ENERGY STAR® Commercial Refrigerators and Freezers Version 5.0 Specification and Test Method Discussion Guide December 2020

Overview

The U.S. Environmental Protection Agency (EPA) is sharing this ENERGY STAR Version 5.0 Commercial Refrigeration Equipment (CRE) Discussion Guide to invite stakeholder input on the following topics for discussion prior to releasing a Draft 1 Version 5.0 specification:

- Revision of energy efficiency criteria for existing ENERGY STAR product categories;
- ENERGY STAR specification scope expansion to new equipment classes;
- Review of existing and forthcoming test procedures to best support scope expansion; and
- Exploring opportunities to promote energy efficient best practices including retrofitting doors and the use of night curtains on open cases as well as refrigerant leak mitigation and refrigeration equipment maintenance guidance.

EPA will host two stakeholder webinars on **February 2 and 9, 2021** to discuss these topics in greater detail with a deadline to submit written comments and data to cfs@energystar.gov by **February 23, 2021**.

Criteria Revision to Existing Product Categories

The current ENERGY STAR Commercial Refrigerator and Freezer Version 4.0 specification took effect on March 27, 2017. The most recent ENERGY STAR Unit Shipment Summary Report indicates that 46% of all units shipped in the United States in 2019 are certified to the current specification. This high level of overall ENERGY STAR market share presents an opportunity to revise the specification to ensure it continues to recognize top performing products in existing categories and continues to deliver meaningful energy savings over conventional models.[1] Of the eight existing categories, three in particular (VCT.SC.M, VCS.SC.M, and VCS.SC.L) present the greatest savings opportunity that would be evaluated for revision in Draft 1.

Stakeholder engagement is key to the success of the ENERGY STAR program and to the product specification development process. The ENERGY STAR Standard Operating Procedure on revising and establishing product specifications highlights the reliance on stakeholder and partner supplied data and insights on trends in the market. As such, EPA looks forward to working closely with stakeholders to revise the ENERGY STAR Commercial Refrigeration Equipment specification. EPA anticipates proposing revised energy efficiency criteria in a Draft 1 specification in the winter based on the existing ENERGY STAR certified products list and the U.S. Department of Energy's (DOE) Compliance Certification Database.[2] At this time, EPA welcomes stakeholder submission of relevant product attributes or energy efficiency data that may not be contained in these databases.

Proposed Scope Expansion

The ENERGY STAR specification covers eight out of the 49 commercial refrigeration equipment classes regulated under the DOE Federal standard. The eight equipment classes represent 8,179 of 20,543 models (40%) in the DOE's Compliance Certification Database. There is an opportunity to expand ENERGY STAR scope to a subset of the remaining 60% of CRE models in the Version 5.0 specification. EPA is also considering expanding scope to equipment with no currently applicable Federal DOE energy conservation standards. Therefore, EPA and DOE are interested in vetting

[1] Equipment classes currently included in the ENERGY STAR Version 4.0 Specification: VCS.SC.M, VCS.SC.L, VCT.SC.M, VCT.SC.L, HCT.SC.M, HCS.SC.M, HCT.SC.L, and HCS.SC.L. The first three letters designate configuration (vertical, horizontal, or semi-vertical), cabinet type (closed or open), and door type (for closed models, solid or transparent); the next set of two letters designates condensing unit type (self-contained or remote); and the final letter designates operating temperature (medium, low, or ice cream). Refer to 10 CFR Subpart C §431.62 for detailed equipment class definitions.

[2] https://www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A*

industry test methods relevant for these equipment types for possible reference in the ENERGY STAR specification.

1) Specification scope expansion consideration

EPA has identified three DOE Remote Condensing (RC) equipment classes (VCT.RC.M, VCT.RC.L, and SOC.RC.M) and one additional Self-Contained (SC) equipment class (SOC.SC.M) with existing Federal DOE test procedures, metrics, and energy conservation standards to consider for inclusion in the ENERGY STAR Version 5.0 specification based on energy savings potential and market share. In line with existing Version 4.0 categories, EPA proposes that these new categories' energy consumption criteria be based on DOE's equipment class definitions, metrics (*i.e.*, Total Display Area (TDA)), and test procedure outlined at 10 CFR Part 431 Subpart C.

The RC models being considered in this scope expansion are refrigerated cases that are designed to be connected to separate remote condensing units. DOE's regulations at 10 CFR 431.62 define "remote condensing unit" as a factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is remotely located from the refrigerated equipment and consists of one or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory supplied accessories.

EPA notes that while RC models can be connected to a range of remote condensing units (e.g., dedicated remote condensing units matched to the individual case or complex multi-compressor racks supplying refrigerant to multiple refrigerated cases), DOE's test procedure assesses the energy use and thermal performance of the refrigerated case itself, independent of the remote condensing unit. The tested thermal performance of the case is then used to determine a representative energy use for a remote condensing unit supplying the necessary refrigeration.

Thus, replacing a RC model with a more efficient model would reduce either energy consumption of the case itself or the refrigeration load on the remote condensing unit (regardless of remote condensing unit type), or both.

EPA is interested in better understanding how RC models are installed in the field, including the typical remote condensing unit types used for these models.

a) Vertical Closed Transparent Remote Condensing Refrigerators (VCT.RC.M) and Freezers (VCT.RC.L)

Of the entire vertical closed transparent refrigerators and freezers market segment including both SC (currently in ENERGY STAR scope) and RC models, RC models represent nearly 70% of linear feet shipped[3] annually in the United States based on analysis described in the technical support document for DOE's 2014 final rule that established energy conservation standards for CRE.[4] VCT.RC.M and VCT.RC.L equipment classes, also known as glass door merchandisers, are preferred for the grocery segment as well as other foodservice establishments (i.e., restaurants, cafes, delis, bakeries, and convenience stores). Given the large opportunity for savings, EPA sees an opportunity to expand scope to include RC models in addition to the SC models already in v4.0 scope. While VCT.RC.M models are less prevalent than VCT.RC.L models, there is a greater differentiation among VCT.RC.M model energy use within the market. Furthermore, EPA sees an opportunity to promote

Figure 1. VCT.RC.L

[3] The CRE industry typically measures shipments in linear feet. Section 9.3.2 of the 2014 CRE ECS FR TSD explains that DOE determined the linear feet shipped for any given year by multiplying each typical unit shipped by its associated length, and then summing all the linear footage values. This is because the projections of commercial floor space by building type are used to drive the shipments model.

[4] https://www.regulations.gov/document?D=EERE-2010-BT-STD-0003-0102

the energy savings inherent in closed-door versus open refrigeration case configurations. Therefore, EPA proposes including both VCT.RC.M and VCT.RC.L under Version 5.0 scope.

The following graphs illustrate Daily Energy Consumption (kWh) across Total Display Area (sq. ft) for VCT.RC.M and VCT.RC.L models.

Figure 2. Daily Energy Consumption vs. Total Display Area of VCT.RC.M Models

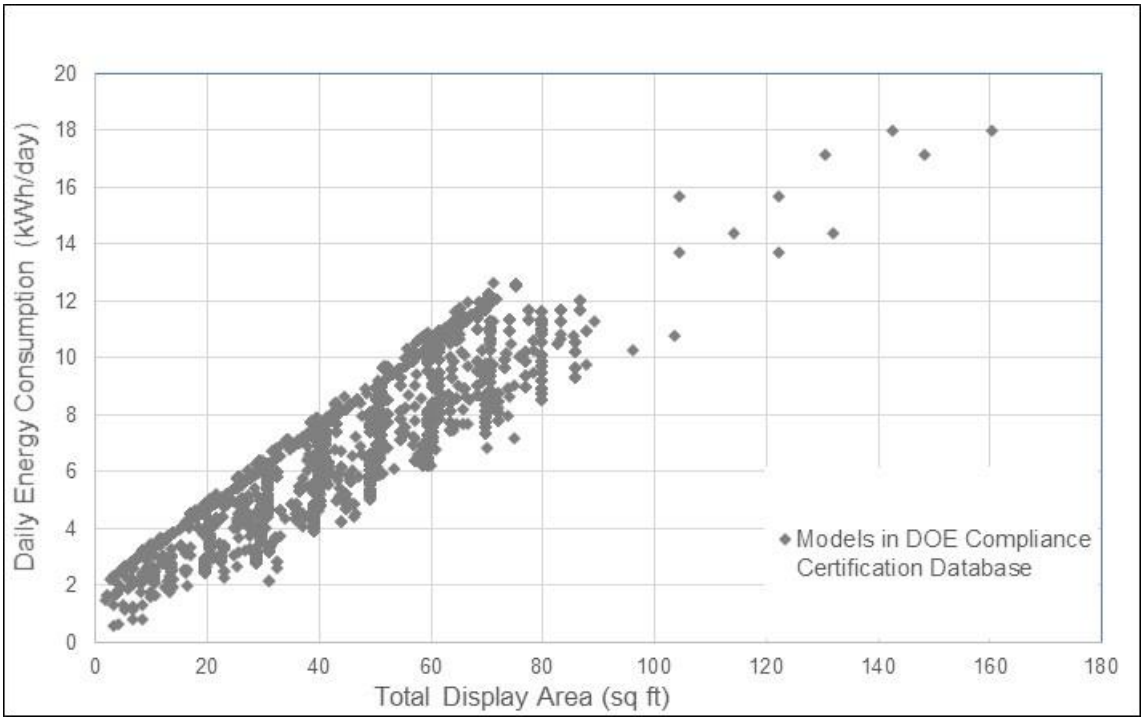
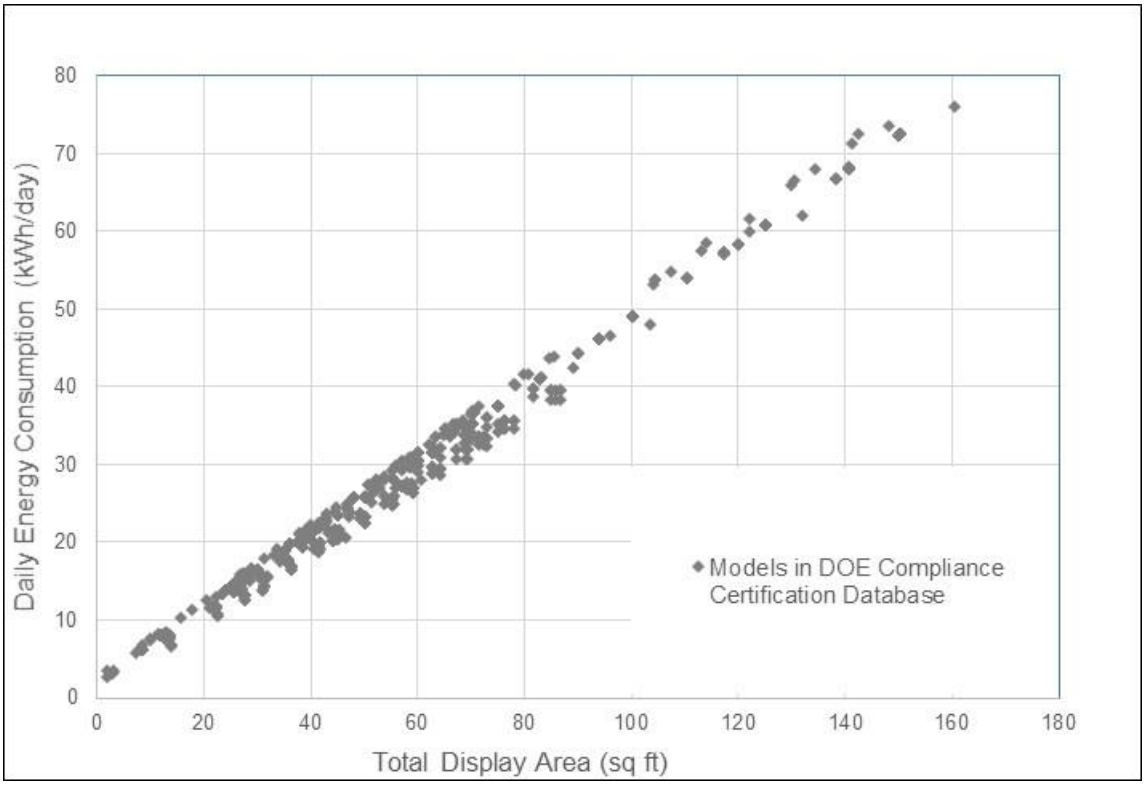


Figure 3. Daily Energy Consumption vs. Total Display Area of VCT.RC.L Models



Discussion Questions

1. EPA is interested in including in scope only models that are connected to dedicated remote condensing units. Recognizing the potential for RC models to be installed connected to a range of remote condensing units, EPA is interested in understanding whether certain model characteristics (volume, display area, refrigeration load, configuration, etc.) drive the type of remote condensing units selected for supplying refrigerant to the case. Are there certain model characteristics or specifications that differentiate between models intended to be connected to dedicated remote condensing units and those connected to multi-compressor rack systems? Please provide supporting data.
2. While glass door merchandisers appear to make up the majority of the VCT.RC.M and VCT.RC.L equipment classes, there are other types of CRE in these equipment classes. How common are dedicated remote condensing unit installations for such models with specialty applications compared to installations with multi-compressor racks? Do these models have distinguishing characteristics should be considered?
3. Based on DOE's Compliance Certification Database, there are no current certifications for hybrid refrigerator-freezers containing only VCT.RC.M and VCT.RC.L compartments. If such models became available on the market, is it appropriate to apply the DOE approach of calculating a maximum daily energy consumption limit based on the sum of the daily energy consumption limits for each refrigerator and freezer compartments based on their total display area (TDA) (see 10 CFR 431.66(e)(2)) in the ENERGY STAR criteria?

b) Service Over Counter Remote Condensing (SOC.RC.M) and Self Contained (SOC.SC.M) Refrigerators

Figure 4. SOC.RC.M

EPA is also considering adding service over counter models with both remote and self-contained condensing unit configurations to the Version 5.0 specification scope. These equipment classes include display cases that can be found in grocery stores, restaurants, delis, and bakeries; but not in a typical convenience store. EPA sees an opportunity for ENERGY STAR to distinguish energy efficient models from more than half a dozen brands. The graphs on the following page illustrate the wide range of energy use among models in DOE's Compliance Certification Database.

Figure 5. Daily Energy Consumption vs. Total Display Area of SOC.RC.M Models

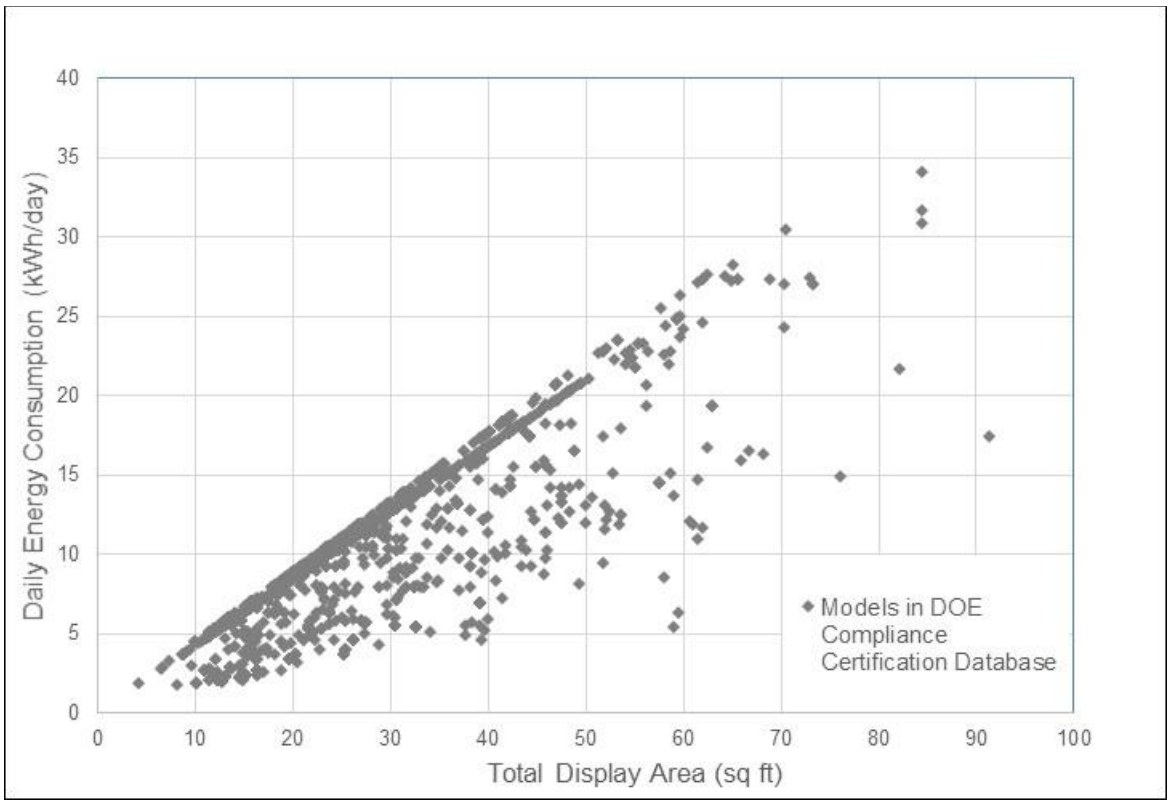
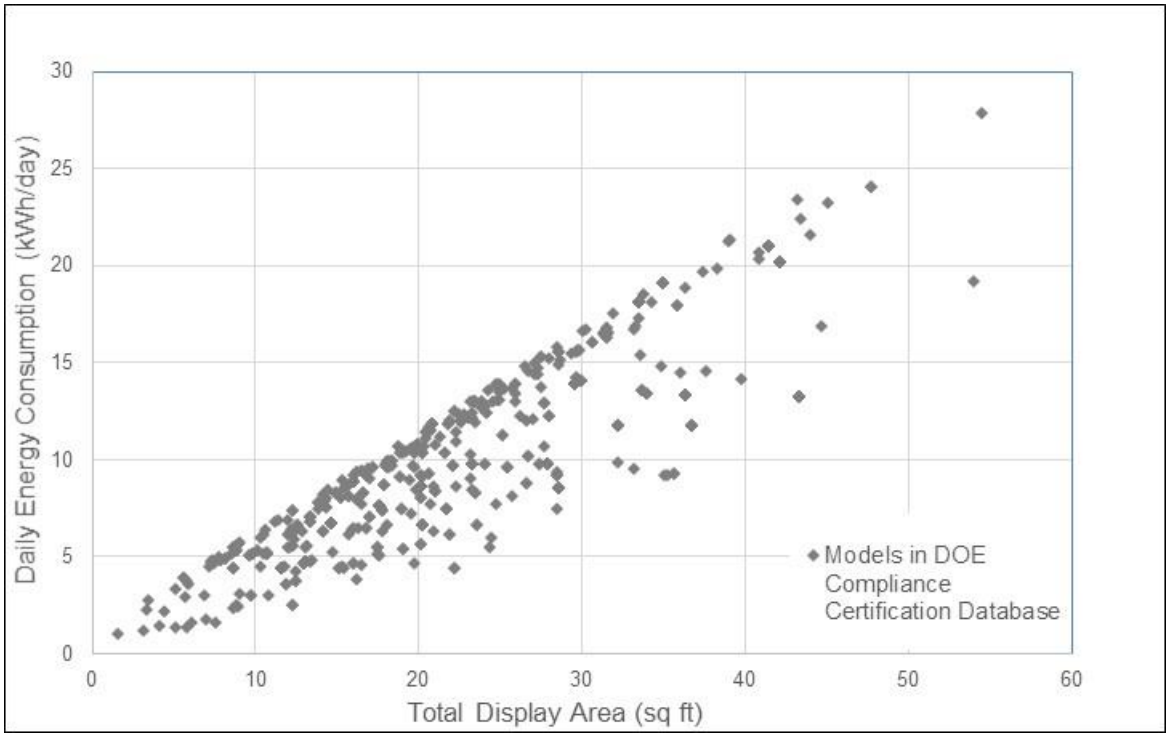


Figure 6. Daily Energy Consumption vs. Total Display Area of SOC.SC.M Models



Discussion Questions:

4. EPA is interested in including in scope only models that are connected to dedicated remote condensing units. Recognizing the potential for RC models to be installed connected to a range of remote condensing units, EPA is interested in understanding whether certain model characteristics (volume, display area, refrigeration load, etc.) drive the type of remote condensing units selected for supplying refrigerant to the case. Are there certain model characteristics or specifications within the SOC.RC.M equipment class that differentiate between models intended to be connected to dedicated remote condensing units and those connected to multi-compressor rack systems? Please provide supporting data.
5. For both SOC.SC.M and SOC.RC.M equipment classes, are there certain energy-saving technologies, components, or equipment designs that drive efficiency improvements? Please provide supporting data.

2) Test method discussion for three potential new product categories

The current Version 4.0 specification references the DOE test protocol: 10 CFR Part 431 Subpart C, 10 CFR Part 431.64, and 10 CFR Part 431.66(e)(2) for the equipment classes under scope. However, ENERGY STAR is exploring opportunities to expand scope to equipment categories with no currently applicable DOE energy conservation standards or DOE test procedures, including the following: refrigerated preparation and buffet tables; chef bases/griddle stands; and, blast chillers/freezers, which are intended to quickly cool prepared food to safe refrigerator or freezer storage temperatures. DOE would provide EPA with support in the development of the corresponding ENERGY STAR test procedures for these equipment categories.

As a reminder, EPA takes baseline data into consideration when determining the potential levels for an ENERGY STAR specification. It's important that the program have as full as possible understanding of the market to propose efficiency levels and estimate annual savings. The ENERGY STAR program relies on industry and stakeholder input for this level of information and includes the following questions that would apply for these three product categories under consideration for scope expansion:

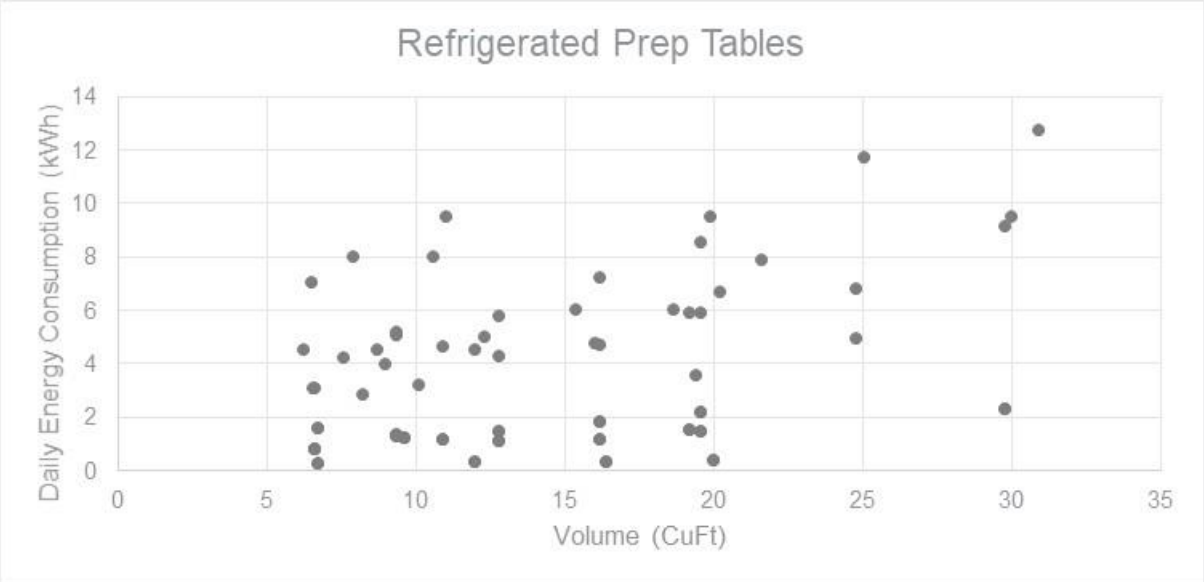
6. Do manufacturers or other stakeholders have specific energy performance data or market reports that are publicly or otherwise available for consideration, and if so, what test method is the basis for such data?
7. Are there typical use schedules that manufacturers recommend for estimating yearly savings?
8. What is the anticipated lifetime for these units?
9. What is an appropriate source or estimate of units shipped in the U.S. each year?
10. Are there any emerging technologies, best practices for efficient product design, or any other trends for this product category that ENERGY STAR should consider?

a. Refrigerated Preparation and Buffet Tables

Refrigerated preparation and buffet tables are units with refrigerated open wells that may or may not include covers and refrigerated storage compartments beneath the wells. More specifically, a refrigerated preparation table is designed for the streamlined assembly of food products that feature a large number of separate refrigerated ingredients. Preparation tables have an open refrigerated well where food can be placed in pans for quick access. They typically have a removable cover and a cutting board that runs the length of the refrigerator. Most preparation tables have a refrigerated compartment underneath the open well, but some only have the refrigerated well and are meant to be placed on top of an existing counter. Buffet tables also have an open refrigerated well where food can be accessed but they do not typically have a removable cover. Some buffet tables have a refrigerated compartment underneath the open well, but others do not.

The California Energy Commission (CEC) database lists energy performance for these product categories based on the ASTM F2143-01 Standard Test Method. Potential energy savings depend on the presence of a refrigerated storage compartment, pan cover(s), pan/compartment geometries, alternative refrigerants, and other considerations. A preliminary ENERGY STAR assessment suggests that there is relatively limited data on preparation table energy usage. However, beginning in Q4 2015, refrigerated preparation tables began being added to the California Appliance Regulations Certification database, which has since grown to include performance data on more than 60 refrigerated preparation table models from multiple manufacturers. This database indicates there is significant variation in energy performance in like-sized models and shows significant energy savings opportunities. A closer look at the scatterplot of daily energy consumption data from the CEC on refrigerated preparation tables suggests there could be potential for energy efficiency improvements; however, the performance is dependent on the configuration of the individual model and variations of each unique model may not be conducive to all types of operations.

Figure 7. Daily Energy Consumption vs. Volume of Refrigerated Prep Tables



ENERGY STAR and DOE are considering referencing the most current existing industry test method, ASTM test method F2143-16, with potential amendments, as the basis for a potential test method for

this product category. Through the ASTM standard test method development process, industry stakeholders collectively and actively contribute to, review, and ultimately approve standards. However, EPA and DOE would like to take the opportunity in this discussion guide to request feedback on areas for refinement of the existing ASTM F2143-16 *Standard Test Method for Performance of Refrigerated Buffet and Preparation Tables*, and to request additional information regarding energy savings potential of this equipment category. Partners and stakeholders are asked to comment on the following questions and provide any additional input.

Discussion Questions:

Questions

11. How should preparation tables and buffet tables be classified and defined to distinguish them from other currently covered equipment categories?
    a. Are the performance profiles and operating conditions different enough such that the two product types should be more clearly distinguished from one another?
12. Does ASTM test method F2143-16 provide a repeatable and reproducible method for assessing representative energy performance of refrigerated preparation and buffet tables?
13. Are any other industry test methods available that would be more appropriate for measuring the energy performance of refrigerated preparation and buffet tables?
14. Is ASTM F2143-16 representative of typical use for this equipment? Specifically, EPA and DOE request feedback on whether the following aspects and requirements of the Standard Test Method are appropriate for testing:
    b. Pan characteristics (standard 4-in. deep 1/6-size metal steam table pans with a weight of the pan as 0.70 ± 0.07 lbs.)
    c. Unloaded refrigerated storage compartments
    d. Installation clearances
    e. Door/cover opening periods
    f. Storage temperatures and control settings
    g. Ambient test conditions
15. What is the appropriate capacity metric for refrigerated preparation and buffet tables? For models with refrigerated pans and storage compartments, can a single capacity metric be applied or are separate capacities (one for the pans and one for the refrigerated storage compartment) needed to accurately characterize the representative capacity that would affect energy performance?
16. Are more energy performance data per ASTM F2143-16 or other relevant test methods available for consideration? Would multiple equipment classes be required within this category to address unique equipment configurations (e.g., refrigerated storage compartments, presence of a pan cover)?

b. Chef Bases or Griddle Stands

In 10 CFR 431.62, DOE defines a “chef base or griddle stand” as commercial refrigeration equipment that is designed and marketed for the express purpose of having a griddle or other cooking appliance placed on top of it that is capable of reaching temperatures hot enough to cook food. This equipment is designed to hold hot equipment on top of the unit and may include oversized refrigeration systems or increased insulation to ensure proper cooling in storage compartments.

Chef bases and griddle stands are excluded from the DOE’s energy conservation standards (10 CFR 431.66(f)); thus, are not required to certify to DOE’s Compliance Certification database. However, the CEC database includes a categorization for work-top table CRE, which have similar designs to chef bases and may serve as an appropriate surrogate for potential efficiency improvements for chef bases.
Several technological features and thermal considerations make certain chef bases more efficient than others including thicker insulation, efficient refrigeration systems, energy savings controls, use of alternative refrigerants and other considerations. A preliminary assessment of the CEC database suggests that there is differentiation among like-sized products in terms of energy efficiency. Because

chef bases and griddle stands are intended to be used underneath a griddle or other cooking appliance, their oversized refrigeration systems may use more energy compared to other commercial refrigeration equipment with a similar volume. This presents an opportunity to incentivize high efficiency models for a product type that may inherently use more energy than other similarly sized commercial refrigeration equipment.

ENERGY STAR is considering adopting the existing DOE CRE test procedure for this product category. This discussion guide is intended to request stakeholder comment regarding whether the current DOE CRE test procedure is appropriate for chef bases or griddle stands and to identify the energy savings potential associated with this equipment category. Stakeholders are asked to comment on the following questions and provide any additional input.

Discussion Questions:

17. What is the time per day that cooking equipment is active on this equipment, and what are typical temperatures of the cooking equipment when active?
18. What, if any, modifications to the current DOE CRE test procedure would be appropriate for testing chef bases and griddle stands to better represent real-world use conditions?
    a. Are the ambient conditions required for DOE CRE testing representative of actual operating conditions for chef bases or griddle stands?
    b. Is the test product load required in the DOE test procedure appropriate for chef bases and griddle stands (i.e., is this equipment typically loaded in the same way as other CRE)?
    c. Do chef bases and griddle stands typically have the same door-opening schedule as other CRE?

c. Blast Chillers and Freezers

Blast chillers and freezers are designed for rapid pull down of food temperature, intended to cool food from cooking temperatures to safe storage temperatures within a short time period to limit bacteria growth. The food service industry has always managed food safety issues and blast chillers have recently become a focal point as restaurants adapt to COVID-19 concerns. Furthermore, blast chillers are associated with better seafood quality. Model types consist of undercounter, countertop, and floor models, including roll-in or roll-through models, with the ability to hold a wide range of pan quantities. Capacities are often marketed by the weight of food a unit is capable of cooling within a certain time period.

ASHRAE SPC 220 is developing an energy test method for blast chillers and freezers, but no standard or test procedure currently exists apart from a similar ASTM test method under development that requires a different medium for testing. While the fundamentals of the ASTM test method under development mirror the ongoing efforts of the ASHRAE SPC 220, one of the major areas where the proposed procedure deviates is using a food product as the testing medium. Upon reviewing marketing materials and spec sheets, an estimate of the range of available efficiencies could not be determined, so the potential for efficiency improvement is unknown. Certain information is provided (refrigeration system cooling capacities, electric input requirements, pull-down temperatures and times), but the information is inconsistent across different brands and manufacturers. However, because blast chillers and freezers are intended to rapidly pull product temperature down from cooking temperatures to safe storage temperatures, their oversized refrigeration systems use more energy compared to other CRE with similar volumes. This presents an opportunity to incentivize high efficiency models for a product type that may inherently use more energy

ENERGY STAR is considering adopting the ASHRAE test method (currently in development) with potential amendments for this product category, or to develop an ENERGY STAR test method based on the likely ASHRAE approach if the industry test method is not yet published. This discussion guide is intended to request information to inform the appropriate test method and to determine the energy savings potential for this category. In the absence of further information, criteria development could be on hold until a test method is finalized, and energy performance estimates are available for the next specification revision. Partners and stakeholders are asked to comment on the following questions and provide any additional input.

Discussion Questions:

19. The ENERGY STAR program is interested in better understanding the overall blast chiller and blast freezer market, including estimates on number of units installed in the U.S. as well as annual units shipped. Information and supporting data pertaining to unit installation and annual shipments are requested.
20. What are the unique features of blast chillers and blast freezers that would help characterize and differentiate this equipment from other pull-down temperature applications such as beverage coolers?
21. What are appropriate starting conditions, loading methods and other necessary specifications for a potential test method to verify the pull-down performance of blast chillers and blast freezers? Additionally, ENERGY STAR requests comment and supporting data on the energy performance of loaded and unloaded pull-down periods of blast chillers and blast freezers.
22. ENERGY STAR requests comment and supporting data on the energy consumption associated with pull-down operation for blast chillers and blast freezers, including the amount of time this equipment typically spends in both pull-down conditions and steady-state operation.
23. What capacity and energy consumption metric would be appropriate for blast chillers and blast freezers? Should both pull-down and steady state energy consumption be included in this measurement?
24. How can the various operating states and modes of blast chillers and blast freezers best be represented in the test procedure (or is there a typical operating state or mode)?
25. What are the typical ambient conditions experienced by blast chillers and blast freezers?
26. What are the typical usage settings for blast chillers and blast freezers and how do different set-point modes affect energy performance? For units with multiple target temperature settings within the refrigerator or freezer temperature range, which setting is appropriate for testing? Additionally, for units with settings that affect the pull-down duration, should the fastest or slowest setting (or any other setting if more than two settings are provided) be used for testing?

Energy Savings Education for Open Cases

Although the ENERGY STAR program does not include open cases under the current specification, nor propose the addition of this equipment category in the Version 5.0 revision, there are a number of energy saving options to consider as best practices that the program envisions sharing with purchasers and users of this equipment.

Refrigerated display cases without doors (open cases) allow consumers easy access to products while maintaining temperatures that ensure food safety. Based on the linear feet of shipments provided in the Technical Support Document supporting DOE's 2014 final rule that established energy conservation standards for CRE and the typical size of equipment in each class, open cases represent approximately 15 to 20% of all CRE models shipped.

Because open cases are designed without a door, open cases typically use a significant amount more energy than display cases with doors. For this reason, EPA will not include ENERGY STAR certification criteria for open cases in the Version 5.0 specification. However, the ENERGY STAR program is interested in encouraging purchasers to reduce the high energy consumption of this equipment and save money through known energy saving steps. For example, DOE's Better Buildings program has a useful online toolkit for retrofitting open refrigerated display cases with doors which includes a guide, case study, and a savings calculator for retailers. In addition, EPA's GreenChill program offers other energy saving best practices through multiple online guidance documents on leak prevention, equipment repair/management, and retrofitting.

The refrigeration load for open cases is dominated by air infiltration, or the entrainment of warm and moist air into the air curtain. Infiltration could be substantially reduced during the hours when the store is closed by using night curtains on open cases. Night curtains typically take the form of a flexible barrier, often composed of plastic or metalized fabric, which can be pulled down over the open case and fastened to provide a temporary cover over the case opening. By fully or partially covering the

case opening, night curtains reduce the convective heat transfer into the case through reduced air infiltration. Additionally, they provide a measure of insulation, reducing conduction and also radiated heat from warmer-temperature surroundings.

DOE included night curtains as a design option for the Vertical Open (VOP) and Semi-Vertical Open (SVO) equipment classes, as discussed in the engineering analysis of the 2014 energy conservation standards final rule. The performance of the night curtains considered in the analysis was based on a survey of field studies of night curtain effectiveness, which resulted in an average 39% reduction in case heat load during periods when the night curtains were deployed from midnight to 6am. DOE also found an average energy savings of 6.1% for the analysed VOP equipment classes and 6.3% for the analysed SVO equipment classes through the use of night curtains.

With the below questions, EPA seeks to improve its understanding of the use cases, types, and saving potential for night curtains to support the program's educational information.

Discussion Questions

27. What installation locations are most typical for open cases used in the field? In these typical end uses, are night curtains deployed for 6 hours per day? If not, how long are night curtains deployed for per day?
28. What is the percentage of open case models that are shipped with night curtains as a standard feature? Does this vary by equipment class (VOP, SVO, HZO)?
29. How does the night curtain material affect measured performance, and what type of night curtains have the best performance for open cases? How common are the best performing night curtains compared to other options? What are the achievable energy savings?
30. Have air curtain designs improved since the 2014 DOE energy conservation standards final rule? Southern California Edison noted that air curtain performance can depend on the unit's air jet's velocity and temperature, the number of jets, and the air jet width. What is the typical range of air curtain performance currently available on the market based on these factors? Are there any other factors that are important to air curtain performance?
31. EPA is aware of a "dual flow air curtain" design,[5] consisting of an inner and outer air curtain to reduce case heat load. The inner air curtain contains cooler air which is intended to maintain safe internal temperatures. The outer air curtain has warmer air which is intended to reduce the heat load. Are any data available indicating the relative energy performance of such an air curtain design?
32. EPA is aware of an "aerofoil" device[6] that can be retrofitted to existing VOP cases as well as incorporated into new equipment that guides the air curtain from the top of the display opening through the intake at the bottom of the display opening. This reduces the amount of refrigerated air that leaks out into the ambient environment. Are any data available indicating the relative energy performance of cases with aerofoils compared to cases without aerofoils? Is this technology only appropriate for retrofitting existing open cases, or would it also improve the performance of newly manufactured equipment? Are any manufacturers or end users incorporating this technology into their equipment in the United States?

Tentative Timeline

- Discussion Guide: December 2020
- Stakeholder Webinars & Comment Deadline: February 2021
- Draft 1 Version 5.0 and Webinar: April 2021
- Draft 2 Version 5.0: August 2021
- Final Draft: December 2021
- Final: February 2022

Please send any written comments and data to cfs@energystar.gov no later than **February 23, 2021**. If you have any questions, please feel free to contact Tanja Crk, EPA, at Crk.Tanja@epa.gov and

[5] See https://freor.com/freors-dual-air-curtain/
[6] See https://www.wae.com/what-we-do/case-studies/aerofoils

202-566-1037 about the product specification or Stephanie Johnson stephanie.johnson@ee.doe.gov and 202-287–1943 about the test method.

Thank you for your interest in ENERGY STAR certified commercial refrigeration.