



ENERGY STAR® Product Specification for Residential Water Heaters

Partner Commitments

Following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacture and labeling of ENERGY STAR qualified products. The ENERGY STAR Partner must adhere to the following partner commitments:

Qualifying Products

1. Comply with current ENERGY STAR Eligibility Criteria, which define performance requirements and test procedures for residential water heaters. A list of eligible products and their corresponding Eligibility Criteria can be found at www.energystar.gov/specifications.
2. **Prior to associating the ENERGY STAR name or mark with any product**, obtain written certification of ENERGY STAR qualification from a Certification Body recognized by EPA for residential water heaters. As part of this certification process, products must be tested in a laboratory recognized by EPA to perform residential water heater testing. A list of EPA-recognized laboratories and Certification Bodies can be found at www.energystar.gov/testingandverification.

Using the ENERGY STAR Name and Marks

3. Comply with current ENERGY STAR Identity Guidelines, which define how the ENERGY STAR name and marks may be used. Partner is responsible for adhering to these guidelines and ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance. The ENERGY STAR Identity Guidelines are available at www.energystar.gov/logouse.
4. Use the ENERGY STAR name and marks only in association with qualified products. Partner may not refer to itself as an ENERGY STAR Partner unless at least one product is qualified and offered for sale in the U.S. and/or ENERGY STAR partner countries.
5. Provide clear and consistent labeling of ENERGY STAR qualified residential water heaters.
 - 5.1. The ENERGY STAR mark must be clearly displayed on the top/front of the product (on product labels and/or as a permanent mark), in product literature (i.e., user manuals, spec sheets, etc.), and on the Partner's Internet site where information about ENERGY STAR qualified models is displayed.
 - 5.2. It is also recommended that the mark appear on the product packaging.

Verifying Ongoing Product Qualification

6. Participate in third-party verification testing through a Certification Body recognized by EPA for residential water heaters, providing full cooperation and timely responses. EPA/DOE may also, at its discretion, conduct tests on products that are referred to as ENERGY STAR qualified. These products may be obtained on the open market, or voluntarily supplied by Partner at the government's request.
-

Providing Information to EPA

7. Provide unit shipment data or other market indicators to EPA annually to assist with creation of ENERGY STAR market penetration estimates, as follows:
 - 7.1. Partner must submit the total number of ENERGY STAR qualified residential water heaters shipped in the calendar year or an equivalent measurement as agreed to in advance by EPA and Partner. Partner shall exclude shipments to organizations that rebrand and resell the shipments (unaffiliated private labelers).
 - 7.2. Partner must provide unit shipment data segmented by meaningful product characteristics (e.g., type, capacity, presence of additional functions) as prescribed by EPA.
 - 7.3. Partner must submit unit shipment data for each calendar year to EPA or an EPA-authorized third party, preferably in electronic format, no later than March 1 of the following year.

Submitted unit shipment data will be used by EPA only for program evaluation purposes and will be closely controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the Partner.
8. Report to EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.
9. Notify EPA of a change in the designated responsible party or contacts within 30 days using the My ENERGY STAR Account tool (MESA) available at www.energystar.gov/mesa.

Performance for Special Distinction

In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures, and should keep EPA informed on the progress of these efforts:

- Provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and its message.
- Consider energy efficiency improvements in company facilities and pursue benchmarking buildings through the ENERGY STAR Buildings program.
- Purchase ENERGY STAR qualified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product information to employees for use when purchasing products for their homes.
- Feature the ENERGY STAR mark(s) on Partner website and other promotional materials. If information concerning ENERGY STAR is provided on the Partner website as specified by the ENERGY STAR Web Linking Policy (available in the Partner Resources section of the ENERGY STAR website), EPA may provide links where appropriate to the Partner website.
- Ensure the power management feature is enabled on all ENERGY STAR qualified displays and computers in use in company facilities, particularly upon installation and after service is performed.
- Provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR qualified products.
- Provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, EPA may be able to coordinate, and communicate Partner's activities, provide an EPA representative, or include news about the event in the ENERGY

STAR newsletter, on the ENERGY STAR website, etc. The plan may be as simple as providing a list of planned activities or milestones of which Partner would like EPA to be aware. For example, activities may include: (1) increasing the availability of ENERGY STAR qualified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrating the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) providing information to users (via the website and user's manual) about energy-saving features and operating characteristics of ENERGY STAR qualified products; and (4) building awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event.

- Join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. The SmartWay Transport Partnership works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit www.epa.gov/smartway.
- Join EPA's Green Power Partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities. For more information on Green Power, visit www.epa.gov/greenpower.



ENERGY STAR® Product Specification for Residential Water Heaters

Eligibility Criteria Version 3.0

Following is the Version 3.0 product specification for ENERGY STAR certified 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. Residential Water Heater: A product that utilizes gas, electricity, or solar thermal energy to heat potable water for use outside the heater upon demand, including:
- a. Storage type units¹ designed to heat and store water at a thermostatically controlled temperature of less than 180 °F, including: gas storage water heaters with a nominal input of 75,000 British thermal units (Btu) per hour or less and having a rated storage capacity of not less than 20 gallons nor more than 100 gallons; electric heat pump type units with a maximum current rating of 24 amperes at an input voltage 250 volts or less, and, if the tank is supplied, having a manufacturer's rated storage capacity of 120 gallons or less.
 - b. Instantaneous (or "tankless") type units^{1,2} which initiate heating based on sensing water flow and deliver water at a controlled temperature of less than 180 °F, heat water, but contain no more than one gallon of water per 4,000 Btu per hour of input with an input capacity greater than 50,000 Btu/h but less than 200,000 Btu per hour.
 - c. Solar water heaters include a collector and storage tank, and use the sun's thermal energy to heat water using one of the four basic types of solar water heating systems:
 - i. forced circulation (includes both direct and indirect systems),
 - ii. integrated collector and storage,
 - iii. thermosiphon, or
 - iv. self-pumped.
 - d. Add-on Heat Pump Units¹ are air to water heat pumps designed for use with a storage-type water heater or a storage tank that is not specified or supplied by the manufacturer.
 - e. Light Duty EPACT covered gas water heaters heat and store water at a thermostatically controlled temperature, with an input rate >75,000 Btu per hour and ≤100,000 Btu per hour, and storage volume between 20 and 100 gallons.
- B. Energy Factor³: Energy Factor (EF), a measure of water heater overall efficiency, is the ratio of useful energy output from the water heater to the total amount of energy delivered to the water heater.
- C. Solar Energy Factor: Solar Energy Factor (SEF) refers to the energy delivered by the total system divided by the electrical or gas energy put into the system.

¹ 10 CFR 430, Subpart B, Appendix E

² 10 CFR 430, Subpart A, § 430.2 Definitions

³ Based on definition in 10 CFR 430, Subpart B, Appendix E

- D. Thermal Efficiency⁴: Thermal efficiency (TE) is the ratio of the heat transferred to the water flowing through the water heater to the amount of energy consumed by the water heater.
- E. Standby Loss⁴: Standby Loss (SL) means the average hourly energy required to maintain the stored water temperature.
- F. First-Hour Rating¹: The First-Hour Rating (FHR) is an estimate of the maximum volume of hot water in gallons that a storage water heater can supply within an hour that begins with the water heater fully heated.
- G. Gallons per Minute¹: Gallons per Minute (“GPM”) is the amount of gallons per minute of hot water that can be supplied by an instantaneous water heater while maintaining a nominal temperature rise of 77°F during steady state operation.
- H. Manufacturer Limited Warranty: Manufacturer limited warranty is an assurance by the manufacturer to the consumer that the water heater, including purchased system equipment and components, are guaranteed to work for a defined period of time.
- I. Basic Model: All units of a given type of covered product (or class thereof) manufactured by one manufacturer and which have the same primary energy source and, which have essentially identical electrical, physical, or functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption or water efficiency¹. Further, all individual models within a basic model have the same certified rating based on the applicable sampling criteria per U.S. Department of Energy’s (DOE) regulations in Part 429⁵, and this rating must be used for all manufacturer literature, the qualified product list and certification of compliance to DOE standards.
- J. Lower Compressor Cut-off Temperature: The temperature below which a heat pump water heater’s compressor will no longer operate, such that the unit will only work as a conventional electric resistance water heater.
- K. Combination Space-Heating and Water Heating Appliance: Appliance that provides both space conditioning (boiler) and hot water heating with one appliance or energy source. The combination appliance circulates hot water from the water heater through a heat exchanger in the air handler. A blower will move the heated air through a standard duct system. In the summer, an air conditioner is connected to the exchanger and the system functions similarly, with cool air being pushed through the ductwork.

2) **Scope:**

- A. Included Products: Only products that meet the definition of a Residential Water Heater, as specified herein, are eligible for ENERGY STAR qualification with exception of those products listed in Section 2B.
- B. Excluded Products:
 - a. Electric resistance water heaters,
 - b. Add-on Heat Pump units,
 - c. Products intended only for commercial applications,
 - d. Combination Space-Heating and Water Heating Appliances.

⁴ 10 CFR 431, Subpart G

⁵ 10 CFR 429, Subpart B

3) Qualification Criteria:

A. 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 limit shall be evaluated using exact values without any benefit from rounding.
- c. Reporting on the ENERGY STAR website shall be performed using calculation results or measured values that are rounded to the nearest unit in the last right-hand digit as specified in the corresponding specification requirement below.
- d. EF shall be rounded to the nearest 0.01, as specified in 10 CFR 430.23(e)(2), for purposes of evaluating compliance and for reporting on the ENERGY STAR website.

B. Product Performance Requirements for Electric Water Heaters:

Table 1: Criteria for Qualified Electric Water Heaters

Criteria		ENERGY STAR Requirements
Energy Factor	≤ 55 gallons	EF ≥ 2.00
	> 55 gallons	EF ≥ 2.20
First Hour Rating		FHR ≥ 50 gallons per hour
Warranty		Warranty ≥ 6 years on sealed system
Safety		UL 174 and UL1995
Lower Compressor Cut-Off Temperature (Reporting Requirement Only)		Report ambient temperature below which the compressor cuts off and electric resistance only operation begins

C. Product Performance Requirements for Gas Water Heaters:

- a. Gas Storage Units:

Table 2: Criteria for Qualified Gas Storage Water Heaters

Criteria		ENERGY STAR Requirements
Energy Factor	≤ 55 gallons	EF ≥ 0.67
	> 55 gallons	EF ≥ 0.77
First Hour Rating		FHR ≥ 67 gallons per hour
Warranty		Warranty ≥ 6 years on system (including parts)
Safety		ANSI Z21.10.1/CSA 4.1

b. Gas Instantaneous Units:

Table 3: Criteria for Qualified Gas Instantaneous Water Heaters

Criteria	ENERGY STAR Requirements
Energy Factor	EF \geq 0.90
Gallons-Per-Minute	GPM \geq 2.5 over a 77° rise
Warranty	Warranty \geq 6 years on heat exchanger and \geq 5 years on parts
Safety	ANSI Z21.10.3/CSA 4.3

c. Light Duty EPACT covered Gas Water Heaters

Table 4: Criteria for Qualified Light Duty EPACT covered Gas Water Heaters

Criteria	ENERGY STAR Requirements
Thermal Efficiency	TE \geq 0.90
Standby Loss	Standby loss \leq 1889 Btu/hr \times (TE-0.73)
Warranty	Warranty \geq 6 years on system
Safety	ANSI Z21.10.3/CSA 4.3

D. Product Performance Requirements for Solar Water Heaters:

Table 5: Criteria for Qualified Solar Water Heaters

Criteria	ENERGY STAR Requirements
Solar Energy Factor	SEF \geq 1.8 for electric backup SEF \geq 1.2 for gas backup
Warranty	Warranty \geq 10 years on collector, \geq 6 years sealed system, \geq 2 years on controls, \geq 1 year on parts

4) Test Requirements:

- A. One of the following sampling plans shall be used to test energy performance for qualification to ENERGY STAR:
 - a. A representative unit shall be selected for testing based on the definition for Basic Model provided in Section 1 above. The measured performance of this unit and of each subsequent unit manufactured must be equal to or better than the ENERGY STAR specification requirements; or
 - b. Units are selected for testing and results calculated according to the sampling requirements defined in 10 CFR Part 429, Subpart B § 429.17. The certified rating must be equal to or better than the ENERGY STAR specification requirements.
- B. When testing residential water heaters, the following test methods shall be used to determine ENERGY STAR qualification:

Table 6: Test Methods for ENERGY STAR Qualification

Applicable Products	ENERGY STAR Requirement	Test Method Reference
Gas and electric units; FHR only for storage units, GPM only for instantaneous.	Energy Factor	10 CFR 430, Subpart B, Appendix E*
	First Hour Rating (FHR)	
	Gallons per minute (GPM)	
Light Duty EPACT covered gas water heaters	Thermal Efficiency	10 CFR 431, Subpart G
	Standby Loss	
Whole-home solar units	Solar Energy Factor	SRCC – OG-300: Operating Guidelines and Minimum Standards for Certifying Solar Water Heating Systems

* Includes any applicable guidance that DOE has issued regarding the testing of these products (See <http://www1.eere.energy.gov/guidance/default.aspx?pid=2&spid=1>).

Note on recovery efficiency: Guidance includes that for thermostatically-controlled water heaters that do not initiate and complete a recovery cycle prior to the start of the second draw of the simulated-use test, the recovery efficiency shall be determined as specified in Section 11.2 of ASHRAE 118.2.

5) Effective Date:

The ENERGY STAR Residential Water Heater specification shall take effect on **April 16, 2015**. To qualify 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.

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 qualification is not automatically granted for the life of a product model.