



# ENERGY STAR® Program Requirements Product Specification for Boilers

## Eligibility Criteria Draft 2: Version 3.0

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Following is the **Draft 2 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 applications<sup>1</sup>. A heating unit that meets this definition and also provides hot water for domestic or other use is considered a boiler for purposes of this agreement.
- B. Basic Model<sup>1</sup>: 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)<sup>1</sup>: 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.

**Note:** The input rate in the definition of Residential Boiler has been corrected to 300,000 Btu/h from 300,000 Btu. This correction has been made throughout the specification.

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**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 qualification, 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%

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

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49 **Note:** EPA received several stakeholder comments on performance criteria proposed in the Draft 1  
50 specification. The two areas that received significant feedback are summarized and discussed below.

51 **Condensing Boiler Life Expectancy and Payback:** Some stakeholders asserted that condensing  
52 boilers have shorter life expectancy, typically half or two-thirds that of non-condensing boilers. This would  
53 affect consumer payback by requiring the additional expense of more frequent replacements. EPA  
54 investigated this claim by speaking with a wide range of additional stakeholders, but was unable to find  
55 any data supporting the concern. Many agreed that in the past it was likely true that condensing boilers  
56 had shorter life expectancy, which was addressed by changing the material of the heat exchangers.  
57 Others mentioned that poor maintenance by technicians unfamiliar with the technology could contribute to  
58 shorter lifetimes in some cases. In the absence of data showing otherwise, EPA thus continues to  
59 believe that if condensing boilers are properly installed and maintained the life expectancy should be  
60 similar to non-condensing boilers.

61 Stakeholders also asserted that the initial cost of purchasing and installing condensing boilers is very high.  
62 EPA's research to date indicates that installation costs vary widely, depending on the region of the country  
63 and the characteristics of the dwelling. In particular, in new construction or deep retrofits, the cost of  
64 installation is similar to that of conventional equipment. Stakeholders also commented that the design of  
65 the system in which the boiler is installed affects how frequently condensing units actually condense, due  
66 to return water temperatures being too high. In retrofit applications with higher temperature heat  
67 exchangers in the conditioned space, homeowners will not save as much energy and money as the AFUE  
68 might indicate.

69 As with all heating and cooling equipment, EPA encourages homeowners to seek the advice of a qualified  
70 contractor in their area to evaluate the best option for their particular home. In many situations,  
71 consumers already find it worthwhile to install a condensing boiler, and EPA anticipates that as the  
72 technology continues to become more common, differential costs will come down. Also as is common for  
73 heating and cooling equipment, rebates offered by utilities, states, and local governments will continue to  
74 be important in offsetting the total installed cost of an ENERGY STAR qualified unit. Despite all this, EPA  
75 recognizes the value proposition of a condensing boiler will be higher for some consumers than others.  
76 EPA intends to help educate consumers about their choices.

77 **AFUE Criteria:** Stakeholders that were in agreement with EPA's intention to recognize condensing gas  
78 boilers have also asked EPA to revisit the 90% AFUE proposal once DOE finalizes the AFUE calculation  
79 for condensing boilers. On July 1, 2013, DOE issued a final rule on the Residential Furnaces and Boilers  
80 test procedure. The revised test method incorporates additional equations to calculate AFUE for two-stage  
81 and modulating condensing furnaces and boilers when manufacturers opt for the option of omitting the  
82 heat-up and cool-down tests during product testing (Section 9.10 in 10 CFR part 430 Subpart B, Appendix  
83 N). Given the enhanced efficiency delivered by condensing units in general and in the interest of offering  
84 consumers a good selection of ENERGY STAR labeled models, EPA intends for the Version 3.0  
85 specification to be set at the condensing level, as reflected by DOE's AFUE calculation. If manufacturers  
86 find that the revised calculation results in AFUE below 90 for condensing products, please inform EPA.

87 In order to be consistent with DOE's rounding principles that require AFUE to be rounded to the nearest  
88 whole percentage point, EPA has revised the proposed requirements to 90% (from 90.0%) and 87% (from  
89 87.0%) for gas and oil boilers respectively.

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91 B. Significant Digits and Rounding:

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94 a. All calculations shall be carried out with actual measured (unrounded) values. Only the final  
95 result of a calculation shall be rounded.

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97 b. Unless otherwise specified, compliance with specification limit shall be evaluated using exact  
98 values without any benefit from rounding.

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100 c. Directly measured or calculated values that are submitted for reporting on the ENERGY  
101 STAR website shall be rounded to the nearest whole percentage point, as specified in 10  
102 CFR 430.23(n)(2).  
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104 **Note:** In alignment with DOE rounding and reporting requirements, EPA has dropped the decimal point  
105 from the proposed criteria in Table 1.

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

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133 **5) Effective Date:** The ENERGY STAR Boiler specification shall take effect on **TBD**. To certify as  
134 ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on its date of  
135 manufacture. The date of manufacture is specific to each unit and is the date on which a unit is  
136 considered to be completely assembled.  
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138 **Note:** EPA expects to finalize the Version 3.0 Boiler specification in the fourth quarter of 2013. When  
139 revising ENERGY STAR product specifications, EPA chooses an effective date that will provide  
140 manufacturers with sufficient lead time to update product literature and other marketing materials for those  
141 products that no longer meet ENERGY STAR requirements (i.e., 9 months after finalization). EPA will  
142 propose an effective date in the final draft version when the completion date for this specification is more  
143 certain. .

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145 **6) Future Specification Revisions:** EPA reserves the right to change this specification should  
146 technological and/or market changes affect its usefulness to consumers, industry, or the environment.  
147 In keeping with current policy, revisions to the specification are arrived at through industry

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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.