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

January 3, 2023

Ms. Catherine Rivest
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-2021-BT-STD-0029: Energy Conservation Standards for Consumer Furnace Fans

Dear Ms. Rivest:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), American Council for an Energy-Efficient Economy (ACEEE), National Consumer Law Center (NCLC) on behalf of its low-income clients, and the Natural Resources Defense Council (NRDC) on the preliminary technical support document (PTSD) for energy conservation standards for consumer furnace fans. 87 Fed. Reg. 65687 (November 1, 2022). We appreciate the opportunity to provide input to the Department.

DOE's preliminary analysis shown in the PTSD shows that amended efficiency standards for furnace fans could provide 1.4 quads of full-fuel-cycle energy savings with positive net present value (NPV) savings for consumers.[1] Most of the potential energy savings are based on a 10% reduction in fan energy rating (FER) for the major furnace fan product classes.[2] While we are generally supportive of DOE's approach to the preliminary analysis, we encourage the Department to further investigate the most efficient furnace fans on the market and to analyze an efficiency level (EL) associated with higher efficiency brushless permanent magnet (BPM) motors. Each of these topics are discussed in more detail below.

We encourage DOE to further investigate the most efficient furnace fans currently available on the market. For the major furnace fan product classes, DOE analyzed only one EL above baseline, EL 1, which represents a 10% reduction in FER; EL 1 assumes use of a backwards-inclined impeller. DOE tentatively concluded that previously considered design options, constant-airflow BPM motors and multi-staging, do not significantly reduce furnace fan energy usage.[3] However, models with lower FERs (i.e., more efficient) than EL 1 are available in each of the major furnace fan product classes. For example, Figure 1 plots furnace fan FER (blue dots) versus maximum calculated airflow for unique basic models in the Compliance Certification Database (CCD) for both condensing (left) and non-condensing

[1] Cumulative consumer NPVs are 4.24 billion USD at a 3% discount rate and 1.03 billion at a 7% discount rate. NPVs using both discount rates are positive for all product classes and efficiency levels analyzed.
[2]Non-weatherized, non-condensing gas (NWG-NC); non-weatherized, condensing gas (NWG-C); weatherized, non-condensing gas (WG-NC); and non-weatherized electric furnace/modular blower fan (NWEF/NWMB).
[3]PTSD, pp. 5-5, 5-6. www.regulations.gov/document/EERE-2021-BT-STD-0029-0014

(right) non-weatherized gas furnace fans;[4] the current standard (black line) and EL 1 (green line) are also shown.[5] It is clear from Figure 1 that furnace fans with efficiencies exceeding EL 1 are available across a broad range of airflows. Further, DOE notes in the PTSD that many manufacturers rate their furnace fans conservatively,[6] so we suspect Figure 1 may understate the number of higher efficiency furnace fans available on the market.

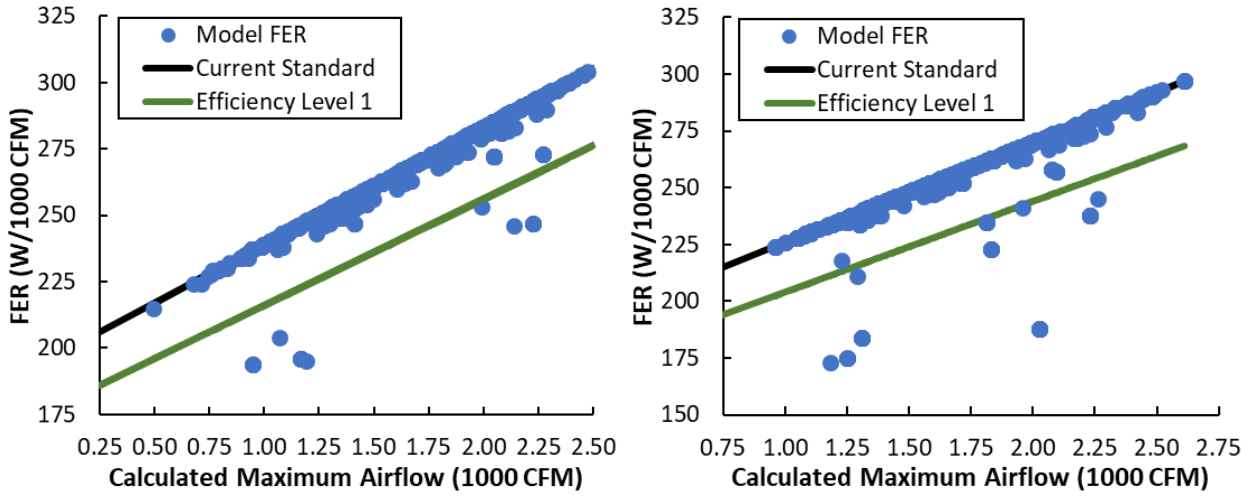

Figure 1: Furnace fan FER (W/1000 CFM) vs. calculated maximum airflow for condensing (left) and non-condensing (right) non-weatherized gas furnace fans. Black and green lines represent the current standard and EL 1, respectively.

Additionally, DOE's engineering analysis provides a detailed look at the design options employed for the models in the CCD.[7] The current standards for both weatherized and non-weatherized non-condensing gas furnace fans were set at a level intended to effectively require use of efficient BPM motors. However, DOE's analysis shows that some non-condensing gas furnace fans utilizing PSC motors can meet the current standards. For example, one currently available furnace/furnace fan model utilizes a PSC motor and is marketed as having a small footprint.[8] DOE should investigate how this model and others are able to meet the current standards with presumably less efficient motors.

Taken together, these results suggest that additional design options that increase efficiency beyond a backwards-inclined impeller are currently available on the market. Airflow path and fan housing improvements represent potential options for improving furnace fan efficiency. In the PTSD, DOE screened out fan housing and airflow path design modifications since these changes could impact the thermal performance of the furnace.[9] While we acknowledge this concern, we note that one of the

[4]Accessed on December 15, 2022. www.regulations.doe.gov/certification-data/CCMS-4-Furnace_Fans.html#q=Product_Group_s%3A%22Furnace%20Fans%22
[5]These two classes represent over two-thirds of total estimated shipments for covered furnace fans.
[6]PTSD, p. 5-5. www.regulations.gov/document/EERE-2021-BT-STD-0029-0014
[7]PTSD, pp. 3-15 to 3-21. www.regulations.gov/document/EERE-2021-BT-STD-0029-0014
[8]store.acpro.com/ac-pro-m-series-packaged-gas-electric-2-5-ton-14-seer-11-5-eer-208-230v-single-phase-single-stage-low-nox-77235
[9]PTSD, p. 4-3. www.regulations.gov/document/EERE-2021-BT-STD-0029-0014

models exceeding EL1 is used in a condensing furnace with an AFUE of 97%;[10] this suggests manufacturers may be able to optimize the furnace fan efficiency without negatively impacting the efficiency of the furnace. Overall, we encourage DOE to continue investigating furnace fan efficiencies and how certain design features in the current market permit furnace fan FER levels below those analyzed in the PTSD.

We encourage DOE to analyze an efficiency level associated with improved BPM motor efficiency. We understand there is a range of BPM motor efficiencies currently on the market. DOE similarly states in the preliminary analysis that there may be a range of BPM motor efficiencies for both constant-torque and constant-airflow BPMs, yet the Department did not analyze improved motor efficiency as a potential design option.[11] We encourage DOE to gather additional information from motor manufacturers to characterize the FER reductions that are achievable with the most efficient BPM motors available on the market and to analyze an EL associated with these higher efficiency BPM motors for the next stage of the rulemaking.

Thank you for considering these comments.

Sincerely,

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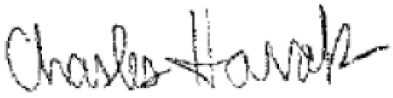

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[10] www.napoleon.com/sites/default/files/hvac_products/9700%20Spec%20sheet.pdf
[11] PTSD, pp. 2-12, 5-5. www.regulations.gov/document/EERE-2021-BT-STD-0029-0014