



ENERGY STAR Program Requirements

Product Specification for Commercial Water Heaters

Eligibility Criteria

Final Draft Version 2.0

Following is the Final Draft Version 2.0 product specification for ENERGY STAR certified commercial water heaters. A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

1) Definitions: Below are the definitions of the relevant terms in this document.

- A. Commercial Water Heater: A product that utilizes gas or electricity to heat potable water for use outside the heater upon demand, at a thermostatically controlled temperature, including:
- a. A storage type unit¹ which heats and stores water within the appliance at a thermostatically controlled temperature for delivery on demand, including:
 - i. Gas-fired storage water heaters with an input rate both greater than 75,000 British thermal units (Btu) per hour and less than 4,000 Btu/h per gallon of stored water, and
 - b. Commercial heat pump water heaters¹ designed to transfer thermal energy from a low-temperature source to a higher-temperature sink for the purpose of heating potable water, including air-source, water-source, and direct geo-exchange units, with a rated electric power input greater than 12 kW (including all ancillary equipment such as fans, blowers, pumps, storage tanks, piping, and controls, as applicable).
 - c. A gas-fired instantaneous type unit¹ with an input rate both greater than 200,000 Btu/h and not less than 4,000 Btu/hr per gallon of stored water.
 - i. Storage-type instantaneous water heater means an instantaneous water heater that includes a storage tank with a storage volume greater than or equal to 10 gallons.
- B. Thermal Efficiency (TE)¹: The ratio of the heat energy (Btu/hr) transferred to the water flowing through the water heater to the amount of energy (Btu/hr) consumed by the water heater during full-firing rate, steady-state operation.
- C. Standby Loss (SL)¹: The average hourly energy, expressed in Btu per hour, required to maintain the stored water temperature based on a 70°F temperature differential between stored water and ambient room temperature.
- D. Coefficient of Performance (COP_h)¹: The dimensionless ratio of the rate of useful heat transfer gained by the water, expressed in Btu/h, to the rate of electrical power consumed during full input rate operation, expressed in Btu/h.
- E. Manufacturer Limited Warranty: An assurance by the manufacturer to the consumer that the water heater, including purchased system equipment and components, is guaranteed to work for a defined period of time.
- F. Basic Model¹: All units of a given type of covered product (or class thereof) manufactured by one manufacturer, having the same primary energy source, and which have essentially identical

¹ 10 CFR Part 431 Subpart G

electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency.

- G. Fault Detection and Display: System is capable of detecting and reporting, in plain text, system faults to the owner and/or technical professional. This includes, but is not limited to, the ability to detect leaks which may lead to catastrophic failure. Faults are displayed on the system or remotely (preferred). The system is also capable of storing at least five faults in a history log.
- H. Performance Reporting: System is capable of reporting at least three system performance metrics. Examples of performance metrics include, but are not limited to, fuel usage, hot water usage, and run time.
- I. Energy Savings Reporting: System is capable of analyzing performance in order to report energy saving opportunities capable of being addressed via maintenance, firmware updates, or operational changes. Plain text indications and/or detailed visuals that relay opportunities for improvement to technical professionals are reported.
- J. Predictive Maintenance Alert: System is capable of tracking water heater use and wear rates to predict and alert the owner/technical professional when maintenance may be required. Predictions are based on wear rates that are measured in real time or pre-programmed data that indicate typical lifetimes of water heater components.

Note: For this Final Draft, the definition for storage-type instantaneous water heater has been added as a subcategory of gas-fired instantaneous water heater. See the note box regarding product performance requirements later in this document for a detailed explanation.

EPA has removed the definitions for commercial-duty residential heat pump water heater and uniform energy factor. Many stakeholder comments on the Draft 1 specification expressed concern about the proposed commercial-duty residential heat pump product category. Upon further deliberation, and in light of the difficulty of crafting a clear definition and defining an appropriate test method, EPA proposes forgoing the inclusion of this product category at the moment. EPA will continue to work with industry, DOE, and other stakeholders to define this product category and an appropriate method of test, so that it may be recognized as ENERGY STAR in the future. With the removal of the commercial-duty residential heat pump product category, the definition of uniform energy factor is no longer applicable. All associated requirements, test procedures, and sampling criteria have been updated from Draft 1 to reflect these changes.

Definitions for Fault Detection and Display, Performance Reporting, and Energy Savings Reporting, and Predictive Maintenance Alert have been maintained in this Final Draft. These are the definitions for the reporting criteria that were originally outlined in the Draft 1 specification. EPA received comments that were opposed to these reporting criteria; however, EPA feels that they will offer consumer benefits regarding predictive maintenance and the potential for energy savings through performance monitoring. In this Final Draft, EPA has decided to make these reporting criteria optional.

2) Scope:

- A. Included Products: Only products that meet the definition of a commercial water heater, as specified herein, which are marketed for sale in the commercial market are eligible for ENERGY STAR certification.
- B. Excluded Products: The following products are not eligible for certification under this specification:
 - a. Products that are covered under other ENERGY STAR product specifications, including gas-fired storage residential-duty commercial water heaters, as defined in the ENERGY STAR Residential Water Heaters specification. The list of specifications currently in effect can be found at www.energystar.gov/specifications.

- b. Oil fired water heaters.
- c. Combined heating/cooling and hot water systems.
- d. Storage water heaters with greater than 140 gallons of capacity. Heat pump water heaters designed to operate in conjunction with tanks or storage type water heaters are exempt from this exclusion.

Note: EPA has removed sections 2B.e. and 2B.f. as detailed in the Draft 1 specification. These exclusions are no longer applicable as they were originally included to provide guidance regarding commercial-duty residential heat pump water heaters. Since this product category has been removed in the Final Draft, the associated exclusions are not necessary.

To reduce confusion, EPA has explicitly called out gas-fired residential-duty commercial water heaters as a product type covered in another ENERGY STAR specification.

3) Certification Criteria:

A. Product Performance Requirements for Gas-fired Water Heaters:

Table 1: Requirements for Certified Gas-fired Water Heaters

Criteria	Type	ENERGY STAR Requirements
Thermal Efficiency	Storage; Instantaneous	TE ≥ 0.94
Maximum Standby Loss ²	Storage	≤ 0.84 * [(Input Rate / 800) + 110(Volume _r) ^{1/2}] (expressed in Btu/hr)
	Storage-type Instantaneous	

B. Product Performance Requirements for Commercial Heat Pump Water Heaters:

Table 2: Criteria for Certified Electric Heat Pump Water Heaters

Criteria	Type	ENERGY STAR Requirements
Coefficient of Performance (COP _h)	Commercial Heat Pump	COP _h ≥ 3.0

Note: In this Final Draft, EPA maintains the COP_h requirement of 3.0 for commercial heat pump water heaters, but has removed all product performance requirements associated with commercial-duty residential heat pump water heaters as detailed in Draft 1. Also, EPA has refined the standby loss requirement for instantaneous products greater than or equal to 10 gallons to only apply to storage-type instantaneous water heaters, as defined in Section 1 of this document. Stakeholders expressed concern that a standby loss requirement for all instantaneous water heaters greater than or equal to 10 gallons (which was intended to include models with 10 or more gallons of water in the heat exchanger, and not necessarily a tank) may not be appropriate given the timing of the newest DOE standby loss test procedure for non-storage-type instantaneous water heaters. EPA agrees that it is beneficial to wait until more data has been collected on the standby loss of these particular products, but feels that the requirement is still valid and timely for storage-type instantaneous water heaters. These products have storage tanks very similar to storage-type water heaters, and the test method for standby loss of storage-type water heaters is well-established.

² Volume is the rated volume in gallons. Input Rate is the nameplate input rate in Btu/hr.

Aside from this, EPA has removed warranty requirements. Through review of additional market information and discussion with stakeholders, EPA learned that for commercial water heaters, the market is typically supplying warranties that address product reliability concerns purchasers may have.

C. Status and Messaging Reporting: While not required, the reporting of any system status and messaging features as outlined below is encouraged. Products reported to offer any of the following functionality, as defined in Section 1, will have that information identified in the ENERGY STAR Product Finder. If reporting these functions, Partners should also report any ancillary equipment needed to use them, such as a Wi-Fi router or proprietary hub.

- a. Fault Detection and Display
- b. Performance Reporting
- c. Energy Savings Reporting
- d. Predictive Maintenance Alerts

Note: In this Final Draft, EPA proposes modifying the system status and messaging reporting criteria to be optional. Two stakeholders commented in Draft 1 that they did not support the reporting criteria. The stakeholders commented that these functions do not alter the rated efficiency of the equipment and that they can add significant cost. To the extent manufacturers opt to include features that offer potential additional opportunities for savings and would like them highlighted for consumers, EPA remains interested in providing that service through the ENERGY STAR Product Finder.

D. Significant Digits and Rounding:

- a. All calculations shall be carried out with actual measured (unrounded) values. Only the final result of a calculation shall be rounded.
- b. Unless otherwise noted in this section, compliance with specification limits shall be evaluated using exact values without any benefit from rounding.
- c. Reporting on the ENERGY STAR website shall be performed using measured or calculated values that are rounded to the nearest unit in the last right-hand digit as specified in the corresponding specification requirements. Standby Loss shall be rounded to the nearest whole number.

4) Test Requirements:

- A. One of the following sampling plans shall be used for purposes of testing 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. Results of the tested unit 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, is met; or
 - b. Units are selected for testing and results calculated according to the sampling requirements defined in 10 CFR Part 429, Subpart B § 429.44. The certified rating must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to certify additional model variations within a basic model as long as the definition for basic model provided in Section 1, above, is met. Further, all individual models within a basic model must have the same certified rating based on the applicable sampling criteria. This

rating must be used for all manufacturer literature, the qualified product list, and certification of compliance to DOE standards.

Note: The reference to 10 CFR Part 429, Subpart B § 429.17 that was outlined in Draft 1 has been removed. The sampling requirements outlined in that section of the CFR are specific to residential water heating equipment and are no longer necessary given the removal of commercial-duty residential heat pump water heaters from the specification.

B. When testing commercial water heaters, the following test methods shall be used to determine ENERGY STAR certification:

Table 4: Test Methods for ENERGY STAR Certification

ENERGY STAR Requirement	Test Method Reference	Applicable Products
Thermal Efficiency	10 CFR Part 431.106	Gas-fired Storage and Instantaneous Water Heaters
Standby Loss	10 CFR Part 431.106	Gas-fired Storage and Storage-type Instantaneous Water Heaters
Coefficient of Performance	10 CFR Part 431.106, Subpart G, Appendix E	Commercial Heat Pump Water Heaters

Note: EPA has removed DOE's test procedure for residential (consumer) water heaters (10 CFR Part 430, Subpart B, Appendix E) as it pertained only to now removed commercial-duty residential heat pump water heaters.

EPA has also clarified that the test procedure for standby loss is applicable to gas-fired storage and storage-type instantaneous water heaters, rather than all gas-fired instantaneous water heaters as proposed in Draft 1.

5) Effective Date:

The ENERGY STAR Commercial Water Heater specification shall take effect **October 1, 2018**. To certify for ENERGY STAR, 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: EPA plans to complete this revision by the end of 2017. Once Version 2.0 is finalized, products may immediately be certified to it. After a transition period of nine months from finalization, Version 2.0 will take effect and only products certified to Version 2.0 will remain on the Product Finder.

6) Future Criteria Revisions:

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 industry discussions. In the event of a specification revision, please note that the ENERGY STAR certification is not automatically granted for the life of a product model.