Appliance Standards Awareness Project
Alliance to Save Energy
American Council for an Energy-Efficient Economy
Consumers Union
National Consumer Law Center
Natural Resources Defense Council

August 4, 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–2014–BT–TP–0010/ RIN 1904–AC80: Notice of Proposed Rulemaking for Test Procedures for Dehumidifiers

Dear Ms. Edwards:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), Alliance to Save Energy (ASE), American Council for an Energy-Efficient Economy (ACEEE), Consumers Union (CU), National Consumer Law Center (NCLC), and Natural Resources Defense Council (NRDC) on the notice of proposed rulemaking (NOPR) for test procedures for dehumidifiers. 79 Fed. Reg. 29272 (May 21, 2014). We appreciate the opportunity to provide input to the Department.

In our comments on the framework document, we urged DOE to amend the test procedures for dehumidifiers to better reflect ambient conditions in the field and to capture continuous fan operation.[1] We appreciate the analysis that DOE conducted to evaluate the issues we raised, and we believe that the changes proposed in the NOPR will significantly improve the test procedures to better reflect dehumidifier energy consumption and to allow for capturing greater energy savings. However, we believe that additional changes could further improve the test procedures, specifically to capture performance under frost conditions and part-load performance.

Below we provide our comments on specific issues related to the test procedures. In summary:

- We support the clarification that whole-home dehumidifiers, including refrigerant-desiccant units, are covered products.
- We support DOE's proposal to require testing of "convertible dehumidifiers" as both portable and whole-home dehumidifiers.
- We strongly support DOE's proposal to change the ambient dry-bulb temperature for testing of portable dehumidifiers from 80°F to 65°F.

[1] Comment ID: EERE-2012-BT-STD-0027-0009.

- We encourage DOE to consider requiring a test for portable dehumidifiers at a dry-bulb temperature lower than 65°F in addition to testing at 65°F to capture performance under frost conditions.
- We support DOE's proposal to test whole-home dehumidifiers with ducting.
- We encourage DOE to consider adding a part-load test to capture efficiency degradation due to cycling and the re-evaporation of removed moisture associated with certain fan control strategies.
- We strongly support DOE's proposal to measure fan-only mode.

Scope

We support DOE's proposal in the NOPR to clarify that whole-home dehumidifiers, including refrigerant-desiccant units, are covered products.[2] While whole-home dehumidifiers currently represent a small portion of the total dehumidifier market, we expect that their market share will continue to grow. As homes are being built more airtight and mechanical ventilation is often required, the mix of sensible and latent loads is shifting, requiring proportionately more moisture to be removed.[3] Therefore, we expect dehumidification to become increasingly important.

"Convertible" Dehumidifiers

We support DOE's proposal in the NOPR that if a given model meets both the proposed definition of a portable dehumidifier and a whole-home dehumidifier, the product must be tested as both product categories and certified as meeting both standards.[4] DOE found that there are some dehumidifiers that have optional ducting kits to accommodate either free-standing portable operation or ducted installations.[5] Since different factors affect performance in a ducted installation versus in a free-standing installation, we believe that it is important to capture performance of these "convertible" dehumidifiers in both configurations to ensure good efficiency performance regardless of how the consumer chooses to operate the unit. In addition, testing of "convertible" dehumidifiers in both ducted and free-standing conditions will provide information to consumers about capacity and efficiency in each of the configurations.

Ambient Dry-Bulb Temperature for Portable Dehumidifiers

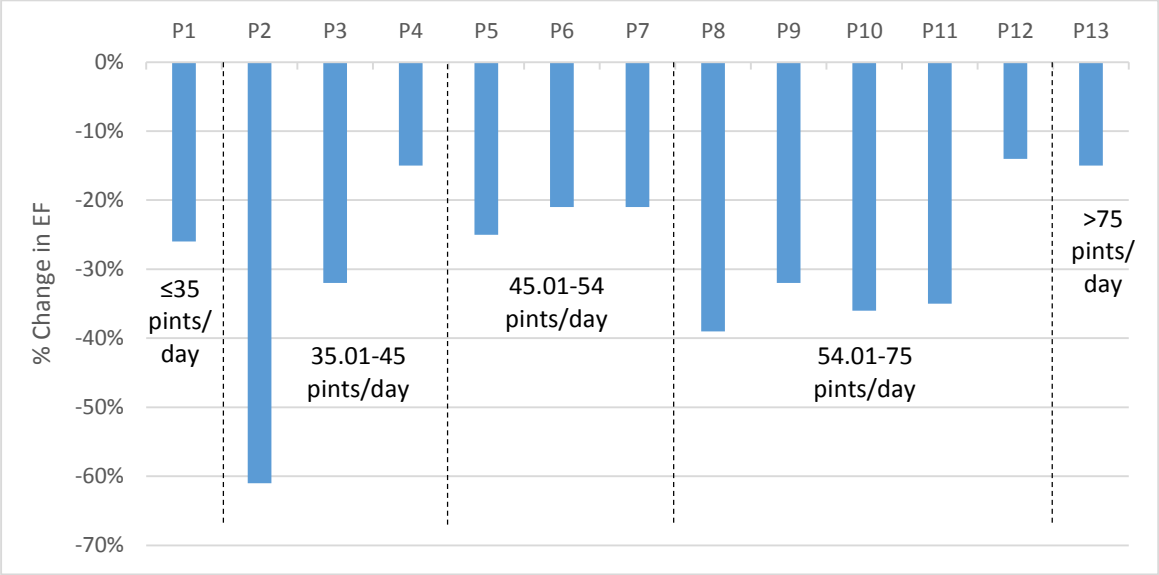
We strongly support DOE's proposal in the NOPR to change the ambient dry-bulb temperature for testing of portable dehumidifiers from 80°F to 65°F.[6] In our comments on the framework document, we explained that the current dry-bulb temperature specification of 80°F is likely significantly higher than typical ambient temperatures where portable dehumidifiers are used since most portable dehumidifiers are likely used in basements.[7] DOE's analysis for the NOPR

[2] 79 Fed. Reg. 29297.
[3] Winkler, J., D. Christensen and J. Tomerlin. 2014. Measured Performance of Residential Dehumidifiers Under Cyclic Operation. NREL/TP-5500-61076. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/dehumidifiers_cyclic_operation.pdf. pp. 1-2.
[4] 79 Fed. Reg. 29275.
[5] 79 Fed. Reg. 29275.
[6] 79 Fed. Reg. 29279.
[7] Comment ID: EERE-2012-BT-STD-0027-0009.

confirmed that the average ambient temperature when dehumidifiers are used is likely significantly lower than 80°F, and found that 65°F would be the most representative dry-bulb temperature for testing.[8]

Since 65°F is more representative of the ambient temperature where dehumidifiers are used, testing at 65°F will provide better information to consumers about the capacity and efficiency of dehumidifiers. In addition, testing at 65°F will better ensure energy savings in the field. DOE's testing for the NOPR found that performance at 80°F is not necessarily a good predictor of performance at 65°F. As shown in Figure 1 below, there is significant variation among units in terms of the impact of a decrease in dry-bulb temperature on efficiency. For portable dehumidifiers in DOE's test sample, EF decreased by 14-61% when tested at 65°F compared to 80°F. This significant variation is also present within product classes. For example, for dehumidifiers with capacities from 35.01-45 pints/day,[9] the EF of unit P4 decreased by only 15%, while the EF of unit P2 decreased by 61%. Testing at 65°F will better ensure that dehumidifiers have good efficiency performance at typical ambient conditions where they are actually used.

Figure 1. % Change in EF from 80°F to 65°F for Portable Dehumidifiers.



We also encourage DOE to consider requiring a test at a dry-bulb temperature lower than 65°F (e.g. 55°F) in addition to testing at 65°F to capture performance under frost conditions which dehumidifiers are likely to encounter in the field. Consumer Reports' ratings of dehumidifiers include a "cool room performance" test, which measures dehumidifier capacity and efficiency at 50°F.[10] DOE's testing for the NOPR found that similar to the variation observed in the impact on efficiency of a decrease in dry-bulb temperature from 80°F to 65°F, there is also significant variation in the impact of testing at 55°F. For example, when tested at 65°F, the decrease in EF relative to EF at 80°F was almost identical for units P4 and P12 (15% and 14%, respectively).

[8] 79 Fed. Reg. 29278-79.
[9] As measured by the current test procedure.
[10] http://www.consumerreports.org/cro/dehumidifiers.htm.

However, when tested at 55°F, the decrease in EF for unit P4 was 46% while the decrease for unit P12 was 64%.[11]

DOE observed that when tested at 55°F, dehumidifiers perform frequent defrost functions.[12] DOE's analysis for the preliminary technical support document (TSD) assumed that manufacturers would likely adjust a unit's controls or refrigeration system operation to avoid triggering defrost at 65°F rather than improving the defrost method,[13] which means that testing at 65°F likely will not capture defrost performance. We understand that testing at 55°F in addition to testing at 65°F would almost certainly capture defrost cycles, and therefore testing at 55°F would encourage improved defrost methods and controls.

The preliminary TSD notes that manufacturers indicated that testing at an ambient temperature in the range of 65-70°F may be more appropriate than the current test condition, but that they test their units at even lower ambient temperatures to "ensure they will operate acceptably in low-temperature consumer installations."[14] If manufacturers are already testing their units at very low ambient temperatures, requiring testing at an ambient temperature lower than 65°F in addition to testing at 65°F may not represent a significant additional testing burden.

Ambient Dry-Bulb Temperature for Whole-Home Dehumidifiers

In our comments on the framework document, we recommended that DOE develop separate ambient conditions for testing whole-home dehumidifiers since for ducted whole-home units, the dry-bulb temperature of the entering air will be close to the thermostat setting.[15] In analysis for the NOPR, DOE found that the average indoor temperature in the regions requiring the most dehumidification is 73°F.[16] We believe that testing of ducted whole-home dehumidifiers at 73°F may be most representative of performance in the field. However, we understand that dehumidifiers have to work harder to remove moisture at lower dry-bulb temperatures for a given relative humidity condition, and therefore we would expect that dehumidifiers that provide good efficiency performance at 65°F would also provide good performance at 73°F.

Testing of Whole-Home Dehumidifiers

We support DOE's proposal in the NOPR to test whole-home dehumidifiers with ducting,[17] since whole-home dehumidifiers are intended to be installed as part of a home's HVAC system. As DOE describes in the NOPR, the ducting in a typical whole-home dehumidifier installation imposes an external static pressure, which reduces airflow and impacts capacity and efficiency.[18] We also believe that DOE's proposal to use an external static pressure of 0.5 in. w.c. is appropriate.[19] As DOE notes in the NOPR, an external static pressure of 0.5 in. w.c. would align

[11] 79 Fed. Reg. 29280. Table III.4.
[12] 79 Fed. Reg. 29281.
[13] Preliminary TSD. p. 5-24.
[14] Preliminary TSD. p. 5-17.
[15] Comment ID: EERE-2012-BT-STD-0027-0009.
[16] 79 Fed. Reg. 29279.
[17] 79 Fed. Reg. 29286.
[18] 79 Fed. Reg. 29283.
[19] 79 Fed. Reg. 29288.

with the assumed external static pressure in the furnace fans test procedure for furnace fans designed to be installed in systems with an internal evaporator coil.[20]

Part-Load Operation

We encourage DOE to consider adding a part-load test to the test procedures for dehumidifiers. NREL conducted testing of the part-load performance of four dehumidifiers using a similar procedure to that used for air conditioners and heat pumps in AHRI Standard 210/240.[21] NREL's testing found that when there is a high rate of compressor cycling, dehumidifier efficiency can degrade significantly, especially for units that continue to operate the fan after the compressor cycles off.[22] NREL found that the two portable dehumidifiers in their test sample operated the fan for three minutes after the compressor shut off, which results in some of the moisture removed by the dehumidifier being re-evaporated.[23] When compressor runtimes ranged from 3-6 minutes, NREL found that 17-42% of the removed moisture was returned to the space for these two units, meaning that 17-42% of the energy consumed was wasted.[24] (We note that the compressor "on" time in the AHRI 210/240 cyclic test is 6 minutes.)[25] A test procedure that captures part-load performance would discourage this type of fan control strategy which can significantly decrease dehumidifier efficiency in the field. In addition, capturing part-load performance in the test procedures would encourage technologies such as variable-speed compressors, which may improve real-world efficiency by reducing compressor cycling, but which would not improve efficiency as measured by the current test procedures.

Fan-Only Mode

We strongly support DOE's proposal in the NOPR to require measurement of fan-only mode.[26] DOE's testing for the NOPR found that fan-only mode may consume more than 300 times more energy than off-cycle or inactive mode.[27] However, while DOE's proposal for measuring fan-only mode would capture the significant fan power consumed in fan-only mode, it would not capture the additional efficiency impact of re-evaporating moisture when the fan is running after the compressor cycles off, as described above. Adding a part-load test to the test procedures, as we recommend above, should capture this wasted energy when running the fan results in removed moisture being returned to the space. However, if DOE does not adopt a part-load test, we urge DOE to consider adopting an alternative approach to capture this impact on efficiency which the NREL testing suggests can be significant.

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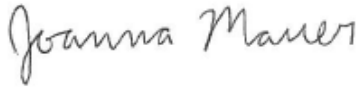
[20] *Ibid*.
[21] Winkler, J., D. Christensen and J. Tomerlin. 2014. Measured Performance of Residential Dehumidifiers Under Cyclic Operation. NREL/TP-5500-61076. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/dehumidifiers_cyclic_operation.pdf.
[22] *Ibid*. pp. 17-18. The unit shown in Figure 13 operates the fan for three minutes after the compressor cycles off.
[23] *Ibid*. p. ii.
[24] *Ibid*. p. 15.
[25] http://www.ahrinet.org/App_Content/ahri/files/standards%20pdfs/ANSI%20standards%20pdfs/ANSI.AHRI%20Standard%20210.240%20with%20Addenda%201%20and%202.pdf. p. 70.
[26] 79 Fed. Reg. 29291.
[27] *Ibid*.

Thank you for considering these comments.

Sincerely,



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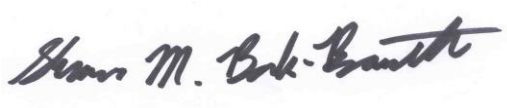

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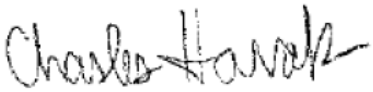

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