



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

Eligibility Criteria Draft 2 Version 4.0

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8 Following is the **Draft 2 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. Refrigerated Food Vending Machine: A refrigerated food vending machine that holds and/or
41 prepares mechanically distributed refrigerated food products that are perishable or potentially
42 hazardous; or a combination machine containing refrigerated food products that are perishable or
43 potentially hazardous and refrigerated bottled and/or canned beverage products.
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45 D. Rebuilt Refrigerated Beverage Vending Machine: An Underwriters Laboratory (UL) Listed or
46 Classified refrigerated beverage vending machine that has been previously in use and subjected
47 to various degrees of retrofitting, remanufacturing, refurbishing, repairing, or reconditioning for
48 resale or reuse. For purposes of ENERGY STAR certification, rebuilt models shall include the
49 machine and energy efficiency components or kit installed to meet ENERGY STAR requirements.
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51 E. Rebuilding Kit: A combination of components that may be installed in a previously used vending
52 machine at a refurbishment center.
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¹ 10 CFR §431.292.

- 54 F. Basic Model¹: All units of a given type of covered product (or class thereof) manufactured by one
55 manufacturer, having the same primary energy source, and which have essentially identical
56 electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption,
57 energy efficiency, water consumption, or water efficiency.
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- 59 G. Low Power Mode²: A state in which a beverage vending machine's lighting, refrigeration, and/or
60 other energy-using systems are automatically adjusted (without user intervention) such that they
61 consume less energy than they consume in an active vending environment.
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- 63 H. Accessory Low Power Mode²: A state in which a beverage vending machine's lighting and/or other
64 energy-using systems are in low power mode, but that is not a refrigeration low power mode.
65 Functions that may constitute an accessory low power mode may include, for example, dimming
66 or turning off lights, but does not include adjustment of the refrigeration system to elevate the
67 temperature of the refrigerated compartment(s).
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- 69 I. Refrigeration Low Power Mode²: A state in which a beverage vending machine's refrigeration
70 system is in low power mode because of elevation of the temperature of the refrigerated
71 compartment(s). To qualify as low power mode, the unit must satisfy the requirements described
72 in Appendix B to Subpart Q, Part 431, Section 2.3.2.1.
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- 74 J. Standard Product²: The standard product shall be standard 12-ounce (355 ml) aluminum
75 beverage cans filled with a liquid with a density of 1.0 grams per milliliter (g/mL) ± 0.1 g/mL at 36
76 °F. For product storage racks that are not capable of vending 12-ounce cans, but are capable of
77 vending 20-ounce bottles, the standard product shall be 20-ounce plastic bottles filled with a liquid
78 with a density of 1.0 g/mL ± 0.1 g/mL at 36°F. For product storage racks that are not capable of
79 vending 12-ounce cans or 20-ounce bottles, the standard product shall be the packaging and
80 contents specified by the manufacturer in product literature as the standard product (i.e., the
81 specific merchandise the refrigerated bottled or canned beverage vending machine is designed to
82 vend).
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- 84 K. Vendible Capacity²: The vending capacity of refrigerated bottled or canned beverage vending
85 machine, as specified in the first paragraph of section 5 of the American National Standards
86 Institute (ANSI)/Association of Home Appliance Manufacturers (AHAM) Standard 32.1 - 2010,
87 "Methods of Testing for Rating Vending Machines for Bottled, Canned or Other Sealed
88 Beverages." For combination vending machines, the vending capacity includes only the capacity
89 of any portion of the refrigerated bottled or canned beverage vending machine that is refrigerated
90 and does not include the capacity of the non-refrigerated compartment(s).
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- 92 L. OEM: Original Equipment Manufacturer.
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- 94 M. Qualified component supplier (QCS): A company that produces components and/or rebuilding kits
95 for vending machines.
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- 97 N. Refurbishment Center (RC): A facility equipped to rebuild vending machines.
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Note: In Draft 1, EPA requested input regarding the introduction of 'food vending machine' products, along with a proposed definition. Though the Agency received some feedback in support of this sub-category of vending products, the absence of a test method and minimal market share of these products suggests it's not the right time to expand the ENERGY STAR scope to include these products at this time. EPA remains interested in these products and would consider expanding scope to address them at a later date should a test method and product performance data become available. Based on additional stakeholder feedback, EPA is, however, proposing a change to the term from 'Food Vending Machine' to 'Refrigerated Food Vending Machine' which suggests the food product is perishable and potentially hazardous. According to at least one manufacturer, this is a more accurate term used in the industry. The proposed term and definition in Section 1.C. reflects these changes to establish a clear separation of eligible products.

² 10 CFR 431 Subpart Q, Appendix B.

99 **2) Scope:**

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- 101 A. Included Products: Products that meet the definitions of a Refrigerated Beverage Vending
- 102 Machine and Class A, Class B, Combination A, or Combination B, including new and rebuilt, as
- 103 specified herein are eligible for ENERGY STAR certification, with the exception of products listed
- 104 in Section 2.B.
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- 106 B. Excluded Products: Products that do not meet the Refrigerated Beverage Vending Machine and/or
- 107 Class A, Class B, Combination A, or Combination B, as defined in Section 1 above; and
- 108 refrigerated food vending machines are not eligible for ENERGY STAR. The following product
- 109 categories are also excluded:
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- 111 a. Refrigerated beverage vending machines that offer operating temperatures that may be
- 112 selected by the end user that are lower than the DOE test procedure rating condition (i.e.,
- 113 36° F) are not eligible for ENERGY STAR.
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- 115 b. Larger refreshment centers that include modular refrigerated vending compartments are not
- 116 eligible for ENERGY STAR.
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- 118 c. Refrigerated beverage vending machines with dedicated heating systems for the sole
- 119 purpose of maintaining temperature in heated compartments.
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Note: In Draft 1, EPA proposed expanding the scope to include Combination A and Combination B machines to align with DOE's introduction of requirements for new Combination A and Combination B machines in the forthcoming federal minimum standards. One stakeholder indicated that while they support the scope expansion eventually, concern was raised that EPA is basing the proposed levels of Combination A and Combination B machines on a modeling approach instead of testing performance data, which risks setting the levels too lenient or too stringent, which could render the ENERGY STAR criteria ineffective. Considering the proposed Combination A and Combination B machines' levels align with the percentage reductions for Class A and Class B machines, respectively, the Agency expects the levels to offer a reasonable energy savings over DOE levels. In keeping alignment with the DOE scope, with the general support from the industry, EPA is maintaining the scope expansion to include Combination A and Combination B machines.

In an effort to further clarify scope in Draft 1, EPA proposed explicit exclusion of refrigerated beverage vending machines with heated compartments. One stakeholder responded by stating that the heated compartment may not be consuming additional energy, but rather could be repurposing waste heat from the condenser of the refrigeration system. Since this design would not impact the Daily Energy Consumption (DEC), the stakeholder suggests these products should remain eligible for ENERGY STAR if they meet the MDEC.

The intent of the exclusion of refrigerated beverage vending machines with heated compartments is to exclude machines that have an internal heating system. If a product has a non-refrigerated section, in addition to a refrigerated section separated by a partition, then that would be classified as a Combination machine, which EPA is proposing to expand scope to include. However, if additional energy is used to heat a section of the machine that requires additional energy, the product is ineligible. EPA is not intending to limit innovation. If expelled heat from the condensing section is transferred to a separate, non-refrigerated compartment, then that would be acceptable as long as there is not a dedicated heating system. In response to this comment, EPA has amended Section 2.B.c. to further clarify the type of machines with heated compartments that remain ineligible for ENERGY STAR certification.

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123 **3) Certification Criteria:**

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- 125 A. Maximum Daily Energy Consumption (MDEC): To certify for ENERGY STAR, refrigerated
- 126 beverage vending machines shall consume equal to or less than the MDEC values, in kWh/day,
- 127 obtained using the equations below:
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- 129 a. Class A – New and Rebuilt Machines: $0.04836V + 2.2599$

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- b. Class B – New and Rebuilt Machines: $0.04576V + 1.936$
- c. Combination A – New and Rebuilt Machines: $0.07998V + 2.4738$
- d. Combination B - New and Rebuilt Machines: $0.09768V + 1.7952$

Where, V = the refrigerated volume (ft³) of the refrigerated bottled or canned beverage vending machine, as specified in Appendix C of the American National Standards Institute (ANSI)/ American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 32.1 - 2010, "Methods of Testing for Rating Vending Machines for Bottled, Canned or Other Sealed Beverages." For combination vending machines, the refrigerated volume does not include any non-refrigerated compartments.²

Note: EPA received multiple comments on the MDEC levels EPA proposed in Draft 1. While some stakeholders supported the Draft 1 levels, most noted that the Draft 1 levels are too aggressive and raised concerns that the levels would unduly limit selection of products. Some manufacturers stated that many products already include some of the most efficient components currently available in the U.S. market and that opportunities to further reduce the MDEC are limited. Further, EPA received several comments addressing a challenge the industry is facing regarding the placement restrictions for refrigerated beverage vending machines operating with low-Global Warming Potential (GWP) refrigerants, classified as A2 or A3, such as R-290. Stakeholders informed EPA that these placement limitations are of significant concern because the majority of locations where these refrigerated beverage vending machines are installed are in lobbies or places of egress, which coincidentally are areas that are location placement restricted. EPA understands the industry is working together on developing solutions to mitigate the safety concern in the event of a leak in the refrigerant line. The industry is exploring solutions such as a dedicated fan to disperse the refrigerant in the event of a leak or installing leak detection sensors that upon detection of a leak activate a type of dispersing mechanism. Though the industry is currently unable to provide energy consumption data for various leak mitigation technologies, they expect these options to require additional energy and may hinder the performance of the machines making it more challenging to meet the ENERGY STAR levels.

Due to this challenge, stakeholders emphasized the point that the industry is unable to fully transition to low-GWP refrigerants until UL 541, CSA 128, and ASHRAE 15 standards are amended such that placement restrictions are reduced or removed. It was noted that these standards could take up to 3 years to change and it was requested that EPA hold off on finalizing this revision until these standards are revised.

In light of these comments, EPA revisited the Draft 1 levels and, using the combined DOE compliance database and the ENERGY STAR qualified product listing, proposes new, less stringent MDEC levels in Draft 2. EPA will revise this vending specification now to ensure ENERGY STAR remains a leadership mark once the new DOE standard is in effect. EPA will work closely with stakeholders to watch the market response to issues such as placement and mitigation technology associated with use of alternative refrigerants and revise this specification again in the future when appropriate. EPA is proposing amended levels for Class A and Combination A machines of 7% more stringent than the DOE standard, and Class B and Combination B machines of 12% more stringent than the DOE standard, as presented in Section 3.A.a-d, above. The Agency has not assumed use of low-GWP refrigerants when developing Draft 2 eligibility criteria.

Based on these revised Draft 2 proposed levels, approximately 31% of Class A machines and 32% of Class B machines available on the market today from seven unique brand owners would be eligible for the ENERGY STAR, thus expanding product selection for the customers. 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.

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.

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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 mode³. 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: One stakeholder questioned why the 3% credit is only applicable to machines with a refrigeration low power mode and not applicable to machines with an accessory low power mode. DOE captured the accessory low power mode savings in their analysis when developing the DOE standard and as such, did not extend a separate credit for the accessory low power mode function. As noted in Draft 1, EPA added the same 3% credit for products with refrigeration low power mode for consistency to align with DOE per Appendix B to Subpart Q, Part 431, Section 2.3.2.1., in which the credit is applicable only to machines with validated refrigeration low power mode.

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4) Test Requirements:

- A. One of the following sampling plans shall be used to test energy performance for ENERGY STAR certification:
 - a. A single unit is selected, obtained, and tested. The measured performance of this unit and of each subsequent unit manufactured must be equal to or better than the ENERGY STAR specification requirements. Note that to determine the represented value per 10 CFR Part 429, Subpart B § 429.52, additional testing outside of ENERGY STAR is required. The represented value must also be equal to or better than the ENERGY STAR specification requirements; or
 - b. At least two units are selected, obtained and tested. The represented value is calculated from the test results according to the sampling requirements defined in 10 CFR Part 429, Subpart B § 429.52. The represented value must be equal to or better than the ENERGY STAR specification requirements.
- Results of the tested unit(s) may be used to certify additional individual model variations within a Basic Model as long as the definition for Basic Model provided in Section 1, above, and in 10 CFR Part 431.292 is met.
- B. When testing refrigerated beverage vending machines, the following test methods shall be used to determine ENERGY STAR certification:

³ The DOE’s rulemaking analysis considered refrigeration low-power modes as a design option (TSD Section 5.5.4.11).

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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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- C. Represented Value: The represented value is the identical value certified to the DOE, listed on the ENERGY STAR QPL, and shown on consumer facing materials.
- D. Significant Digits and Rounding: All calculations shall be carried out as specified in Appendix B to Subpart Q of Part 431.
- E. Additional Reporting Requirement a. Report the type of refrigerant used in the respective Vending model, for example: R-404A, R290, or R-134a.

Note: The Agency proposes to make refrigerant type a reporting requirement under Version 4.0 as it has done for ENERGY STAR Commercial Ice Machines.

One stakeholder commented that in order to achieve ENERGY STAR certification, it is possible that different or additional components would be needed, which, in turn, could lead to significant additional costs. The stakeholder pointed out that manufacturers might want to offer a separate ENERGY STAR certified machine and pass that additional cost on to the operator. The stakeholder expressed concern that the ENERGY STAR model would have to list an MDEC that is equal to the model listed for DOE, which may result in confusion.

EPA understands that models are registered in DOE's Compliance Certification Database and if they achieve ENERGY STAR certification, then the MDEC should be the same in DOE's database as the ENERGY STAR QPL. If two machines do in fact have different MDEC values due to changes in design or componentry, then those should be treated as two separate models in the DOE database and on the ENERGY STAR product finder and identified as such with separate model numbers.

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

Note: A couple stakeholders suggested postponing the Version 4.0 effective date to allow the industry additional time to re-design their products to improve energy performance and transition to low-GWP refrigerants. In response, EPA has proposed levels achievable by a broad selection of models on the market today and will work with stakeholders to develop a new specification that considers use of alternative refrigerants and other efficiency gains in the future. EPA anticipates finalizing this specification by the end of Q1 2019 with it taking effect 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.