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

August 16, 2021

Dr. Stephanie Johnson
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–2017–BT–STD–0009/RIN 1904-AD79: Request for Information for Energy Conservation Standards for Walk-In Coolers and Freezers

Dear Dr. Johnson:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), American Council for an Energy-Efficient Economy (ACEEE), and Natural Resources Defense Council (NRDC) on the request for information (RFI) for energy conservation standards for walk-in coolers and freezers. 86 Fed. Reg. 37687 (July 16, 2021). We appreciate the opportunity to provide input to the Department.

Based on available models certified to DOE, there appears to be significant potential to strengthen the energy conservation standards for walk-in coolers and freezers. In evaluating potential amended standards, we encourage DOE to re-evaluate the structure of the standards for refrigeration systems to ensure that the standards appropriately reflect the relationship between efficiency and capacity. We also encourage DOE to evaluate potential standards for display panels and to consider a range of technology options not included in the last rulemaking such as vacuum-insulated glass packs, multiple- and variable-speed compressors, and alternative refrigerants. Finally, we encourage DOE to investigate whether the methods in AHRI 1250-2020 for adaptive defrost and hot gas defrost would provide a reasonable basis for including these defrost technologies in the analysis of potential amended standards and in demonstrating compliance with any future standards.

There appears to be significant potential to strengthen the energy conservation standards for walk-in coolers and freezers. For walk-in refrigeration systems, doors, and panels, there are models certified to DOE that are significantly more efficient than the minimum standards.[1] For example, as shown in Figures 1 and 2 below for dedicated condensing systems used outdoors, the most efficient medium-temperature system has an AWEF that is 44% higher than a unit just meeting the current standards, while the AWEFs of the most efficient low-temperature systems are more than twice as high as those of units just meeting the current standards. Similarly, there are many models of dedicated condensing systems used indoors and both medium- and low-temperature unit coolers that significantly exceed the minimum AWEF values.

[1] Based on models in the DOE Compliance Certification Database as of August 5, 2021.

Figure 1. Dedicated condensing systems, medium temperature, outdoor

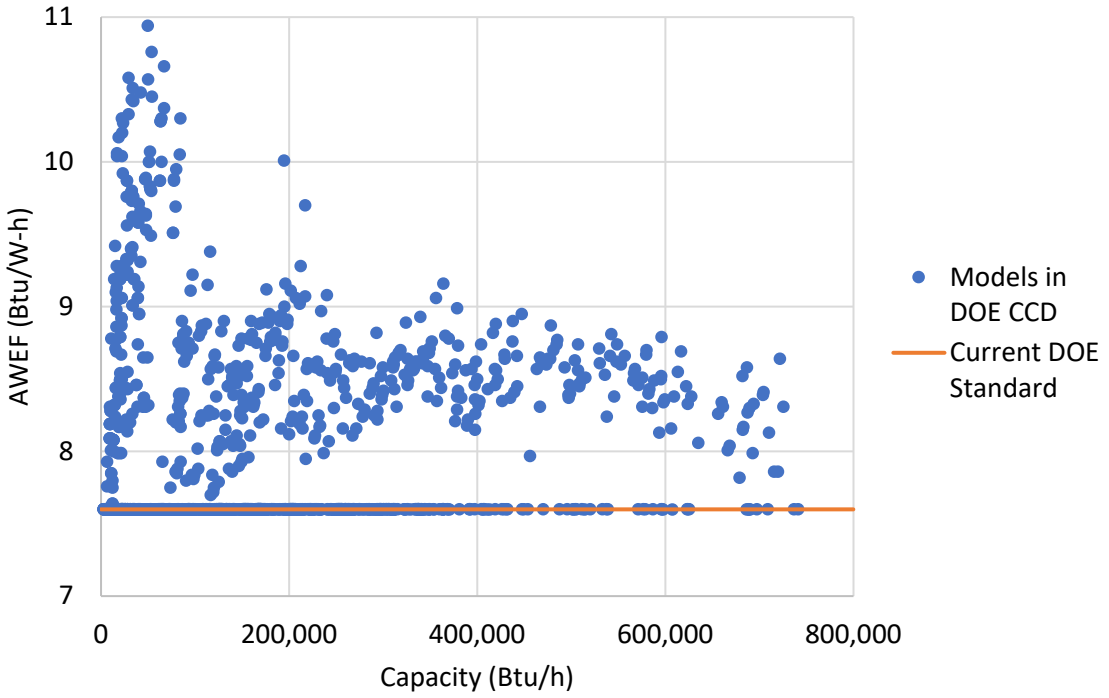
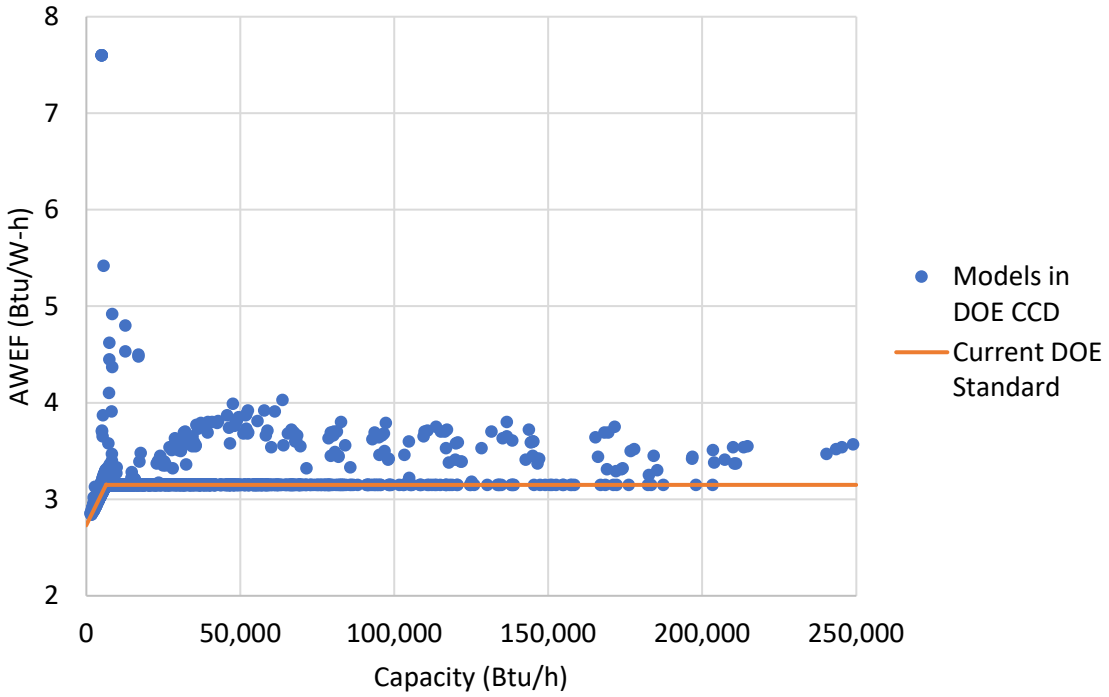


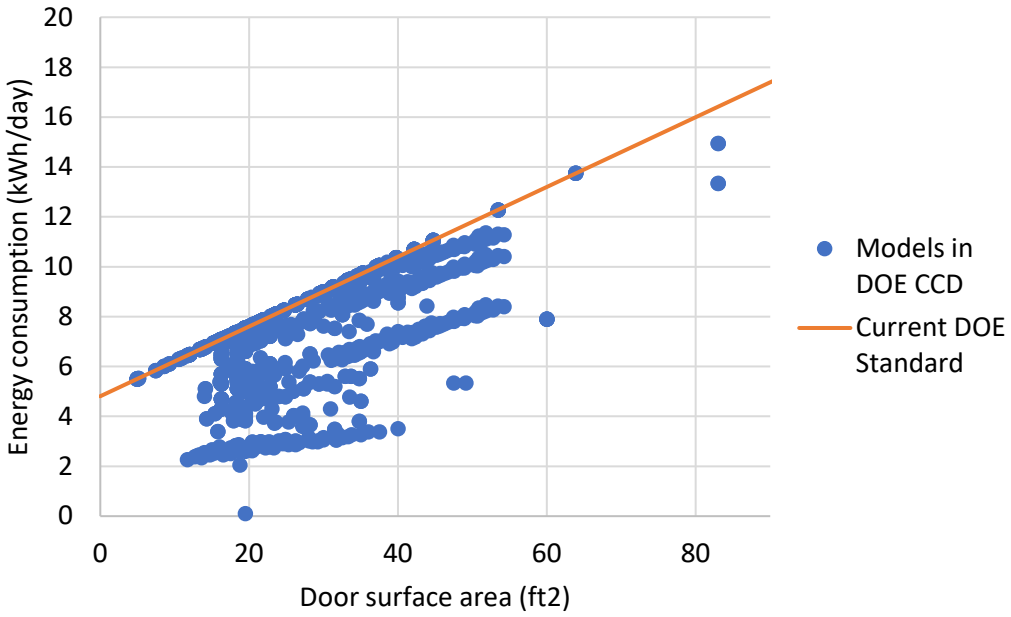
Figure 2. Dedicated condensing systems, low temperature, outdoor



For walk-in doors, there are models in each of the equipment classes that consume significantly less energy than models just meeting the current standards. For example, as shown in Figure 3

below, there are many models of low-temperature passage doors that consume only roughly one-third of the energy of models just meeting the current standards.

Figure 3. Passage doors, low temperature



Finally, for panels, as shown in Table 1 below, while the current standards require a minimum R-value of between 25 and 32 depending on the type of panel, the highest rated R-values in the DOE certification database are between 46 and 49 depending on the panel type.

Table 1. Maximum R-values of walk-in panels certified to DOE compared to the current standards

Equipment class	Current DOE standard (R-value)	Maximum R-value in DOE CCD
Wall or ceiling panels for walk-in coolers	25	46
Wall or ceiling panels for walk-in freezers	32	49
Floor panels for walk-in freezers	28	48

We encourage DOE to re-evaluate the structure of the standards for walk-in refrigeration equipment. For medium-temperature walk-in refrigeration equipment (both dedicated condensing systems and unit coolers), there is a single AWEF standard for each equipment class that is independent of capacity (e.g., for medium-temperature dedicated condensing systems used outdoors as shown in Figure 1 above). For low-temperature walk-in refrigeration systems, there is a single AWEF standard above a certain capacity for each equipment class, with less-stringent standards for the smallest capacities (e.g., for low-temperature dedicated condensing systems used outdoors as shown in Figure 2 above). However, based on data in the DOE certification database, for most equipment classes the most efficient models are at low capacities. For example, as shown in Figure 2 above, for low-temperature dedicated condensing systems used outdoors, the capacity breakpoint in the standard is at 6,500 Btu/h (above 6,500 Btu/h the standard is an AWEF of 3.15); the most efficient unit has a rated AWEF of 7.6 and a capacity of 4,975

Btu/h. We note that the rated efficiencies of available models may not necessarily reflect technological potential. Nevertheless, we encourage DOE to re-evaluate the structure of the standards for walk-in refrigeration equipment to ensure that the standards appropriately reflect the relationship between efficiency and capacity.

We encourage DOE to evaluate potential standards for display panels. DOE explains in the RFI that while there is a DOE test procedure for calculating total daily energy consumption for display panels, there are currently no energy conservation standards for this equipment.[2] DOE also notes that, similar to display doors, some models of display panels contain anti-sweat heaters,[3] which can result in significant energy consumption. Based on DOE's analysis for the June 2014 final rule, the current standards for display doors will achieve large energy savings (0.6 quads over 30 years of sales),[4] which suggests that standards for display panels may also have the potential to achieve significant savings. We therefore encourage DOE to evaluate potential standards for display panels.

We encourage DOE to consider additional technology options that were not considered in the last rulemaking. The RFI lists the technology options that were considered in the June 2014 and July 2017 final rules along with potential new technology options.[5] In addition to the technology options considered in the June 2014 and July 2017 final rules, we encourage DOE to consider additional technology options including the following:

- Vacuum-insulated glass packs: The RFI notes that DOE has identified two manufacturers that produce display doors with vacuum-insulated glass packs.[6] We understand that this technology can allow for eliminating the use of anti-sweat heaters, which can result in significant energy savings.[7]
- Multiple- and variable-capacity compressors: As described in the RFI, DOE screened out multiple- and variable-capacity compressors in the last rulemaking since the analysis was based on stand-alone dedicated condensing units and the current test procedure does not allow for rating stand-alone variable-capacity dedicated condensing units.[8] In our comments on the June 2021 test procedures RFI, we encouraged DOE to investigate test methods that would allow for separate ratings of stand-alone variable-capacity condensing units and better reflect the real-world efficiency of all condensing units, including the impacts of cycling losses.[9] Such an amended test procedure would allow DOE to evaluate multiple- and variable-capacity compressors as a technology option.
- Compressor type: The RFI explains that while DOE evaluated higher-efficiency compressors in the last rulemaking, in most cases the Department did not consider compressor type (e.g., semi-hermetic vs. scroll) as a technology option.[10] The RFI further explains that DOE found examples

[2] 86 Fed. Reg. 37690.
[3] Ibid.
[4] 79 Fed. Reg. 32110 (June 3, 2014). Table V.32. DOE adopted TSL 2. "DD.M" and "DD.L" are the equipment classes for display doors.
[5] 86 Fed. Reg. 37694-97. Tables II.6, II.7, II.8, II.12, and II.13.
[6] 86. Fed. Reg. 37695.
[7] See, for example: https://www.regulations.gov/document/EERE-2017-BT-STD-0009-0008.
[8] 86 Fed. Reg. 37697.
[9] https://www.regulations.gov/comment/EERE-2017-BT-TP-0010-0013.
[10] 86 Fed. Reg. 37697.

of dedicated condensing units with semi-hermetic compressors with higher rated AWEFs than similar units with scroll compressors.

- Crankcase heater controls: The methods in AHRI 1250-2020 for measuring off-cycle power consumption capture the power consumption of any crankcase heaters. The RFI notes that DOE has found through its testing that some crankcase heaters are energized 100% of the time when the compressor is operating, without any demand-based controls.[11] The RFI further notes that for central air conditioners and heat pumps, there are crankcase heaters with control systems such as thermostatically-controlled crankcase heaters and self-regulating crankcase heaters.[12] These control systems have the potential to provide significant reductions in off-cycle power consumption for walk-in coolers and freezers.
- Improved thermal insulation and air sealing: The RFI explains that due to the construction of single-package refrigeration systems, where the entire refrigeration system is outside the refrigerated space, single-package refrigeration systems may experience additional thermal losses compared to split systems.[13] The RFI also notes that improved thermal insulation may reduce conduction losses, and improved air sealing may reduce air infiltration.[14]
- Alternative refrigerants, including hydrocarbons: As DOE notes in the RFI, some refrigerants provide efficiency advantages relative to others.[15] We support DOE's investigation of non-traditional refrigerants, such as hydrocarbons, in addition to low-GWP refrigerants. We understand that single-package refrigeration systems using propane are available in the U.S.[16]

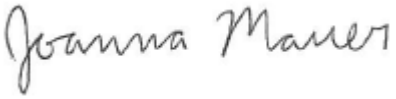
We encourage DOE to evaluate the potential to include adaptive defrost and/or hot gas defrost in the analysis and in demonstrating compliance with any future standards. As DOE describes in the RFI, for refrigeration systems with adaptive defrost, manufacturers cannot take credit for using adaptive defrost for purposes of demonstrating compliance with the current standards, but they may voluntarily make representations that include the benefit of adaptive defrost.[17] Refrigeration systems with hot gas defrost are currently treated as if they had electric defrost. We understand that AHRI 1250-2020 includes a calculation method for accounting for hot gas defrost thermal load and energy use. AHRI 1250-2020 also includes challenge tests for both adaptive defrost and hot gas defrost.

We understand that the ASHRAE 210P committee is investigating how to measure frost formation on a coil, which could potentially lead to the development of a test method to measure the energy consumption associated with defrost irrespective of defrost method. In the interim, we encourage DOE to investigate whether the combination of the calculation methods in AHRI 1250-2020 and the challenge tests would provide a reasonable basis for including adaptive defrost and/or hot gas defrost in the analysis of potential amended standards and in demonstrating compliance with any future standards.

Thank you for considering these comments.

[11] 86 Fed. Reg. 37698.
[12] 86 Fed. Reg. 37697-98.
[13] 86 Fed. Reg. 37691.
[14] 86 Fed. Reg. 37698.
[15] Ibid.
[16] http://hydrocarbons21.com/articles/8863/rivacold_bringing_r290_walk_in_unit_to_u_s
[17] 86 Fed. Reg. 37699.

Sincerely,



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