



ENERGY STAR® Program Requirements Product Specification for Boilers

Eligibility Criteria Final Draft: Version 3.0

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Following is the **Final Draft Version 3.0** product specification for ENERGY STAR certified boilers. 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 Boiler: A self-contained fuel burning appliance, with input less than 300,000 Btu/h and operating at or below 160 psig water pressure and 250°F water temperature, to supply low pressure steam or hot water for space heating applications¹. A heating unit that meets this definition and also provides hot water for domestic or other use is considered a combination space-heating and water heating appliance for purposes of this agreement.
- B. 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 electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency.
- C. Annual Fuel Utilization Efficiency (AFUE)¹: The ratio of annual output energy to annual input energy, which includes any non-heating season pilot input loss and, for gas or oil-fired furnaces or boilers, does not include electric energy.

2) Scope:

- A. Included Products: Products that meet the definition of a residential boiler and/or a combination space-heating and water heating appliance as specified herein are eligible for ENERGY STAR certification, with the exception of products listed in Section 2.B.
- B. Excluded Products: Boilers intended only for commercial applications and/or with an input rating of 300,000 Btu per hour energy or higher are not eligible for ENERGY STAR.

3) Qualification Criteria:

- A. Energy Efficiency Requirements: To certify for ENERGY STAR, residential boilers shall meet the following minimum requirements.

**Table 1: Performance Criteria for
ENERGY STAR Certified Boilers**

Fuel Type	AFUE
Gas	90%
Oil	87%

¹ Based on definition in 10 CFR §430.2. When in conflict, the definitions in the 10 CFR §430.2 take precedence.

49 **Note:** EPA received several stakeholder comments on performance criteria proposed in the Draft 2
50 specification. The two areas that received significant feedback are summarized and discussed below.

51 **Condensing Boiler Life Expectancy:** In response to some stakeholder concerns that condensing boilers
52 have a shorter life expectancy as evidenced by shorter warranties, EPA took a number of steps to fully
53 evaluate these concerns. First, EPA confirmed that condensing boilers often do have shorter warranties
54 (12-15 years) than non-condensing boilers (20 or more years), though this is not universal for all
55 manufacturers. Further, EPA investigated the claim that shorter warranties are based on shorter product
56 lifetimes by speaking to several boiler manufacturers who offer both condensing and non-condensing
57 boilers, and have different length warranties. Manufacturers initially based these shorter warranties on the
58 warranties of the condensing heat exchangers, which are purchased from other companies. Additionally,
59 manufacturers have not seen market demand for longer warranties on condensing boilers, and thus have
60 not investigated whether longer warranties are practical. Thus, the shorter condensing boiler warranty is
61 not related to the condensing boiler lifetime but instead, solely driven by general industry practice. In
62 addition, some manufacturers specifically indicated that their condensing and non-condensing products
63 have the same lifetimes.

64 Next, EPA contacted European regulators, who have more extensive and longer-term experience with
65 condensing boilers. In several European countries most newly installed boilers condense. An analysis by
66 the U.K. Department of Environment, Food and Rural Affairs (DEFRA) did not find a difference in lifetime
67 between condensing and non-condensing boilers.

68 EPA also evaluated lifetime issues associated with maintenance. Manufacturers indicated that while they
69 recommend annual service for both condensing and non-condensing boilers, the longevity of condensing
70 boilers may be more sensitive to whether that maintenance is in fact performed. In addition, condensing
71 boilers improperly sized or installed, become even more sensitive to improper maintenance. Based on
72 this and other concerns, EPA will seek to educate consumers who are replacing non-condensing boilers to
73 fully understand the benefits as well as requirements for realizing the maximum benefit of a condensing
74 boiler.

75 In the absence of solid indicators of shorter life expectancy, EPA continues to believe that with proper
76 installation and maintenance, the life expectancy of condensing boilers should be similar to non-
77 condensing boilers.

78 Some stakeholders continued to assert that the installation and maintenance costs of condensing boilers
79 are very high. EPA reiterates that installation costs vary widely, depending on the region of the country and
80 the characteristics of the dwelling, and therefore, the cost effectiveness of condensing boilers will also
81 vary widely. As noted, above, EPA understands the role the Agency can play in educating consumers
82 about their HVAC choices. EPA will develop educational material aimed at assisting consumers with their
83 Boiler choices and will encourage consumers to seek the advice of a qualified contractor in their area to
84 evaluate the best option for their individual needs.

85 **AFUE Criteria:** In the Draft 2 document, EPA asked manufacturers to share any AFUE data suggesting
86 that the change made to the DOE test procedure resulted in an AFUE below 90% for condensing
87 products. Having received no data suggesting an AFUE below 90% for condensing units, EPA continues
88 to propose the Version 3.0 AFUE for gas boilers at the condensing level of 90%.

89 With regards to rounding requirements, EPA adopts DOE's rounding principles such that the ENERGY
90 STAR requirements are consistent with minimum standard requirements. As such, the ENERGY STAR
91 specification requires AFUE to be rounded to the nearest whole percentage point. EPA will monitor DOE
92 standards activities and update the specification accordingly if any changes in rounding principles occur in
93 the future.

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98 B. Significant Digits and Rounding:

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- 100 a. All calculations shall be carried out with actual measured (unrounded) values. Only the final
- 101 result of a calculation shall be rounded.
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- 103 b. Unless otherwise specified, compliance with specification limit shall be evaluated using exact
- 104 values without any benefit from rounding.
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- 106 c. Directly measured or calculated values that are submitted for reporting on the ENERGY
- 107 STAR website shall be rounded to the nearest whole percentage point, as specified in 10
- 108 CFR 430.23(n)(2).
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111 **4) Test Requirements:**

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- 113 A. One of the following sampling plans shall be used for purposes of testing for ENERGY STAR
- 114 certification:
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- 116 a. A single unit is selected, obtained, and tested. The measured performance of this unit and of
- 117 each subsequent unit manufactured must be equal to or better than the ENERGY STAR
- 118 specification requirements. Results of the tested unit may be used to certify additional
- 119 individual model variations within a basic model as long as the definition for basic model
- 120 provided in Section 1, above, is met; or
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- 122 b. Units are selected for testing and results calculated according to the sampling requirements
- 123 defined in 10 CFR Part 429, Subpart B § 429.18. The certified rating must be equal to or
- 124 better than the ENERGY STAR specification requirements. Results of the tested unit may be
- 125 used to certify additional model variations within a basic model as long as the definition for
- 126 basic model provided above and in 10 CFR Part 430.2 is met. Further, all individual models
- 127 within a basic model must have the same certified rating per DOE's regulations in Part 429
- 128 and this rating must be used for all manufacturer literature, the qualified product list, and
- 129 certification of compliance to DOE energy conservation standards.
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- 132 B. Test methods identified in Table 2 shall be used to determine qualification for ENERGY STAR.
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Performance Metric	Test Method Reference
AFUE	10 CFR part 430 Subpart B, Appendix N

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- 136 **5) Effective Date:** The ENERGY STAR Boiler specification shall take effect on **October 1, 2014**. To
- 137 certify as ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on
- 138 its date of manufacture. The date of manufacture is specific to each unit and is the date on which a
- 139 unit is considered to be completely assembled.
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141 **Note:** The proposed effective date reflects EPA's plan to finalize the Version 3.0 specification in late

142 December 2013.

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