



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Test Procedure for Clothes Dryers and Room Air Conditioners

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

NOPR Public Meeting

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

December 17, 2008

www1.eere.energy.gov/buildings/appliance_standards/residential/clothes_dryers.html

www1.eere.energy.gov/buildings/appliance_standards/residential/room_ac.html

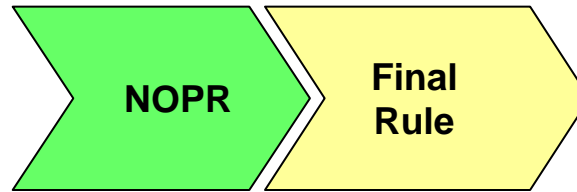


Purpose of the Test Procedure NOPR Public Meeting

- **Present the Department's proposed test procedures for clothes dryers and room air conditioners**
- **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**



Steps in the Clothes Dryer and Room Air Conditioner Test Procedures Rulemaking



- **NOPR issued by DOE on December 2, 2008**
- **NOPR Public Meeting today, December 17, 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 issued by the March 31, 2009 deadline required by the Energy Independence and Security Act of 2007



Test Procedure Overview and Issues

1. **Products Covered by the Test Procedure Changes**
2. **Effective Date for the Amended Test Procedures**
3. **Incorporating by Reference IEC Standard 62301 (First Edition, 2005-06) for Measuring Standby Mode and Off Mode Power in Clothes Dryers and Room Air Conditioners**
4. **Determination of Modes to be Incorporated**
5. **Adding Specifications for the Test Methods and Measurements for Clothes Dryer and Room Air Conditioner Standby Mode and Off Mode Testing**
6. **Calculation of Energy Use Associated with Standby Modes and Off Mode**
7. **Measures of Energy Consumption**
8. **Correction of Text Describing Energy Factor Calculation for Clothes Dryers**
9. **Correction of Text Reference to Room Air Conditioner Test Standard**
10. **Compliance with Other EPCA Requirements**



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**



Regulatory History

- **Clothes Dryer Test Procedure Final Rule. 46 FR 27324, May 19, 1981.**
 - Established test procedure with provisions for measuring the energy factor (EF)
 - Currently provides for a measure of standby mode energy consumption only for gas dryers, in the form of pilot energy consumption.

- **Room Air Conditioner Test Procedure Final Rules. 42 FR 27898, June 1, 1977; 44 FR 37938, June 29, 1979.**
 - Established and amended test procedure with provisions for measuring the energy efficiency ratio (EER).
 - Incorporated by reference:
 - ANSI Z234.1-1972, “Room Air Conditioners”
 - ASHRAE Standard 16-69, “Method of Testing for Rating Room Air Conditioners”
 - Does not currently provide for a measure of standby or off mode energy use.



Regulatory History – Continued

- **Energy Independence and Security Act of 2007 (EISA 2007) Amendments to the Energy Policy and Conservation Act (42 U.S.C. 6291 *et seq.*)**
 - Directs DOE to incorporate a measure of standby- and off-mode energy consumption into its test procedures for residential clothes dryers and room air conditioners by March 31, 2009
 - Directs DOE to integrate such energy consumption into the energy descriptor. If technically infeasible, DOE must prescribe a separate standby mode and off mode energy use test procedure if technically feasible
 - 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
 - IEC Standard 62087, Methods of measurement for the power consumption of audio, video and related equipment, First Edition 2002-03 [Not Relevant]



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Products Covered by the Test Procedure Changes – Clothes Dryers

- **The proposed test procedure amendments for clothes dryers cover both gas and electric clothes dryers. 10 CFR 430.2 provides the following definitions:**
 - “Electric clothes dryer means a cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation. The heat source is electricity and the drum and blower(s) are driven by an electric motor(s).”
 - “Gas clothes dryer means a cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation. The heat source is gas and the drum and blower(s) are driven by an electric motor(s).”
- **The proposed amendments cover:**
 - Vented gas and electric clothes dryers
 - Vent-less clothes dryers, including combination washer/dryers.



Products Covered by the Test Procedure Changes – Room Air Conditioners

- **10 CFR 430.2 defines “room air conditioner” as “a consumer product, other than a ‘packaged terminal air conditioner,’ which is powered by a single phase electric current and which is an encased assembly designed as a unit for mounting in a window or through the wall for the purpose of providing delivery of conditioned air to an enclosed space. It includes a prime source of refrigeration and may include a means for ventilating and heating.”**
- **Proposed amendments cover:**
 - Room air conditioners designed for single- or double-hung windows
 - With or without louvered sides
 - With or without reverse cycle
 - Casement-slider and casement-only window-type room air conditioners.



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Effective Date for the Amended Test Procedures

- **The effective date of the modified clothes dryer and room air conditioner test procedures (i.e., the date the amendments are codified in the CFR) would be 30 days after the date of publication of a final rule in the *Federal Register*.**
- **DOE's regulations in the CFR would clarify that the amended procedures and calculations for standby and off mode energy consumption would not need to be performed to determine compliance with existing energy conservation standards.**
- **DOE expects that this clarification would be removed in any new or amended energy conservation standard rulemaking that accounts for standby and off mode energy consumption (currently scheduled to be issued June 2011, with an effective date of June 2014).**



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Incorporating by Reference IEC Standard 62301 (First Edition, 2005-06) for Measuring Standby Mode and Off Mode Power in Clothes Dryers and Room Air Conditioners

- **EPCA, as amended by EISA 2007, requires that amendments to the test procedure must take into consideration the most current version of IEC Standards 62301 and 62087.**
- **DOE determined that IEC Standard 62087 does not cover clothes dryers or room air conditioners, and, therefore, was not suitable for the proposed amendments.**
- **IEC Standard 62301 provides for measuring standby power in electrical appliances, including clothes dryers and room air conditioners, and, thus, is applicable to the proposed amendments to the test procedures.**



IEC Standard 62301

- **DOE proposes to incorporate the same clauses from IEC Standard 62301 for measuring both standby mode and off mode power consumption.**
- **Section 4 clauses – provide conditions for:**
 - Supply voltage, frequency, and waveform
 - Ambient room air temperature
 - Power measurement meter tolerances
- **Section 5 clauses:**
 - Clarify the measurement of standby mode for units with a short-duration higher power state before a lower power state
 - Provide methods for measuring standby mode and off mode power when the power measurement is either stable or unstable (i.e., varies over a representative cycle).



Request for Comment on the Incorporation of IEC Standard 62301

DOE seeks comment on the adequacy of IEC Standard 62301 to measure standby power for clothes dryers and room air conditioners in general, and on the suitability of incorporating the specified provisions into DOE regulations. (Issue #1)



Standby Mode Definition

- **The EPCA requirement to consider IEC Standard 62301 presents a potential conflict in defining “standby mode.”**
- **Paragraph 3.1 of IEC Standard 62301 defines “standby mode” as the “lowest power consumption mode which cannot be switched off (influenced) by the user and that may persist for an indefinite time when an appliance is connected to the main electricity supply and used in accordance with the manufacturer’s instructions.”**
- **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))
- **Prior to EISA 2007, DOE adopted a definition for “standby mode” nearly identical to that of IEC Standard 62301 in the dishwasher test procedure**



Request for Comment on Standby Mode Definitions

- While EPCA specifies that DOE may consider the definition for “standby mode” provided in the most current version of IEC Standard 62301 in updating its test procedure, DOE proposes to adopt the broader, statutory definition of “standby mode” provided in EPCA for reasons of greater specificity and clarity, and to include that definition in the test procedures for clothes dryers and room air conditioners.

*DOE invites comment on the differences in the definition of “standby mode” provided by EPCA, as amended by EISA 2007, and the definition provided in the current version of IEC Standard 62301.
(Issue #2)*



Other Standby Test Procedures Considered

- **DOE also reviewed testing conditions and testing methods specified in the test procedures used by countries that are considered to be international leaders in reducing standby power consumption.**
- **These countries include Japan, Korea, and Australia.**
- **All use procedures similar to those of IEC Standard 62301 and/or reference that standard.**



Updated IEC Standard 62301

- **IEC is developing an updated test procedure (IEC Standard 62301 Ed. 2.0) with a projected publication date of July 2009.**
 - This updated version is expected to include definitions of “off mode,” “network-connected standby mode,” and “disconnected mode,” and would also revise the current IEC Standard 62301 definition of “standby mode.”
- **DOE expects to publish the final rule for the clothes dryer and room air conditioner test procedures by March 2009.**
- **Therefore, DOE plans to use the current version of IEC Standard 62301 in the NOPR.**
- **Subsequent amendments to IEC Standard 62301 would become part of the DOE test procedures only if DOE amends its test procedures to incorporate them.**



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Definition of Modes

- DOE plans to use the EPCA, as amended by EISA 2007, definitions of “active mode,” “standby mode,” and “off mode.”
- DOE proposes amend to the clothes dryer and room air conditioner test procedures to clarify the range of main functions that would be classified as active mode functions and to define multiple standby modes.
- “Active mode” is defined by EPCA as “the condition in which an energy-using product –
 - (I) is connected to a main power source;
 - (II) has been activated; and
 - (III) provides 1 or more main functions.” (42 U.S.C. 6295(gg)(1)(A)(i))
- For clothes dryers, DOE proposes that “active mode” define a mode in which the clothes dryer is performing the main function of tumbling the clothing with or without heated or unheated forced air circulation to remove moisture from the clothing and/or remove or prevent wrinkling of the clothing.
- For room air conditioners, DOE proposes that “active mode” define a mode in which the room air conditioner is performing the main function of cooling or heating the conditioned space, or circulating air through activation of its fan or blower, with or without energizing active air-cleaning components or devices such as ultraviolet (UV) radiation, electrostatic filters, ozone generators, or other air-cleaning devices.



Definition of Modes – Continued

- **“Standby mode” is defined by EPCA 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))

- **“Off mode” is defined by EPCA as “the condition in which an energy-using product –**
 - (I) is connected to a main power source; and
 - (II) is not providing any standby mode or active mode function.” (42 U.S.C. 6295(gg)(1)(A)(ii))



Proposed Clothes Dryer Standby and Off Modes

- **“Inactive mode”** – a standby mode other than delay start mode or cycle finished mode that facilitates the activation of active mode by remote switch (including remote control), internal sensor, or timer, or provides continuous status display
- **“Cycle finished mode”** – a standby mode that provides continuous status display following operation in active mode
- **“Delay start mode”** – a standby mode that facilitates the activation of active mode by timer
- **“Off mode”** – a mode in which the clothes dryer is not performing any active or standby function



Request for Comment on Clothes Dryer Standby Modes

DOE seeks comment on the establishment of the following specific standby modes for clothes dryers: inactive mode, delay start mode, and cycle finished mode. DOE further invites comment on the definitions proposed for these modes and on the question of whether there are any modes consistent with the “active mode,” “standby mode,” or “off mode” definitions under EPCA that have not been identified and that can represent significant energy use. (Issue #3)



Proposed Room Air Conditioner Standby and Off Modes

- **“Active mode”** – a mode in which the room air conditioner is performing the main function of cooling or heating the conditioned space, or circulating air through activation of its fan or blower, with or without energizing active air-cleaning components or devices such as ultraviolet (UV) radiation, electrostatic filters, ozone generators, or other air-cleaning devices
- **“Inactive mode”** – a standby mode other than delay start mode or off-cycle mode that facilitates the activation of active mode by remote switch (including remote control) or internal sensor or provides continuous status display
- **“Delay start mode”** – a standby mode in which activation of an active mode is facilitated by a timer



Proposed Room Air Conditioner Standby and Off Modes – Continued

- **“Off-cycle mode” – a standby mode in which the room air conditioner: (1) has cycled off its main function by thermostat or temperature sensor; (2) does not have its fan or blower operating; and (3) will reactivate the main function according to the thermostat or temperature sensor signal**
 - Off-cycle mode could be considered part of an active mode in which a room air conditioner is cycling its compressor on and off to maintain an average room temperature.
 - However, since the current test procedure treats the cooling mode as occurring only when the compressor is operating, DOE proposes the off-cycle mode to account for the time when the space is being conditioned and the compressor and fan are not operating.
- **“Off mode” – a mode in which a room air conditioner is not performing any active or standby function**



Request for Comment on Room Air Conditioner Standby Modes

DOE seeks comment on the establishment of the following specific standby modes for room air conditioners: inactive mode, delay start mode, and off-cycle mode. DOE further invites comment on the definitions proposed for these modes and on the question of whether there are any modes consistent with the “active mode,” “standby mode,” or “off mode” definitions under EPCA that have not been identified and that can represent significant energy use. (Issue #4)



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Specifications for Test Methods and Measurements – Clothes Dryers

■ Auto-Dimming Displays

- DOE proposes that the test be conducted after the power level has dropped to its low level.

■ Delay Start

- Paragraph 5.3.1 of IEC Standard 62301 instructs a test technician to “[c]onnect the product to be tested to the metering equipment, and select the mode to be measured. After the product has been allowed to stabilize for at least 5 min, monitor the power consumption for not less than an additional 5 min.”
- Power consumption during delay start mode may depend on the delay time, the time displayed, and/or the display indication of mode status
- DOE proposes to include in the clothes dryer test procedure a specification for the delay start time to be set at 5 hours, and for power to be monitored for 60 minutes after waiting at least 5 minutes for power input to stabilize to ensure comparable and valid results.
- The 5 hour delay start time was determined by analysis of average LED illumination for different delay start times of 1- and 2-digit displays, as well as a review of current product features.



Specifications for Test Methods and Measurements – Clothes Dryers (Continued)

■ Test room ambient temperature

- DOE proposes to adopt the test room ambient temperature specified by IEC Standard 62301 for standby and off mode testing.
- Under these conditions, the test room ambient temperature would be $73 \pm 9^{\circ}\text{F}$, which is slightly different from the more stringent ambient temperature range currently specified for DOE 's drying performance tests ($75 \pm 3^{\circ}\text{F}$).
- Manufacturers would have the option to:
 - Test simultaneously for all three conditions using the current ambient temperature requirements for drying tests, since these are within the limits specified by IEC Standard 62301.
 - Conduct standby and off mode testing separately from drying tests, with more latitude in ambient conditions.



Specifications for Test Methods and Measurements – Room Air Conditioners: Delay Start

- A given unit with a temperature, clock, or timer display may use varying amounts of standby power depending on the numbers being displayed.
- Preliminary DOE testing showed that standby power for a room air conditioner with a 2-digit display capable of displaying temperature or delay start time could vary by as much as 22%.
- **Delay Start**
 - As with clothes dryers, DOE proposes to incorporate Paragraph 5.3.1 of IEC Standard 62301.
 - Power consumption during delay start mode may depend on the delay time, the time displayed, temperature, and/or the display indication of mode status
 - DOE proposes to include in the room air conditioner test procedure a specification for the delay start time to be set at 5 hours, and for power to be monitored for 60 minutes after waiting at least 5 minutes for power input to stabilize to ensure comparable and valid results.
 - The 5 hour delay start time was determined by analysis of average LED illumination for different delay start times of 1- and 2-digit displays, as well as a review of current product features.



Specifications for Test Methods and Measurements – Room Air Conditioners: Test Room Temperature

- **Some room air conditioners display actual room temperature, while others display setpoint temperature.**
- **DOE proposes to address the possibility of these different display approaches by requiring that the test room temperature for standby and off mode measurements be maintained at $74 \pm 2^\circ\text{F}$ and that the setpoint temperature be set at 79°F .**
 - For these temperatures, the power consumption of any display, whether indicating actual or setpoint temperature, represents an average power consumption associated with the range of typical user room temperatures and setpoints.
 - The proposed room air temperature is lower than that specified in the existing DOE cooling performance tests ($80 \pm 0.5^\circ\text{F}$) in order to:
 - Ensure that the compressor does not cycle on during standby tests.
 - Represent actual conditions in which the unit would be in a standby rather than active mode.
 - The proposed test room air temperature specification is within the allowable range in IEC Standard 62301 ($73 \pm 9^\circ\text{F}$), which is broadly specified to allow measurement of many different products.



Request for Comment on Delay Start Test Procedure

DOE invites comment on the proposed clarification to IEC Standard 62301, in which DOE would specify in the clothes dryer and room air conditioner test procedures, the set delay start time, stabilization period, and test duration for delay start mode power measurements. (Issue #5)



Request for Comment on Test Room Conditions

DOE invites comment on the proposed room ambient temperature range for standby mode and off mode power measurements for room air conditioners and clothes dryers. (Issue #6)



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Standby and Off Mode Usage Patterns – Clothes Dryers

- **The current test procedure established that a gas clothes dryer is in the active drying mode 140 hours per year, and that the balance of the year (8,620 hours) is the established number of hours associated with the pilot light energy consumption.**
- **DOE proposes to adopt the 140 hours associated with active mode and to associate the remaining 8,620 hours of the year with standby and off modes.**
- **DOE investigated studies of dryer usage patterns which include standby and off mode, and found only one, conducted in 2000 in Australia:**
 - 35 clothes dryers were measured with an average age of 11 years.
 - The daily time spent in each mode in this study averaged:
 - 15 minutes for “drying” (active mode)
 - Zero time for “delay start” and “active standby” (inactive) modes
 - The remaining hours were split 5 percent for “end of program” (cycle finished) mode and 95 percent for “off mode”



Standby and Off Mode Usage Patterns – Clothes Dryers (Continued)

- **The average age of the clothes dryers in the study suggests that most of these dryers had electromechanical rather than electronic controls**
 - Dryers in the study would not likely have had inactive mode or delay start mode.
- **A different study monitored the time clothes washers in Australia and New Zealand spent in different modes, and showed that the average amount of time spent in delay start mode per wash cycle was approximately 5 minutes.**
- **DOE believes that the results for clothes washers may be applicable for clothes dryers due to:**
 - Similarities between the control capabilities for both types of products
 - Comparable consumer usage patterns when a clothing load is washed and dried.



Standby and Off Mode Usage Patterns – Clothes Dryers (Continued)

- **Based on these two information sources, DOE has tentatively concluded that a typical modern clothes dryer spends a small amount of time in delay start mode.**
 - (5 minutes/cycle) X (416 cycles/yr from DOE test procedure) = 34 hours/yr
- **The remaining time not associated with active mode or delay start mode can be split as suggested by one of the studies**
 - 5% allocated to cycle finished mode
 - 95% allocated to off or inactive mode



Estimate of Annual Energy Use of Clothes Dryer Modes if All Modes are Possible

Mode	Hours	Typical (W)	Annual Energy Use (kWh)
Active	140	6,907 ⁵	967 ⁵
Delay Start	34 ¹	3 ⁴	0.1
Cycle Finished	429 ²	3 ⁴	1
Off and Inactive	8,157 ³	0.5 to 3 ⁴	4 to 24

¹ 5 minutes per cycle times 416 cycles per year.

² 5 percent of remaining time (0.05 x (8,760 – 140 – 34)).

³ 95 percent of remaining time (0.95 x (8,760 – 140 – 34)).

⁴ The approximate range of wattages associated with the standby and off modes are based on the referenced sources and on “Clothes Dryers Background/Issues/Standby,” presented by Robert Foster of Energy Efficiency Strategies at the E3 White Goods Forum in Sydney, Australia, in February 2007.

⁵ For a baseline EF of 3.01 for a standard electric clothes dryer:

- (7 lb of clothing)/(3.01 kWh/lb) = 2.33 kWh per cycle
- (2.33 kWh/cycle) x (416 cycles/year) = 967 kWh annual energy use
- (967 kWh/yr) / (140 hours/yr in active mode) = 6,907 W in active mode



Estimate of Annual Hours for Clothes Dryer Modes

Mode	All Modes Possible	No Delay Start Mode	No Cycle Finished Mode	No Delay Start or Cycle Finished Modes
Active	140	140	140	140
Delay Start*	34	0	34	0
Cycle Finished**	429	431	0	0
Off and Inactive†	8,157	8,189	8,586	8,620

* 5 minutes per cycle x 416 cycles per year.

** 5 percent of remaining time.

† 95 percent of remaining time.



Estimate of Annual Hours for Off/Inactive Modes

- **Information to guide the allocation of the off/inactive hours for clothes dryers that have both inactive and off modes is currently unavailable.**
- **Possibilities:**
 - A clothes dryer reverts to an off mode after a specified time in inactive mode
 - A clothes dryer stays in inactive mode unless the user switches the appliance back to off mode
- **DOE proposes to allocate half of the off/inactive hours to each of the two modes, if both are present.**



Calculation of Energy Use Associated with Standby Modes and Off Mode – Clothes Dryers

- **DOE proposes to calculate clothes dryer energy use per cycle associated with standby and off modes by:**
 1. Calculating the product of wattage and allocated hours for all possible standby and off modes
 2. Summing the results
 3. Dividing the sum by 1,000 to convert from Wh to kWh
 4. Dividing by 416 cycles per year



Alternative Approach for Calculating Energy Use Associated with Standby Modes and Off Mode – Clothes Dryers

- **Delay start and cycle finished modes represent a relatively small number of hours at low power consumption levels.**
- **DOE could propose specifying hours only for off and inactive modes to calculate energy use associated with standby and off modes.**
- **In that case, all of the non-active hours, which total 8,620, would be allocated to the inactive and off modes.**



Request for Comment on the Energy Use Calculation for Standby Mode and Off Mode for Clothes Dryers

DOE seeks comment on the approach for determining total energy use for standby mode and off mode for clothes dryers, including its accuracy and test burden. Given that individual units may be capable of different combinations of standby modes, DOE also invites comment and requests data on the estimates for annual hours associated with each mode, including the 140 hours specified by the current test procedure for active mode (drying). (Issue #7)

DOE also seeks comment on whether the alternative approach for calculating standby and off mode annual energy use would be representative of the standby and off mode power consumption of clothes dryers currently on the market.



Room Air Conditioner Unplugged Time

- DOE is aware that a room air conditioner may be unplugged for a certain percentage of time, and, therefore, will not be in active mode, standby mode, or off mode.
- For the purposes of this analysis, DOE estimates that approximately half of room air conditioners are unplugged for half of the year.
- The “unplugged” time associated with these units is averaged over all units.
 - $(\frac{1}{2} \text{ of all room air conditioners}) \times (\frac{1}{2} \times 8,760 \text{ annual hours}) = 2,190$ average annual unplugged hours.
 - $(8,760 \text{ annual hours}) - (2,190 \text{ annual unplugged hours}) = 6,570$ average annual plugged-in hours



Room Air Conditioner Cooling Season

- **The prime cooling season is estimated to last 90 days a year (2,160 hours).**
- **During this time, it is estimated that room air conditioners spend 750 hours in cooling mode, according to the current test procedure.**



Standby and Off Mode Usage Patterns – Room Air Conditioners

- **DOE estimates that 10 percent of room air conditioners that have a delay start mode function will use this function for 10 hours a day during the cooling season.**
 - (90 days) x (10 hr/day) x (10 % of units using delay start mode) = 90 annual hours in delay start mode
 - (2,160 cooling season hours) – (750 annual cooling mode hours) – (90 annual delay start mode hours) = 1,320 remaining cooling season hours
- **DOE assumes that these remaining cooling season hours divide equally into whichever of the following modes are present:**
 - Fan-only mode (an active mode in which the compressor shuts down when operating in constant-fan mode or user selection of fan-only operation)
 - Off-cycle mode
 - Inactive mode (and/or off mode for units that have such capability)



Standby and Off Mode Usage Patterns – Room Air Conditioners (Continued)

- **The cooling season inactive and/or off mode hours are summed with the additional inactive and/or off mode hours when the unit is plugged in outside of the cooling season.**
 - (6,570 total annual plugged-in hours) - (2,160 cooling season hours) = 4,410 annual inactive/off mode hours outside of cooling season
 - For the example where all standby modes are present:
 - (1,320 remaining cooling season hours) / (3 possible modes in addition to active cooling mode and delay start mode) = 440 annual hours per additional mode during cooling season
 - (440 annual inactive/off mode hours during cooling season) + (4,410 annual inactive/off mode hours outside of cooling season) = 4,850 annual inactive/off mode hours



Annual Energy Use of Room Air Conditioner Modes for a Representative Unit with 8,000 Btu/hr Capacity and 9 EER, if All Modes are Possible

Mode	Hours	Typical (W)	Annual Energy Use (kWh)
Active Cooling	750	889 ¹	667
Delay Start	90	2 ²	0.2
Off-Cycle	440	2 ²	0.9
Off/Inactive	4,850	0.5 to 4 ²	2.5 to 20

¹ $(8,000 \text{ Btu/hr}) / (9 \text{ Btu/hr/W}) = 889 \text{ W}$

² Estimates based on DOE measurements of 12 representative units and data reported for window/wall and portable air-conditioners in “Standby Product Profile 2004/06”, published by the National Appliance and Equipment Energy Efficiency Committee of Australia in June 2004. Test results demonstrated somewhat wider range of off/inactive power consumption than was reported in the NOPR.



Estimate of Annual Hours for Room Air Conditioner Modes

Mode	All Modes Possible	No Delay Start Mode	No Off-Cycle Mode	No Delay Start or Off-Cycle Modes
Active, Cooling	750	750	750	750
Active, Fan-Only**	440	470	660	705
Delay Start*	90	0	90	0
Off-Cycle**	440	470	0	0
Off and Inactive**	4,850	4,880	5,070	5,115

* 10% of units will use delay start for 10 hours/day during the 90-day cooling season. The 90-day cooling season represents 2,160 hours.

** $(2,160 \text{ cooling season hours} - 750 \text{ cooling mode hours} - \text{delay start mode hours})$ divided by the number of these three modes which are present (fan-only, off-cycle, and off/inactive). Off and inactive modes are treated as one, and also include all of the 4,410 plugged in hours outside of the cooling season.



Estimate of Annual Hours for Off/Inactive Modes

- **DOE is unaware of any room air conditioners that incorporate both off and inactive modes.**
 - Typically, room air conditioners with remote control can be controlled whenever they are plugged in; hence, these units do not include an off mode.

- **If a room air conditioner allows the user to switch off remote control operation, such a product would be capable of both inactive and off mode.**
 - For these units, DOE proposes that the plugged-in non-active hours be allocated equally to the inactive and off modes.



Calculation of Energy Use Associated with Standby Modes and Off Mode – Room Air Conditioners

- **DOE proposes to calculate room air conditioner annual energy use associated with standby and off modes by:**
 1. Calculating the products of wattage and allocated hours for all possible standby and off modes
 2. Summing the results
 3. Dividing the sum by 1,000 to convert from Wh to kWh



Alternative Approach for Calculating Energy Use Associated with Standby Modes and Off Mode – Room Air Conditioners

- **Delay start and off-cycle modes represent a relatively small number of hours at low power consumption levels.**
- **DOE could propose specifying hours only for off and inactive modes to calculate energy use associated with standby and off modes.**
- **In that case, all of the non-active hours, which total 5,115, would be allocated to the inactive and off modes.**



Request for Comment on the Energy Use Calculation for Standby Mode and Off Mode for Room Air Conditioners

DOE seeks comment on the approach for determining total energy use for standby mode and off mode for room air conditioners including its accuracy and test burden. Given that individual units may be capable of different combinations of standby modes, DOE also invites comment and requests data on the estimates for annual hours associated with each mode, including the estimate of “unplugged” time. (Issue #8)

DOE also seeks comment on whether the alternative approach for calculating standby and off mode annual energy use would be representative of the standby and off mode power consumption of room air conditioners currently on the market.



Test Procedure Overview

1. Products Covered by the Test Procedure Changes
2. Effective Date for the Amended Test Procedures
3. Incorporating by Reference IEC Standard 62301 (First Edition, 2005-06) for Measuring Standby Mode and Off Mode power in Clothes Dryers and Room Air Conditioners
4. Determination of Modes to be Incorporated
5. Adding Specifications for the Test Methods and Measurements for Clothes Dryer and Room Air Conditioner Standby Mode and Off Mode Testing
6. Calculation of Energy Use Associated with Standby Modes and Off Mode
7. **Measures of Energy Consumption**
8. Correction of Text Describing Energy Factor Calculation for Clothes Dryers
9. Correction of Text Reference to Room Air Conditioner Test Standard
10. Compliance with Other EPCA Requirements



Measures of Energy Consumption

- **DOE test procedures for clothes dryers and room air conditioners currently provide for the calculation of several measures of energy consumption.**
 - **Clothes Dryers**
 - Total per-cycle electric dryer energy consumption
 - Per-cycle gas dryer electrical energy consumption
 - Per-cycle gas dryer gas energy consumption
 - Per-cycle gas dryer continuously burning pilot light gas energy consumption
 - Total per-cycle gas dryer gas energy consumption expressed in Btu and kWh
 - EF (equal to the clothes load in pounds divided by either the total per-cycle electric dryer energy consumption or by the total per-cycle gas dryer energy consumption expressed in kWh)
 - **Room Air Conditioners**
 - Annual energy consumption in kWh
 - EER



Measures of Energy Consumption

- **Section 325(gg)(2)(A) of EPCA, requires amendments to the test procedure to include standby mode and off mode energy consumption “with such energy consumption integrated into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product, unless the Secretary determines that—**
 - (i) the current test procedures for a covered product already fully account for and incorporate standby mode and off mode energy consumption of the covered product; or
 - (ii) such an integrated test procedure is technically infeasible for a covered product, in which case the Secretary shall prescribe a separate standby mode and off mode energy use test procedure for the covered product, if technically feasible.” (42 U.S.C. 6296(gg)(2)(A))
- **DOE explored whether the existing measures of energy consumption for clothes dryers and room air conditioners can be combined with standby mode and off mode energy use to form a single metric.**



Measures of Energy Consumption

- **DOE notes that certain test procedures do combine a measure of cycle efficiency and standby energy use to derive an overall energy efficiency measure.**
 - When the difference in energy use between the primary function of those products and the standby power is so large that the standby power has little impact on the overall measure of energy efficiency, as is the case for clothes dryers and room air conditioners, the combined measure of energy efficiency is a meaningful measure.
- **Therefore, DOE is proposing a combined metric addressing active, standby, and off modes for both clothes dryers and room air conditioners.**



Measures of Energy Consumption – Clothes Dryers

- **DOE proposes to establish the following integrated measures of energy consumption:**
 - “Per-cycle integrated total energy consumption expressed in kWh” =
 - (per-cycle standby and off mode energy consumption) + (total per-cycle electric dryer energy consumption) for electric dryers
 - (per-cycle standby and off mode energy consumption) + (total per-cycle gas dryer energy consumption expressed in kWh) for gas dryers
 - “Integrated energy factor” (IEF) = (clothes dryer test load weight in lb) / (per-cycle integrated total energy in kWh)



Measures of Energy Consumption – Room Air Conditioners

- **DOE proposes to establish the following integrated measures of energy consumption:**
 - “Integrated annual energy consumption” = (annual energy consumption) + (standby and off mode energy consumption)
 - “Integrated energy efficiency ratio” (IEER) = (cooling capacity in Btu/hr) x (750 annual cooling mode hours) / (integrated annual energy consumption x 1,000 Wh per kWh)



Request for Comment on the New Integrated Measures of Energy Consumption and Energy Efficiency

DOE invites comment on the proposed plan to establish new integrated measures of energy consumption and energy efficiency for clothes dryers and room air conditioners: “per-cycle integrated total energy consumption expressed in kilowatt-hours” and “integrated energy factor” for clothes dryers; and “integrated annual energy consumption” and “integrated energy efficiency ratio” for room air conditioners. (Issue #9)



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Correction of Text Describing Energy Factor Calculation for Clothes Dryers

- **The reference to sections 2.6.1 and 2.6.2 of 10 CFR part 430, subpart B, appendix D in the calculation of EF for clothes dryers found at section 430.23(d)(2) is incorrect.**
 - Sections 2.7.1 and 2.7.2 should be referenced instead.
 - Section 2.6 provides instructions for the test cloths to be used in energy testing of clothes dryers, whereas section 2.7 provides instructions on test loads.

- **Since the EF calculation requires the weight of the test load, DOE proposes to correct these references in 10 CFR 430.23(d)(2).**



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Correction of Text Reference to Room Air Conditioner Test Standard

- **The room air conditioner test procedure currently references ASHRAE Standard 16-69, “Method of Testing for Rating Room Air Conditioners.”**
- **The text in 10 CFR part 430, subpart B, appendix F, section 1, however, incorrectly identifies ASHRAE as “American Society of Heating, Refrigerating and Air Conditioning in Engineers.”**
 - The actual name of the referenced organization is “American Society of Heating, Refrigerating and Air-Conditioning Engineers.”
- **DOE proposes to correct this reference in 10 CFR part 430, subpart B, appendix F, section 1.**



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Test Burden

- **Section 323(b)(3) of EPCA requires that “[a]ny test procedures prescribed or amended under this section shall be reasonably designed to produce test results which measure energy efficiency, energy use . . . or estimated annual operating cost of a covered product during a representative average use cycle or period of use . . . and shall not be unduly burdensome to conduct.” (42 U.S.C. 6293(b)(3))**
- **DOE has tentatively concluded that amending the relevant DOE test procedures to incorporate clauses regarding test conditions and methods found in IEC Standard 62301, along with the proposed modifications, would satisfy this requirement.**
 - IEC Standard 62301 is widely used and accepted internationally to measure power in standby and off mode.
 - Based on DOE's testing and analysis of IEC Standard 62301, DOE determined that the proposed amendments to the test procedures would produce standby and off mode average power consumption measurements that are representative of an average use cycle, both when the measured power is stable and unstable (i.e., when power varies by more than 5 percent during 5 minutes).
 - The proposed test methods and equipment are not substantially different from, or can be even less burdensome to implement than, the current DOE test procedures for measuring the products' energy consumption.
 - Manufacturers would not be required to make significant investments in new facilities and equipment.



Potential Incorporation of IEC Standard 62087

- **Section 325(gg)(2)(A) of EPCA directs DOE to consider IEC Standard 62087 when amending test procedures to include standby mode and off mode power measurements.**
- **DOE reviewed IEC Standard 62087 “Methods of measurement for the power consumption of audio, video, and related equipment” (Second Edition 2008-09) and determined that it would not be applicable to measuring power consumption of electrical appliances such as clothes dryers and room air conditioners.**
- **Therefore, DOE has determined that referencing IEC Standard 62087 is not necessary for the proposed amendments to the test procedures that are the subject of this rulemaking.**



Integration of Standby Mode and Off Mode Energy Consumption into the Energy Efficiency Metrics

- **Section 325(gg)(2)(A) requires that standby mode and off mode energy consumption be “integrated into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product” unless the current test procedures already fully account for the standby mode and off mode energy consumption or if such an integrated test procedure is technically infeasible. (42 U.S.C. 6295(gg)(2)(A))**
 - Clothes Dryers – DOE is proposing to incorporate the standby and off mode energy consumption into a “per-cycle integrated total energy consumption expressed in kilowatt-hours” and into an IEF.
 - Room Air Conditioners - DOE is proposing to incorporate the standby and off mode energy consumption into a metric for “integrated annual energy consumption” and into an IEER.



Integration of Standby Mode and Off Mode Energy Consumption into the Energy Efficiency Metrics

- **EPCA provides that test procedure amendments adopted to comply with the new EPCA requirements for standby and off mode energy consumption will not determine compliance with previously established standards. (42 U.S.C. 6295(gg)(2)(C))**
- **The proposed test procedure amendments pertaining to standby mode and off mode energy consumption would not apply to, and would have no impact, on existing standards.**
 - Existing energy standards for clothes dryers and room air conditioners, which are based on EF and EER, respectively, would not be altered by today's proposal.
- **The test procedures' provisions for standby/off mode would be required to be used for demonstrating compliance with DOE's energy conservation standards upon the effective date of a subsequent standards rulemaking for clothes dryers and room air conditioners that account for standby mode and off mode power consumption.**



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-2008-BT-TP-0010 and/or RIN #: 1904-AB76

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