Appliance Standards Awareness Project
Alliance to Save Energy
American Council for an Energy-Efficient Economy
Consumer Federation of America
Natural Resources Defense Council
Northeast Energy Efficiency Partnerships
Northwest Energy Efficiency Alliance
Northwest Power and Conservation Council

September 5, 2017

Bryan Berringer
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Office, EE-5B
1000 Independence Avenue, SW
Washington, DC 20585

RE: Docket Number EERE–2017–BT–TP–0012: **Request for Information for Test Procedures for Room Air Conditioners**

Dear Mr. Berringer:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), Alliance to Save Energy, American Council for an Energy-Efficient Economy (ACEEE), Consumer Federation of America (CFA), Natural Resources Defense Council (NRDC), Northeast Energy Efficiency Partnerships (NEEP), Northwest Energy Efficiency Alliance (NEEA), and Northwest Power and Conservation Council (NPCC) on the request for information (RFI) for test procedures for room air conditioners (ACs). 82 Fed. Reg. 36349 (August 4, 2017). We appreciate the opportunity to provide input to the Department.

DOE has the opportunity as part of this rulemaking to make amendments to the room AC test procedures to better reflect the performance of room ACs in the field and encourage the introduction of new features. In particular, incorporating part-load performance would allow new technologies such as variable-speed compressors to compete on a fair basis. Variable-speed compressors not only save energy, but also provide better temperature control and dehumidification and lower noise levels in addition to facilitating integration with the smart grid. We note that part-load performance could be captured with just a single load-based test.

It would make sense in the future for the test procedures for room ACs and portable ACs to be aligned. We agree with DOE that room ACs and portable ACs provide similar functions and consumer utility.[1] Room ACs and portable ACs can often be used for the same applications, and therefore it would be useful for consumers to be able to compare the efficiency ratings of both types of products. As DOE notes in the RFI, there are several significant differences

[1] 82 Fed. Reg. 36351.

between the current test procedures for room ACs and portable ACs that do not allow for comparing ratings of the two different products.[2] The most significant difference between the two test procedures is that the test for room ACs is conducted at a single outdoor dry-bulb temperature of 95 F, while the test for portable ACs is conducted at two outdoor conditions—one is equivalent to the room AC condition and the other is conducted at a dry-bulb temperature of 83 F. Because the metric for portable ACs is heavily weighted towards the 83 F dry-bulb condition,[3] portable ACs will achieve significantly higher capacity and efficiency ratings than if they were tested at the room AC test condition.

While we believe that it makes sense in the future for the test procedures for room ACs and portable ACs to be aligned so that consumers can compare the two products, there is a significant flaw in both current test procedures—neither captures part-load performance. Therefore, we do not recommend aligning the room AC test procedure with the current test procedure for portable ACs.

The test procedure for room ACs should incorporate part-load performance to capture the benefits of technologies such as variable-speed compressors. As DOE notes in the RFI, the current test procedure for room ACs measures only the full-load performance.[4] The current test procedure therefore does not capture the benefits of technologies such as variable-speed compressors, which can improve efficiency by reducing cycling losses and improving heat exchanger effectiveness during part-load operation. Variable-speed compressors can also provide significant additional benefits to consumers and the electrical grid. Variable-speed compressors can improve comfort by providing more precise temperature control (since the compressor is not cycling on and off) and improved dehumidification while also reducing noise levels. They also facilitate integration with the smart grid when units are "connected" due to the ability to adjust the speed of the compressor during times of peak demand with little impact on comfort.[5] Amending the room AC test procedure to capture part-load performance would enable variable-speed technology to compete on a fair basis, which would likely increase the adoption of this feature.

We believe that the best way to capture actual room AC performance in the field, including part-load performance, would be to test units under a dynamic, load-based test. For single-speed units, this approach would capture the impact of cycling losses. For variable-speed units, it would capture the effectiveness of the unit's controls in adjusting compressor and fan speeds to optimize efficiency. Promising recent work by the Canadian Standards Association in developing such a test for other types of air conditioning equipment could potentially serve as a model.[6]

The test procedure for portable ACs does not capture part-load performance. The RFI states that harmonizing the room AC test procedure with the portable AC test procedure would "capture benefits associated with variable-speed compressors and other components that improve

[2] *Ibid*.
[3] The weightings are 20% and 80% for the 95 F and 83 F test conditions, respectively.
[4] 82 Fed. Reg. 36352.
[5] http://www.hpac.com/archive/parallel-benefits-variable-speed.
[6] http://neep.org/sites/default/files/NEEPCSAHarley2017-06-28.pdf.

part-load performance."[7] However, this does not reflect our understanding of the portable AC test procedure. As noted above, the portable AC test procedure does include two outdoor test conditions (95 F and 83 F dry-bulb temperatures), and when operated in the field, we would expect that a portable AC unit would be operating at part load at an outdoor dry-bulb temperature of 83 F. However, our understanding is that the test conducted at 83 F is not a part-load test, but rather a full-load test conducted at a lower outdoor ambient temperature. In particular, we understand that all portable AC units would run continuously at both the 95 F and 83 F test conditions. As noted in the Technical Support Document for the portable AC final rule, "the test procedure does not account for the efficiency impacts of compressor cycling for single-speed compressors."[8] This means that the test also does not capture the benefits of variable-speed compressors in terms of reducing cycling losses. Therefore, we do not believe that harmonizing the room AC test procedure with the portable AC test procedure would capture the benefits of technologies that improve part-load performance such as variable-speed compressors. Instead, the room AC test procedure (and eventually the portable AC test procedure) should be amended such that they do in fact capture part-load performance.

We support testing of room ACs in accordance with manufacturer-provided installation materials. The RFI notes that the portable AC test procedure requires that the test unit be set up and tested with all manufacturer-provided materials "to ensure that the performance measured during the test is reflective of actual installation and operation."[9] In contrast, in the room AC test, "the unit is set up so all air leakage around the unit that would normally be present in a typical installation is precluded by means of sealing."[10] As noted in the RFI, EPCA requires DOE "to adopt test procedures that are representative of an average use cycle, which would encompass typical installation and operation."[11] Sealing off any air leakage during the test clearly is not representative of typical installation and operation. This means that the current test is not providing good information to consumers about actual efficiency performance. Testing room ACs in accordance with manufacturer-provided installation materials would provide an incentive to manufacturers to improve the installation materials such that leakage is reduced. In addition to saving energy, reducing leakage would also improve cooling performance by reducing the amount of hot air entering from outdoors, which ultimately would improve consumer comfort.

We support incorporation of power consumption in off-cycle mode as is done in the portable AC test procedure. DOE notes in the RFI that the portable AC test procedure captures the energy consumption of fan operation in off-cycle mode, while this is not captured in the room AC test procedure. DOE further notes that the failure to capture fan operation in off-cycle mode in the room AC test procedure excludes "potentially significant energy consumption" when compared to the test procedures for portable ACs.[12] Capturing off-cycle mode power consumption, including fan operation, would provide a better representation of actual efficiency in the field and better information to consumers. Further, capturing fan operation in off-cycle

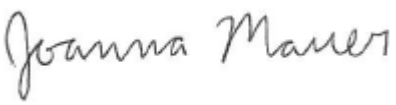
[7] 82 Fed. Reg. 36352.
[8] https://www.regulations.gov/document?D=EERE-2013-BT-STD-0033-0047. p. 5-26.
[9] 82 Fed. Reg. 36352.
[10] *Ibid*.
[11] *Ibid*.
[12] 82 Fed. Reg. 36353.

mode would encourage manufacturers to introduce more-efficient fans and fan motors, which would ultimately provide savings for consumers. In addition to harmonizing with the portable AC test procedure, capturing fan operation outside of cooling mode would also be consistent with the test procedures for dehumidifiers and dishwashers.[13]

The test procedure for room ACs should capture the energy used by "connected" features. Manufacturers have started to introduce "connected" room AC units. For example, there are seven models in the ENERGY STAR list of certified products that are certified as meeting the ENERGY STAR definition of "connected."[14] While connected units have the potential to provide benefits to the electrical grid as described above, connected units may also consume additional power continuously due to operating in an "always on" standby mode. The test procedure for room ACs should capture any power consumption associated with connected features. Capturing this energy use would encourage manufacturers to provide connected functionality with low power consumption.

Thank you for considering these comments.

Sincerely,



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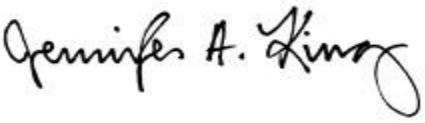

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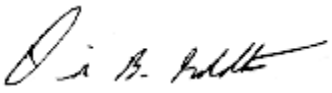

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[13] The new dehumidifier test procedure (Appendix X1) specifies that in "off-cycle mode," a dehumidifier "may or may not operate its fan or blower." The dishwasher test procedure (Appendix C1) defines "fan-only mode" as "an active mode that is not user selectable, and in which a fan circulates air for a finite period of time after the end of the cycle . . . "

[14] https://www.energystar.gov/productfinder/product/certified-room-air-conditioners/. Accessed August 29, 2017.

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