Appliance Standards Awareness Project
American Council for an Energy-Efficient Economy
National Consumer Law Center
Natural Resources Defense Council
New York State Energy Research and Development Authority
Northwest Energy Efficiency Alliance

February 7, 2022

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

RE: Docket Number EERE-2013-BT-TP-0050: Proposed Rule for Test Procedures for Ceiling Fans

Dear Mr. Dommu:

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, Natural Resources Defense Council (NRDC), New York State Energy Research and Development Authority (NYSERDA), and the Northwest Energy Efficiency Alliance (NEEA) for the supplemental notice of proposed rulemaking (NOPR) for the ceiling fans test procedure. 86 Fed. Reg. 69544 (December 7, 2021). We appreciate the opportunity to provide input to the Department.

We support DOE's overall approach to revising the ceiling fan test procedures highlighted in the supplemental NOPR. Specifically, we support the scope expansion to include belt-driven ceiling fans (BDCFs) and large-diameter ceiling fans (LDCFs) greater than 24 ft. We also support DOE's proposal to add a standby power metric for LDCFs. However, there are several additional issues DOE should address. First, DOE should clarify how proposed testing of single-speed BDCFs is compatible with EPCA requirements. Second, DOE should consider whether an alternative metric to CFM/W would be more appropriate for small-diameter ceiling fans. Finally, we encourage DOE to cover very small-diameter (VSD) ceiling fans that are not considered low-speed small-diameter (LSSD) fans in the ongoing fans and blowers rulemaking. These issues and others are discussed in more detail in the following sections.

We support the scope expansion to include BDCFs and the use of CFEI as the efficiency metric. In the supplemental NOPR, DOE proposed definitions and test procedures for high-speed and large-diameter BDCFs based largely on the existing procedure for LDCFs. We understand that BDCFs are generally less efficient than direct-drive fans and that some models were introduced to the market in response to efficiency standards. Thus, we believe inclusion of BDCFs will provide a level playing field for manufacturers and permit purchasers to make more informed decisions. We also support use of CFEI as the efficiency metric for BDCFs. The supplemental NOPR states that the airflow generated by high-speed and/or large-diameter BDCFs is more like LDCFs, which are rated with CFEI, rather than small-diameter

ceiling fans rated using CFM/W.[1] Given the potentially broad range of airflow generated by these fans and the documented concern with CFM/W ratings for fans with very different airflows,[2] we support using CFEI for all BDCFs.

We support the scope expansion to include LDCFs greater than 24 ft. DOE is proposing to expand the LDCF test procedure scope to include fans with blade spans greater than 24 feet in diameter. As stated in the supplemental NOPR, there is nothing in the AMCA industry test procedure, which DOE's LDCF test procedure is based on, that limits LDCF diameter.[3] The supplemental NOPR also states that AMCA has confirmed that testing facilities are available to accommodate these larger blade spans. Thus, we support the scope expansion for LDCFs with diameters greater than 24 ft.

We support DOE's proposal to add a standby power metric for LDCFs. As DOE explains in the supplemental NOPR, the January 2017 final rule established a CFM/W metric for all ceiling fans which included standby mode energy consumption; however, the Energy Act of 2020 required that LDCFs meet efficiency requirements based on CFEI. Thus, standby energy consumption for LDCFs is no longer captured. However, EPCA requires that amended test procedures incorporate standby mode energy use. Incorporating a standby power metric will provide a more complete representation of overall energy usage for LDCFs. Thus, we support DOE's proposal to include such a standby power metric for LDCFs.

We support DOE's proposal to require that certification reports include all relevant information required to certify products based on the standards established in the 2017 Final Rule.[4] Currently, for a certification report, manufacturers are only required to include the "number of speeds within the ceiling fan controls and a declaration that the manufacturer has incorporated the applicable design requirements."[5] In the 2019 test procedure NOPR for ceiling fans, DOE proposed that additional product-specific information be added to the public certification report.[6] Additionally, DOE proposed to require additional product-specific information that would not be included in the public CCD database for each basic model.[7] We support DOE's efforts to finalize the certification requirements so that product information like blade span, ceiling fan efficiency, and product class are visible to the public. Moreover, we encourage DOE to also publish additional information publicly such as airflow (CFM) and tip speed (ft/min). This additional information will assist stakeholders and consumers in understanding the relative energy efficiency of ceiling fans across a broad range of product characteristics.

DOE should clarify how the proposed testing requirements for single-speed BDCFs interact with EPCA requirements. DOE states in the supplemental NOPR that some BDCFs are advertised as only capable of single-speed operation.[8] For these single-speed fans, DOE proposes that they will be tested at this single speed only (i.e., high-speed). However, one of the EPCA requirements states that all ceiling fans

[1]86 Fed. Reg. 69552, 69553.
[2]Introducing Ceiling Fan Energy Index (CFEI) and Changes to the U.S. Regulation for Large Diameter Ceiling Fans, https://www.amca.org/assets/resources/public/assets/uploads/Introducing_Ceiling_Fan_Energy_Index_2.pdf
[3]86 Fed. Reg. 69551.
[4]82 Fed Reg. 6826 (March 21, 2017).
[5]10 CFR § 429.32(b).
[6]blade span (in); ceiling fan efficiency (CFM/W); for small-diameter ceiling fans, a declaration whether the fan is a multi-head ceiling fan; for LSSD ceiling fans, a declaration whether the ceiling fan is a multi-mount ceiling fan.
[7]For small-diameter ceiling fans: blade edge thickness (in), airflow (CFM) at high-speed, and blade RPM at high-speed; 2) for LSSD ceiling fans: the distance (in) between the ceiling and the lowest point on the fan blades.
[8]86 Fed Reg. 69553.

manufactured after January 1, 2007 are required to have adjustable speed controls (e.g., either more than 1 speed or variable speed).[9] Thus, DOE should clarify how testing of these single-speed BDCFs interacts with the EPCA requirements.

We encourage DOE to consider a metric other than CFM/W that would account for fans of the same diameter that may deliver very different airflows. Figure 1 (left) shows the efficiency of standard LSSD ceiling fans in the Energy Star database[10] along with the DOE minimum standard and the minimum Energy Star level. It is apparent that there is a significant range of CFM/W ratings achievable at the same fan diameter. For example, Energy Star rated 60-inch diameter LSSD ceiling fans have efficiency ratings ranging from 161 to 400 CFM/W. The minimum DOE efficiency levels, in CFM/W, for small-diameter ceiling fans are a function of diameter only and do not reflect the cubic relationship between airflow and power. Thus, higher airflow fans generally have more difficulty meeting CFM/W standards compared to fans of the same diameter that provide lower airflow. The Energy Star minimum level assumes the use of more efficient permanent magnet motors. DOE should thus investigate the extent to which the large range of CFM/W ratings discussed herein are a product of airflow differences rather than use of technologies aimed at reducing power consumption.

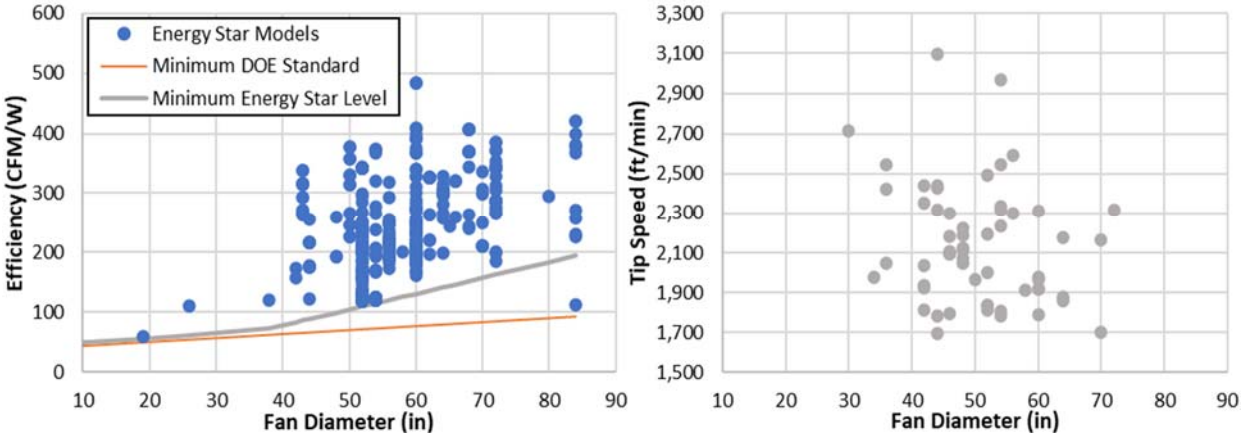


Figure 1: left) Energy Star standard LSSD model efficiency (blue dots), the DOE minimum standard (orange line), and the Energy Star minimum level (gray line) vs. fan diameter (in); right) LSSD tip speed (ft/min, gray dots) vs. fan diameter (in) for a sample of Hunter LSSDs.

Further, Figure 1 (right) shows maximum tip speed data for LSSD fans from a single manufacturer (Hunter) that was submitted by AMCA in comments to the 2019 ceiling fan test procedure NOPR.[11] This data shows significant variation in tip speed for fans of the same diameter. For example, tip speeds for 44-inch diameter fans varied from about 1700 to 3100 ft/min. Given that these models are from the same manufacturer, we suspect that there may be even more variation in the overall market. Fan tip speed is a major variable for airflow, so these results suggest airflow differences for LSSD fans may be large. Differences in airflow for various fan models was especially problematic for LDCFs, which led to the introduction of CFEI.[12] CFEI was developed in part to ensure that manufacturers cannot comply with

[9]42 U.S. Code § 6295(ff).
[10]Accessed on 1/13/22. data.energystar.gov/Active-Specifications/ENERGY-STAR-Certified-Ceiling-Fans/2te3-nmxp
[11]EERE-2013-BT-TP-0050-0033, www.regulations.gov/comment/EERE-2013-BT-TP-0050-0033
[12]Introducing Ceiling Fan Energy Index (CFEI) and Changes to the U.S. Regulation for Large Diameter Ceiling Fans, https://www.amca.org/assets/resources/public/assets/uploads/Introducing_Ceiling_Fan_Energy_Index_2.pdf

standards simply by reducing fan speed, while at the same time removing the unintentional barrier to compliance for high-speed fans. Thus, we believe DOE should investigate whether an alternative metric similar to CFEI would provide similar benefits for small diameter ceiling fans.

We encourage DOE to cover VSD ceiling fans that are not included in the LSSD category in the ongoing fans and blowers rulemaking. As discussed in the supplemental NOPR, the physical characteristics of these higher speed VSD ceiling fans are more akin to air circulating fan heads (ACFHs).[13] In particular, these VSD fans have a diameter-to-maximum operating speed ratio less than 0.06 and thus would be excluded from the scope of ceiling fans under the proposed definition. We thus encourage DOE to cover these VSD fans as air circulating fan heads as part of the fans and blowers rulemaking.

We encourage DOE to further clarify the ceiling fan definition. Consistent with the current DOE test procedure and the EPCA definition, the supplemental NOPR defines a ceiling fan as "a nonportable device that is suspended from a ceiling for circulating air via the rotation of fan blades." Additionally, the supplemental NOPR further defines "circulating air" to mean "the discharge of air in an upward or downward direction with the air returning to the intake side of the fan. A ceiling fan that has a ratio of fan blade span (in inches) to maximum rotation rate (in revolutions per minute) greater than 0.06 provides circulating air." While we understand that DOE's intention is to explain the distinction between ceiling fans and ACFHs, we encourage DOE to further clarify this definition. In particular, we are concerned that ceiling fans which offer alternative mounting options could be excluded based on the "suspended from a ceiling" criteria, a concern discussed in the supplemental NOPR.[14] Thus, we suggest DOE clarify "suspended from a ceiling" to avoid a potential loophole. For example, "suspended from a ceiling" could be interpreted or further defined as "packaged with hardware for such an installation" and/or "marketed for such an installation."

We encourage DOE to better understand whether changes to both the stability criteria and "low-speed" definition are needed. In the supplemental NOPR, DOE proposes to define "low-speed" as the "lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors per individual axis are measuring less than 40 feet per minute." In contrast, the current low-speed measurement for LSSD fans specifies testing at the lowest available speed. DOE notes in the supplemental NOPR that this change will ensure the "low-speed" test will be representative of a speed that can circulate air while also reducing test burden by making it easier for laboratories to meet air velocity stability criteria. As part of the previous NOPR,[15] DOE proposed to increase the stability criteria for average air velocity measurements for LSSD fans from 5% or 2 CFM, whichever is greater, to 10% or 2 CFM, whichever is greater. Since increasing the "low-speed" definition will help address the difficulty in meeting stability criteria at low-speeds, it is unclear whether the air velocity measurement stability criteria also need to be increased.

We encourage DOE to explore methods of incorporating occupancy sensors and other "smart" features that can save energy into the ceiling fan test procedures. The proposed ceiling fan test procedures capture both active and standby mode energy consumption. However, ceiling fans provide little utility if the space in which the fan is operating in is unoccupied. Thus, use of occupancy sensors and other smart features have the potential to provide significant energy savings (e.g., by turning fans

[13] 86 Fed. Reg. 69550.
[14] 86 Red. Reg. 69548, 69549.
[15] 84 Fed. Reg. 51446 (September 30, 2019).

off when the space is not occupied). Currently, there is no additional provision (e.g., an energy usage credit) for fans using an occupancy sensor or any other smart feature aimed at reducing energy consumption. Thus, we encourage DOE to consider methods for incorporating the energy savings potential of these technologies into the test procedure and fan efficiency ratings.

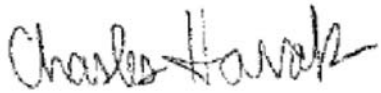
We encourage DOE to consider requiring that ceiling fan accessories and non-airflow related features be tested in their "as-shipped" configuration. The supplemental NOPR proposes to amend language in Appendix U specifying more broadly that any additional accessories or features that do not relate to the fan's ability to circulate air by fan blade rotation shall not be energized during or shall be set to their lowest energy-consuming mode. While we understand the intention of this proposal is to include ceiling fan energy consumption only as it relates to air circulation, we are concerned this amendment could obscure the potentially significant energy consumption of these accessories. A requirement to test accessories "as-shipped" would encourage manufacturers to ship these additional features "off"; this would help ensure that these additional features only consume power if they are turned on by the user (e.g., to provide some utility beyond air circulation). DOE should thus consider such a requirement as it relates to ceiling fan accessories.

Thank you for considering these comments.

Sincerely,

Jeremy Dunklin, PhD
Technical Advocacy Associate
Appliance Standards Awareness Project

Amber Wood
Director, Buildings Program
American Council for an Energy-Efficient Economy



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

Joe Vukovich
Energy Efficiency Advocate
Natural Resources Defense Council

Chris Corcoran
Team Lead – Codes, Products, & Standards
New York State Energy Research and Development Authority (NYSERDA)

Nicole Dunbar
Product Manager
Northwest Energy Efficiency Alliance