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

November 28, 2022

Mr. Jeremy Dommu
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Office, EE-2B
1000 Independence Avenue SW
Washington, DC 20585

RE: Docket Number EERE-2022-BT-STD-0002: Energy Conservation Standards for Fans and Blowers

Dear Mr. Dommu:

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) on behalf of its low-income clients, and the Natural Resources Defense Council (NRDC) on the notice of data availability (NODA) for energy conservation standards for fans and blowers. 87 Fed. Reg. 62038 (October 13, 2022). We appreciate the opportunity to provide input to the Department.

We are pleased that DOE has advanced the fans and blowers standards rulemaking by publishing this NODA regarding potential standards for air circulating fans (ACFs). In the NODA, DOE has provided inputs and a preliminary approach for the engineering analysis, cost modeling, and energy usage estimates of ACFs. While we are generally supportive of DOE's methodology presented in the NODA, we encourage DOE to address several issues. First, we encourage DOE to ensure that the baseline efficiency levels (ELs) represent the least efficient ACFs available. Next, we encourage DOE to consider additional ELs to better represent the range of efficiencies for the ACF models analyzed in the NODA. Finally, we encourage DOE to analyze multi-speed ACFs in subsequent analyses. These considerations as well as comments regarding potential ACF equipment classes are discussed in more detail below.

We encourage DOE to ensure that the baseline efficiency levels are representative of the least efficient ACFs on the market. DOE's analysis presented in the NODA relies on the Bioenvironmental and Structural System (BESS) Laboratory database in estimating baseline ACF efficiencies. DOE used the least efficient products in the BESS database, which utilize permanent split capacitor (PSC) motors, as EL1.[1] DOE then estimated the baseline level (EL0) based on the reduction in efficiency associated with the use of a less efficient split phase motor rather than a PSC motor. We are concerned that this approach may be overestimating the efficiency of a baseline ACF. We understand that fans sent to the BESS lab for testing are generally among the most efficient ACFs on the market; therefore, the least efficient models in the BESS database may not be representative of the least efficient PSC-driven ACFs on the market.

[1]EL1 is defined as the 5th percentile FEI: FEI = 1.70 for the 12" RU and FEI = 0.79 for ACF diameters greater than 20".

Thus, we encourage DOE to ensure their baseline efficiencies are representative of the least efficient ACFs available.

We encourage DOE to consider additional ELs that better represent the range of ACF FEIs presented in the NODA. DOE analyzed four ELs, with EL1, EL2, and EL3 reflecting improved motor efficiency (from split-phase to ECM) and the maximum technologically feasible (max-tech) EL4 level representing an ACF with an ECM and aerodynamic redesign. This approach resulted in a relatively narrow range of FEIs from EL0 to EL3. For example, FEI for the 24" 0.5 hp representative unit (RU) increases by about one-third from EL0 (FEI = 0.73) to EL3 (FEI = 0.98). In comparison, efficiency more than doubles going from EL3 to EL4 (FEI = 2.10). DOE's approach, focusing primarily on improved motor efficiency, appears to be in response to feedback from manufacturers who stated a preference for improving fan efficiency via improved motor efficiency rather than aerodynamic redesign. However, the ELs presented in the NODA do not appear to be representative of the fan efficiency distribution in the BESS database. As shown in Figure 1 (copied from DOE's Fans NODA Engineering Analysis Spreadsheet[2]), the majority of ACFs analyzed in the NODA have FEIs between EL3 and EL4. Importantly, the large range of FEIs in between EL3 and EL4 are for ACFs that presumably all utilize PSC motors.[3] Overall, the broad range of FEIs observed in DOE's analysis of the BESS database fans suggests that the Department's efficiency levels may not be accurately capturing the range of efficiencies available on the market. Thus, we encourage DOE to consider one or more additional ELs between EL3 and EL4 that would better reflect the spread of ACF FEIs in the BESS database.

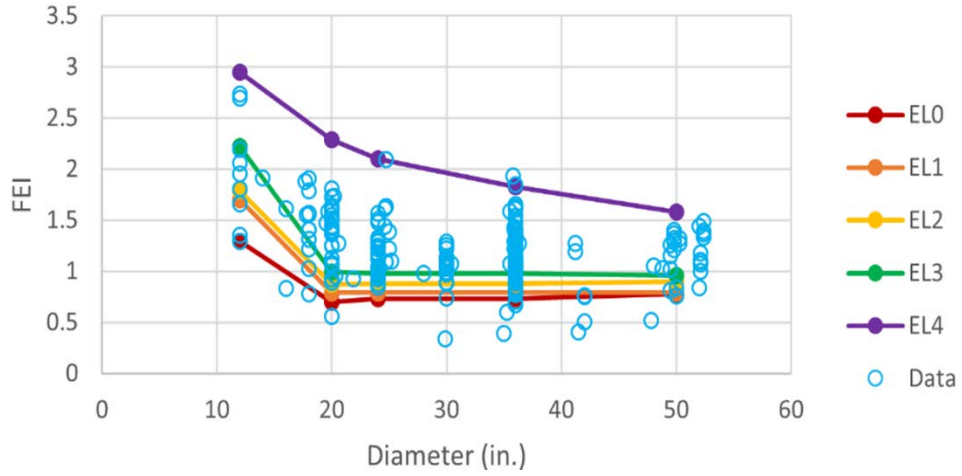

Figure 1: FEI as a function of fan diameter for ACFs in the BESS database (hollow blue circles) and DOE's evaluated ELs (solid circles/lines).

We encourage DOE to analyze multi-speed fans as part of future analyses. DOE discusses in the NODA that the BESS database does not provide performance data for multi-speed fans at all the test speeds proposed in the July 2022 test procedure notice of proposed rulemaking (NOPR). Therefore, DOE evaluated potential efficiency improvements based only on high-speed test data. However, DOE did discuss plans for future analysis of multi-speed fans using the weighted-average FEI approach

[2]Fans NODA Engineering Analysis Spreadsheet, "Efficiency Results by FEI" sheet, EERE-2022-BT-STD-0002-0011. www.regulations.gov/document/EERE-2022-BT-STD-0002-0011

[3]DOE noted that one fan in the database uses an ECM, presumably at max-tech, while the rest use PSC motors.

introduced in the test procedure NOPR.[4] Due to the cubic relationship between fan speed and power, lowering the speed of a fan results in a significant reduction in energy usage, which is captured via the FEI metric. Thus, we encourage DOE to directly analyze multi-speed fans as part of the next stage of the rulemaking.

We do not believe belt-driven ACFs warrant separate equipment classes. In the NODA, DOE did not propose equipment classes for ACFs, but the Department did request comment on whether drive type —belt or direct—may justify separate equipment classes.[5] Per the BESS database, belt-driven fans are common at larger ACF diameters (e.g., 36", 50"), but direct-drive fans are also available in those sizes. We understand that belt-driven fans largely function as a cheaper alternative to more efficient direct-drive fans. Thus, separating belt-driven fans could significantly undermine the potential energy savings for larger diameter ACFs. Overall, we believe the market for belt-driven fans is driven predominately by first cost rather than by performance or utility considerations, and thus belt-driven fans do not warrant separate equipment classes.

We encourage DOE to consider whether different axial ACF types may be combined into a single equipment class. Air circulating fan heads, box fans, air circulating panel fans, and personnel coolers[6] are categories of axial ACFs intended to provide directional airflow. We understand that some of these ACF subcategories are delineated in AMCA 230 primarily for descriptive purposes rather than for regulatory delineation. Further, the California Investor-Owned Utilities (CA IOUs) comments to the February 2022 request for information showed significant overlap of FEI ratings[7] for these four fan types in the BESS database across a broad range of fan diameters.[8] Thus, we encourage DOE to explore whether ACFHs, box fans, air circulating fans, and personnel coolers, or a subset of these fan types, may be considered as a single equipment class.

Thank you for considering these comments.

Sincerely,

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[4] 87 Fed. Reg. 62043.
[5] DOE is also considering whether the presence/absence of a safety guard, presence/absence of a housing, housing design, blade type, number of speeds, and air velocity/throw differences may warrant separate equipment classes.
[6] Personnel coolers are also referred to as cylindrical ACFs, barrel fans, drum fans, and portable coolers.
[7] FEIs were based on similar constants as those used in the NODA.
[8] EERE-2022-BT-STD-0002-0007, pp. 4-5. www.regulations.gov/comment/EERE-2022-BT-STD-0002-0007

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