



# ENERGY STAR® Program Requirements Product Specification for Residential Water Heaters

## Eligibility Criteria Draft 1 Version 3.1

Following is the Version 3.1 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.

**Note:** Products may be certified using the Uniform Energy Factor (UEF) metric and current Uniform Test Method for Measuring the Energy Consumption of Water Heaters.<sup>1</sup> Criteria that are specific to UEF for electric and gas-fired water heaters are outlined in Appendix A of this document.

**1) Definitions:** Below are the definitions of the relevant terms in this document. See Appendix A, Section 1 for definitions relevant to UEF.

- A. Residential Water Heater (Consumer 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 units 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.<sup>2</sup>
  - b. Instantaneous (or "tankless") type units 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 per hour but less than 200,000 Btu per hour.<sup>3,4</sup>
  - 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 Units 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.

<sup>1</sup> 10 CFR 430, Subpart B, Appendix E

<sup>2</sup> 10 CFR 430, Subpart B, Appendix E. Revised as of January 1, 2014.

<sup>3</sup> 10 CFR 430, Subpart B, Appendix E. Revised as of January 1, 2014.

<sup>4</sup> 10 CFR 430, Subpart A, § 430.2 Definitions. Revised as of January 1, 2014.

- 43 B. Energy Factor<sup>5</sup>: Energy Factor (EF), a measure of water heater overall efficiency, is the ratio of  
44 useful energy output from the water heater to the total amount of energy delivered to the water  
45 heater.  
46
- 47 C. Solar Energy Factor: Solar Energy Factor (SEF) refers to the energy delivered by the total system  
48 divided by the electrical or gas energy put into the system.  
49
- 50 D. Thermal Efficiency<sup>6</sup>: Thermal efficiency (TE) is the ratio of the heat transferred to the water  
51 flowing through the water heater to the amount of energy consumed by the water heater.  
52
- 53 E. Standby Loss<sup>7</sup>: Standby Loss (SL) means the average hourly energy required to maintain the  
54 stored water temperature.  
55
- 56 F. First-Hour Rating<sup>8</sup>: The First-Hour Rating (FHR) is an estimate of the maximum volume of hot  
57 water in gallons that a storage water heater can supply within an hour that begins with the water  
58 heater fully heated.  
59
- 60 G. Gallons per Minute<sup>9</sup>: Gallons per Minute (“GPM”) is the amount of gallons per minute of hot water  
61 that can be supplied by an instantaneous water heater while maintaining a nominal temperature  
62 rise of 77°F during steady state operation.  
63
- 64 H. Manufacturer Limited Warranty: Manufacturer limited warranty is an assurance by the  
65 manufacturer to the consumer that the water heater, including purchased system equipment and  
66 components, are guaranteed to work for a defined period of time.  
67
- 68 I. Basic Model: All units of a given type of covered product (or class thereof) manufactured by one  
69 manufacturer and which have the same primary energy source and, which have essentially  
70 identical electrical, physical, or functional (or hydraulic) characteristics that affect energy  
71 consumption, energy efficiency, water consumption or water efficiency.<sup>10</sup> Further, all individual  
72 models within a basic model have the same certified rating based on the applicable sampling  
73 criteria per U.S. Department of Energy’s (DOE) regulations in Part 429<sup>11</sup>, and this rating must be  
74 used for all manufacturer literature, the qualified product list and certification of compliance to  
75 DOE standards.  
76
- 77 J. Lower Compressor Cut-off Temperature: The temperature below which a heat pump water  
78 heater’s compressor will no longer operate, such that the unit will only work as a conventional  
79 electric resistance water heater.
- 80 K. Combination Space-Heating and Water-Heating Appliance: Appliance that provides both space  
81 conditioning (boiler) and hot water heating with one appliance or energy source. The combination  
82 appliance circulates hot water from the water heater through a heat exchanger in the air handler.  
83 A blower will move the heated air through a standard duct system. In the summer, an air  
84 conditioner is connected to the exchanger and the system functions similarly, with cool air being  
85 pushed through the ductwork.  
86

---

<sup>5</sup> Based on definition in 10 CFR 430, Subpart B, Appendix E. Revised as of January 1, 2014.

<sup>6</sup> 10 CFR 431, Subpart G. Revised as of January 1, 2014.

<sup>7</sup> 10 CFR 431, Subpart G. Revised as of January 1, 2014.

<sup>8</sup> 10 CFR 430, Subpart B, Appendix E. Revised as of January 1, 2014.

<sup>9</sup> 10 CFR 430, Subpart B, Appendix E. Revised as of January 1, 2014.

<sup>10</sup> 10 CFR 430, Subpart B, Appendix E

<sup>11</sup> 10 CFR 429, Subpart B

87 L. Critical Fault Alarm: An audible alarm or push notification (e.g., email, text, alert from an app)  
 88 indicating that the water heater is experiencing a fault that must be addressed immediately (such  
 89 as a leak), or any condition indicating the water heater is likely to stop functioning within 4 weeks.  
 90

91 **2) Scope:**

92 A. Included Products: Only products that meet the definition of a Residential Water Heater, as  
 93 specified herein, are eligible for ENERGY STAR certification with exception of those products  
 94 listed in Section 2B.  
 95

96 B. Excluded Products:

- 97 a. Electric resistance water heaters,
- 98 b. Add-on Heat Pump units,
- 99 c. Products intended only for commercial applications,
- 100 d. Combination Space-Heating and Water-Heating Appliances.
- 101

102 **Note:** The scope is essentially unchanged, though EPA notes that with the DOE UEF test method it is  
 103 possible to test and certify instantaneous products with storage volumes between two and 20 gallons and  
 104 storage products with less than 20 gallons of storage (see Appendix A).

105  
 106 **3) Certification Criteria:**

107 **Note:** Products may be certified using the Uniform Energy Factor (UEF) metric and current Uniform Test  
 108 Method for Measuring the Energy Consumption of Water Heaters.<sup>12</sup> See Appendix A, Section 2 for  
 109 Product Performance Requirements for water heaters certifying using UEF.

110 A. Significant Digits and Rounding:

- 111 a. All calculations shall be carried out with actual measured (unrounded) values. Only the  
 112 final result of a calculation shall be rounded.
- 113 b. Unless otherwise noted in this section, compliance with specification limit shall be  
 114 evaluated using exact values without any benefit from rounding.
- 115 c. Reporting on the ENERGY STAR website shall be performed using calculation results or  
 116 measured values that are rounded to the nearest unit in the last right-hand digit as  
 117 specified in the corresponding specification requirement below.
- 118
- 119

120 B. Product Performance Requirements for Electric Water Heaters:

**Table 1: Criteria for Certified 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<br>(Reporting Requirement Only) |              | Report ambient temperature below which the compressor cuts off and electric resistance only operation begins |

<sup>12</sup> 10 CFR 430, Subpart B, Appendix E

123  
124  
125  
126  
127

C. Product Performance Requirements for Gas Water Heaters:

a. Gas Storage Units:

**Table 2: Criteria for Certified 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                          |

128  
129  
130  
131  
132

b. Gas Instantaneous Units:

**Table 3: Criteria for Certified Gas Instantaneous Water Heaters**

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

133  
134  
135  
136

c. Light Duty EPACT covered Gas Water Heaters

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

| Criteria           | ENERGY STAR Requirements             |
|--------------------|--------------------------------------|
| Thermal Efficiency | TE ≥ 0.90                            |
| Standby Loss       | Standby loss ≤ 1889 Btu/h ×(TE-0.73) |
| Warranty           | Warranty ≥ 6 years on system         |
| Safety             | ANSI Z21.10.3/CSA 4.3                |

137

138 D. Product Performance Requirements for Solar Water Heaters:  
139  
140

**Table 5: Criteria for Certified Solar Water Heaters**

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

141 E. Optional Critical Fault Alarm Reporting: Compliance with Section 3E is optional. ENERGY STAR  
142 certified water heaters that offer a Critical Fault Alarm meeting the definition in Section 1L will be  
143 identified on the ENERGY STAR website as having Critical Fault Alarm functionality.

144 **Note:** EPA proposes that products be recognized for providing notice to homeowners to address a water  
145 heater problem before it becomes catastrophic. EPA has proposed a definition, in Section 1, and this  
146 optional reporting criterion. Products do not need to provide a critical fault alarm to be certified as  
147 ENERGY STAR.

148 The proposed definition specifies an alarm that is likely to be noticed by residents who rarely see their  
149 water heater, by requiring audible or push notifications. EPA welcomes feedback on the general approach  
150 and the details of the definition.

151  
152 **4) Test Requirements:**

153 **Note:** See Appendix A, Section 3 for Test Methods for water heaters certifying using UEF.

154 A. One of the following sampling plans shall be used to test energy performance for qualification to  
155 ENERGY STAR:

- 156 a. A single unit is selected, obtained, and tested. The measured performance of this unit  
157 and of each subsequent unit manufactured must be equal to or better than the ENERGY  
158 STAR specification requirements. Results of the tested unit may be used to certify  
159 additional individual model variations within a basic model as long as the definition for  
160 basic model provided in Section 1, above, is met; or  
161  
162 b. Units are selected for testing and results are calculated according to the sampling  
163 requirements defined in 10 CFR Part 429, Subpart B §429.17. The certified rating must  
164 be equal to or better than the ENERGY STAR specification requirements. Results of the  
165 tested unit may be used to certify additional variations within a basic model as long as the  
166 definition for basic model provided in Section 1, above, is met. Further, all individual  
167 models within a basic model must have the same certified rating based on the applicable  
168 sampling criteria. This rating must be used for all manufacturer literature, the qualified  
169 products list, and certification of compliance to DOE standards.

170 B. When testing residential water heaters, the following test methods shall be used to determine  
171 ENERGY STAR certification:  
172

**Table 6: Test Methods for ENERGY STAR Certification**

| 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*<br>Revised as of January 1, 2014**                                |
|   | First-Hour Rating (FHR)  |  |
|   | Gallons per minute (GPM) |  |
| Light Duty EPACT covered gas water heaters                                      | Thermal Efficiency       | 10 CFR 431, Subpart G<br>Revised as of January 1, 2014**   |
|   | 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.

\*\*Refer to the 10 CFR parts 200 to 499 edition revised as of January 1, 2014. An abbreviated version of this reference, titled "*Historical Water Heaters Test Method*" can be found on the ENERGY STAR Water Heaters for [Partners webpage](#).

**Note:** For clarity, the references for definitions and test methods have been updated to specify the appropriate version of 10 CFR for testing Energy Factor, First-Hour Rating, Gallons per Minute, Thermal Efficiency, and Standby Loss. The definitions and test methods themselves have not changed. Since the appropriate version of these references is no longer available in the CFR, EPA has updated its reference to the 10 CFR parts 200 to 499 edition revised as of January 1, 2014 and provided a copy of the appropriate materials on the ENERGY STAR Water Heaters for Partners webpage. This document is titled "*Historical Water Heaters Test Method*", and has been abridged for clarity by removing sections that are not relevant to this use. The sampling criteria language in Section 4A has been updated to that common to other current ENERGY STAR specifications, but its meaning remains essentially the same.

#### 5) Effective Date:

The ENERGY STAR Residential Water Heaters 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.

**Note:** EPA hopes to complete this Version 3.1 specification revision promptly, so that models tested to UEF can be certified to that metric. Models reporting converted or tested UEF can be certified as soon as this revision is finalized. Models that are currently certified based on EF will remain on the Qualified Products List and will continue to be verified against the EF test method.

#### 6) Future Specification 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

212 model. EPA is planning to further investigate the following topics in future revisions:  
213

- 214 A. Several factors will lead to significant change to the mix of products available on the market in the  
215 next few years. First, the impact of the newest federal standards has been delayed by confusion  
216 around test method and metric. Second, the new test method allows different types of products to  
217 move into the market. Third, all products will eventually have UEF test data available, and  
218 consumers may use this measure to more easily compare different types of water heaters. Taking  
219 these factors into consideration, EPA expects the market will be in a position to begin a revision  
220 in the 2019 or 2020 timeframe.  
221
- 222 B. For some time, DOE has had minimum efficiency standard equations that rely largely on some  
223 measure of capacity while EPA has had single levels. This continues to be true now. EPA has not  
224 examined this practice for this version, but will reconsider it for future revisions.  
225
- 226 C. The service delivered by gas-fired storage and gas-fired instantaneous water heaters is similar  
227 enough that consumers, particularly those working with new construction, actively consider which  
228 type of water heater to purchase. Therefore, it would be appropriate for EPA to set a single level  
229 for all gas-fired water heaters. EPA has not done so in the past because market dynamics and  
230 test method peculiarities have prevented this course of action. EPA will reexamine this possibility  
231 for the next revision.  
232
- 233 D. Several stakeholders have mentioned that the time may be approaching for EPA to develop  
234 connected requirements for electric storage water heaters. EPA is interested in establishing  
235 connected requirements in the next revision. Water heater models that meet these optional  
236 requirements would be identified as “connected” on the ENERGY STAR certified products list.  
237

238 EPA plans to consider criteria similar to those in the ENERGY STAR [Version 1.1 Pool Pump](#)  
239 [specification](#), with requirements for open standards and an Interface Control Document (IDC)  
240 covering similar capabilities. This would include the same three types of demand response (i.e., a  
241 short deep load reduction, a longer shallower load reduction, and a temporary load increase)  
242 originally derived from the Electric Power Research Institute (EPRI) device framework. EPA  
243 would also consider user message criteria to include a notice of fault condition or similar. EPA  
244 seeks stakeholder feedback on the best way to encourage useful demand response capability.  
245

246 EPA will continue to monitor industry efforts to establish technical criteria for grid responsive  
247 water heaters, and to whatever extent possible, harmonize with such efforts. EPA participation in  
248 such industry efforts eases the path to harmonization, so EPA encourages stakeholders to  
249 proactively include the Agency in any such efforts.

250 **Appendix A – Eligibility Requirements in terms of Uniform Energy Factor**

251 Appendix A contains the definitions, product performance criteria, and test requirements applicable to  
252 water heaters certifying using UEF, which, by appearing in Appendix A, supersede those in the rest of the  
253 specification. Aside from those appearing in Appendix A, all definitions, criteria, and test requirements in  
254 the specification above apply to water heaters certified via UEF.  
255

256 **Note:** EPA’s goal with this revision is to make it possible for new water heater models to be certified using  
257 UEF as soon as possible. This may be done once the revision is finalized. Models currently certified as  
258 ENERGY STAR will not need to recertify – UEF data for these models may be added at the Partners’  
259 convenience and will be displayed on the ENERGY STAR Qualified Product List. Products certified with  
260 UEF will be verified pursuant to UEF testing whether the certified UEF value was originally reported from  
261 a UEF test or from an EF value that was converted to UEF. EPA expects there will be an opportunity to  
262 revise the specification more thoroughly in 2019 or 2020, once the market has responded to the change  
263 of metrics. This approach avoids requiring products to recertify now, and again relatively soon.

264  
265 **1) Definitions:** Below are the definitions relevant to the UEF test method.

- 266 A. Residential Water Heater (Consumer Water Heater): A product that utilizes gas, electricity, or  
267 solar thermal energy to heat potable water for use outside the heater upon demand, including:
- 268 a. Storage type units designed to heat and store water at a thermostatically-controlled  
269 temperature, including: gas-fired storage water heaters with a nameplate input of 75,000 Btu  
270 per hour or less, containing more than one gallon of water per 4,000 Btu per hour of input;  
271 electric heat pump type units with a maximum current rating of 24 amperes at an input  
272 voltage 250 volts or less.<sup>13</sup>  
273
- 274 b. Instantaneous type units heat water, but contain no more than one gallon of water per 4,000  
275 Btu per hour of input with an input capacity less than or equal to 200,000 Btu per hour for  
276 gas-fired instantaneous.<sup>14</sup>  
277
- 278 c. Gas-fired storage residential-duty commercial water heaters include gas-fired storage water  
279 heaters that are designed to deliver hot water at a temperature less than or equal to 180°F,  
280 with an input rate greater than 75,000 Btu per hour and not exceeding 105,000 Btu per hour,  
281 containing more than one gallon of water per 4,000 Btu per hour of input, and storage volume  
282 less than or equal to 120 gallons. For models requiring electricity, a single-phase external  
283 power supply is used.<sup>15</sup>
- 284 B. Uniform Energy Factor<sup>16</sup>: Uniform Energy Factor (UEF) is the measure of water heater overall  
285 efficiency.  
286
- 287 C. First-Hour Rating<sup>17</sup>: The First-Hour Rating (FHR) is an estimate of the maximum volume of “hot”  
288 water that a storage-type water heater can supply within an hour that begins with the water heater  
289 fully heated (i.e., with all thermostats satisfied). It is a function of both the storage volume and the  
290 recovery rate.  
291

<sup>13</sup> Adapted from 10 CFR 430, Subpart A §430.2 *Definitions*  
<sup>14</sup> Adapted from 10 CFR 430, Subpart A §430.2 *Definitions*  
<sup>15</sup> Adapted from 10 CFR 431, Subpart G §431.102 *Definitions*  
<sup>16</sup> 10 CFR 430, Subpart B, Appendix E  
<sup>17</sup> 10 CFR 430, Subpart B, Appendix E

292 D. Maximum GPM Rating<sup>18</sup>: Maximum GPM is the maximum gallons per minute of hot water that  
 293 can be supplied by an instantaneous water heater while maintaining a nominal temperature rise  
 294 of 67 °F (37.3 °C) during steady-state operation.

295 **Note:** The definitions in Appendix A align with the current 10 CFR Parts 430 and 431 where applicable.  
 296 These updated or new definitions include Storage, Instantaneous, and Gas-fired Storage Residential-duty  
 297 Commercial water heaters, as well as Uniform Energy Factor, First-Hour Rating, and Maximum GPM  
 298 Rating. The current “Light-duty EPACT covered Gas Water Heaters” category is referred to as “Gas-fired  
 299 Storage Residential-duty Commercial Water Heaters” in Version 3.1 Appendix A.

300 The definitions for Thermal Efficiency and Standby Loss are not applicable under the Department of  
 301 Energy’s (DOE) UEF test method and are not referenced in Appendix A. The definition for UEF is  
 302 necessary and is referenced here in place of EF. For any definitions that apply without change to  
 303 products certified with UEF (e.g., Basic Model), refer to Section 1 of this specification.

304  
 305 **2) Product Performance Requirements:**

306 **Note:** Below are the product performance requirements for water heaters certifying using UEF.  
 307

308 **Note:** The following performance requirements for electric storage, gas-fired storage, gas-fired  
 309 instantaneous, and gas-fired storage residential-duty commercial water heaters have been converted in  
 310 terms of UEF per the DOE “mathematical conversion factor” rulemaking (10 CFR 429.17). No changes  
 311 have been made in this document regarding solar water heater performance criteria.

312 For all product classes, the proposed performance requirements represent a direct translation from EF,  
 313 thermal efficiency, and standby loss to UEF. To maintain differentiation between ENERGY STAR and the  
 314 proposed Federal Standard, EPA has proposed separate levels for gas-fired storage water heaters based  
 315 on draw pattern. With a minimum first-hour rating of 67 gal/h, all ENERGY STAR water heaters will have  
 316 either a medium or high draw pattern.

317 As previously stated, EPA has proposed UEF product performance requirements based solely on DOE’s  
 318 mathematical conversion. EPA requests feedback regarding the applicability of converted metrics versus  
 319 real-world testing results.

320  
 321 A. Product Performance Requirements for Electric Water Heaters:

322 **Table 1: Criteria for Certified Electric Water Heaters**

| Criteria   |              | ENERGY STAR Requirements   |
|--|--------------|--|
| Uniform Energy Factor  | ≤ 55 gallons | UEF ≥ 2.00   |
|  | > 55 gallons | UEF ≥ 2.16   |
| First-Hour Rating  |              | FHR ≥ 46 gallons per hour  |
| Warranty   |              | Warranty ≥ 6 years on sealed system  |
| Safety   |              | UL 174 and UL 1995   |
| Lower Compressor Cut-Off Temperature<br>(Reporting Requirement Only) |              | Report ambient temperature below which the compressor cuts off and electric resistance only operation begins |

324

<sup>18</sup> 10 CFR 430, Subpart B, Appendix E

325 B. Product Performance Requirements for Gas-fired Water Heaters:

326  
327  
328  
329

a. Gas-fired Storage Units:

**Table 2: Criteria for Certified Gas-fired Storage Water Heaters**

| Criteria              |              | ENERGY STAR Requirements                                       |
|-----------------------|--------------|--|
| Uniform Energy Factor | ≤ 55 gallons | Medium Draw Pattern UEF ≥ 0.64<br>High Draw Pattern UEF ≥ 0.68 |
|                       | > 55 gallons | Medium Draw Pattern UEF ≥ 0.78<br>High Draw Pattern UEF ≥ 0.80 |
| First-Hour Rating     |              | FHR ≥ 67 gallons per hour                                      |
| Warranty              |              | Warranty ≥ 6 years on system<br>(including parts)              |
| Safety                |              | ANSI Z21.10.1/CSA 4.1  |

330  
331  
332  
333

b. Gas-fired Instantaneous Units:

**Table 3: Criteria for Certified Gas-fired Instantaneous Water Heaters**

| Criteria                   | ENERGY STAR Requirements                                       |
|----------------------------|--|
| Uniform Energy Factor      | UEF ≥ 0.87   |
| Maximum Gallons Per Minute | Max GPM ≥ 2.9 over a 67°F rise                                 |
| Warranty                   | Warranty ≥ 6 years on heat exchanger and<br>≥ 5 years on parts |
| Safety                     | ANSI Z21.10.3/CSA 4.3  |

334  
335  
336  
337

c. Gas-fired Storage Residential-duty Commercial Water Heaters

**Table 4: Criteria for Certified Gas-fired Storage Residential-duty Commercial Water Heaters**

| Criteria              | ENERGY STAR Requirements     |
|-----------------------|------------------------------|
| Uniform Energy Factor | UEF ≥ 0.80                   |
| Warranty              | Warranty ≥ 6 years on system |
| Safety                | ANSI Z21.10.3/CSA 4.3        |

338  
339  
340  
341  
342  
343

**Note:** EPA's goal with this revision is to translate the current EF requirements into UEF requirements without altering the stringency. EPA also strove to keep the number of categories of water heaters as small as possible. Finally, it has been true for some time that DOE minimum efficiency requirements are equations based largely on capacity, while ENERGY STAR requirements are not. Given the complexity of

344 converting to a new metric, EPA has not reexamined this decision for the Version 3.1 UEF requirements,  
345 but may do so for the next revision.

346 The FHR for electric storage water heaters, although a different value than the current requirement,  
347 represents the same desired performance. The difference in value stems from the requirements of the  
348 DOE test procedure for UEF.

349 All current ENERGY STAR gas-fired storage water heaters are expected to meet or exceed the proposed  
350 UEF levels based on draw pattern, according to the conversion factors published by DOE in 10 CFR  
351 429.17. EPA seeks feedback on how currently-certified water heaters are testing compared to the  
352 conversion, and on the proposed requirements for gas-fired storage water heaters larger than 55 gallons  
353 and the potential market for this category.

354 For gas-fired instantaneous water heaters, EPA is proposing a single UEF level for all federally-covered  
355 products. EPA is under the assumption that new products larger than two gallons will perform at a high  
356 level comparable to standard products less than two gallons, based on conversations with manufacturers  
357 of similar products. The Maximum GPM rating for gas-fired instantaneous water heaters, although a  
358 different value from the current requirement, represents the same desired performance. The difference in  
359 value stems from the requirements of the DOE test procedure for UEF. All current ENERGY STAR gas-  
360 fired instantaneous models are expected to exceed the proposed criteria.

361 Lastly, for gas-fired storage residential-duty commercial water heaters, all current ENERGY STAR models  
362 are expected to meet or exceed the proposed UEF level.

363  
364 **3) Test Methods:**

365 **Note:** Below are the test methods for water heaters certifying using UEF.

- 366  
367 A. When testing residential water heaters, the following test methods shall be used to determine  
368 ENERGY STAR certification:  
369

370 **Table 5: Test Methods for ENERGY STAR Certification**

| Applicable Products   | ENERGY STAR Requirement     | Test Method Reference             |
|---|-----------------------------|-----------------------------------|
| Gas and Electric products (not including gas-fired storage residential-duty commercial water heaters); FHR is applicable to storage products and Maximum GPM is applicable to instantaneous products. | Uniform Energy Factor (UEF) | 10 CFR 430, Subpart B, Appendix E |
|   | First Hour Rating (FHR)     |                                   |
|   | Maximum GPM Rating          |                                   |
| Gas-fired Storage Residential-duty Commercial products  | Uniform Energy Factor (UEF) | 10 CFR 431, Subpart G             |

371  
372 **Note:** UEF ratings derived via DOE's mathematical conversion rather than through testing, which DOE  
373 will accept through December 29, 2017, may also be used for certification to ENERGY STAR. Products  
374 certified with UEF will be verified pursuant to UEF testing whether the certified UEF value was originally  
375 reported from a UEF test or from an EF value that was converted to UEF.