



ENERGY STAR® Program Requirements Product Specification for Refrigerated Beverage Vending Machines

Eligibility Criteria Draft 1 Version 4.0

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8 Following is the **Draft 1 Version 4.0** product specification for ENERGY STAR certified refrigerated
9 beverage vending machines. A product must meet all of the identified criteria if it is to earn the ENERGY
10 STAR.

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12 **1) Definitions:** Below are the definitions of the relevant terms in this document. Where applicable, the
13 cited definitions are identical with the definitions in the U.S. Department of Energy's (DOE) regulations
14 found in 10 Code of Federal Regulations (CFR) Part 431, Subpart Q, §431.292 and Appendix B. The
15 definitions from the CFR have been reprinted for ease of use, however, the CFR definitions take
16 precedence and may be modified by DOE during the rulemaking process.

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18 A. Refrigerated Beverage Vending Machine: A commercial refrigerator that cools bottled and/or
19 canned beverages and dispenses the bottled and/or canned beverages on payment. *Bottled or*
20 *canned beverages* means a beverage in a sealed container.
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22 a. Class A Machine¹: A refrigerated bottled and/or canned beverage vending machine that is not
23 a combination vending machine and in which 25 percent or more of the surface area on the
24 front side of the beverage vending machine is transparent.
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26 b. Class B Machine¹: Any refrigerated bottled and/or canned beverage vending machine not
27 considered to be Class A, and is not a combination vending machine.
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29 B. Combination Vending Machine¹: A bottled and/or canned beverage vending machine containing
30 two or more compartments separated by a solid partition, that may or may not share a product
31 delivery chute, in which at least one compartment is designed to be refrigerated, as demonstrated
32 by the presence of temperature controls, and at least one compartment is not.
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34 a. Combination A Machine¹: A combination vending machine where 25 percent or more of the
35 surface area on the front side of the beverage vending machine is transparent.
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37 b. Combination B Machine¹: A combination vending machine that is not considered to be
38 Combination A.
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40 C. Food Vending Machine. A refrigerated food vending machine that holds and/or prepares
41 mechanically distributed refrigerated food products or a combination of refrigerated food
42 product(s) and refrigerated bottled and/or canned beverage products.
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44 D. Rebuilt Refrigerated Beverage Vending Machine: An Underwriters Laboratory (UL) Listed or
45 Classified refrigerated beverage vending machine that has been previously in use and subjected
46 to various degrees of retrofitting, remanufacturing, refurbishing, repairing, or reconditioning for
47 resale or reuse. For purposes of ENERGY STAR certification, rebuilt models shall include the
48 machine and energy efficiency components or kit installed to meet ENERGY STAR requirements.
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50 E. Rebuilding Kit: A combination of components that may be installed in a previously used vending
51 machine at a refurbishment center.
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53 F. Basic Model¹: All units of a given type of covered product (or class thereof) manufactured by one

¹ 10 CFR §431.292.

- 54 manufacturer, having the same primary energy source, and which have essentially identical
55 electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption,
56 energy efficiency, water consumption, or water efficiency.
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- 58 G. Low Power Mode²: A state in which a beverage vending machine's lighting, refrigeration, and/or
59 other energy-using systems are automatically adjusted (without user intervention) such that they
60 consume less energy than they consume in an active vending environment.
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- 62 H. Accessory Low Power Mode²: A state in which a beverage vending machine's lighting and/or other
63 energy-using systems are in low power mode, but that is not a refrigeration low power mode.
64 Functions that may constitute an accessory low power mode may include, for example, dimming
65 or turning off lights, but does not include adjustment of the refrigeration system to elevate the
66 temperature of the refrigerated compartment(s).
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- 68 I. Refrigeration Low Power Mode²: A state in which a beverage vending machine's refrigeration
69 system is in low power mode because of elevation of the temperature of the refrigerated
70 compartment(s). To qualify as low power mode, the unit must satisfy the requirements described
71 in Appendix B to Subpart Q, Part 431, Section 2.3.2.1.
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- 73 J. Standard Product²: The standard product shall be standard 12-ounce (355 ml) aluminum
74 beverage cans filled with a liquid with a density of 1.0 grams per milliliter (g/mL) ± 0.1 g/mL at 36
75 °F. For product storage racks that are not capable of vending 12-ounce cans, but are capable of
76 vending 20-ounce bottles, the standard product shall be 20-ounce plastic bottles filled with a liquid
77 with a density of 1.0 g/mL ± 0.1 g/mL at 36°F. For product storage racks that are not capable of
78 vending 12-ounce cans or 20-ounce bottles, the standard product shall be the packaging and
79 contents specified by the manufacturer in product literature as the standard product (i.e., the
80 specific merchandise the refrigerated bottled or canned beverage vending machine is designed to
81 vend).
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- 83 K. Vendible Capacity²: The vending capacity of refrigerated bottled or canned beverage vending
84 machine, as specified in the first paragraph of section 5 of the American National Standards
85 Institute (ANSI)/Association of Home Appliance Manufacturers (AHAM) Standard 32.1 - 2010,
86 "Methods of Testing for Rating Vending Machines for Bottled, Canned or Other Sealed
87 Beverages." For combination vending machines, the vending capacity includes only the capacity
88 of any portion of the refrigerated bottled or canned beverage vending machine that is refrigerated
89 and does not include the capacity of the non-refrigerated compartment(s).
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- 91 L. OEM: Original Equipment Manufacturer.
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- 93 M. Qualified component supplier (QCS): A company that produces components and/or rebuilding kits
94 for vending machines.
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- 96 N. Refurbishment Center (RC): A facility equipped to rebuild vending machines.
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Note: The EPA made updates to several terms and definitions related to refrigerated beverage vending machine products to align with the U.S. Department of Energy (DOE) regulations (10 CFR §431 Subpart Q). The DOE incorporated definitions relevant to the testing of refrigerated beverage vending machines in 10 CFR §431.292 and Appendix B to Subpart Q of Part 431. The new and amended terms and definitions pertinent to this specification are reflected in Section 1.

The changes from the previous version of this specification, include: (1) amendments to the Class A and Combination Vending Machine definitions; (2) the addition of Combination A and Combination B definitions; (3) amendments to the Low Power Mode and Standard Product definitions; and (4) the introduction and addition of the terms Accessory Low Power Mode and Refrigeration Low Power Mode, along with their respective definitions.

² 10 CFR 431 Subpart Q, Appendix B.

Note cont.

The EPA is interested in adding food vending machines to this specification and has proposed a definition. The Agency encourages stakeholder feedback on the food vending definition and whether ‘food vending’ is the appropriate term for this category of refrigerated vending machine considering the potential uses may include frozen (*i.e.*, ice cream) and chilled (*i.e.*, salads, sandwiches) packaged items. The EPA also requests feedback on whether sub-definitions are needed to address multiple equipment classes of food vending machines. For example, additional equipment categories and corresponding definitions may be needed to address different operating temperatures, the presence of transparent fronts (similar to the existing class A machine and class B machine definitions), and combination machines (both combinations with refrigerated beverage/can storage or with thermally separated non-refrigerated volumes). The EPA is also interested in information on the energy consumption impacts associated with the different categories of food vending machines.

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2) Scope:

- A. Included Products: Products that meet the definitions of a Refrigerated Beverage Vending Machine; and Class A, Class B, Combination A, or Combination B, including new and rebuilt, as specified herein are eligible for ENERGY STAR certification, with the exception of products listed in Section 2.B.
- B. Excluded Products: Products that do not meet the Refrigerated Beverage Vending Machine; and/or Class A, Class B, Combination A, or Combination B, as defined in Section 1 above, are not eligible for ENERGY STAR. The following product categories are also excluded:
 - a. Refrigerated beverage vending machines that offer operating temperatures that may be selected by the end user that are lower than the DOE test procedure rating condition (*i.e.*, 36° F) are not eligible for ENERGY STAR.
 - b. Larger refreshment centers that include modular refrigerated vending compartments are not eligible for ENERGY STAR.
 - c. Refrigerated beverage vending machines with heated compartments.

Note: The EPA is expanding the refrigerated beverage vending machine scope to include Combination A and Combination B machines. The DOE introduced standards for new Combination A and Combination B machines in the forthcoming federal minimum standards. The EPA is aligning with the DOE scope.

In addition, the EPA is interested in expanding scope to food vending machines (as defined in Section 1) and welcomes input from stakeholders on the food vending market including the following: size and scope of the market as well as projected growth; use cases for food vending; key stakeholders such as manufacturers and purchasers; and, efficiency opportunities.

The EPA and the DOE are also interested in developing a test method to measure energy consumption of food vending machines. To inform a potential test method, the EPA and the DOE request feedback on how a food vending machine test method should differ from the existing DOE test procedure for refrigerated beverage vending machines. Specifically, the DOE seeks information on typical operating temperatures of refrigerated compartments, standardized products to be used as a test load and for temperature measurements, and the different operating modes that the test method should consider (including vending or preparation modes, if they represent a significant portion of overall energy consumption). Furthermore, the EPA and the DOE are interested in whether these categories of refrigerated vending machines come equipped with refrigeration low power modes or other types of power savings features.

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3) Certification Criteria:

- A. Maximum Daily Energy Consumption (MDEC): To certify for ENERGY STAR, refrigerated beverage vending machines shall consume equal to or less than the MDEC values, in kWh/day,

126 obtained using the equations below:

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128 a. Class A – New and Rebuilt Machines: $0.0468V + 2.187$

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130 b. Class B – New and Rebuilt Machines: $0.0442V + 1.87$

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132 c. Combination A – New and Rebuilt Machines: $0.0774V + 2.394$

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134 d. Combination B - New and Rebuilt Machines: $0.09435V + 1.734$

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136 Where, V = the refrigerated volume (ft³) of the refrigerated bottled or canned beverage vending
137 machine, as specified in Appendix C of the American National Standards Institute (ANSI)/
138 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard
139 32.1 - 2010, “Methods of Testing for Rating Vending Machines for Bottled, Canned or Other
140 Sealed Beverages.” For combination vending machines, the refrigerated volume does not include
141 any non-refrigerated compartments.²
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Note: Since the last time this specification was revised, the DOE issued new federal minimum efficiency requirements³ for new Class A and Class B refrigerated beverage vending machines, with a compliance date of January 8, 2019. The new Class A minimum standard aligns with the performance criteria for Version 3.1 ENERGY STAR and the new Class B minimum standard exceeds current ENERGY STAR levels by approximately 22%. Additionally, the DOE introduced standards for new Combination A and Combination B machines. To ensure ENERGY STAR labeled refrigerated beverage vending products continue to offer significant savings beyond standard products, The EPA has proposed updates to the ENERGY STAR performance levels presented in Section 3.A.a-d, above.

The EPA performed an analysis of available energy performance data assembled from the ENERGY STAR Qualified Products List (QPL) and the DOE’s Compliance Certification Database. This dataset includes 48 unique models (26 Class A models and 22 Class B models) that meet the DOE’s 2019 minimum standards. For considering Combination A and Combination B machines the Agency reviewed the DOE’s final rule technical support document (TSD) and sought information from manufacturers on incremental efficiency gains that could be made with available upgrades. Each of the four categories of vending machines have unique federal standards (10 CFR 431.296(b)). The EPA has proposed that Class A and Combination A machines be 10% more stringent than the DOE standard and that Class B and Combination B machines be 15% more stringent than the DOE standard.

Based on the proposed levels, approximately 15% of Class A machines and 18% of Class B machines (including rebuilt) would be eligible for the ENERGY STAR. The datasets for Class A and Class B, in addition to the available technology and component review for all eligible refrigerated beverage vending machines, suggests that the proposed performance levels for each type of machine are attainable. Energy performance for Combination A and Combination B machines were based on modeling data (see Chapter 5 and Appendix 5A in the DOE final rule TSD).

The EPA anticipates that as manufacturers reconfigure their refrigerated beverage vending machines in order to comply with the amended federal standard, there will be opportunities to reduce the incremental cost to achieve ENERGY STAR by leveraging existing technologies, design options, and components. Examples of this include, but are not limited to: higher efficiency lighting, improved insulation, and the use of alternative refrigerants.

Efficient Lighting

Market research suggests that advanced lighting, such as light-emitting diode (LED), is highly energy efficient compared to conventional lighting, and when applied to refrigerated beverage vending machines, advanced lighting increases overall product energy efficiency. Higher efficiency lighting uses less energy and emits less heat, which reduces the heat load on the compressor. For example, DOE’s rulemaking

³ Information on DOE’s rulemaking that established the new and amended energy conservation standards is available on [regulations.gov](https://www.regulations.gov) in docket ID EERE-2013-BT-STD-0022.

Note cont. analysis for refrigerated beverage vending machines showed, on average, approximately 9% reduction in energy consumption when switching from fluorescent to LED lighting (see Chapter 5 of the final rule TSD). Additional efficiency gains can be achieved when efficient lighting is combined with occupancy sensors that switch off or dim vending machine lighting during periods of non-use.

Improved Insulation

Based on market research, the EPA understands that improving or increasing the amount of insulation in solid sections of a refrigerated beverage vending machine can result in considerable energy savings. Based on the DOE final rule analysis (see Chapter 5 of the final rule TSD), improved and/or increased insulation can achieve energy savings in a range between less than 2% to 4% depending on the size and type of machines. Additional savings may be achieved by implementing vacuum-insulated panels or improved glass pack (for Class A machines). Furthermore, *Vending Times* recently reported on a foam insulation formula that improves thermal insulation by up to 10%.

Climate Friendly Low-GWP Refrigerants

The transition to low-Global Warming Potential (GWP) refrigerants offers potential for additional energy savings in refrigeration equipment, including refrigerated beverage vending machines. Some vending machine and compressor manufacturers have already made significant progress in the transition from HFCs to low-GWP refrigerants. Based on industry feedback, CO₂ and Propane are the preferred alternatives the industry is exploring. As discussed in DOE's final rule analysis, switching to propane results in a 15% reduction in compressor power (while switching to CO₂ may result in a 10% increase); however, the overall energy impact varies depending on the entire system design (see chapter 5 of the final rule TSD).

The EPA estimates that the models that will meet the proposed ENERGY STAR levels will represent the top performers in the marketplace when the new the DOE standards take effect in January 2019. The EPA encourages stakeholders to provide feedback on the proposed ENERGY STAR performance criteria and provide additional details regarding other energy-efficient technologies.

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B. Low Power Mode:

- a. Refrigeration low power mode: A 3% credit would apply to the calculated daily energy consumption used to determine compliance with the DOE standards for products with a low-power refrigeration mode⁴. The ENERGY STAR specification also applies the 3% credit to products with the refrigeration low-power mode. Refrigeration low power mode must undergo validation testing per Appendix B to Subpart Q, Part 431, Section 2.3.2.1.
- b. Accessory low power mode: Machines capable of accessory low power modes will be highlighted on the ENERGY STAR Product Finder if the features are reported at time of certification.
- c. The EPA encourages partners to train vending machine installers to provide information to host sites on the low power mode capabilities of their machines so that these capabilities may be enabled as desired by the host site. Machines that house vending temperature sensitive products, such as milk, shall not have the refrigeration low power state enabled on site by the vending operator or machine owner due to the risk of product spoilage.

Note: In addition to the energy efficiency criteria, the current specification includes low power mode eligibility criteria. Version 4.0 includes a requirement that all ENERGY STAR refrigerated beverage vending machines are capable of operating at a minimum of one of the three following states: (1) Lighting low power state; (2) Refrigeration low power state; and/or (3) Whole machine low power state. The EPA has effectively replaced the Lighting Low Power State and Refrigeration Low Power State terms with the Accessory Low Power Mode and Refrigeration Low Power Mode terms, respectively, in Section 3.B., above. The EPA has changed the terms to align with the DOE terminology and applied the same 3% credit to products with refrigeration low-power mode.

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⁴ The DOE's rulemaking analysis considered refrigeration low-power modes as a design option (TSD Section 5.5.4.11).

162 **4) Test Requirements:**

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164 A. One of the following sampling plans shall be used to test energy performance for ENERGY STAR
165 certification:

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- 167 a. A single unit is selected, obtained, and tested. The measured performance of this unit and of
- 168 each subsequent unit manufactured must be equal to or better than the ENERGY STAR
- 169 specification requirements. Note that to determine the represented value per 10 CFR Part
- 170 429, Subpart B § 429.52, additional testing outside of ENERGY STAR is required. The
- 171 represented value must also be equal to or better than the ENERGY STAR specification
- 172 requirements; or
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- 174 b. At least two units are selected, obtained and tested. The represented value is calculated from
- 175 the test results according to the sampling requirements defined in 10 CFR Part 429, Subpart
- 176 B § 429.52. The represented value must be equal to or better than the ENERGY STAR
- 177 specification requirements.
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179 Results of the tested unit(s) may be used to certify additional individual model variations within a
180 Basic Model as long as the definition for Basic Model provided in Section 1, above, and in 10 CFR
181 Part 431.292 is met.

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183 B. When testing refrigerated beverage vending machines, the following test methods shall be used to
184 determine ENERGY STAR certification:

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186 **Table 1: Test Standards for ENERGY STAR Certification**

ENERGY STAR Requirement	Test Method Reference
MDEC and Refrigerated Volume	10 CFR Part 431 Subpart Q, Appendix B

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Note: The referenced test method in Table 1 has been updated to align with the DOE’s final standard.

If the EPA were to expand scope beyond refrigerated beverage vending machines to include food vending machines, a separate ENERGY STAR test method would be developed to assess the energy performance of those models as there is currently no DOE test procedure for that equipment.

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189 C. Represented Value: The represented value is the identical value certified to the DOE, listed on the
190 ENERGY STAR QPL, and shown on consumer facing materials.

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192 D. Significant Digits and Rounding: All calculations shall be carried out as specified in Appendix B to
193 Subpart Q of Part 431.

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Note: The EPA has updated the sampling language in section 4A to better harmonize sampling procedures between ENERGY STAR and DOE standards. Though the intent of this section has essentially remained the same for ENERGY STAR, the updates provide clearer information about appropriate sampling and clarify that additional testing is required for compliance with minimum standards if the sampling procedure outlined in section 4Aa is chosen.

The EPA also moved the Significant Digits and Rounding section from section 3 to section 4 for this Draft specification. The language has been altered to reference the CFR for rounding applicable to the Appendix B test procedure.

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197 **5) Effective Date:** The Version 4.0 ENERGY STAR Product Specification for Refrigerated Beverage
198 Vending Machines shall take effect on **TBD**. For ENERGY STAR certification, a product model shall
199 meet the ENERGY STAR specification in effect on the model’s date of manufacture. The date of
200 manufacture is specific to each unit and is the date on which a unit is considered to be completely
201 assembled.

Note: The EPA anticipates this specification development process will be completed by the end of 2018 with the effective date following 9 months after.

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- 6) Future Specification Revisions:** The EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through stakeholder discussions. In the event of a specification revision, please note that ENERGY STAR certification is not automatically granted for the life of a product model.