

September 2002 NOPR at the October 22 public hearing. These revisions added provisions for measuring stable standby power consumption using a wattmeter and for measuring unstable standby power consumption using a watt-hour meter.

The modified measurement method, which is set forth in section 4.4 of the test procedure, requires allowing the dishwasher's standby power consumption to stabilize for five minutes, and then monitoring the dishwasher for an additional five minutes to determine whether the dishwasher's standby power consumption meets the criteria for stability (discussed below). If stable, the standby power could be measured directly using a wattmeter to obtain an instantaneous reading in watts. AHAM had recommended this alternative to measuring standby power in watt-hours and prorating the value for the measurement period as a way to simplify, and perhaps improve, the accuracy of the measurement. (AHAM No. 33 at 5)

The Department presented the criteria for stability as a power level drift of not more than 1 percent from the maximum observed value during the monitoring period with no cyclic or pulsing behavior. (Public Hearing Tr. p. 154) AHAM pointed out that the U.S. Technical Advisory Group had submitted comments to the IEC recommending a 5 percent drift instead of a 1 percent drift, stating that "at the levels that you're monitoring, typically three to five watts, a drift of five percent is almost negligible. One percent drift is extremely tight." (Public Hearing Tr. p. 156) The Department followed up with the IEC committee and learned that the IEC was in the process of revising its July 12, 2002, committee draft and had accepted the 5 percent drift as a revised specification. The March 7, 2003, IEC committee draft included the 5 percent specification in section 4.3.1. (IEC No. 40 at 8) In the interest of harmonization, and because DOE agrees based on the data and comments presented that the 1 percent drift tolerance is too restrictive, DOE is changing the 1 percent drift tolerance to 5 percent drift tolerance in section 4.4 of the test procedure.

The modified procedure, which is based on the March 7, 2003, IEC committee draft document, provides instructions for measuring the standby power for dishwashers which fail to meet the stability criteria presented above. In the case where the standby power varies over a cycle, the energy must be accumulated over a period of one or more complete cycles and prorated over a period of at least five

minutes in order to get the average standby power. (Public Hearing Tr. p. 154) The final rule also includes the editorial change of replacing "not less than 5 minutes" with "at least 5 minutes" to express the required time interval consistently throughout section 4.4, and retains the original NOPR method for measuring standby power using a watt-hour meter.

The Department is making these modifications to provide more flexibility in testing, to increase harmonization with the IEC, and to maintain accuracy and improve clarity of the procedure. The Department believes that permitting the use of a single point measurement using a wattmeter has no negative impact on measurement accuracy and is an acceptable alternative to measuring in watt-hours and prorating the value for the measurement period. Thus, section 4.4 of the test procedure now includes two measurement options, allowing standby power measurements using a wattmeter or a watt-hour meter.

New Instrumentation Requirements

Section 3.5 of the September 2002 NOPR defined the instrumentation requirements for the standby power meter. At the October 22 public hearing, DOE stated that it was considering an additional requirement: "The meter shall have a maximum error no greater than 1 percent of the measured value." This specification establishes a level of accuracy for the instrumentation used to measure standby power. It is the same level of accuracy already required of the watt-hour meter used for measuring the machine electrical energy consumption of the dishwasher to ensure reliable results and does not present a significant test burden. There were no written or public hearing comments regarding this proposed requirement.

Discussion at the public hearing, however, did explore the differences in the RMS (root mean squared) value and the crest factor value (a measure of the instrument's capability to get good readings during power fluctuations). The NOPR proposed a value of 5 RMS whereas the IEC draft proposed a value of 3 or more RMS. Whirlpool Corporation recommended 3 RMS, commenting that 5 RMS would potentially increase the cost of the measuring equipment beyond what is practical for this level. (Public Hearing Tr. p. 152) The OOE raised the question of whether independently modifying the requirements for total harmonic distortion (THD) and the crest factor created a conflict in the specifications, and recommended that the test procedure be consistent with the IEC

whenever possible. (Public Hearing Tr. p. 154)

Following the public hearing, DOE contacted an equipment manufacturer of power meters, Yokogawa Electric Corporation, to determine if there was any conflict in the specifications as written in the NOPR and to discuss whether 5 RMS was unnecessarily restrictive. From this discussion, DOE learned that it is important to match the crest factor with RMS and that the way DOE had written the specification in the NOPR was incorrect. The manufacturer also confirmed that the 5 RMS requirement would be more restrictive than necessary for ensuring accurate testing and would require manufacturers or private labelers to purchase equipment that was considerably more expensive.

As a result of this discussion and the public comments, DOE has concluded that reducing the crest factor requirement to 3 or more RMS would still ensure accurate testing, while at the same time reduce unnecessary manufacturer expense and establish a testing value consistent with the IEC. Therefore, DOE has adopted this change. For clarification purposes, DOE also restructured the format of the instrumentation section to present the requirements for each of the power meters separately. The requirements for the watt-hour meter to measure the machine electrical energy consumption of the dishwasher are in section 3.5. The requirements for the standby wattmeter to measure standby power are in section 3.6. The requirements for the standby watt-hour meter to measure standby power are in section 3.7.

Corrected Calculation Procedure for the Estimated Annual Energy Use

The September 2002 NOPR provided equations for incorporating standby power into the calculations of the EAOE and EAEU. Those equations only calculated the per-cycle energy consumption and did not calculate values for annual usage. In written comments, AHAM suggested a change in the way DOE calculated the EAEU in the NOPR, editing the equations for EAEU to include the number of cycles per year so that the energy consumption is calculated for annual consumption. (AHAM No. 30FF at 7) The Department agrees that this change improves the utility of the EAEU equations proposed in the NOPR. The revised equations for EAEU in section 10 CFR 430.23(c)(3) now reflect the total annual energy use of the dishwasher.

It should be noted that only the EAOE and EAEU calculations include standby power consumption; the energy factor