Appliance Standards Awareness Project
American Council for an Energy-Efficient Economy
National Consumer Law Center

August 8, 2022

Mr. Lucas Adin
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-2020-BT-TP-0029: Proposed Rule for Test Procedures for Portable Air Conditioners

Dear Mr. Adin:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), the American Council for an Energy-Efficient Economy (ACEEE), and the National Consumer Law Center, on behalf of its low-income clients on the notice of proposed rulemaking (NOPR) for test procedures for portable air conditioners (PACs). 87 Fed. Reg 34934 (June 8, 2022). We appreciate the opportunity to provide input to the Department.

We support DOE's amendments to the operating hours in Appendix CC1 to account for cyclic behavior. DOE proposes to maintain the current operating hour breakdown in Appendix CC with the 750 cooling hours split between the 95 °F and 83 °F test conditions (with 880 off-cycle and 1,355 off/inactive hours). However, in Appendix CC1, DOE proposing a more representative division of operating hours, distinguishing between variable-speed units that are designed to match the load, avoiding cycling (and therefore will have no off-cycle mode hours) and single-speed units that do cycle (and therefore will have hours split between on- and off-cycle modes). We believe that this approach to updating the operating hours better reflects the operation of single- and variable-speed units and will result in the calculation of more representative performance values.

We support DOE's proposal to maintain the requirement that if a PAC model can operate in both single- and dual-duct configurations, the model should be tested and rated for both configurations. For units that can operate in both single- and dual-duct configurations, the current test procedure in Appendix CC requires testing of both configurations, in recognition that a model will likely perform differently in the two configurations. We believe that it is important to continue to require testing and rating for both configurations in order to provide relevant information to purchasers and to ensure that such units meet the minimum standards with either configuration.

We support DOE's proposal that the full compressor speed for variable-speed units be achieved with user controls. Variable-speed units are equipped with an inverter frequency drive that is programmed to modulate compressor speed based upon detected conditions. Under full-load conditions in a test chamber, a variable-speed unit will self-adjust to achieve full-speed operation. In both Appendix CC and Appendix CC1, consistent with the alternate test procedure specified in the Midea Interim Waiver, DOE is

proposing to require that variable-speed units operate under their native controls, with the thermostat setpoint at 75 °F, to achieve the full compressor speed operation.[1] We support the requirement of unlocked controls to achieve full compressor speed, which better reflects how a variable-speed unit would operate in the field compared to testing a unit at fixed manufacturer settings.

We are concerned that the proposed cycling factor is too high, which would result in overrepresenting the performance of single-speed units compared to variable-speed units in Appendix CC. In Appendix CC, DOE defines a cycling factor (CF) that represents the cycling losses of a theoretical comparable single-speed unit. If the CF value is set too high–which we believe DOE has done here–the calculated CEER of a variable-speed unit will be artificially deflated relative to the CEER of a single-speed unit. We are concerned that if the efficiency metric fails to appropriately recognize the full performance benefits of variable-speed units, manufacturers will have less incentive to adopt variable-speed technology.

We believe that the CF value DOE proposes is almost certainly too high. In the NOPR, DOE determined the proposed CF value from the results of testing single-speed units.[2] While we support the approach to empirically derive a representative value, the approach does not account for all inefficiencies associated with a single-speed unit. Specifically, in the NOPR, DOE considered cycling losses only, ignoring fan energy consumption during the off cycle. However, DOE recognized that a single-speed unit "may experience inefficiencies by continuing to operate the blower fan during compressor off periods after the evaporator coils have warmed to the point that any further fan operation does not contribute to the unit's overall cooling capacity."[3] Because this fan energy in off-cycle mode is not captured, the cycling factor likely overrepresents the efficiency of a single-speed unit compared to a variable-speed unit. We therefore encourage DOE to fully account for the losses of single-speed units by including this fan energy in the determination of an appropriate cycling factor value.

For Appendix CC1, we encourage DOE to provide an option to measure the cycling factor. In Appendix CC1, DOE is proposing to apply the CF to single-speed units to directly account for cycling losses. However, DOE's test results showed that there are significant differences in cycling factors across units.[4] Therefore, using a single CF for all single-speed units would fail to capture the efficiency benefits of units with improved cycling performance. We encourage DOE to allow manufacturers who can demonstrate improved performance under cycling operation the option to use a CF value determined by testing. Specifically, DOE could consider establishing a conservative CF value while allowing manufacturers the option of performing testing to demonstrate improved cycling performance.

We encourage DOE to continue to investigate load-based testing. We acknowledge that the proposed provisions better approximate the field operation of variable-speed units at full load by achieving the full compressor speed using unlocked controls. However, the tests at low compressor speed will still be achieved using fixed, manufacturer-specified settings. DOE notes that "the only way to reach reduced compressor speeds using native controls during testing would be with load-based tests, which DOE has tentatively concluded are impractical for portable ACs at this time."[5] However, we are still concerned that the test procedure may not adequately represent the operation of variable-speed units under part-load

[1] https://www.regulations.gov/document/EERE-2020-BT-WAV-0023-0007

[2] These units were tested under constant full-load conditions and part-load cycling load conditions, and the relative efficiency between the two operational modes was calculated. DOE averaged the relative efficiency of the 5 test units during cycling operation compared to continuous operation, resulting in a CF value of 0.82.

[3] https://www.regulations.gov/document/EERE-2020-BT-TP-0029-0013. p. 34949.

[4] The relative efficiency values ranged from 76 to 86%.

[5] https://www.regulations.gov/document/EERE-2020-BT-TP-0029-0013. p. 34947.

conditions. We believe that DOE should strive to move away from "steady-state" testing (currently achieved by the reconditioning equipment in a psychrometric chamber that maintains temperature and humidity conditions) and towards load-based testing. We therefore encourage DOE to continue to explore approaches that would capture the performance of variable-speed units under unlocked native controls.

We encourage DOE to include a measurement of heat losses through the casing to better represent the capacity of PACs. A PAC is an encased assembly, with both the condenser and evaporator present in a single casing, that conditions an enclosed space. When a PAC operates in cooling mode, heat transfer occurs through the flexible ducting and through the chassis of the unit into the surrounding space. This heat transfer imparts additional heat load to the surrounding room, effectively reducing the cooling capacity of the unit. In the NOPR, DOE continues to acknowledge the impact of duct losses (and air infiltration at the condenser inlet), but once again ignores case heat transfer losses. We encourage DOE to treat heat losses in a consistent manner by adopting the approach the Department proposed in the February 2015 test procedures NOPR for PACs.[6]

We encourage DOE to test portable ACs that have network connectivity capabilities in their as-shipped configuration. In the NOPR, DOE proposes that units with network functions shall be tested with the network function off (if the settings can be disabled by the user and the product manual provides instructions to do so). We are concerned that turning the network functions off does not reflect consumer use, since we believe that a consumer is unlikely to adjust this type of capability from the original factory settings. We therefore encourage DOE to require units with network functions to be tested as shipped to increase the representativeness of the test procedure.[7]

Thank you for considering these comments.

Sincerely,

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Appliance Standards Awareness Project

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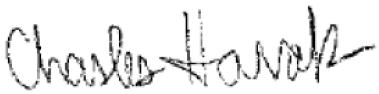
American Council for an Energy-Efficient Economy



Charles Harak, Esq.
National Consumer Law Center
(On behalf of its low-income clients)

[6] https://www.regulations.gov/document/EERE-2014-BT-TP-0014-0009. p. 10219.
[7] While DOE argues the impact of this feature on energy consumption is small, this provision can easily be integrated into the test procedure. We expect there to be no additional test burden, as the network functions would simply remain 'on' for the duration of the test.