



# ENERGY STAR<sup>®</sup> Program Requirements Product Specification for Boilers

## Eligibility Criteria Draft 1: Version 3.0

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9 Following is the **Draft 1 Version 3.0** product specification for ENERGY STAR qualified boilers. A product  
10 shall meet all of the identified criteria if it is to earn the ENERGY STAR.

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

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14 A. Residential Boiler: A self-contained fuel burning appliance, with input less than 300,000 Btu and  
15 operating at or below 160 psig water pressure and 250°F water temperature, to supply low  
16 pressure steam or hot water for space heating applications<sup>1</sup>. A heating unit that meets this  
17 definition and also provides hot water for domestic or other use is considered a boiler for  
18 purposes of this agreement.  
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20 B. Combination Space-Heating and Water-Heating Appliance: Appliance that provides both space  
21 conditioning (boiler) and hot water heating with one appliance or energy source. The combination  
22 appliance circulates hot water from the water heater through a heat exchanger in the air handler.  
23 A blower will move the heated air through a standard duct system. In the summer, an air  
24 conditioner is connected to the exchanger and the system functions similarly, with cool air being  
25 pushed through the ductwork.  
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27 C. Basic Model<sup>1</sup>: All units of a given type of covered product (or class thereof) manufactured by one  
28 manufacturer, having the same primary energy source, and which have essentially identical  
29 electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption,  
30 energy efficiency, water consumption, or water efficiency.  
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32 D. Annual Fuel Utilization Efficiency (AFUE)<sup>1</sup>: The ratio of annual output energy to annual input  
33 energy, which includes any non-heating season pilot input loss and, for gas or oil-fired furnaces  
34 or boilers, does not include electric energy.  
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36 **Note:** EPA proposes to remove the Combined Appliance Annual Fuel Utilization Efficiency (CAafue)  
37 requirement, having found that manufacturers of combined space-heating and water-heating appliances  
38 seldom use the CAafue metric to rate their products. Also, there is currently not a Federal test method  
39 associated with CAafue. Thus, EPA has deleted the associated definition from the above definitions  
40 section. DOE and EPA are committed to working on a test method that reflects the true efficiency of  
41 combined appliances, to be referenced in a later revision of this specification. Stakeholders are  
42 encouraged to provide feedback if the removal of the CAafue metric will inadvertently exclude any of their  
43 products.

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45 **2) Scope:**

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47 A. Included Products: Products that meet the definition of a residential boiler and/or a combination  
48 space-heating and water-heating appliance as specified herein are eligible for ENERGY STAR  
49 qualification, with the exception of products listed in Section 2.B.

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

50 B. Excluded Products: Boilers intended for commercial applications and/or with an input rating of  
51 300,000 Btu per hour energy or higher are not eligible for ENERGY STAR.  
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53 **3) Qualification Criteria:**  
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55 A. Energy Efficiency Requirements: To qualify for ENERGY STAR, residential boilers shall meet the  
56 following minimum requirements.  
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**Table 1: Performance Criteria for ENERGY STAR Qualified Boilers**

Fuel Type	AFUE
Gas	90.0%
Oil	87.0%

59 **Note:** EPA is revising the boiler specification due to: 1) availability of higher efficiency  
60 approaches/technologies/products in the market; 2) new Federal energy conservation standards that  
61 went into effect on September 1, 2012, thus reducing the efficiency differential between ENERGY STAR  
62 qualified models and boiler designs that would minimally comply with the Federal energy conservation  
63 standards (i.e., gas boilers at 82% and oil boilers at 84% AFUE); and 3) relatively high ENERGY STAR  
64 market penetration, 46% in 2011 (gas boilers – 42% and oil boilers – 52%).

65 EPA proposes to raise the gas boiler requirement to 90% AFUE. Based on the review of AHRI certified  
66 products directory, there appears to be good product availability at 90% AFUE and above. This analysis  
67 was performed before AHRI instituted an automatic re-rate of select condensing boilers due to a test  
68 procedure issue. Since the analysis compares number of models in the current market that use  
69 condensing technology to those that use non-condensing technology, EPA believes the rerating will not  
70 affect the conclusions.

71 EPA is aware that high efficiency boilers deliver significant savings but that care must be given to  
72 installation factors in order to glean the largest savings possible. Similar to many HVAC products,  
73 contractors play an important role in working with homeowners to determine whether or not a condensing  
74 boiler is the best choice for their intended use and conditions. For example, EPA understands that  
75 maximum savings are achieved when a condensing boiler is part of a system designed to ensure that the  
76 boiler operates in condensing mode. EPA is interested in discussing measures EPA can take to ensure  
77 consumers are likely to achieve maximum savings from their ENERGY STAR boiler.

78 For oil boilers, EPA proposes to raise the level to 87% AFUE. Analysis of the AHRI certified products  
79 directory shows that there are a sufficient number of models available at this level. Because heating oil is  
80 relatively expensive, even a modest increase in efficiency can translate to substantial cost savings.

81 **Idle Loss Requirement:** EPA has learned of the opportunity to save energy in the summer by reducing  
82 idle losses in boilers which also provide domestic hot water to the residence (i.e., are part of a combined  
83 appliance). In the summer, combined appliance tanks are required to remain hot in order to meet  
84 domestic hot water needs. Idle loss becomes a significant issue in this use case, where the boiler  
85 continues to operate, only to deliver domestic hot water. According to a December 2011 ASHRAE journal  
86 article on Performance of Combination Hydronic Systems, testing conducted showed an average idle loss  
87 varies from 0.15% to 4.9%. Products with lower idle loss in this scenario deliver meaningful consumer  
88 savings and EPA is interested in highlighting higher performing products for consumers. As such, EPA  
89 plans to add an idle loss requirement to the ENERGY STAR requirements for combined appliances in the  
90 future. As a first step, DOE plans to initiate the development of an idle loss test procedure as part of the  
91 combined appliance test procedure in 2013. Once this test is available, EPA will engage with  
92 stakeholders to add consideration of idle loss in a later specification revision.

93 EPA welcomes stakeholder feedback on the above proposed levels and encourages stakeholders to  
94 provide data and/or other documentation in support of their comments.

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B. Significant Digits and Rounding:

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a. All calculations shall be carried out with directly measured (unrounded) values, except AFUE shall be rounded to the nearest whole percentage point, as specified in 10 CFR 430.23(n)(2).

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b. Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.

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**Note:** EPA has modified the significant digits and rounding requirements to be consistent with the other ENERGY STAR HVAC specification requirements.

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**4) Test Requirements:**

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A. One of the following sampling plans shall be used for purposes of testing for ENERGY STAR qualification:

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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 qualify additional individual model variations within a basic model as long as the definition for basic model provided in Section 1, above, is met; or

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b. Units are selected for testing and results calculated according to the sampling requirements defined in 10 CFR Part 429, Subpart B § 429.18. The certified rating must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to qualify additional model variations within a basic model as long as the definition for basic model provided above and in 10 CFR Part 430.2 is met. Further, all individual models within a basic model must have the same certified rating per DOE's regulations in Part 429 and this rating must be used for all manufacturer literature, the qualified product list, and certification of compliance to DOE energy conservation standards.

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**Note:** EPA has modified the sampling requirements to be consistent with the DOE sampling requirements for boilers as defined in 10 CFR Part 429, Subpart B § 429.18. This language replaces previous direction regarding individual and product family testing.

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B. When testing residential boilers, the following test method shall be used to determine ENERGY STAR qualification:

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Table 1: Test Methods for ENERGY STAR Qualification	
ENERGY STAR Requirement	Test Method Reference
AFUE	10 CFR part 430 Subpart B, Appendix N

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**Note:** The CAafue test method is deleted as the metric is no longer part of the specification. EPA intends to include an idle loss metric and test method once they are available.

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- 5) Effective Date:** The ENERGY STAR Boiler specification shall take effect on **TBD**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on its 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.

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**Note:** EPA expects to finalize the Version 3.0 Boiler specification in the third quarter 2013. At that point, EPA will establish sufficient lead time before the specification becomes effective for manufacturers to update product literature and other marketing materials for those products that no longer meet ENERGY STAR requirements.

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- 6) Future Specification Revisions:** EPA reserves the right to change this 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.