



Test Procedures for Furnaces and Boilers

Incorporation of Provisions for Addressing Energy Use in Standby Mode and Off Mode

Notice of Proposed Rulemaking (NPR) Public Meeting

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

August 18, 2009



Purpose of the Public Meeting

■ Purposes

- To present the Department's proposed test procedure amendments;
- Seek comment from participants on the proposed test procedure amendments
- To discuss specific issues or questions related to the proposed amendments; and
- To describe the next steps.



Opening Remarks and Comments from Interested Parties on the Proposed Test Procedures

■ Opening Remarks

- At this time, DOE welcomes opening remarks from interested parties on the NOPR for Furnaces and Boilers.

■ Comments from Participants

- Participants are invited to provide summary comments or statements;
- Participants are invited to raise additional issues for discussion today; and
- Participants are invited to submit comments during the NOPR comment period, which is open through October 13, 2009.



Steps in Furnace/Boiler Test Procedure Rulemaking

- **NOPR issued by DOE on July 27, 2009**
- **NOPR Public Meeting today, August 18, 2009**
- **Comments on NOPR from interested parties**
 - Transcript of oral comments from today's public meeting
 - Written comments (comment **period** closes 75 days after publication in the Federal Register October 13, 2009)
- **DOE reviews and considers all comments**
- **Final Rule Publication**
 - Final Rule will be issued as soon as possible after the close of the comment period.



Regulatory History

■ Test Procedures:

DOE's current test procedure for residential furnaces and boilers is found at 10 CFR part 430, subpart B, appendix N, Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers. May 12, 1997. 62 FR 26140.

These procedures include energy efficiency, energy use descriptors. (e.g. annual fuel utilization efficiency (AFUE), annual fuel and electric energy consumption and annual operating cost.

■ Energy Conservation Standards:

DOE prescribed an amended AFUE-based standard for furnaces and boilers in 2007. 72 FR 65136 (Nov. 19, 2007). AFUE is a fossil fuel only efficiency descriptor.



Regulatory History- continued

- **Energy Independence and Security Act of 2007 (EISA 2007)**
Directs DOE to incorporate a measure of standby- and off-mode energy consumption into its test procedures for residential furnaces and boilers
- **EISA 2007 also directs DOE to integrate such energy consumption into the energy efficiency, energy consumption, or other energy descriptor.**
- **DOE must consider the most current versions of IEC Standards 62301 and 62087. *IEC Standard 62301, Household electrical appliances—Measurement of standby power, First Edition 2005-06, and IEC Standard 62087, Methods of measurement for the power consumption of audio, video and related equipment, First Edition 2002-03***



Review of F&B test procedure:

The first four discussion items of the NOPR, III.A, III.B., III.C. and III.D, establish the following:

- **With some clarification, the EISA 2007 concepts and definitions are applicable and workable within the existing F&B test procedure**
- **In the existing test procedure, fossil-fuel energy consumption is accounted for over a full-year cycle, thereby satisfying EISA 2007 requirements for inclusion of fossil-fuel standby mode and off mode energy consumption.**
- **Electrical energy consumption in standby mode and off mode is not accounted for in the current test procedures. This applies to both fossil fueled and electric furnaces and boilers.**



Summary of Proposed Amendments NOPR Discussion item III.E

- Add measurement provisions utilizing the IEC Standard 62301 to obtain power consumption rate in standby mode and off mode. P_{SB} and P_{OFF}
- Add new equation for annual standby mode and off mode energy use.
- Integrate annual standby mode and off mode energy use into the existing annual energy use equations and other energy descriptors.



Summary of proposal (continued)

Annual accounting for standby mode and off mode energy

- Key simplifying assumptions: Active mode can be approximated by burner operating hours (BOH). Non-heating season can be estimated as the 4600 hours already assigned in the AFUE calculation.
- Annual standby mode and off mode electrical energy consumption, E_{SO} , can be incorporated into the existing test procedure equations.

$$E_{SO} = ((P_{SB} * (4160 - BOH)) + (P_{OFF} * 4600))$$

$$E_{AE} = BOH_{SS} (y_P PE + y_{IG} PE_{IG} + y_{BE}) + E_{SO}$$



Energy Conservation Standards

NOPR discussion item III.F

- **EISA requires:**
 1. Standby mode and off mode test procedure amendments can not be used to determine compliance with current standards
 2. After July 1, 2010 any final standard shall incorporate standby mode and off mode energy use into a single amended or new standard
 3. If such incorporation is not feasible, a separate standard shall be prescribed
- **The proposed amendments do not change the current standard metric, AFUE**
- **The proposed amendments will allow a subsequent standard to address standby mode and off mode energy consumption, either by an incorporated metric or separate standard**



Technical Details of the Proposal NOPR discussion items III.G through J

- Before moving on to the technical details are there questions on the overall proposal's concepts just presented?

- NOPR items III. G through J provide supporting discussion for the technical aspects of the proposal.

- The topics covered are:
 - Active hours approximated as burner operating hours
 - Active hours for electric furnaces
 - Details of the added measurement provisions
 - Use of the IEC procedures



Active mode hours approximated by burner operating hours

NOPR Discussion item III.G., III.H.

- Burner operating hours are a calculated result in the existing test procedure. BOH could be exactly active mode hours for the burner itself. Most furnaces and boilers have multiple electric auxiliaries. There can be some runtime difference, for example for circulating fans, because of time delays and overruns.
- Separate accounting of each auxiliaries' standby mode and off mode is impractical. The potential accounting error associated with “BOH = Active Mode” is insignificant.
- Active mode for electric furnaces and boilers can be estimated by including a calculation similar to BOH in the F&B electric consumption equations.



Details of added measurement provisions

Discussion item III.I

- **New section is added to the F&B test procedure that requires measurement of standby and off mode wattage utilizing the IEC 62301 standard. The new section provides that:**
 - A separate measurement of off mode wattage is only needed if there is a difference with standby mode and off mode, otherwise a single measurement will serve as both standby and off mode wattage
 - The purpose of the measurement is to include all possible standby and/or off mode wattage not just the standby and/or off mode of a single component.
 - Accuracy requirements of the IEC 62301, not those in the existing test procedure, are to apply when measuring the low wattages of standby and off mode power (see explanation on next slide)



Details of added measurement provisions Discussion item III.I (continued)

■ Accuracy differences of existing test procedure and IEC standard:

- ASHRAE 103- 1993 specifies that all electricity be measured with an error no greater than 1%. This specification is deemed appropriate for the range of active mode wattages encountered on furnaces and boilers
- IEC 62301 specifies measurement of (standby) power shall be made with an uncertainty of less than or equal to 2% at the 95% confidence level and the resolution of the instrument shall be 0.01 W for measurements of 10 W and below and 0.1 W for measurements of above 10 W. The proposal maintains these provisions and not that of the ASHRAE standard are appropriate for the low wattage that might be encountered in standby mode and off mode.



Proposed use of IEC Standard 62301 NOPR Discussion item III.J

- Other than the mentioned clarifications the IEC Standard 62301 is adopted without modification
- DOE believes the IEC 62301 procedure is appropriate for measuring the low wattage that would be encountered when testing furnaces and boilers. In reviewing the IEC provisions, DOE sees no conflicts or difficulties for the F&B industry when testing their products.

DOE seeks comment on the adequacy and appropriateness of IEC Standard 62301 in general, and whether there is a need to modify or depart from the provisions in the IEC Standard 62301 with regard to residential furnaces and boilers.



Closing Remarks and Comments from Interested Parties on the Proposed Test Procedures

■ Closing Remarks

- **At this time, DOE welcomes any additional remarks or questions from interested parties on the NOPR for furnaces and boilers.**

■ DOE specifically invites comment on:

- **Clarifying edits;**
- **Use of the IEC 62301 standard**
- **The proposed energy accounting**
- **How to address standby mode and off mode energy use in energy conservation standard.**



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 October 13, 2009.
Reference docket #: **EERE-2008-BT-STD-0013** and/or RIN #: **1904-AB83**.

Email: _rulemaking@ee.doe.gov

Mail: Ms. Brenda Edwards
 U.S. Department of Energy
 Building Technologies Program, Mail stop EE-2J
 NOPR for ASHRAE Standard 90.1 Equipment
 EERE-2008-BT-STD-0013
 1000 Independence Avenue, SW.
 Washington DC, 20585-0121

Courier: Ms. Brenda Edwards
 U.S. Department of Energy
 Building Technologies Program
 950 L'Enfant Plaza, 6th Floor
 Washington, DC 20024



Back-Up Slides

8.6 Measurement of electrical standby and off mode power.

8.6.1 Standby power. With all electrical components of the furnace or boiler not activated, measure the standby power (PSB) in accordance with the procedures in IEC 62301 (incorporated by reference, see §430.22). Utilize the accuracy and precision specifications in IEC Standard 62301 in lieu of those in ASHRAE Standard 103 -1993. Measure the wattage so that all possible standby mode wattage for the entire appliance is recorded, not just the standby mode wattage of a single auxiliary.



Back-up slide

8.6.2 Off mode power. If the unit is equipped with a seasonal off switch or there is an expected difference between off mode power and standby mode power, measure off mode power (POFF) in accordance with the standby power procedures in IEC 62301 (incorporated by reference, see §430.22). Utilize the accuracy and precision specifications in IEC Standard 62301 in lieu of those in ASHRAE Standard 103-1993. Measure the wattage so that all possible off mode wattage for the entire appliance is recorded, not just the off mode wattage of a single auxiliary. If there is no expected difference in off mode power and standby power, let $POFF = PSB$, in which case no separate measurement of off mode power is necessary.



Back-up slide

For electric furnaces and boilers,

$$\text{BOH} = 100(2080)(0.77)\text{DHR}/(\text{E}_{\text{in}} 3.412)(\text{AFUE})$$

where:

100 = to accommodate AFUE in denominator expressed as a percent

2,080 = as specified in 10.2.1 of this appendix

0.77 = as specified in 10.2.1 of this appendix

DHR = as defined in 10.2.1 of this appendix

3.412 = conversion to express energy in terms of KBtu instead of kilowatt-hours

AFUE = as defined in 11.1 of ANSI/ASHRAE Standard 103-1993, (incorporated by reference, see §430.22) in percent,

E_{in} = Steady state electric rated power, in kilowatts, from section 9.3 of ANSI/ASHRAE Standard 103-1993.