Appliance Standards Awareness Project
Alliance to Save Energy
American Council for an Energy-Efficient Economy
National Consumer Law Center
Natural Resources Defense Council
Northeast Energy Efficiency Partnerships
Northwest Energy Efficiency Alliance

September 26, 2016

Mr. Bryan Berringer
U.S. Department of Energy
Building Technologies Program
Mailstop EE-5B
1000 Independence Avenue, SW
Washington, DC 20585

RE: Docket Number EERE–2013–BT–STD–0033/RIN 1904–AD02: **Notice of Proposed Rulemaking for Portable 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), National Consumer Law Center (NCLC), Natural Resources Defense Council (NRDC), Northeast Energy Efficiency Partnerships (NEEP), and Northwest Energy Efficiency Alliance (NEEA) on the notice of proposed rulemaking (NOPR) for portable air conditioners. 81 Fed. Reg. 38398 (June 13, 2016). We appreciate the opportunity to provide input to the Department.

We urge DOE to adopt TSL 3. In the NOPR, DOE proposes to adopt TSL 2. DOE estimates that the proposed standard would save 0.53 quads of energy and net savings of $2.2-5.2 billion for consumers. However, TSL 3 would increase both national energy savings and NPV savings by 50% to 0.78 quads and $3.2-7.6 billion.[1] As we describe below, we believe that DOE's concerns regarding the availability of high-efficiency compressors to meet higher efficiency levels are unwarranted. Further, there are multiple ways to improve the efficiency of portable ACs that are not captured in the analysis, including the use of alternative refrigerants, and yet manufacturers will be able to use these technology options to help meet the standard. We urge DOE in the final rule to adopt TSL 3, which can be met by the most-efficient units available on the market today.[2] We also note that TSL 4, which would save 1.15 quads, would maximize savings for consumers, with average LCC savings of $276 and NPV savings of $4.5-10.6 billion.

We believe that DOE's concerns regarding the availability of high-efficiency compressors to meet higher efficiency levels are unwarranted. In the NOPR, in rejecting TSLs 3 and 4, DOE raises the concern that the high-efficiency compressors needed to meet TSLs 3 and 4 "may

[1] 81 Fed. Reg. 38446.
[2] 81 Fed. Reg. 38436.

not be available to all manufacturers for the full range of capacities of portable ACs." DOE further states that "because high-efficiency components available at any given time are driven largely by the markets for other products with higher shipments (e.g., room ACs), portable AC manufacturers may be constrained in their design choices."[3] We believe that DOE's concerns regarding the availability of high-efficiency compressors to meet higher efficiency levels are unwarranted for several reasons.

First, because portable ACs are a newly covered product, which means the lead time between the publication of the final rule and the compliance date will be 5 years, the likely compliance date will not be until late 2021 or early 2022.[4] Manufacturers and component suppliers, including compressor manufacturers, will have 5 years to develop new products and components. Second, while DOE notes that the availability of high-efficiency components is often driven by markets for other products with higher shipments, the markets for both room ACs and dehumidifiers in fact will likely drive increased production of high-efficiency compressors. The next room AC standard is scheduled to take effect no later than 2022,[5] which as noted above is roughly when the portable AC standard will take effect. And DOE is funding a project conducted by Oak Ridge National Laboratory (ORNL) in partnership with GE to develop a 13 EER room AC.[6] Dehumidifiers also use similar components as portable ACs. A new ENERGY STAR specification for dehumidifiers that will take effect later this year is roughly equivalent to the max-tech level for small dehumidifiers in the recent DOE rulemaking.[7] Since 2010, the market penetration of ENERGY STAR certified dehumidifiers has been no lower than 84%,[8] and so we would expect a similarly high portion of sales to meet the new 2016 ENERGY STAR dehumidifier specification. And there are dehumidifiers listed in the DOE certification compliance database with efficiency levels that significantly exceed the new ENERGY STAR specification.[9]

Finally, it is important to note that available compressor efficiencies are not fixed in time. For example, in the 2011 final rule for room air conditioners, DOE found that the maximum available efficiency of single-speed R-410A compressors was 10.0 Btu/Wh.[10] At the time of the preliminary analysis for portable ACs, DOE found that the maximum available compressor

[3] 81 Fed. Reg. 38448.
[4] Assuming the final rule is published in late 2016 or early 2017.
[5] Based on the 6-year review provision, DOE must publish a proposed rule or a determination that no change is warranted by April 2017 and a final rule no later than two years later. The standard would take effect 3 years after publication of the final rule, or no later than April 2022.
[6] http://energy.gov/eere/buildings/downloads/13-energy-efficiency-ratio-window-air-conditioner.
[7] The new ENERGY STAR dehumidifier specification, effective October 25, 2016, is 2.00 EF for units with capacities less than 75 pints/day (as measured by the current test procedure). The max-tech level in the 2016 final rule for dehumidifiers with capacities less than 25 pints/day (as measured by the new test procedure) is 1.57 IEF, which DOE found is equivalent to 2.01 EF as measured by the current test procedure. See: https://www.energystar.gov/sites/default/files/ENERGY%20STAR_Dehumidifiers_V4%200_Specification_Final.pdf; Final Rule Technical Support Document for Dehumidifiers. Document ID: EERE-2012-BT-STD-0027-0046. p. 5-10; and NOPR Technical Support Document for Dehumidifiers. Document ID: EERE-2012-BT-STD-0027-0030. p. 8-31.
[8] ENERGY STAR Unit Shipment Data. https://www.energystar.gov/index.cfm?c=partners.unit_shipment_data.
[9] Bionaire has two units listed with efficiencies of 2.2 and 2.39 EF. https://www.regulations.doe.gov/certification-data/CCMS-414316940 81.html#q=Product_Group_s%3A%22Dehumidifiers%22.
[10] Final Rule Technical Support Document for Clothes Dryers and Room Air Conditioners. Document ID: EERE-2007-BT-STD-0010-0053. p. 5-117. For capacities below 15,000 Btu/h.

efficiency was 10.5 Btu/Wh, while at the time of the NOPR analysis the maximum compressor efficiency had increased to 11.1 Btu/Wh.[11] Therefore, it is reasonable to expect that the available efficiencies of both single-speed and variable-speed compressors will increase in the years before the standard takes effect.

In sum, we believe that the long lead time before the portable AC standard takes effect along with multiple market drivers will ensure adequate availability of high-efficiency compressors to meet higher efficiency levels.

We believe DOE improperly screened out alternative refrigerants as a technology option. In the analysis for the NOPR, DOE screened out alternative refrigerants, including propane and R-32, as a technology option. DOE's rationale for screening out propane is that the new UL charge limits make propane infeasible, while for R-32, the NOPR states that "DOE is aware of very few portable or room ACs available commercially in other markets that utilize the mildly flammable R–32."[12] We believe that DOE's decision to screen out alternative refrigerants was inappropriate.

The NOPR notes that "propane refrigerant is widely used for portable ACs manufactured and sold internationally,"[13] and the Technical Support Document (TSD) notes that "one manufacturer claims to have achieved a 10-percent portable AC efficiency improvement using propane."[14]As DOE notes in the NOPR, EPA's Significant New Alternatives Policy (SNAP) Program has approved alternative refrigerants, including propane, in sufficient quantities for manufacturers to make portable ACs with those refrigerants.[15] And while UL's revised charge limits for propane are not feasible for providing adequate cooling capacity, UL certification has failed to become industry standard for portable ACs. TopTenReviews' list of 10 "2016 Best" portable ACs includes 4 units that are not UL certified.[16]

Perhaps more importantly, R-32 may be the most likely future refrigerant for the US portable AC market as it presents the simplest transition away from high global warming potential R-410A. And unlike for propane, the charge limits for R-32 in the latest edition of UL 484 are sufficiently high such that R-32 can be used and UL certified across the full range of portable AC capacities. While DOE screened out R-32 due to the limited number of commercially-available portable or room ACs in other markets that use R-32, in other markets UL's charge limitations do not apply, allowing manufacturers to use hydrocarbon refrigerants. And there are, in fact, already several portable ACs on the market using R-32,[17] which demonstrates that R-32 is technologically feasible for portable ACs. Daikin/Amana claims a 10% reduction in energy use using R-32 in PTACs.[18] And ORNL found that R-32 demonstrates a higher COP than R-410A in mini-split

[11] Technical Support Document. p. 5-23.
[12] 81 Fed. Reg. 38411-12.
[13] 81 Fed. Reg. 38410.
[14] Technical Support Document. p. 3-23.
[15] 81 Fed. Reg. 38411.
[16] http://www.toptenreviews.com/home/hvac/best-portable-air-conditioners.
[17] See, for example: http://cooperandhunter.com/bd/product/portable-air-conditioner-ch-m09k6s/ and http://www.atompolska.pl/download.html?id=99006780051216a7edd4c5af0fb7a8112e4f61f3.
[18] http://www.amana-ptac.com/r32.

ACs engineered for R-410A by 1-6% across a range of test conditions.[19] Portable ACs designed for R-32 should be capable of outperforming R-410A by an even higher margin.

While DOE's analysis has not captured the potential efficiency gains from alternative refrigerants, manufacturers will have the option of using alternative refrigerants—in particular R-32—to help meet the standard. Using alternative refrigerants with improved efficiency performance would mean that manufacturers would not need to utilize all of the design options assumed in DOE's analysis to meet a given standard level.

In addition to alternative refrigerants, there are also other ways to improve the efficiency of portable ACs that similarly are not captured in the analysis. In particular, the engineering analysis for the NOPR did not consider potential efficiency gains from microchannel heat exchangers, reducing air infiltration, or improving duct connections. DOE notes in the TSD that research performed in 2006 found that the use of microchannel condensers can result in a 6-10% increase in COP, and additional research for mobile air conditioning indicated that microchannel heat exchangers can increase COP by 8%.[20]

DOE states in the NOPR that under testing according to the test procedures final rule, "air flow optimization that would lead to zero infiltration air is no longer associated with improved efficiencies."[21] We recognize that compared to the test procedures NOPR, the impact of infiltration on measured efficiency based on the test procedures final rule is significantly reduced. However, we would expect that reducing infiltration air would improve measured efficiency to some extent, in particular at the 95 F ambient test condition. Finally, DOE notes in the TSD that "the duct connections at the window mounting bracket or portable AC are often not well sealed." While DOE was not able to incorporate improved duct connections as a technology option in the analysis due to a lack of data, manufacturers may be able to improve duct connections as a way to improve efficiency.

As with alternative refrigerants, while DOE's analysis has not captured the potential efficiency gains from additional technology options such as microchannel heat exchangers, reducing air infiltration, and improving duct connections, manufacturers may be able to use these additional technology options to help meet the standard. And as with alternative refrigerants, using these additional technology options would mean that manufacturers would not need to utilize all of the design options assumed in DOE's analysis to meet a given standard level.

We continue to strongly support a single product class for portable ACs. We agree with DOE's conclusion that there is "no unique consumer utility associated with the number of ducts for portable ACs that would warrant a division of single-duct and dual-duct units into separate product classes."[22] DOE found that "all window fixtures are of sufficient width to accommodate connections to two ducts" and that there is no correlation between noise levels and duct configuration. DOE also estimated that a dual-duct portable AC would be less than 5 pounds heavier than a comparable single-duct unit with the same capacity, which would not impact

[19] http://energy.gov/sites/prod/files/2015/10/f27/bto_pub59157_101515.pdf. p. xviii.
[20] Technical Support Document. p. 3-19.
[21] 81 Fed. Reg. 38416.
[22] 81 Fed. Reg. 38410.

portability, especially since all units have wheels.[23] The NOPR also notes that "no manufacturer could identify a situation in which a dual-duct portable AC could not be installed in the same location as a single-duct portable AC."[24] Further, DOE found that there is no correlation between duct configuration and efficiency.[25]

The consideration of additional heat exchanger area increases represents a significant improvement to the analysis. In the preliminary analysis, DOE limited heat exchanger area increases to 10%.[26] For the NOPR, DOE further evaluated the heat exchanger areas as a function of capacity for units in the Department's test sample and found that the heat exchanger areas ranged from approximately 20% below to 20% above the average trend.[27] We agree with DOE's conclusion that these data suggest that heat exchanger areas can be increased beyond what DOE estimated for the preliminary analysis. The incorporation of a 20% increase in heat exchanger area represents a significant improvement to the analysis in order to better capture the full range of potential efficiency improvements.

The incorporation of variable-speed compressors in the engineering analysis represents another significant improvement to the analysis. In the preliminary analysis, DOE did not consider variable-speed compressors in the engineering analysis based on the rationale that they would have no measurable impact on efficiency since portable ACs would be tested under constant ambient conditions.[28] In the NOPR, DOE correctly notes that variable-speed compressors offer improved efficiency not just under varying conditions but also at full load.[29] DOE found that while the current maximum efficiency for single-speed rotary R-410A compressors is 11.1 Btu/Wh, variable-speed compressors are available with efficiencies as high as 13.7 Btu/Wh.[30] The incorporation of variable-speed compressors in the engineering analysis represents another significant improvement to the analysis in order to better capture the full range of potential efficiency improvements.

The assumed cooling mode hours appear to be reasonable. For the analysis for the NOPR, DOE assumed that cooling mode operating hours for portable ACs are the same as those for room ACs.[31] In the absence of other data, it is reasonable to assume the same cooling mode hours for portable ACs as for room ACs since portable ACs are often used in place of room ACs, such as when window configurations or building regulations prevent the installation of room ACs.[32] We also note that DOE conducted a sensitivity analysis where cooling mode hours were assumed to be 50% of those of room ACs. We do not believe that it is realistic to assume that the cooling mode hours of portable ACs are only half of those of room ACs. Nevertheless, even with

[23] Technical Support Document. p. 3-2.
[24] 81 Fed. Reg. 38431.
[25] Technical Support Document. p. 3-2.
[26] 81 Fed. Reg. 38412.
[27] Technical Support Document. p. 5-22.
[28] Preliminary Technical Support Document. Document ID: EERE-2013-BT-STD-0033-0007. p. 5-22.
[29] 81 Fed. Reg. 38412.
[30] Technical Support Document. p. 5-23.
[31] Technical Support Document. p. 7-4.
[32] http://www.consumerreports.org/cro/news/2014/06/are-portableair-conditioner-claims-a-lot-of-hot-air/index.htm.

this assumption, DOE still found all evaluated efficiency levels to be cost effective for consumers, including the max-tech level.[33]

The average lifetime assumed in the analysis appears to be reasonable. For the analysis for the NOPR, DOE assumed that the lifetime distribution of portable ACs is the same as that of room ACs given similar mechanical components and uses.[34] We agree that in the absence of other data, it is reasonable to assume the same lifetime distribution of portable ACs as for room ACs given the similarity between the two products. We also note that portable dehumidifiers are very similar to portable ACs, as the two products share the same basic refrigeration system components and are both portable units placed inside a room. DOE estimates that the average lifetime of a portable dehumidifier (11 years)[35] is slightly longer than the average lifetime of a room AC (10 years). Therefore, DOE's assumption for the average lifetime of portable ACs may actually be conservative.

We support DOE's proposed certification reporting requirements. In the NOPR, DOE proposes that portable AC certification reports include CEER and SACC, duct configuration, presence of heating function, and primary condensate removal feature.[36] We support these proposed certification reporting requirements, which will provide useful information both to the public and to DOE for use in a future rulemaking.

Thank you for considering these comments.

Sincerely,

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[33] Technical Support Document. pp. 8F-1, 8F-2.
[34] 81 Fed. Reg. 38425.
[35] Final Rule Technical Support Document for Dehumidifiers. Document ID: EERE-2012-BT-STD-0027-0046. p. 8-22.
[36] 81 Fed. Reg. 38450.

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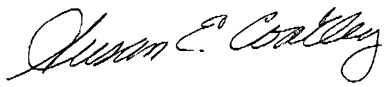

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