Commission (IEC) 60081.**
- **DOE would determine the appropriate lamp replacement that exists in the industry standard and use the corresponding reference ballast settings for all lamps that fall into that category.**

DOE seeks comment on the proposed reference ballast settings. (Issue #6)


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General Service Incandescent Lamps

Test Procedures for General Service Incandescent Lamps

- EISA 2007 establishes energy conservation standards for GSIL.
- Currently, for the purpose of Federal Trade Commission labeling, a limited test procedure for GSIL is provided in the CFR.
- In this NOPR, DOE proposes to amend this test procedure to:
 1. Specify the units to be tested in 10 CFR 430.24(r)(1);
 2. Define the “basic model” for GSIL in 10 CFR 430.2; and
 3. Provide a method for calculating GSIL annual energy consumption and efficacy in 10 CFR 430.23(r).
- Because of the similarity in technology of GSIL and IRL, DOE is proposing that the above additions to the GSIL test procedure be implemented in the same manner as the existing IRL test procedure.

DOE seeks comment on the proposed additions to the GSIL test procedure. (Issue #7)


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Off-Mode and Standby Mode

Off Mode and Standby Mode Energy Consumption

- Section 310(3) of EISA 2007 directs DOE to amend its test procedures to incorporate a measure of “off mode” and “standby mode” energy consumption, if feasible.
- DOE believes that GSFL, IRL, and GSIL do not employ a standby mode or off mode.
 - The lamp must be disconnected from the main power source in order for it to provide no active mode function (i.e., emit light). If the lamp is disconnected from the main power source, the lamp does not satisfy the requirements of operating in standby mode or off mode.
 - DOE also believes that all covered products that meet the definitions of GSFL, IRL and GSIL are single-function products and do not offer any secondary user-oriented or protective functions.

DOE seeks comment on its proposal to not incorporate a measure of off mode and standby mode energy consumption in its test procedures for GSFL, IRL, and GSIL. (Issue #8)

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How to Submit Comments...

- Public Meeting – oral comments will be captured in the transcript and become part of the public record.
- Written comments – NOPR comment period open until 75 days after publication in the *Federal Register*
Reference docket #: EERE-2007-BT-TP-0013 and/or RIN #: 1904-AB72

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