Appliance Standards Awareness Project
American Council for an Energy-Efficient Economy
Consumer Federation of America
National Consumer Law Center
Natural Resources Defense Council

January 31, 2014

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
1000 Independence Avenue, SW
Mailstop EE-2J
Washington, DC 20585

RE: Docket Number EERE–2012–BT–TP–0016 / RIN 1904–AC76: Notice of Proposed Rulemaking for Test Procedures for Refrigerators, Refrigerator-Freezers, and Freezers

Dear Ms. Edwards:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), American Council for an Energy-Efficient Economy (ACEEE), Consumer Federation of America (CFA), National Consumer Law Center (NCLC), and Natural Resources Defense Council (NRDC) on the notice of proposed rulemaking (NOPR) for test procedures for refrigerators, refrigerator-freezers, and freezers. 78 Fed. Reg. 41610 (July 10, 2013). We appreciate the opportunity to provide input to the Department.

We strongly urge DOE to adopt a test procedure to measure icemaker energy use. The 2010 consensus agreement between AHAM and efficiency advocates included recommendations for new standards for five products and also included recommendations for test procedure changes for several products including refrigerators. As part of the consensus agreement, the Joint Stakeholders agreed to petition DOE to conduct a test procedure rulemaking to revise the test procedures for refrigerators and freezers to incorporate measured icemaker energy use. The Joint Stakeholders also agreed to petition DOE for a rulemaking to incorporate measured icemaker energy use into amended standards for refrigerators and freezers.[1] Incorporating measured icemaker energy use in the standards for refrigerators and freezers was an important part of the overall consensus agreement.

Currently, icemaker energy use is not measured. The 2014 standards for refrigerators and freezers include a placeholder value of 84 kWh/year for icemaker energy consumption for products with icemakers. While this placeholder value provides additional information to consumers, it provides no incentive to manufacturers to reduce icemaker energy consumption. All models with icemakers receive the same placeholder value regardless of the actual energy consumption of the icemaker. Therefore, we urge DOE to adopt a test procedure to measure

[1] Comment ID: EERE-2008-BT-STD-0012-0052.

icemaker energy use in order to encourage improved icemaker efficiency and to drive reductions in total refrigerator and freezer energy consumption.

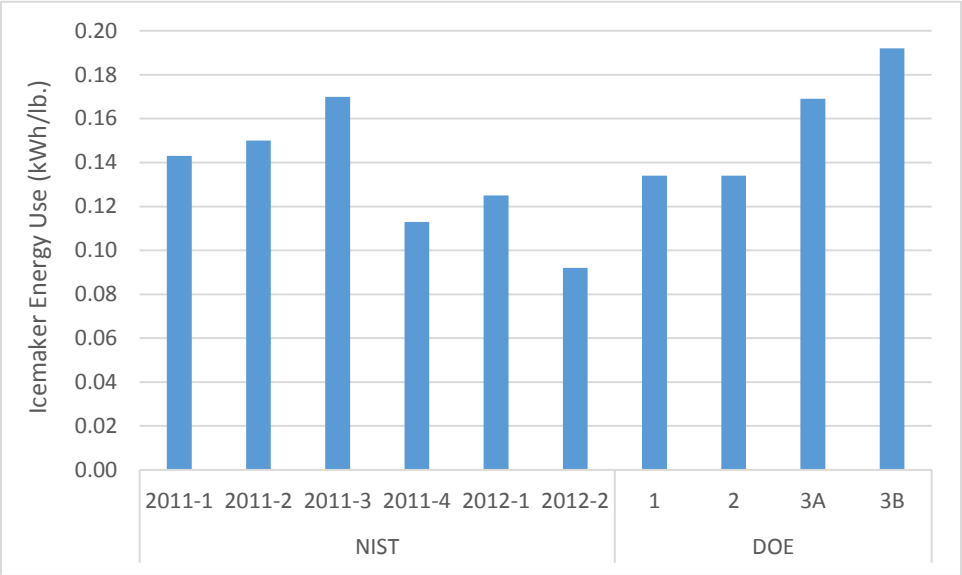
We do not support retaining the fixed placeholder value for icemaker energy consumption. In the NOPR, DOE requests comment on whether the fixed placeholder value for the icemaker energy use should be retained, rather than adopting a laboratory measurement.[2] DOE found that the current placeholder value of 84 kWh/year is very close to the average annual energy consumption of the units tested by DOE and NIST (92 kWh/year). The NOPR states that "given the closeness of these values, DOE may also consider, as an alternative to the test procedure detailed in [the NOPR], retaining the 84 kWh/year value to denote the energy usage stemming from icemaking."[3] We do not believe that the closeness of the current placeholder value and average actual icemaker energy consumption is relevant to the question of whether the test procedures should be amended to incorporate measured icemaker energy use. As explained above, any placeholder value will neither encourage improved icemaker efficiency nor achieve energy savings. Therefore, we do not support retaining a fixed placeholder value, and instead urge DOE to adopt a laboratory-based test procedure to measure icemaker energy use.

We believe that there are significant potential energy savings from improving icemaker efficiency. The NOPR states that DOE analysis of a recent NEEA field study found that average icemaker production in the northwest is 0.7 lbs./day.[4] We also understand that a manufacturer nationwide study found that average icemaker production is about 0.8 lbs./day. These new data suggest that average icemaker production and icemaker energy use may be significantly lower than previously assumed. However, while the potential energy savings may be smaller than we previously assumed, we believe that there is still a significant opportunity to achieve national energy savings from improved icemaker efficiency given the high annual sales volume of products with icemakers and the wide variation in icemaker energy use.

Figure 1 below shows icemaker energy use per pound of ice produced (kWh/lb.) for 10 models tested by NIST and DOE. These data show that the highest-energy-consuming icemaker ("DOE 3B") consumes more than twice as much energy per pound as the lowest-energy-consuming icemaker ("NIST 2012-2").

[2] 78 Fed. Reg. 41660.
[3] *Ibid*. 41629.
[4] *Ibid*. 41628.

Figure 1. Icemaker Energy Use of Models Tested by NIST and DOE.



There is also significant variation in icemaker energy use even among similar models. For example, units referred to in the NOPR as "NIST 2011-3" and "NIST 2011-4" are both French-door units with through-the-door ice. Both units use a mold heater and both units also produce similar amounts of ice per icemaker cycle (0.15 and 0.12 lbs./cycle, respectively).[5] However, the "NIST 2011-3" unit consumes 50% more energy per pound of ice produced than the "NIST 2011-4" unit.

Table 1 below shows annual icemaker energy use for the same 10 models tested by NIST and DOE based on two different assumptions for ice production rate: 1.8 lbs./day, which is the assumption for the current placeholder value of 84 kWh/year; and 0.8 lbs./day, which is roughly the average ice production rate found by both the NEEA study and the manufacturer study referenced above. Even assuming the lower ice production rate of 0.8 lbs./day, the difference in annual energy consumption between the highest-energy-consuming icemaker ("DOE 3B") and the lowest-energy-consuming unit ("NIST 2012-2") is 29 kWh per year. These potential energy savings are significant: for a top-freezer model with an icemaker with an adjusted volume of 20 cu. ft., 29 kWh per year represents 6% of the allowable energy use under the 2014 standards. Looking at just the two similar units mentioned above ("NIST 2011-3" and "NIST 2011-4"), the difference in annual energy consumption is 17 kWh per year, which represents 2.5% of the allowable energy use for a French-door model with an adjusted volume of 20 cu. ft. For comparison, the most recent ENERGY STAR criteria require a 10% reduction in energy consumption relative to the 2014 standards. Furthermore, given the limited number of models tested by DOE and NIST to date, the range of icemaker energy use is most likely greater than indicated by the data in the NOPR. The wide range of icemaker energy use exists because manufacturers do not currently have any incentive to work to improve icemaker energy efficiency when designing a refrigerator model.

[5] *Ibid*. 41628-29.

Table 1. Annual Icemaker Energy Use of Models Tested by NIST and DOE Based on Different Assumptions for Ice Production Rate.

ID	Product Class	kWh/lb	kWh/year based on 1.8 lbs/day	kWh/year based on 0.8 lbs/day
NIST 2011-1	3	0.143	94	42
NIST 2011-2	7	0.150	99	44
NIST 2011-3	5A	0.170	112	50
NIST 2011-4	5A	0.113	74	33
NIST 2012-1	5	0.125	82	37
NIST 2012-2	5	0.092	60	27
DOE 1	7	0.134	88	39
DOE 2	3	0.134	88	39
DOE 3A	5A	0.169	111	49
DOE 3B	5A	0.192	126	56

In addition to the significant variation in icemaker energy use among currently-available models, new technologies may be available in the future that could provide additional reductions in energy use. For example, researchers at Dartmouth College have discovered a method of ice removal called pulse-electro thermal de-icing (PETD). This technology heats a thin, electrically-conductive film applied to a surface with a milliseconds-long pulse of electricity, which eliminates the heating and re-cooling portion of a typical icemaker cycle.[6] If icemaker energy consumption is not measured, manufacturers will not have an incentive to adopt new technologies that could significantly improve efficiency.

We urge DOE to carefully consider AHAM's comments on the NOPR regarding the technical details of the proposed icemaker test procedure. We appreciate the significant work that AHAM and their members have contributed to developing a test procedure to measure icemaker energy use. We believe that many of AHAM's recommendations on the technical details of the icemaker test procedure would reduce test burden while still providing an accurate (or more accurate) representation of icemaker energy consumption. In particular, we encourage DOE to consider AHAM's comments on the following issues:

- Anti-sweat heater operation (Issue 2.d)
- Setup for icemaking (Issue 2.e)
- Icemaker cycle indication (Issues 2.h and 2.i)
- Control settings (Issues 2.j and 2.k)
- Baseline test period (Issue 2.l)
- Icemaking test stability (Issue 2.n)
- Duration of the icemaking test period and initiation of icemaking (Issue 2.o)

We encourage DOE to investigate whether the test burden for measuring icemaker energy use could be reduced while still providing an accurate value of energy use per pound of ice. We understand that manufacturers are concerned that the proposed icemaker test procedure

[6] http://engineering.dartmouth.edu/research/engineering-innovation-for-ice-adhesion-and-friction-control.

would represent a significant additional test burden. As noted above, we believe that many of AHAM's recommendations on the technical details of the icemaker test procedure would reduce test burden. In addition, we encourage DOE to investigate whether there may be other ways to reduce test burden while still providing a reasonable representation of icemaker energy consumption. In particular, we encourage DOE to evaluate whether a stability threshold could be used to determine when the icemaker test should be terminated.

The proposed icemaker test procedure in the NOPR would require that icemaking operation continue for most units until either: (1) the ice storage bin becomes full and stops the icemaker; or (2) an icemaker harvest occurs at least 24 hours after the initial icemaker harvest.[7] However, test data presented in the NOPR indicate that icemakers may reach a stable cumulative kWh/lb. value after just five or six icemaker cycles. Table III-4 of the NOPR shows a comparison of the cumulative kWh/lb. after each icemaker cycle for the AHAM Draft Test Procedure and the AHAM Revised Draft Test Procedure for one icemaker. The table shows that with the AHAM Draft Test Procedure, the cumulative kWh/lb. fluctuates throughout the 21 icemaker cycles. In contrast, with the AHAM Revised Draft Test Procedure, the cumulative kWh/lb. reaches a stable value after just five or six cycles.[8] These data suggest that it may be possible to use a stability threshold to determine when to terminate icemaking operation, which could potentially reduce testing time. For example, the test procedures could specify that icemaking operation be terminated once the difference in cumulative kWh/lb. between two successive icemaker cycles is less than some specified value.

We are disappointed that DOE is not proposing to follow the timeline specified in the 2010 consensus agreement for incorporating measured icemaker energy use in the standards for refrigerators and freezers. As DOE notes in the NOPR, the 2010 consensus agreement between AHAM and efficiency advocates included a specific timeline for amending the test procedures to incorporate measured icemaker energy use and for adjusting the standards to account for the test procedure change.[9] Specifically, the Joint Stakeholders recommended that DOE publish a final rule no later than December 31, 2012 amending the test procedures, and that DOE incorporate measured icemaker energy use into an amended standard within six months of completing the test procedure, with the amended standards taking effect three years after publication of the final rule.[10] Based on the Joint Stakeholders' recommendation, amended standards incorporating measured icemaker energy use would have taken effect in mid-2016. However, the NOPR instead proposes that manufacturers would not be required to use an amended test procedure incorporating measured icemaker energy consumption until the compliance date of any amended standards established by the next standards rulemaking (which likely will not be before 2020 at the earliest).[11]

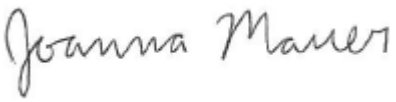
We encourage DOE to amend the test procedures to require that built-in products be tested in an enclosure. DOE found that some models of built-in products reject heat through the front of the unit, while others reject heat through the back of the unit. DOE's preliminary testing

[7] 78 Fed. Reg. 41674.
[8] *Ibid*. 41627.
[9] *Ibid*. 41611, 41653.
[10] Comment ID: EERE-2008-BT-STD-0012-0052.
[11] 78 Fed. Reg. 41612.

showed that for models which reject heat through the front of the unit, there is essentially no change in energy usage between testing in a free-standing condition and testing in a built-in condition. On the other hand, for the tested model which rejects heat through the back of the unit, the unit consumed 5% more energy when tested in a built-in condition compared to a free-standing condition.[12] We believe that for built-in products, testing in a built-in condition would be more representative of field energy consumption than testing in a free-standing condition since built-in products are not installed in a free-standing condition in the field. DOE's test results suggest that designing a built-in unit to reject heat through the front can reduce field energy consumption compared to a design that rejects heat through the back. If the test procedure does not test built-in products in a built-in condition (as they would be installed in the field), manufacturers will not have an incentive to implement designs that can reduce field energy consumption but which do not affect measured energy consumption. Therefore, we encourage DOE to amend the test procedures to require that built-in products be tested in an enclosure.

Thank you for considering these comments.

Sincerely,



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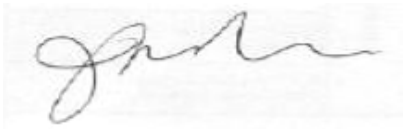

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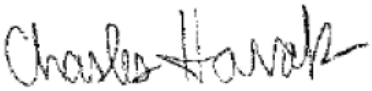

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(On behalf of its low-income clients)

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[12] *Ibid*. 41650.