Appliance Standards Awareness Project
American Council for an Energy-Efficient Economy
Natural Resources Defense Council
Northwest Energy Efficiency Alliance

June 21, 2022

Dr. Stephanie Johnson
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-2017-BT-TP-0010: Test Procedures for Walk-in Coolers and Walk-in Freezers

Dear Dr. Johnson:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), American Council for an Energy-Efficient Economy (ACEEE), Natural Resources Defense Council (NRDC), and the Northwest Energy Efficiency Alliance (NEEA) on the notice of proposed rulemaking (NOPR) for walk-in cooler and walk-in freezer test procedures. 87 Fed. Reg. 23920 (April 21, 2022). We appreciate the opportunity to provide input to the Department.

Overall, we are supportive of many of DOE's proposed changes to the walk-ins test procedure as presented in the NOPR. In particular, we support measuring off-cycle power consumption using AHRI 1250-2020. We also support the proposal to allow separate ratings of stand-alone variable-capacity condensing units, the proposals regarding "high-temperature" refrigeration systems, and the addition of specific percent time off (PTO) values for motorized door openers. However, there are several issues DOE should address. First, we encourage DOE to include dedicated CO_2 condensing units within the test procedure scope. Second, we encourage DOE to develop a test procedure for liquid-cooled refrigeration systems. Third, we encourage DOE to establish more representative test conditions for "high-temperature" walk-in freezers. Fourth, we encourage DOE to provide an option for direct measurement of door component electrical power and to capture air-infiltration for walk-in doors. Finally, we encourage DOE to consider including refrigerated shipping containers within the scope of the walk-ins test procedure. Each of these considerations and other issues are discussed in more detail below.

We support adopting the procedure for measuring off-cycle power consumption in AHRI 1250-2020. AHRI 1250-2020 updated off-cycle testing such that the unit's total input wattage is measured during the off cycle, rather than just the input wattage of the unit cooler fan. This change accounts for ancillary power from components such as crankcase heaters and delivers more representative off-cycle power results. Inclusion of power consumption from ancillary components is also consistent with the 2015 ASRAC working group recommendation.[1] The NOPR discusses that DOE testing found that the additional energy use measured using the off-cycle power measurements in AHRI 1250-2020 can be up to 60%

[1]EERE-2015-BT-STD-0016-0056, p. 3. www.regulations.gov/document/EERE-2015-BT-STD-0016-0056

greater than the off-cycle power measurements in the current test procedure.[2] Thus, we expect that use of AHRI 1250-2020 to measure off-cycle power consumption will result in more representative overall AWEF ratings.

We support DOE's proposed amendments that would allow for separate ratings of stand-alone variable-capacity condensing units. In contrast to single-speed compressors that cycle on and off in response to a load, variable-speed or variable-capacity units can reduce speed and output to match the load; this can result in significant energy savings versus conventional single-speed compressors. As DOE describes in the NOPR, variable-capacity condensing units can currently only be rated as matched pairs (with a unit cooler) since there is no current industry or DOE test method to rate stand-alone variable-capacity condensing units. DOE further noted that the majority of walk-in equipment certified in the dedicated condensing class were certified as dedicated condensing units tested and rated alone rather than matched pairs.[3] The ASRAC working group therefore recommended that DOE amend the test procedure to include a method to separately rate variable-capacity condensing units. DOE has added test procedures and conditions for variable-, two-, and multiple-capacity dedicated condensing units as part of the NOPR that specify how parameters representing the unit cooler would change at part-load compared to full-load. We support DOE's proposal to measure performance at the minimum, intermediate, and maximum capacities of variable-capacity condensing units.[4] We expect the market share of variable-capacity dedicated condensing units to grow, and allowing for separate ratings of stand-alone variable-capacity condensing units may help facilitate their market adoption.

We support DOE's proposals regarding "high-temperature" refrigeration systems. DOE has granted test procedure waivers to multiple manufacturers for models marketed as wine cellar refrigeration systems. These walk-ins are intended to operate at higher temperatures than typical refrigeration systems and may be incapable of testing at the default test conditions (e.g., a 35°F walk-in storage temperature). Thus, DOE has proposed to define walk-ins designed to operate at cooling temperatures above 45°F as employing a ''high-temperature refrigeration system'' and has developed unique test parameters associated with these high-temperature walk-ins.[5] We support the approach of providing a consistent, representative test procedure for high-temperature refrigeration systems.

We support adding specific PTO values for motorized door openers. DOE's current test procedure includes PTO values for door components including lights and anti-sweat heaters. However, there are no specific PTO values for motorized door openers, which fall under the category of "all other electricity consuming devices" and are assigned a PTO of either 0% or 25%. Hence, DOE has granted several manufacturer test procedure waivers for motorized door openers, allowing use of higher PTO values (92-97%).[6] We support DOE's proposal to establish a standard PTO value for motorized door openers, which will provide similar treatment in comparison to other door components and eliminate the need for ongoing test procedure waivers.

We encourage DOE to include dedicated CO_2 condensing units within the scope of the test procedure. In the NOPR, DOE is proposing test procedures for walk-ins that use CO_2 as a refrigerant. While we

[2]87 Fed. Reg. 23954.
[3]87 Fed. Reg. 23962.
[4]87 Fed. Reg. 24007.
[5]87 Fed. Reg. 23930, 23952.
[6]87 Fed. Reg. 23941.

support inclusion of CO_2 refrigerant systems, DOE's proposed test procedure applies only to single-packaged dedicated systems and unit coolers, thus excluding dedicated CO_2 condensing units. DOE states in the NOPR that they were not aware of any CO_2 dedicated condensing units available and thus adopting a test procedure for them was unwarranted.[7] However, we understand that dedicated condensing units using CO_2 as the refrigerant are now available from multiple manufacturers.[8] We thus encourage DOE to include dedicated CO_2 condensing units within the test procedure scope.

We continue to encourage DOE to develop a test procedure for liquid-cooled refrigeration systems. DOE explains in the NOPR that DOE has tentatively determined that liquid-cooled refrigeration systems are within the scope of DOE's coverage for walk-ins, but the Department is not proposing a test procedure for these units.[9] Liquid-cooled condensing units are readily available from walk-in refrigeration system manufacturers in a broad range of capacities.[10] In comments to the 2021 test procedures RFI,[11] Daikin suggested EN 17432 as a potential test method for liquid-cooled systems. While the NOPR discusses that liquid-cooled systems represent a small portion of the market,[12] we understand that these systems are more efficient than typical air-cooled units and are growing in market share. Thus, adopting test methods for liquid-cooled condensing units would provide purchasers comparable efficiency ratings regardless of the cooling type and could promote adoption of these efficient products.

We encourage DOE to establish a more representative standardized rating temperature for "high-temperature" walk-in freezers. Currently, walk-in freezers are tested at a storage temperature of -10 °F. However, DOE discusses "high-temperature" walk-in freezers in the NOPR which have a storage temperature range of 10 °F to 32 °F. These units are often refrigerated with medium-temperature condensing units rather than the low-temperature condensing units used in typical walk-in freezers. In the 2021 test procedures RFI, DOE requested comment on three potential approaches for addressing high-temperature freezer walk-ins.[13] In our written comments to the RFI,[14] we supported establishing a new product class for low-temperature refrigeration systems for high-temperature freezers along with uniform test conditions (i.e., a storage temperature between 10 °F and 32 °F, the third option discussed in the NOPR).[15] While DOE acknowledges that testing high-temperature freezer refrigeration systems at a temperature less than 35 °F would be more representative of their energy use,[16] DOE nonetheless elected to propose that high-temperature freezers be tested at 35 °F, consistent with walk-in refrigeration systems. We are concerned that DOE's proposed approach may not provide representative ratings and we thus encourage the Department to further consider testing high-temperature freezers at a lower, more representative temperature.

[7] 87 Fed. Reg. 23951, 23952.
[8] See, for example: www.hillphoenix.com/product/co2one-single-condensing-unit/; natref.carel.com/condensing-unit; www.scmfrigo.com/en/products/co2-condensing-unit/; www.rivacold.com/ww/en/condensing-units-with-housing; climate.emerson.com/en-gb/shop/1/copeland-eu-copeland-co2-refrigeration-units-en-gb
[9] 87 Fed. Reg. 23924.
[10] See, for example: www.airdyne.com/freezertable.html; russell.htpg.com/product/Next-Gen-WC-Series
[11] EERE-2017-BT-TP-0010-0019, p. 1. www.regulations.gov/comment/EERE-2017-BT-TP-0010-0019
[12] 87 Fed. Reg. 23927.
[13] 86 Fed. Reg. 32332, 32349 (June 17, 2021).
[14] EERE-2017-BT-TP-0010-0013, p. 3. www.regulations.gov/comment/EERE-2017-BT-TP-0010-0013
[15] 87 Fed. Reg. 23960.
[16] 87 Fed. Reg. 23961.

We continue to support an option for direct measurement of door component electrical power. As explained in the NOPR**,** calculation of energy consumption for electricity-consuming door components is based on the component's rated power. However, DOE noted that some manufacturers were using a component's rated output power rather than input power for this determination.[17] Moreover, DOE discussed that calculating a door's total energy consumption may be challenging when a test facility does not have in-depth knowledge of the electrical characteristics of the door components. While we support DOE's proposed change specifying the door component power as the input power rating of the component, we continue to support direct measurement of power consumed by door electrical components. We believe that it makes sense to add a direct measurement of door component electrical power into the test procedure both as an option for manufacturers wishing to make direct measurements as well as for DOE (or third-party) testing.

We continue to encourage DOE to incorporate a measurement of air infiltration for walk-in doors. DOE explained in the 2021 test procedures RFI that technologies such as fast-acting doors and air curtains can reduce air infiltration.[18] However, the current test procedure does not capture the impact of air infiltration, and thus does not capture the energy-saving benefits of technologies that can reduce it. In the NOPR, DOE is not proposing to include measurement of air infiltration in the walk-ins test procedure. We continue to encourage DOE to incorporate measurement of air infiltration in the test procedure for walk-in doors, which would improve representativeness and encourage the development and deployment of technologies that can save energy by reducing air infiltration.

We continue to encourage DOE to investigate appropriate methods to capture the overall thermal transmittance of walk-in panels. The NOPR explains that while the April 2011 walk-ins test procedure final rule included a measurement of the overall thermal transmittance of walk-in panels, DOE removed this portion of the test procedure after receiving comments about potential testing lab challenges for conducting the thermal transmittance test.[19] Thus, panels are treated as single thermal components and rated based on their conductance; however, concerns regarding the impact of framing materials and fixtures on overall performance remain. We believe DOE's proposals to reference NFRC 102 rather than NFRC 100 will result in more representative estimates of panel thermal transmittance. However, we encourage DOE to continue investigating methods that would further improve representativeness and capture the impact of door designs that can reduce thermal transmittance beyond insulation improvements (e.g., framing materials, fixtures, etc.).

We encourage DOE to consider including refrigerated shipping containers within the scope of the walk-ins test procedure. A "walk-in cooler and walk-in freezer" is defined as "an enclosed storage space refrigerated to temperatures, respectively, above, and at or below 32 °F, that can be walked into, and has a total chilled storage area of less than 3,000 square feet."[20] Many refrigerated shipping containers, known as "reefers", would appear to fall within the scope of this definition. A recent European study estimated that the EU stock of reefers consumed 17.2 TWh of site electricity in 2020, which will increase

[17] 87 Fed. Reg. 23940.
[18] 86 Fed. Reg. 3233232340 (June 17, 2021).
[19] 87 Fed. Reg. 23946.
[20] 10 CFR § 431.302.

to 28.2 TWh by 2030.[21] The study estimated potential source electricity savings of 11 TWh/yr, equivalent to about 1 quad over a 30 year period.[22] While details for the US market are less clear, we would expect a comparable number of units and overall energy usage as the similarly-sized EU market. Furthermore, many reefer components are already regulated in Europe, so energy savings in the U.S. could be greater. We therefore encourage DOE to consider including refrigerated shipping containers within the scope of the walk-ins test procedure.

Thank you for considering these comments.

Sincerely,

Jeremy Dunklin, PhD
Technical Advocacy Associate
Appliance Standards Awareness Project

Rohini Srivastava, Ph.D.
Senior Researcher, Buildings Program
American Council for an Energy-Efficient Economy

Joe Vukovich
Energy Efficiency Advocate
Natural Resources Defense Council

Blake Ringeisen
Sr. Engineer, Codes and Standards
Northwest Energy Efficiency Alliance

[21]Table 2-18, p. 109. C.A. Lundsgaard et al. Ecodesign Preparatory study on Refrigerated Containers, 2020. circabc.europa.eu/d/a/workspace/SpacesStore/8d75ce4c-4ff9-4a36-b059-17826a763d61/Refrigerated%20Containers%20Prep%20Study_Task%201%20-%202%20and%20alternative%20policy%20options_report%20_2020-06_v1.1%20FINAL.pdf

[22]Estimated by multiplying 2030 savings (11 TWh/yr) by 30 years and then converting to quads (1 quad = 293.1 TWh). We note that the primary energy conversion factor (3.3) used in the EU study is similar to those used in the recent pool heaters standards NOPR, which are about 2.7.