

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

August 30, 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–0007/RIN 1904-AD82: Request for Information for Energy Conservation Standards for Commercial Refrigerators, Freezers, and Refrigerator-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 Resource Defense Council (NRDC) on the request for information (RFI) for energy conservation standards for commercial refrigerators, freezers, and refrigerator-freezers (“commercial refrigeration equipment”). 86 Fed. Reg. 37708 (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 existing equipment classes of commercial refrigeration equipment. DOE may also be able to achieve large additional savings by establishing standards for new equipment categories such as refrigerated preparation tables and chef bases. Given the large energy savings associated with installing doors on open cases, we encourage DOE to merge the existing equipment classes for refrigerated display cases with and without doors since we do not believe that open cases provide a unique utility. In evaluating potential amended standards, we encourage DOE to consider technology options not included in the last rulemaking such as multiple- and variable-speed compressors and alternative refrigerants and blowing agents. Finally, we support DOE’s efforts to attempt to incorporate price trends for certain design options.

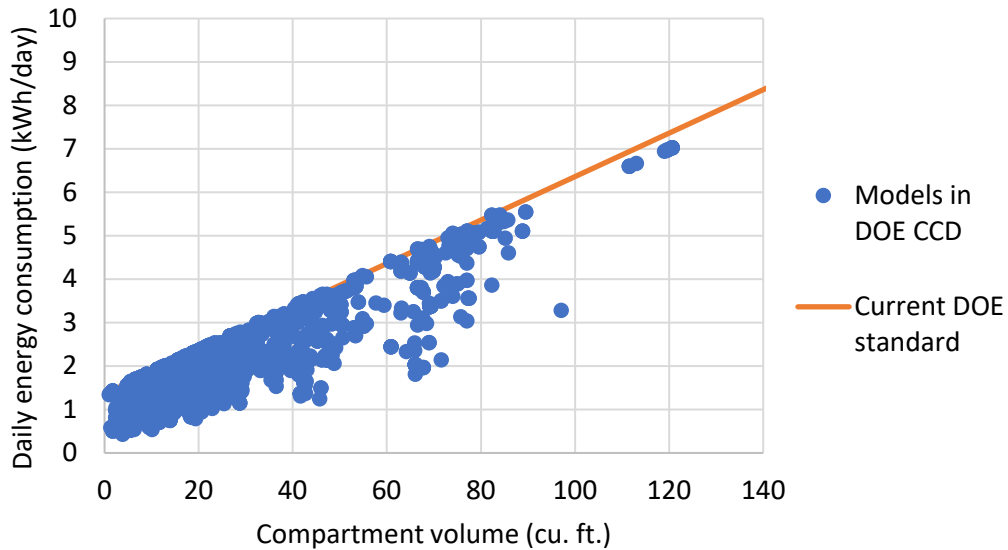
**There appears to be significant potential to strengthen the energy conservation standards for commercial refrigeration equipment.** Across equipment classes there are models that consume substantially less energy than models just meeting the minimum standards.<sup>1</sup> For example, as shown in Figures 1 and 2 below for self-contained vertical solid door refrigerators and freezers, respectively, there are refrigerators that consume up to 72% less energy than the minimum standards and freezers that consume up to 78% less energy than the minimum standards.<sup>2</sup>

---

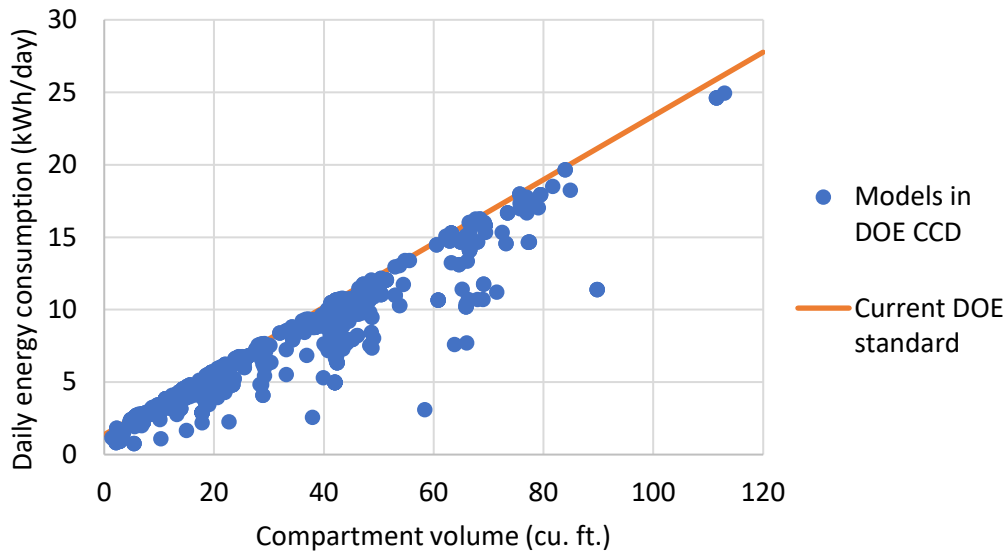
<sup>1</sup> Based on models in the DOE Compliance Certification Database as of August 20, 2021.

<sup>2</sup> Figures 1 and 2 exclude models tested at non-standard rating temperatures. The standard rating temperatures are 38°F for refrigerators and 0°F for freezers.

**Figure 1. Self-contained vertical solid door refrigerators (VCS.SC.M)**



**Figure 2. Self-contained vertical solid door freezers (VCS.SC.L)**



**We encourage DOE to consider establishing standards for new equipment categories.** DOE notes in the RFI that the Department is aware of certain equipment that meets the definition of commercial refrigeration equipment but for which there are no DOE test procedures or energy conservation standards.<sup>3</sup> In our comments on the June 2021 test procedures RFI, we encouraged DOE to work to develop test methods for these additional equipment categories including salad bars, buffet tables, and refrigerated preparation tables; blast chillers and blast freezers; chef bases and griddle stands; and

<sup>3</sup> 86 Fed. Reg. 37711.

mobile refrigerated cabinets.<sup>4</sup> As we described in our comments on the test procedures RFI, preliminary EPA research found that available data on refrigerated preparation tables and work-top table commercial refrigeration equipment (which have similar designs to chef bases) indicate that there is significant variation in energy performance.<sup>5</sup> Furthermore, because chef bases and griddle stands and blast chillers and freezers have oversized refrigeration systems compared to other commercial refrigeration equipment, these equipment types use more energy compared to other equipment with similar volumes. We encourage DOE to consider establishing standards for these potential new equipment categories.

**We urge DOE to merge equipment classes for refrigerated display cases with and without doors.** The current standards for commercial refrigeration equipment include separate equipment classes for refrigerated display cases with and without doors, and open cases are permitted to use substantially more energy than cases with doors. For example, for medium-temperature remote condensing display cases just meeting the minimum standards, open cases use more than three times as much energy as cases with doors.<sup>6</sup> In the last rulemaking, many stakeholders urged DOE to eliminate the separate equipment classes for open refrigerated cases. However, DOE declined to do so, arguing that “ease of access to the product, increased visibility, and ease of use during operations and maintenance, are sufficient to warrant maintenance of two separate equipment classes.”<sup>7</sup>

We continue to believe that open cases do not provide a unique utility given that refrigerated display cases with and without doors both provide the basic function of keeping food cold and displaying product to customers. In fact, cases with doors provide more uniform and stable temperatures, resulting in increased product shelf life,<sup>8</sup> and manufacturer innovations in door design and lighting technology allow new cases with doors to provide excellent product visibility.<sup>9</sup> A shopper survey conducted by Zero Zone found that 94% of shoppers do not mind opening doors, 82% prefer dairy in doored cases, 86% say it is more comfortable to shop when there are doored cases, and 75% would spend more time shopping doored vs. open cases.<sup>10</sup> After installing glass doors on open cases at two supermarkets in Indiana, the director of engineering for the supermarket chain said that “concerns about stocking cases through the doors have proven to be unwarranted.”<sup>11</sup> And according to the refrigeration company Hillphoenix, with doored cases, employees spend less time in the aisles and restocking is faster and easier.<sup>12</sup>

Given the large energy savings associated with installing doors on open cases, we urge DOE to reconsider its prior conclusion regarding the utility of open cases and to merge equipment classes for refrigerated display cases with and without doors.

---

<sup>4</sup> <https://www.regulations.gov/comment/EERE-2017-BT-TP-0008-0008>.

<sup>5</sup>

<https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Commercial%20Refrigerators%20and%20Freezers%20V5.0%20Discussion%20Guide.pdf>.

<sup>6</sup> 10 CFR 431.66.

<sup>7</sup> 78 Fed. Reg. 55909 (September 11, 2013).

<sup>8</sup> <https://www.hillphoenix.com/wp-content/uploads/2018/02/Case-Study-display-case-Adding-Glass-Doors-to-Multi-Deck-Meat-Case-1-1.pdf>.

<sup>9</sup> See, for example: <https://www.zero-zone.com/includes/loadFile.php?GID=a8bdc9056d0baa49edfc8324de37ae28>;  
<https://www.hussmann.com/products/glass-doors-and-lids/ecovision/ecovision-doors>.

<sup>10</sup> <https://www.zero-zone.com/includes/loadFile.php?GID=a8bdc9056d0baa49edfc8324de37ae28>.

<sup>11</sup> <https://www.supermarketnews.com/sustainability/martin-s-installs-case-doors>.

<sup>12</sup> <https://www.hillphoenix.com/product/energy-reduction-solutions/>.

**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 March 2014 final rule.<sup>13</sup> In addition to the technology options considered in the last rulemaking, we encourage DOE to consider additional technology options including the following:

- **Multiple- and variable-capacity compressors:** Variable-speed compressors for commercial refrigeration applications—including compressors designed for equipment using propane (R-290) as the refrigerant—are available from multiple manufacturers.<sup>14</sup> Emerson reports that their variable-speed R-290 compressor increases system efficiency by 13% relative to a high-efficiency, fixed-speed R-290 compressor.<sup>15</sup>
- **Alternative refrigerants:** As DOE notes in the RFI, manufacturers of self-contained commercial refrigeration equipment have begun transitioning to hydrocarbon refrigerants.<sup>16</sup> Of the ENERGY STAR-certified models of commercial refrigerators and freezers, 84% use propane (R-290) and 11% use isobutane (R-600a).<sup>17</sup> Emerson testing has found that propane can increase efficiency by 20% or more relative to R-404A.<sup>18</sup> HFO refrigerants including R-448A and R-449A can be used in remote condensing systems, and Chemours reports energy savings of 3-4% for low-temperature applications and 8-12% for medium-temperature applications relative to R-404A. We encourage DOE to analyze alternative refrigerants that can improve efficiency in commercial refrigeration equipment including propane, isobutane, and R-448A/R-449A.
- **Alternative blowing agents:** The RFI notes that manufacturers may be similarly transitioning from traditional foam blowing agents to alternatives, which can affect energy performance.<sup>19</sup> We encourage DOE to consider alternative blowing agents that can improve efficiency, such as HFOs, as technology options. Specifically, we encourage DOE to consider HFO-1234ze, HFO-1233zd, and HFO-1336mzz, which we understand can provide efficiency improvements relative to conventional blowing agents.<sup>20</sup>

**We encourage DOE to incorporate price trends for specific design options.** The RFI notes that DOE may consider incorporating price trends for certain design options that may experience price declines over time.<sup>21</sup> DOE typically has incorporated price trends for the complete product (or a set of products). For example, the RFI notes that in the March 2014 final rule, DOE developed a price trend for commercial refrigeration equipment based on historical prices of air-conditioning, refrigeration, and heating

---

<sup>13</sup> 86 Fed. Reg. 37694-97. Tables II.6, II.7, II.8, II.12, and II.13.

<sup>14</sup> See, for example: <https://climate.emerson.com/documents/e360-article-copeland-variable-speed-reciprocating-hermetic-compressors-for-refrigeration-en-us-7377610.pdf>; <https://www.secop.com/products/highlights/highlight-show/slve-for-r290-inverter>.

<sup>15</sup> <https://climate.emerson.com/documents/e360-article-copeland-variable-speed-reciprocating-hermetic-compressors-for-refrigeration-en-us-7377610.pdf>.

<sup>16</sup> 86 Fed. Reg. 37713.

<sup>17</sup> <https://www.energystar.gov/productfinder/product/certified-commercial-refrigerators-and-freezers/results>. Accessed August 24, 2021.

<sup>18</sup> <https://climate.emerson.com/documents/e360-article-%E2%80%93propane-stages-a-comeback-in-refrigeration-en-4205674.pdf>.

<sup>19</sup> 86 Fed. Reg. 37713.

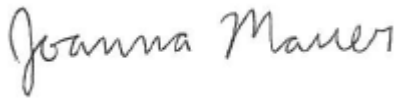
<sup>20</sup> See, for example: <https://www.opteon.com/en/industries-applications/foam-blowing-agents/appliance-insulation>.

<sup>21</sup> 86 Fed. Reg. 37717.

equipment.<sup>22</sup> However, price trends based on the prices of complete products fail to capture that the prices of specific design options that can improve efficiency will likely decline faster than the overall cost of the product. For example, for commercial refrigeration equipment, we would expect that the prices of variable-speed compressors and high-efficiency fan motors will decline faster than the total prices of commercial refrigerators and freezers. Therefore, we support DOE's efforts to attempt to incorporate price trends for certain design options. Such an approach would be similar to that taken in the 2017 final rule for ceiling fans, where DOE estimated a learning rate specific to brushless DC motors.<sup>23</sup>

Thank you for considering these comments.

Sincerely,



Joanna Mauer  
Technical Advocacy Manager  
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

---

<sup>22</sup> Ibid.

<sup>23</sup> 82 Fed. Reg. 6854 (January 19, 2017).