



# ENERGY STAR® Program Requirements Product Specification for Televisions

## Eligibility Criteria Draft 2 Version 8.0

1 Following is the Version 8.0 ENERGY STAR Product Specification for Televisions. A product shall meet  
2 all of the identified criteria if it is to earn the ENERGY STAR.

### 3 **1 DEFINITIONS**

#### 4 A) Product Types:

5 1) Television (TV)<sup>1</sup>: A product designed to produce dynamic video, contains an internal TV tuner  
6 encased within the product housing, and that is capable of receiving dynamic visual content from  
7 wired or wireless sources including but not limited to:

8 a) Broadcast and similar services for terrestrial, cable, satellite, and/or broadband transmission  
9 of analog and/or digital signals; and/or

10 b) Display-specific data connections, such as HDMI, Component video, S-video, Composite  
11 video; and/or

12 c) Media storage devices such as a USB flash drive, a memory card, or a DVD; and/or

13 d) Network connections, usually using Internet Protocol, typically carried over Ethernet or Wi-Fi.

14 2) Home Theater Display (HTD): A product with diagonal viewable screen size greater than 25  
15 inches, that is designed to produce dynamic video, that does not contain an internal TV tuner  
16 encased within the product housing, that is primarily marketed for use in home theater  
17 applications, and that is capable of receiving dynamic visual content from wired or wireless  
18 sources including but not limited to:

19 a) Display-specific data connections, such as HDMI, Component video, S-video, Composite  
20 video; and/or

21 b) Media storage devices such as a USB flash drive, a memory card, or a DVD; and/or

22 c) Network connections, usually using Internet Protocol, typically carried over Ethernet or Wi-Fi.

23 Home Theater Display does not include Computer Monitors or Signage Displays (defined in the  
24 ENERGY STAR Product Specification for Displays).

25 3) Hospitality Television/Home Theater Display: A TV or HTD product which includes the following  
26 features:

27 a) A control port for bi-directional communication (DB-9, RJ11, RJ12, RJ45, coaxial cable, or  
28 HDMI-CEC); and

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1 10 CFR 430.2

29 b) Activated hospitality protocol software (e.g., SmartPort, Meeting Professionals International  
30 (MPI), Multiple Television Interface (MTI), Serial Protocol) to provide direct access to Video-  
31 On-Demand (VOD) systems, non-video hotel services or a digital media player designed for  
32 hospitality-specific applications.

33 B) Operational Modes:

34 1) On Mode<sup>2</sup>: The mode of operation in which the TV/HTD is connected to mains power, and is  
35 capable of producing dynamic video.

36 2) Standby-Passive Mode<sup>3</sup>: The mode of operation in which the TV/HTD is connected to mains  
37 power, produces neither sound nor picture, and can be switched into another mode with only the  
38 remote control unit or an internal signal.

39 3) Standby-Active, Low Mode<sup>4</sup>: The mode of operation in which the TV/HTD is connected to mains  
40 power, produces neither sound nor picture, can be switched into another mode with the remote  
41 control unit or an internal signal, and can additionally be switched into another mode with an  
42 external signal.

43 4) Standby-Active, High Mode<sup>5</sup>: The mode of operation in which the TV/HTD is connected to mains  
44 power, produces neither sound nor picture, is exchanging/receiving data with/from an external  
45 source, and can be switched into another mode with the remote control unit, an internal signal, or  
46 an external signal.

47 a) Download Acquisition Mode: The power mode in which the product is connected to a mains  
48 power source, produces neither sound nor picture, and is actively downloading data. Data  
49 downloads may include channel listing information for use by an Electronic Program Guide,  
50 TV/HTD setup data, channel map updates, firmware updates, monitoring for emergency  
51 messaging/communications or other network communications.

52 5) Off Mode<sup>6</sup>: The mode of operation in which the TV/HTD is connected to mains power, produces  
53 neither sound nor picture, and cannot be switched into any other mode of operation with the  
54 remote control unit, an internal signal, or external signal.

55 C) Additional Functions<sup>7</sup>: Functions that are not required for the basic operation of the device.

56 Note: Additional functions include, but are not limited to, a VCR unit, a DVD unit, an HDD unit, a FM-  
57 radio unit, a memory card-reader unit, or an ambient lighting unit.  
58

59 1) Thin Client Capability: The ability of the TV/HTD to receive, decrypt, and display encrypted  
60 content provided by a Multichannel Video Programming Distributor (MVPD) over the Local Area  
61 Network via a server device co-located on the customer premises without the need for a client  
62 device at the TV/HTD.

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2 10 CFR 430, Subpart B, Appendix H, Section 2.14

3 10 CFR 430, Subpart B, Appendix H, Section 2.18

4 10 CFR 430, Subpart B, Appendix H, Section 2.20

5 10 CFR 430, Subpart B, Appendix H, Section 2.19,

6 10 CFR 430, Subpart B, Appendix H, Section 2.13

7 10 CFR 430, Subpart B, Appendix H, Section 2.1, which references International Electrotechnical Commission (IEC) Standard 62087 Ed. 3.

63 2) Full Network Connectivity: The ability of the TV/HTD to maintain network presence while in  
64 Standby-Active, Low mode. Presence of the TV/HTD, its network services, and its applications, is  
65 maintained even if some components of the TV/HTD are powered down. The TV/HTD can elect  
66 to change power states based on receipt of network data from remote network devices, but  
67 should otherwise stay in Standby-Active, Low mode absent a demand for services from a remote  
68 network device. Full network connectivity is not limited to a specific set of protocols. Also referred  
69 to as “network proxy” functionality and described in the Ecma-393 standard.

70 D) Special Functions<sup>8</sup>: Functions that are related to, but not required for, the basic operation of the  
71 device.

72  
73 Note: Special functions include, but are not limited to, special sound processing, power saving  
74 functions (e.g., Automatic Brightness Control).

75 1) Automatic Brightness Control (ABC): The self-acting mechanism that controls the brightness of a  
76 display as a function of ambient light.

77 2) Gesture Recognition: Ability to recognize non-verbal communication through a movement of the  
78 body, head, or limbs to express or emphasize an idea, sentiment, or command.

79 3) Voice Recognition: Ability to recognize spoken words or phrases and to convert said  
80 communication into text or commands to which meaning has been assigned.

81 E) TV/HTD Settings and Menus:

82 1) Preset Picture Setting<sup>9</sup>: A preprogrammed factory setting obtained from the TV/HTD menu with  
83 pre-determined picture parameters such as brightness, contrast, color, sharpness, etc. Preset  
84 Picture Settings can be selected within the Home or Retail Configurations.

85 2) Default Picture Setting<sup>10</sup>: The Preset Picture Setting that the TV/HTD enters into immediately  
86 after making a selection from the Forced Menu. If the TV/HTD does not have a Forced Menu, this  
87 is the as-shipped Preset Picture Setting.

88 3) Brightest Selectable Preset Picture Setting<sup>11</sup>: The Preset Picture Setting in which the TV/HTD  
89 produces the highest screen luminance within either the Home or Retail Configuration.

90 4) Home Configuration<sup>12</sup>: The TV/HTD configuration selected from the Forced Menu which is  
91 designed for typical consumer viewing and is recommended by the manufacturer for home  
92 environments.

93 5) Retail Configuration<sup>13</sup>: The TV/HTD configuration selected from the Forced Menu which is  
94 designed to highlight the TV/HTD's features in a retail environment. This configuration may  
95 display demos, disable configurable settings, or increase screen brightness in a manner which is  
96 not desirable for typical consumer viewing.

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8 10 CFR 430, Subpart B, Appendix H, Section 2.17, which references IEC 62087 Ed. 3.

9 10 CFR 430, Subpart B, Appendix H, Section 2.15, with the exception of “Home or Retail Configurations”; Section 2.15 uses “home or retail mode” instead.

10 10 CFR 430, Subpart B, Appendix H, Section 2.4

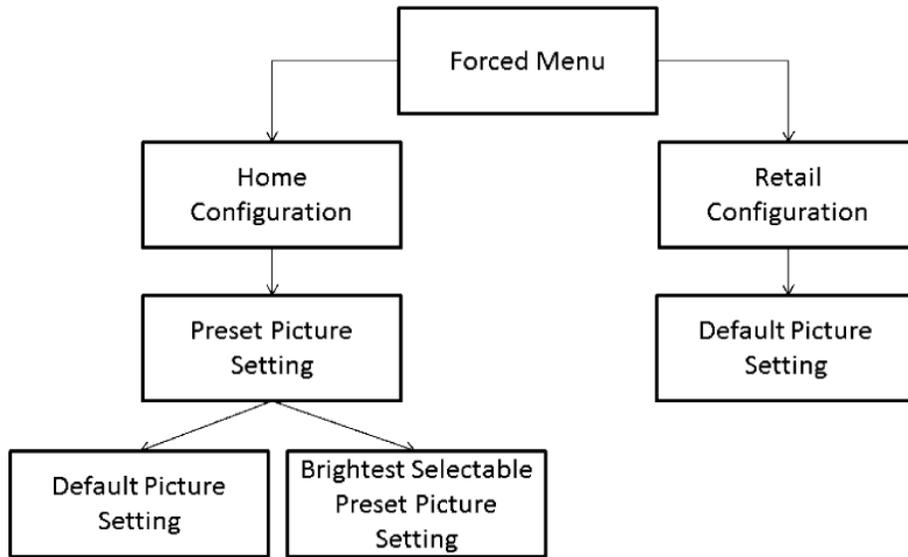
11 10 CFR 430, Subpart B, Appendix H, Section 2.3

12 10 CFR 430, Subpart B, Appendix H, Section 2.6

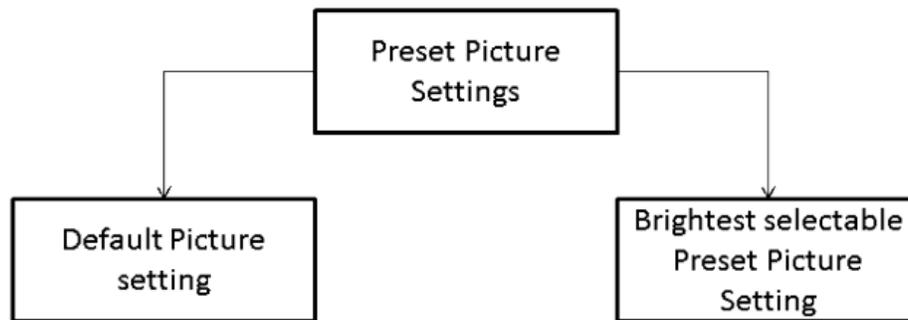
13 10 CFR 430, Subpart B, Appendix H, Section 2.16

- 97 6) High Dynamic Range (HDR) Upscaling: A user-selectable Special Function that extends the  
 98 luminance of the brightest scene elements and apparent saturation of colors of standard-dynamic  
 99 range content in a manner similar to those provided by HDR 10 or Dolby Vision encoding.
- 100 7) Forced Menu<sup>14</sup>: A series of menus which require the selection of initial settings before allowing  
 101 the user to utilize primary functions. Within these menus contains an option to choose the viewing  
 102 environment between Retail and Home Configurations.
- 103 8) Electronic Program Guide (EPG): An interactive on-screen menu of TV/HTD program information  
 104 downloaded from an external source or embedded interstitially in broadcast video streams (e.g.,  
 105 program time, date, and descriptions).

106 **Figure 1: Illustration of Picture Settings for TV/HTDs with a Forced Menu** <sup>15</sup>



107  
 108 **Figure 2: Illustration of Picture Settings for TV/HTDs without a Forced Menu**<sup>16</sup>



109 <sup>14</sup> 10 CFR 430, Subpart B, Appendix H, Section 2.5

<sup>15</sup> U.S. Department of Energy, Energy Conservation Program: Test Procedures for Television Sets; Final rule, *Federal Register*, October 25, 2013, 78 FR 63828.

<sup>16</sup> U.S. Department of Energy, Energy Conservation Program: Test Procedures for Television Sets; Final rule, *Federal Register*, October 25, 2013, 78 FR 63829.

110 F) Power Devices:

111 1) External Power Supply (EPS)<sup>17</sup>: Also referred to as External Power Adapter. An external power  
112 supply circuit that is used to convert household electric current into dc current or lower-voltage ac  
113 current to operate a consumer product.

114 2) Main Battery<sup>18</sup>: A battery capable of powering the TV/HTD to produce dynamic video without the  
115 support of mains power.

116 G) Product Characteristics:

117 1) Luminance<sup>19</sup>: The photometric measure of the luminous intensity per unit area of light traveling in  
118 a given direction, expressed in units of candelas per square meter (cd/m<sup>2</sup>).

119 2) Screen Area: The viewable screen area of the product, calculated by multiplying the viewable  
120 image width by the viewable image height. For curved screens, the measurements shall be made  
121 along the curvature on the face of the screen rather than along a straight line/chord.

122 3) Native Vertical Resolution: The number of visible physical lines along the vertical axis of the  
123 TV/HTD (e.g., a TV/HTD with a screen resolution of 1920 x 1080 (horizontal x vertical) would  
124 have a Native Vertical Resolution of 1080).

125 H) Basic Model<sup>20</sup>: All units of a given type of product (or class thereof) manufactured by one  
126 manufacturer, having the same primary energy source, and which have essentially identical electrical,  
127 physical, and functional characteristics that affect energy consumption and energy efficiency.

128 I) Multichannel Video Programming Distributor (MVPD)<sup>21</sup>: A person such as, but not limited to, a cable  
129 operator, a multichannel multipoint distribution service, a direct broadcast satellite service, or a  
130 television receive-only satellite program distributor, who makes available for purchase, by subscribers  
131 or customers, multiple channels of video programming.

132 J) Unit Under Test (UUT): The unit currently undergoing testing.

133 **2 SCOPE**

134 **2.1 Included Products**

135 2.1.1 Products that are: (1) marketed to the consumer as a TV/HTD (i.e., TV/HTD is the primary  
136 function); (2) capable of being powered from a wall outlet or with an external power supply;  
137 and (3) meet one of the following product type definitions, are eligible for ENERGY STAR  
138 certification, with the exception of products listed in Section 2.2:

- 139 i. TVs
- 140 ii. Hospitality TV/HTDs
- 141 iii. Home Theater Displays

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17 10 CFR 430.2

18 10 CFR 430, Subpart B, Appendix H, Section 2.12

19 10 CFR 430, Subpart B, Appendix H, Section 2.11

20 10 CFR 430.2, with references to water consumption and other specific covered products removed.

21 As defined in 47 USC § 522(13)

142 **2.2 Excluded Products**

143 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible  
144 for certification under this specification. The list of specifications currently in effect can be  
145 found at [www.energystar.gov/specifications](http://www.energystar.gov/specifications).

146 2.2.2 Products that satisfy one or more of the following conditions are not eligible for ENERGY STAR  
147 certification under this specification:

- 148 i. TV/HTDs with a Main Battery that enables operation without connected mains power.
- 149 ii. Products with a computer input port (e.g., VGA), that are marketed and sold primarily as  
150 computer monitors or other displays, and that do not contain an integrated TV tuner encased  
151 within the product housing.

152 **3 CERTIFICATION CRITERIA**

153 **3.1 Significant Digits and Rounding**

154 3.1.1 All calculations shall be carried out with directly measured (unrounded) values. Only the final  
155 result of a calculation shall be rounded.

156 3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using exact  
157 values without any benefit from rounding.

158 3.1.3 Annual Energy Consumption (AEC) values less than 100 kWh shall be rounded to the nearest  
159 tenth of a kWh; otherwise, they shall be rounded to the nearest kWh, as specified in Section  
160 8.2 of Appendix H to 10 CFR Part 430, for reporting on the ENERGY STAR website.

161 3.1.4 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR  
162 website shall be rounded to the nearest significant digit as expressed in the corresponding  
163 specification limit.

164 **3.2 General Requirements**

165 3.2.1 External Power Supplies (EPSs): Single- and Multiple-voltage EPSs shall meet the Level VI or  
166 higher performance requirements under the International Efficiency Marking Protocol when  
167 tested according to the Uniform Test Method for Measuring the Energy Consumption of  
168 External Power Supplies, Appendix Z to Subpart B of 10 CFR Part 430.

- 169 i. Single- and Multiple-voltage EPSs shall include the Level VI or higher marking.
- 170 ii. Additional information on the Marking Protocol is available  
171 at <http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218>.

172 3.2.2 General User Information: The product shall ship with consumer informational materials  
173 located in either (1) the hard copy or electronic user manual, or (2) a package or box insert.  
174 These materials shall include:

- 175 i. Information about the ENERGY STAR program,
- 176 ii. Information on the energy consumption implications of changes to default as-shipped  
177 TV/HTD configuration and settings, and
- 178 iii. Notification that enabling certain optional features and functionalities (e.g., instant-on), may  
179 increase energy consumption beyond the limits required for ENERGY STAR certification, as  
180 applicable.

181 3.2.3 Energy Saving Features: A TV/HTD may not be certified with any detectable or undetectable  
182 energy saving features (e.g., Motion Detection Dimming) that are enabled when tested  
183 according to Appendix H to Subpart B of 10 CFR Part 430 unless that feature provides  
184 comparable energy savings during typical viewing experiences (i.e., the duration of a variety of  
185 popular programming). This prohibition applies irrespective of whether the function's primary  
186 or intended purpose is energy savings.

187 Note: Manufacturers seeking to certify products with new or unvetted energy saving features  
188 enabled are encouraged to submit internal test data demonstrating results over a range of  
189 currently popular content to EPA for review and approval prior to submitting the product for  
190 certification.

191 **Note:** EPA received mixed feedback from stakeholders on its proposal in Section 3.2.3 to limit the use of  
192 an energy saving feature unless it delivers comparable savings during typical viewing experiences.  
193 Manufacturers, utilities and NGOs all expressed a need for a clear definition of "typical viewing  
194 experience" (some preferred an additional test method) to guard against variability in how results may be  
195 interpreted and publicized. Manufacturers relayed that they would be vulnerable to product de-listing if  
196 test results were interpreted differently by EPA and/or other external stakeholders. Manufacturers  
197 commented that such uncertainty would potentially limit the development of future energy saving features  
198 and impede innovation. EPA understands manufacturers' concern regarding variability of "typical viewing  
199 experiences", and thus encourages manufacturers seeking greater assurance to share their assessment  
200 of any new energy saving feature with EPA for approval prior to certification. We would expect to see  
201 performance data demonstrating savings over a range of typical viewing content (i.e., full length of  
202 popular programming such as news, sports, dramas). For energy saving features dependent on content  
203 displayed, using any common length of popular programming over a variety of genres should be  
204 adequate to determine if the features deliver similar savings across different content.

205 Other stakeholders recommended that energy saving features should persist across more Preset Picture  
206 Settings, as EPA is proposing to do for ABC. EPA agrees and has clarified language in Sections 3.2.5  
207 and 3.2.6 to make the persistence requirements apply to any energy saving features. The requirement in  
208 Section 3.2.3 above is intended to prevent certification with features that can detect specific content in a  
209 test method and thus demonstrate savings that are less likely to occur in a real world setting with content  
210 different from that of the test method.

211 3.2.4 Forced Menu: Any product that includes a Forced Menu upon initial start-up shall:

- 212 i. Provide users with a choice of Home Configuration or Retail Configuration. Partners may use  
213 alternative terminology if approved by the U.S. Environmental Protection Agency (EPA).
- 214 ii. Upon selection of Retail Configuration at initial start-up, either (1) display a second prompt  
215 requiring the user to confirm the choice of Retail Configuration, or (2) display information on  
216 the start-up menu that the Home Configuration is the setting in which the product qualifies for  
217 ENERGY STAR. If option (2) is selected, additional detail about ENERGY STAR certification  
218 and energy consumption expectations shall be included in printed product literature and on  
219 the product information page on the Partner's website.

220 3.2.5 Preset Picture Setting Menu: For any product where consumers have the option of selecting  
221 different picture settings from a preset menu at any time:

- 222 i. The product shall display on-screen information that the Default Picture Setting reflects the  
223 setting under which the product qualifies for the ENERGY STAR. For example, such  
224 information may be indicated by including an electronic ENERGY STAR mark alongside the  
225 name or description of that picture setting or in the form of a message displayed each time  
226 any setting other than the Default Picture Setting is selected.
- 227 ii. For products with an energy saving feature (e.g., ABC) enabled in the Default Picture Setting,  
228 the product will display on-screen information that the energy saving feature is being disabled

229 when another Preset Picture Setting is selected that does not also have the energy saving  
230 feature enabled by default.

231  
232 iii. For each Preset Picture Setting with energy saving feature(s) (e.g., ABC) enabled by default,  
233 the energy saving feature(s) shall default back to being enabled whenever the user selects  
234 that preset picture setting.

235 **Note:** Stakeholders provided feedback requesting that EPA add language to Section 3.2.5 requiring ABC  
236 to default back to on after the user switches out of retail mode and after HDR content has been played.  
237 EPA agrees with this feedback and proposes expanded language under Section 3.2.5 requiring energy  
238 saving features to default back to on when entering preset picture settings where the features were  
239 initially enabled as shipped. This may override user choices made last time the preset picture setting was  
240 used.

241 Also, EPA notes that it has modified Section 3.2.5 to reference energy saving features more broadly, not  
242 solely ABC as referenced in Draft 1, to encourage the persistence of all energy saving features, including  
243 new ones that may be developed, that deliver consistent savings.

244 3.2.6 Manual Adjustments to TV Parameters: For products with an energy saving feature (e.g.,  
245 ABC) enabled in the Default Picture setting, the feature's functionality must remain enabled  
246 during manual adjustments to any of the TV's picture parameters, such as screen brightness,  
247 backlight, and contrast ratio.

248 3.2.7 Special Functions: The TV/HTD shall alert the user anytime the activation of any Special  
249 Function disables an energy saving feature.

250 **Note:** Manufacturers provided input for Section 3.2.7 citing that the language proposed in Draft 1, which  
251 stated that the TV/HTD shall alert the user anytime the activation of a Special function increases the  
252 energy consumption of the product, would be challenging to implement due to the lack of a test method  
253 available to measure the energy consumption of Special Functions and a lack of a complete list of all  
254 Special Functions available. As such, manufacturers would have difficulty determining when an alert  
255 would be required. EPA understands these concerns and proposes modified language in Section 3.2.7  
256 where the TV/HTD must provide an alert only when activation of a Special Function disables an energy  
257 saving feature.

258 3.2.8 Standby-Passive Mode and Standby-Active, Low Mode Settings: If users can select and  
259 enable Standby-Passive Mode or Standby-Active, Low Mode functions from a display prompt  
260 in On Mode or a settings menu other than a Forced Menu, and if these functions may alter  
261 power consumption from the default, as-tested Home Configuration:

262 i. The product shall display on-screen information that the default as-shipped settings reflect  
263 the settings under which the product qualifies for the ENERGY STAR. For example, such  
264 information may be indicated by including an electronic ENERGY STAR mark alongside the  
265 name or description of the default as-shipped settings or in the form of a message displayed  
266 each time any setting other than the default as-shipped setting is selected.

267 ii. Products with a physical ENERGY STAR mark affixed to the front or top of the TV/HTD may  
268 alternatively display on-screen information that enabling settings other than the default as-  
269 shipped settings may change the energy consumption of the product.

270 3.2.9 Thin Client Capability and MVPD-ready Information: Products that have Thin Client Capability  
271 as-shipped or are otherwise MVPD-ready shall:

272 i. Report the presence of Thin Client Capability and supporting information including, but not  
273 limited to, interoperability protocols, decryption, and decoding functions for display on the  
274 ENERGY STAR certified products list; and

275 ii. Inform the consumer in the user manual and/or on-screen prompt that the TV/HTD may be  
276 capable of operating without a set-top box from an MVPD.

277 3.2.10 Standby-Active, High Mode Capability: TV/HTDs with Standby-Active, High Mode shall  
278 automatically return to the default as-tested Standby-Active, Low Mode or Standby-Passive  
279 Mode following a manufacturer firmware update or other maintenance operation in Standby  
280 Active, High Mode within a period less than or equal to 15 minutes from the completion of said  
281 update/maintenance operation.

### 282 3.3 On Mode Requirements

283 3.3.1 For all TV/HTDs, On Mode power, as determined per Section 7.1.2 *On Mode Test for TVs*  
284 *without ABC Enabled by Default* or Section 7.1.3.2 *On Mode Power Calculation* (for TVs with  
285 ABC Enabled by Default) in Appendix H shall be less than or equal to the Maximum On Mode  
286 Power Requirement ( $P_{ON\_MAX}$ ) and high resolution allowance, as shown in Equation 1, subject  
287 to the following requirement:

288 i. For TVs with ABC or any other energy saving feature enabled by default: TVs with up to four  
289 Preset Picture Settings shall have only one or no Preset Picture Setting without ABC and any  
290 other energy saving feature enabled by default, and TVs with more than four Preset Picture  
291 Settings shall have no more than two Preset Pictures Settings without ABC and any other  
292 energy saving feature enabled by default. If the TV does not meet these requirements, a  
293 second test shall be performed, whereby ABC shall not be enabled during On Mode testing.  
294 For this second test, the TV shall be tested per Section 7.1.2 of Appendix H to Subpart B of 10  
295 CFR 430, *On Mode Test for TVs without ABC Enabled by Default* and the resulting On Mode  
296 power shall be less than or equal to  $P_{ON\_MAX}$  and high resolution allowance, as shown in  
297 Equation 1. In TVs that offer both Home and Retail configurations, only the total number of  
298 Preset Picture Settings available under the Home configuration under test conditions shall be  
299 considered.

300 **Note:** Multiple stakeholders requested that EPA require ABC and other energy saving features to be  
301 enabled in all Preset Picture Settings, citing that at least one prominent manufacturer is already doing so.  
302 EPA recognizes and applauds manufacturers that have ABC enabled in all Preset Picture Settings.  
303 However, EPA has also heard from other manufacturers that implementing ABC in all Preset Picture  
304 Settings would not be appropriate. Although the proposed requirement remains unchanged from Draft 1,  
305 EPA is considering requiring that for TVs with ABC Enabled by Default, TVs with any number of Preset  
306 Picture Settings shall have only one or no Preset Picture Setting without ABC enabled by default. With  
307 this Draft 2, EPA requests more information from stakeholders for which specific Preset Picture Settings,  
308 excluding the picture setting under the Retail configuration and any picture settings that may only be  
309 visible with true HDR content, manufacturers are unable to implement ABC.

#### 310 Equation 1: On Mode Power Requirement for All TV/HTDs

$$311 P_{ON} \leq P_{ON\_MAX} + P_{HR}$$

312 Where:

- 313 ■  $P_{ON}$  is On Mode Power in watts;
  - 314 ■  $P_{ON\_MAX}$  is the Maximum On Mode Power requirement in watts, calculated in Equation 2; and
  - 315 ■  $P_{HR}$  is a high resolution allowance in watts, as applicable, calculated in Equation 3.
- 316  
317

318 3.3.2 The Maximum On Mode Power Requirement ( $P_{ON\_MAX}$ ) in watts shall be calculated per  
319 Equation 2.

#### 320 Equation 2: Maximum On Mode Power Requirement for All TV/HTDs

$$321 P_{ON\_MAX} = 78.5 \times \tanh[0.0005 \times (A - 140) + 0.038] + 14$$

322 Where:



356 **Note:** EPA received mixed stakeholder input on the Draft 1 proposal requiring that products certifying to  
 357 On Mode requirements with ABC enabled by default shall have a luminance at 3 lux in the Default Picture  
 358 Setting greater than or equal to 150 cd/m<sup>2</sup>. Two manufacturers commented that 150 cd/m<sup>2</sup> was not  
 359 practical since the absolute value of luminance measured may vary significantly from unit to unit. As a  
 360 result, some manufacturers would need to set the minimum screen luminance at an even higher  
 361 brightness than they deem optimal for viewing at 3 lux to provide a buffer that would ensure that all  
 362 models would pass verification testing at 150 cd/m<sup>2</sup>. They instead proposed that EPA either set a 20-30%  
 363 ratio between luminance with ABC enabled at 3 lux and luminance at the Brightest Selectable Preset  
 364 Picture Setting or set a luminance minimum 80 cd/m<sup>2</sup> at 3 lux to account for large variances in measuring  
 365 for a fixed luminance. Other stakeholders generally supported EPA’s proposal to require a screen  
 366 luminance of 150 cd/m<sup>2</sup> at 3 lux. One stakeholder cited 100 cd/m<sup>2</sup> as the minimum screen brightness  
 367 recommended in the TCO Displays standard, whereas another manufacturer confirmed that the 150  
 368 cd/m<sup>2</sup> at 3 lux requirement would be acceptable.

369 In response to varied feedback, EPA requested additional insight from the Imaging Science Foundation  
 370 (ISF) on how it arrived at its recommended screen brightness of 150 cd/m<sup>2</sup> for dark room viewing. ISF  
 371 provided input based on its 10-15 years of gathering insights and field data that consistently showed  
 372 viewer preferences for a screen luminance of 150 cd/m<sup>2</sup> in dark rooms for LCD TVs. Balancing  
 373 stakeholder input, EPA proposes setting a minimum screen luminance of 125 cd/m<sup>2</sup> at 3 lux to account for  
 374 variations in measured screen luminance, as noted by some manufacturers, and to maintain a minimum  
 375 floor to guard against TVs certified with ABC enabled from shipping too dim. EPA maintains its proposal  
 376 to set a minimum required luminance instead of a ratio to guard against TVs with comparatively low  
 377 Brightest Selectable Preset Picture Settings from shipping too dim. EPA welcomes additional feedback  
 378 and data regarding this proposal.

379 **3.7 Download Acquisition Mode (DAM) Requirements for Hospitality TV/HTDs**

380 3.7.1 A product may automatically exit Standby-Passive Mode or Standby-Active, Low Mode and  
 381 enter Download Acquisition Mode according to a predefined schedule, in order to:

- 382 i. Download channel listing information for use by an electronic programming guide,
- 383 ii. Monitor for emergency messaging/communications, or
- 384 iii. Communicate via a network protocol.

385 3.7.2 DAM energy consumption for all DAM states ( $E_{DAM}$ ), as measured per the CEA Procedure for  
 386 DAM Testing, shall be less than or equal to 40 watt-hours per day (0.04 kWh/day).

387 **Note:** Products intended for sale in the US market are subject to minimum toxicity and recyclability  
 388 requirements. Please see ENERGY STAR Program Requirements for Televisions: Partner Commitments  
 389 for details.  
 390

391 **4 TESTING**

392 **4.1 Test Methods**

393 4.1.1 Test methods identified in Table 1 shall be used for certification.

394 **Table 1: Test Methods for ENERGY STAR Certification**

Product Type	Test Method
All Ac Mains-powered TV/HTDs	Uniform Test Method for Measuring the Energy Consumption of Television Sets incorporated in Appendix H to Subpart B of 10 CFR Part 430.

395

396 **4.2 Additional Required Test for TV/HTDs with HDR Upscaling**

397 4.2.1 For products with HDR Upscaling, one of the following additional tests is required for ENERGY  
398 STAR certification:

- 399 i. For products with HDR Upscaling as a Special Function selectable from within the Default  
400 Picture Setting, enable this feature and record the average power consumption value over a  
401 10-minute period following the guidance in Section 7.1.2 of Appendix H to Subpart B of 10  
402 CFR Part 430; or
- 403 ii. For products with a separate Preset Picture Setting with built-in HDR Upscaling that is not the  
404 Default Picture Setting or Brightest Selectable Preset Picture Setting, choose that Preset  
405 Picture Setting and record the average power consumption over a 10-minute period following  
406 the guidance in Section 7.1.2 of Appendix H to Subpart B of 10 CFR Part 430 and record the  
407 luminance following Sections 7.2.1.2 through 7.2.3 of Appendix H to Subpart B of 10 CFR  
408 Part 430.

409 **4.3 Additional Required Test for TV/HTDs with Standby-Active, Low Mode**

410 4.3.1 The following method in Table 2 shall be used for TV/HTDs with a Standby-Active, Low mode:

411 **Table 2: Methods for TV/HTDs with Standby-Active, Low**

Product Type	Method
TV/HTDs with Standby-Active, Low Mode	CEA-2037-A, Determination of Television Set Power Consumption

412

413 4.3.2 If the TV/HTD is network-enabled and tested in Standby-Active, Low per Appendix H, the  
414 following additional test is required for ENERGY STAR certification:

- 415 i. Perform all procedures specified in Section 6.7.5 *Standby-active, Low* of CEA-2037-A with  
416 the additional preconditions:
  - 417 1) Place the UUT in On Mode as tested per Section 7.1.1 *On Mode Test* of Appendix H and  
418 momentarily press the power button on the remote control; and
  - 419 2) Wait 5 minutes after pressing the power button before beginning the Section 6.7.5  
420 procedures in CEA-2037-A.
- 421 ii. TV/HTDs for which availability can be confirmed with one of the methods in Section 6.7.5.2  
422 *Availability* of CEA-2037-A shall be reported as having Full Network Connectivity.

423 **4.4 Additional Required Test for Hospitality TV/HTDs**

424 4.4.1 DAM energy consumption of Hospitality TV/HTDs shall be measured using the following  
425 method in Table 3:

426 **Table 3: Method for Hospitality TV/HTDs**

Product Type	Method
Hospitality TV/HTDs	CEA Procedure for DAM Testing: For TVs, Rev. 0.3, Sept. 2010

## 427 **4.5 Number of Units Required for Testing**

428 4.5.1 One of the following sampling plans shall be used to test for ENERGY STAR certification:

- 429 i. A single representative unit shall be selected for testing the Basic Model;
- 430 ii. Units shall be selected for testing per the sampling requirements defined in 10 CFR 429.25,
- 431 which references 10 CFR 429.11.

## 432 **4.6 International Market Certification**

433 4.6.1 Products shall be tested for certification at the relevant input voltage/frequency combination for  
434 each market in which they will be sold and promoted as ENERGY STAR.

## 435 **5 USER INTERFACE**

436 5.1.1 Partners are encouraged to design products in accordance with the user interface standard  
437 IEEE 1621: Standard for User Interface Elements in Power Control of Electronic Devices  
438 Employed in Office/Consumer Environments. For details, see <http://eetd.LBL.gov/Controls>.

## 439 **6 EFFECTIVE DATE**

440 6.1.1 Effective Date: The Version 8.0 ENERGY STAR Televisions specification shall take effect on  
441 **TBD, 2018**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR  
442 specification in effect on its date of manufacture. The date of manufacture is specific to each  
443 unit and is the date on which a unit is considered to be completely assembled.

444 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should  
445 technological and/or market changes affect its usefulness to consumers, industry, or the  
446 environment. In keeping with current policy, revisions to the specification are arrived at  
447 through stakeholder discussions. In the event of a specification revision, please note that the  
448 ENERGY STAR certification is not automatically granted for the life of a product model.

## 449 **7 CONSIDERATIONS FOR FUTURE REVISIONS**

450 7.1.1 Standby-Active, High Mode: EPA and DOE are interested in learning more about Standby-  
451 Active, High Mode. EPA anticipates exploring this issue and potential power limits and duty  
452 cycle requirements in the next specification revision.

453 7.1.2 Trends and Improvements in Energy Efficiency: EPA anticipates continued gains in energy  
454 efficiency to be achieved in the next few years with advances in technology such as LED  
455 efficacy, the addition of reflective polarizing film, power supply improvements, lower screen  
456 reflectance, improved backplanes (Low Temperature Polysilicon and Indium Gallium Zinc  
457 Oxide), quantum dot technology, and next generation Organic Light Emitting Diodes (OLED).  
458 As such, EPA anticipates an opportunity for proposing further limits on power consumption in  
459 future revisions.

460 7.1.3 ABC Performance Across All Preset Picture Settings: EPA is interested in better  
461 understanding how ABC performs across all Preset Picture Settings. EPA anticipates  
462 exploring this issue once ABC is implemented in and persistent across more Preset Picture  
463 Settings.

464 **Note:** In response to Draft 1, stakeholders recommended that EPA develop a requirement to ensure that  
465 ABC perform similarly in all Preset Picture Settings. EPA shares stakeholder interest in ensuring that ABC  
466 delivers savings across all Preset Picture Settings, but at this time does not have enough information on  
467 variances in ABC savings that may depend on Preset Picture Setting configurations to propose such a  
468 requirement. EPA will continue to monitor the market to better understand the impacts of ABC in different  
469 Preset Picture Settings

470 7.1.4 UHD Allowance: EPA anticipates modifying the UHD allowance in the next revision to account  
471 for UHD gains in efficiency.

472 **Note:** In response to Draft 1, stakeholders provided data from HD and UHD TVs in the California Energy  
473 Commission database and data from UHD and HD TVs in the EU. Both datasets demonstrated that UHD  
474 TVs consume approximately 13% more power than HD models. As such, stakeholders advocated that  
475 EPA reduce in Version 8.0 the 50% UHD allowance. EPA shares stakeholder interest in reducing the  
476 power draw of UHD TVs, however, since its proposal to require a minimum luminance at 3 lux will most  
477 likely impact overall power consumption of TV models qualifying with ABC enabled by default, many of  
478 which are UHD models, EPA is choosing to wait until the next specification revision to address UHD  
479 power consumption limits.

480 7.1.5 HDR Allowance: EPA will monitor the market to assess the extent to which an opportunity  
481 exists to improve the energy efficiency of the HDR upscaling feature and televisions displaying  
482 native HDR content in a future revision.

483 **Note:** Several stakeholders requested that EPA signal its intent to adopt power limits in the future for  
484 power consumption in HDR upscaling mode and to adopt them for the TV displaying native HDR content  
485 once a consensus test clip emerges that contains native HDR content. EPA supports stakeholder efforts  
486 to develop an updated test clip that addresses scene cut frequency and is more representative of the  
487 native 4K and HDR-encoded content increasingly being watched by purchasers of new televisions.