



# ENERGY STAR® Program Requirements Product Specification for Televisions

## Eligibility Criteria Draft 1 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).

---

1 10 CFR 430.2

25 **Note:** EPA is proposing to expand the scope of the ENERGY STAR TV specification to include Home  
26 Theater Displays, which support TV viewing through streaming rather than via a tuner. EPA is proposing  
27 this change based on input from Television Partners that numerous future products, including high-  
28 volume products, will be shipping without a tuner. Since such products would not meet the regulatory  
29 definition of a Television (10 CFR 430.2) which is also used in this ENERGY STAR TV specification, they  
30 would not be able to participate in the ENERGY STAR Televisions program. Further, EPA understands  
31 that consumers are seeking products for use cases that do not call for a tuner such as those associated  
32 with pay-TV services or those used exclusively for streaming content. Since EPA does not anticipate  
33 significant energy consumption differences between these tunerless “Home Theater Display” products  
34 and conventional Televisions, it is proposing to extend the scope of the Televisions specification to  
35 include these new products and apply the same eligibility criteria to them. This way, consumers will be  
36 able to choose energy efficiency whether or not their use case requires a tuner.

37 The proposed HTD definition includes most of the requirements of the regulatory TV definition but  
38 excludes the tuner. It also clarifies that these products do not include Computer Monitors or Signage  
39 Displays, which are subject to separate requirements in the ENERGY STAR Product Specification for  
40 Displays. Finally, to further prevent miscategorization of Computer Monitors, EPA is proposing that HTDs  
41 include only products with diagonal viewable screen size greater than 25 inches. EPA welcomes  
42 comments on the proposed definition. EPA seeks feedback on whether the proposed definition clearly  
43 differentiates between HTDs and Signage displays.

44 In addition to providing a HTD definition and expanding the scope, EPA is proposing a number of small  
45 changes to clarify that all specification requirements also apply to these new products.

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

- 48 a) A control port for bi-directional communication (DB-9, RJ11, RJ12, RJ45, coaxial cable, or  
49 HDMI-CEC); and
- 50 b) Activated hospitality protocol software (e.g., SmartPort, Meeting Professionals International  
51 (MPI), Multiple Television Interface (MTI), Serial Protocol) to provide direct access to Video-  
52 On-Demand (VOD) systems, non-video hotel services or a digital media player designed for  
53 hospitality-specific applications.

54 B) Operational Modes:

- 55 1) On Mode<sup>2</sup>: The mode of operation in which the TV/HTD is connected to mains power, and is  
56 capable of producing dynamic video.
- 57 2) Standby-Passive Mode<sup>3</sup>: The mode of operation in which the TV/HTD is connected to mains  
58 power, produces neither sound nor picture, and can be switched into another mode with only the  
59 remote control unit or an internal signal.
- 60 3) Standby-Active, Low Mode<sup>4</sup>: The mode of operation in which the TV/HTD is connected to mains  
61 power, produces neither sound nor picture, can be switched into another mode with the remote  
62 control unit or an internal signal, and can additionally be switched into another mode with an  
63 external signal.

---

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

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

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

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

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

77  
78 Note: Additional functions include, but are not limited to, a VCR unit, a DVD unit, an HDD unit, a FM-  
79 radio unit, a memory card-reader unit, or an ambient lighting unit.

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

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

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

93  
94 Note: Special functions include, but are not limited to, special sound processing, power saving  
95 functions (e.g., Automatic Brightness Control).

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

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

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

102 E) TV/HTD Settings and Menus:

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.

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

- 103 1) Preset Picture Setting<sup>9</sup>: A preprogrammed factory setting obtained from the TV/HTD menu with  
 104 pre-determined picture parameters such as brightness, contrast, color, sharpness, etc. Preset  
 105 Picture Settings can be selected within the Home or Retail Configurations.
- 106 2) Default Picture Setting<sup>10</sup>: The Preset Picture Setting that the TV/HTD enters into immediately  
 107 after making a selection from the Forced Menu. If the TV/HTD does not have a Forced Menu, this  
 108 is the as-shipped Preset Picture Setting.
- 109 3) Brightest Selectable Preset Picture Setting<sup>11</sup>: The Preset Picture Setting in which the TV/HTD  
 110 produces the highest screen luminance within either the Home or Retail Configuration.
- 111 4) Home Configuration<sup>12</sup>: The TV/HTD configuration selected from the Forced Menu which is  
 112 designed for typical consumer viewing and is recommended by the manufacturer for home  
 113 environments.
- 114 5) Retail Configuration<sup>13</sup>: The TV/HTD configuration selected from the Forced Menu which is  
 115 designed to highlight the TV/HTD's features in a retail environment. This configuration may  
 116 display demos, disable configurable settings, or increase screen brightness in a manner which is  
 117 not desirable for typical consumer viewing.
- 118 6) High Dynamic Range (HDR) Upscaling: A user-selectable Special Function that extends the  
 119 luminance of the brightest scene elements and apparent saturation of colors of standard-dynamic  
 120 range content in a manner similar to those provided by HDR 10 or Dolby Vision encoding.

121 **Note:** EPA is proposing the above definition to permit testing of HDR Upscaling to characterize the  
 122 energy performance of these settings. In contrast to true HDR picture settings, sometimes referred to by  
 123 manufacturers as 'modes,' which require HDR encoded content, these settings can be used with all  
 124 standard dynamic range (SDR) content, with a potential corresponding impact on annual energy  
 125 consumption.

- 126 7) Forced Menu<sup>14</sup>: A series of menus which require the selection of initial settings before allowing  
 127 the user to utilize primary functions. Within these menus contains an option to choose the viewing  
 128 environment between Retail and Home Configurations.
- 129 8) Electronic Program Guide (EPG): An interactive on-screen menu of TV/HTD program information  
 130 downloaded from an external source or embedded interstitially in broadcast video streams (e.g.,  
 131 program time, date, and descriptions).

---

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

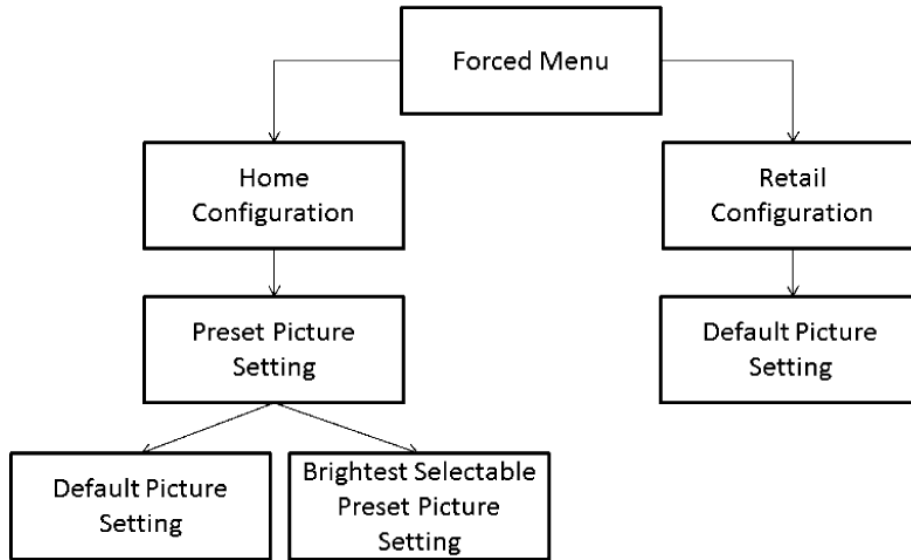
12 10 CFR 430, Subpart B, Appendix H, Section 2.6

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

14 10 CFR 430, Subpart B, Appendix H, Section 2.5

132

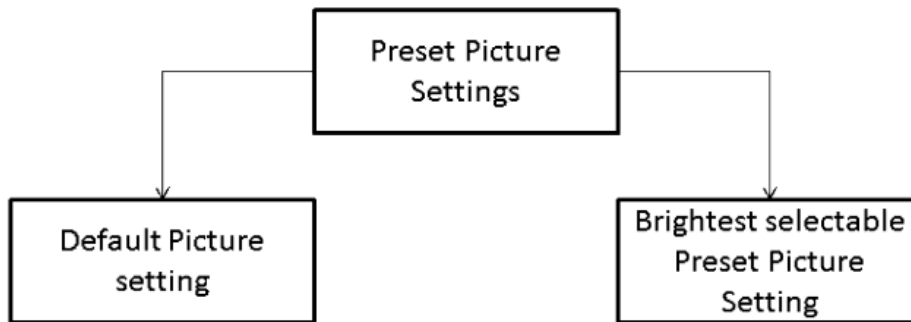
Figure 1: Illustration of Picture Settings for TV/HTDs with a Forced Menu<sup>15</sup>



133

134

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



135

136 F) Power Devices:

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

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

142 G) Product Characteristics:

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

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

17 10 CFR 430.2

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

- 143 1) Luminance<sup>19</sup>: The photometric measure of the luminous intensity per unit area of light traveling in  
144 a given direction, expressed in units of candelas per square meter (cd/m<sup>2</sup>).
- 145 2) Screen Area: The viewable screen area of the product, calculated by multiplying the viewable  
146 image width by the viewable image height. For curved screens, the measurements shall be made  
147 along the curvature on the face of the screen rather than along a straight line/chord.
- 148 3) Native Vertical Resolution: The number of visible physical lines along the vertical axis of the  
149 TV/HTD (e.g., a TV/HTD with a screen resolution of 1920 x 1080 (horizontal x vertical) would  
150 have a Native Vertical Resolution of 1080).
- 151 H) Basic Model<sup>20</sup>: All units of a given type of product (or class thereof) manufactured by one  
152 manufacturer, having the same primary energy source, and which have essentially identical electrical,  
153 physical, and functional characteristics that affect energy consumption and energy efficiency.
- 154 I) Multichannel Video Programming Distributor (MVPD)<sup>21</sup>: A person such as, but not limited to, a cable  
155 operator, a multichannel multipoint distribution service, a direct broadcast satellite service, or a  
156 television receive-only satellite program distributor, who makes available for purchase, by subscribers  
157 or customers, multiple channels of video programming.
- 158 J) Unit Under Test (UUT): The unit currently undergoing testing.

## 159 2 SCOPE

### 160 2.1 Included Products

- 161 2.1.1 Products that are: (1) marketed to the consumer as a TV/HTD (i.e., TV/HTD is the primary  
162 function); (2) capable of being powered from a wall outlet or with an external power supply;  
163 and (3) meet one of the following product type definitions, are eligible for ENERGY STAR  
164 certification, with the exception of products listed in Section 2.2:
- 165 i. TVs
  - 166 ii. Hospitality TV/HTDs
  - 167 iii. Home Theater Displays

168 **Note:** EPA has included Home Theater Displays in the scope of the specification, per the above  
169 definition, based on input from Television Partners that numerous future products, including high-volume  
170 products, will be shipping without a tuner.

### 171 2.2 Excluded Products

- 172 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible  
173 for certification under this specification. The list of specifications currently in effect can be  
174 found at [www.energystar.gov/specifications](http://www.energystar.gov/specifications).
- 175 2.2.2 Products that satisfy one or more of the following conditions are not eligible for ENERGY STAR  
176 certification under this specification:
- 177 i. TV/HTDs with a Main Battery that enables operation without connected mains power.

---

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)

- 178 ii. Products with a computer input port (e.g., VGA), that are marketed and sold primarily as  
179 computer monitors or other displays, and that do not contain an integrated TV tuner encased  
180 within the product housing.

### 181 3 CERTIFICATION CRITERIA

#### 182 3.1 Significant Digits and Rounding

- 183 3.1.1 All calculations shall be carried out with directly measured (unrounded) values. Only the final  
184 result of a calculation shall be rounded.
- 185 3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using exact  
186 values without any benefit from rounding.
- 187 3.1.3 Annual Energy Consumption (AEC) values less than 100 kWh shall be rounded to the nearest  
188 tenth of a kWh; otherwise, they shall be rounded to the nearest kWh, as specified in Section  
189 8.2 of Appendix H to 10 CFR Part 430, for reporting on the ENERGY STAR website.
- 190 3.1.4 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR  
191 website shall be rounded to the nearest significant digit as expressed in the corresponding  
192 specification limit.

#### 193 3.2 General Requirements

- 194 3.2.1 External Power Supplies (EPSs): Single- and Multiple-voltage EPSs shall meet the Level VI or  
195 higher performance requirements under the International Efficiency Marking Protocol when  
196 tested according to the Uniform Test Method for Measuring the Energy Consumption of  
197 External Power Supplies, Appendix Z to Subpart B of 10 CFR Part 430.
- 198 i. Single- and Multiple-voltage EPSs shall include the Level VI or higher marking.  
199 ii. Additional information on the Marking Protocol is available  
200 at <http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218>.
- 201 3.2.2 General User Information: The product shall ship with consumer informational materials  
202 located in either (1) the hard copy or electronic user manual, or (2) a package or box insert.  
203 These materials shall include:
- 204 i. Information about the ENERGY STAR program,  
205 ii. Information on the energy consumption implications of changes to default as-shipped  
206 TV/HTD configuration and settings, and  
207 iii. Notification that enabling certain optional features and functionalities (e.g., instant-on), may  
208 increase energy consumption beyond the limits required for ENERGY STAR certification, as  
209 applicable.
- 210 3.2.3 Energy Saving Features: A TV/HTD may not be certified with any detectable or undetectable  
211 energy saving feature (e.g., Motion Detection Dimming) enabled during testing unless that  
212 feature provides comparable energy savings during typical viewing experiences (i.e., the  
213 duration of a variety of popular programming) as to those realized when tested according to  
214 Appendix H to Subpart B of 10 CFR Part 430. This prohibition applies irrespective of whether  
215 the function's primary or intended purpose is energy savings.

216 **Note:** EPA is adding language to the specification prohibiting certification of TVs as ENERGY STAR if  
217 they have enabled energy saving features during testing with the IEC test clip that do not offer  
218 comparable savings when tested with content that reflects a variety of typical viewing experiences.

219 EPA understands that certain features besides ABC are employed in some TVs and may not consistently  
 220 deliver energy savings. To illustrate this point, EPA examined data, as shown in the table below, where  
 221 three organizations tested a number of televisions containing a feature termed Motion Detection Dimming  
 222 (MDD), enabled by default.

Testing Organization	Realistic Clip Content	IEC Clip			Realistic Clip			Realistic Clip Compared to IEC		
		MDD Off Power (W)	MDD On Power (W)	MDD Savings (W)	MDD Off Power (W)	MDD On Power (W)	MDD Savings (W)	% Difference in non-MDD Power	% Difference in MDD Power	% Difference in MDD Savings
CLASP	STEP Test Clip	72.3	61.5	10.8	70.0	68.0	2.0	3%	-11%	81%
		141.7	131.6	10.1	134.1	135.9	-1.8	5%	-3%	118%
		236.0	130.0	106.0	240.0	191.0	49.0	-2%	-47%	54%
DOE	Movies, News, Sports	70.5	52.7	17.8	70.2	55.6	14.6	0%	-6%	18%
		103.3	91.1	12.2	103.9	97.8	6.1	-1%	-7%	50%
		60.7	42.6	18.1	60.7	55.3	5.4	0%	-30%	70%
NRDC	Drama, News, Comedy, Sports, Commercials	124.9	99.7	25.2	124.2	125.0	-0.8	1%	-25%	103%
		180.5	124.9	55.6	178.2	144.4	33.8	1%	-16%	39%
		119.1	75.3	43.8	118.9	105.3	13.6	0%	-40%	69%
<b>AVERAGE</b>		<b>123.2</b>	<b>89.9</b>	<b>33.3</b>	<b>122.2</b>	<b>108.7</b>	<b>13.5</b>	<b>1%</b>	<b>-21%</b>	<b>59%</b>

223  
 224 The data show energy savings with MDD enabled to be greater using the IEC clip than with the non-IEC  
 225 test clips reflecting a range of content and typical viewing experiences. The column titled “% Difference in  
 226 MDD Power” demonstrates an average 21% variance in power consumption with MDD enabled when  
 227 testing with the IEC test clip versus testing with the non-IEC, typical viewing content. Moreover, as shown  
 228 in the column titled “% Difference in MDD Savings,” on average, TVs with MDD enabled demonstrate a  
 229 59% greater energy savings using the IEC test clip than with more realistic clips.

230 Thus, these data do not indicate comparable performance between testing with the IEC clip and testing  
 231 with the typical viewing experiences. EPA’s limited understanding of certain energy saving features and  
 232 how they are evolving in the market, along with the energy savings variability demonstrated by these  
 233 external testing sources, underscore the need to demonstrate comparable energy savings between the  
 234 IEC test clip and savings in typical viewing situations (such as full viewing of popular programming) when  
 235 such features are enabled for product certification. To address these concerns, EPA is not allowing TV  
 236 certification with energy saving features enabled unless the manufacturer is confident of comparable  
 237 energy savings in typical viewing experiences. As always, EPA encourages manufacturers to engage with  
 238 EPA regarding new energy saving features for TVs to enable proper treatment of them in the ENERGY  
 239 STAR Television specification.

240 3.2.4 Forced Menu: Any product that includes a Forced Menu upon initial start-up shall:

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

249 3.2.5 Preset Picture Setting Menu: For any product where consumers have the option of selecting  
 250 different picture settings from a preset menu at any time:

- 251 i. The product shall display on-screen information that the Default Picture Setting reflects the  
 252 setting under which the product qualifies for the ENERGY STAR. For example, such  
 253 information may be indicated by including an electronic ENERGY STAR mark alongside the  
 254 name or description of that picture setting or in the form of a message displayed each time  
 255 any setting other than the Default Picture Setting is selected.



256 ii. For products with ABC enabled in the Default Picture Setting, the product will display on-  
257 screen information that the energy savings feature is being disabled when another Preset  
258 Picture Setting is selected that does not also have ABC enabled by default.

259 3.2.6 Manual Adjustments to TV Parameters: For products with ABC enabled in the Default Picture  
260 setting, ABC functionality must remain enabled during manual adjustments to any of the TV's  
261 picture parameters, such as screen brightness, backlight, and contrast ratio.

262 3.2.7 Special Functions: The TV/HTD shall alert the user that energy consumption will increase  
263 when activating a more energy consuming Special Function (e.g., HDR Upscaling).

264 **Note:** EPA proposes to include a requirement that the TV/HTD alert the user that energy consumption will  
265 increase when selecting a Preset Picture Setting that does not have ABC enabled by default or when  
266 more energy consumptive features are activated, such as HDR upscaling. EPA considers that these  
267 proposed requirements will help consumers better understand the energy impacts of TVs when selecting  
268 other picture settings and functions. Additionally, EPA seeks to ensure that manual adjustments to screen  
269 brightness and contrast ratio do not automatically disable ABC.

270 3.2.8 Standby-Passive Mode and Standby-Active, Low Mode Settings: If users can select and  
271 enable Standby-Passive Mode or Standby-Active, Low Mode functions from a display prompt  
272 in On Mode or a settings menu other than a Forced Menu, and if these functions may alter  
273 power consumption from the default, as-tested Home Configuration:

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

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

282 3.2.9 Thin Client Capability and MVPD-ready Information: Products that have Thin Client Capability  
283 as-shipped or are otherwise MVPD-ready shall:

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

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

289 3.2.10 Standby-Active, High Mode Capability: TV/HTDs with Standby-Active, High Mode shall  
290 automatically return to the default as-tested Standby-Active, Low Mode or Standby-Passive  
291 Mode following a manufacturer firmware update or other maintenance operation in Standby  
292 Active, High Mode within a period less than or equal to 15 minutes from the completion of said  
293 update/maintenance operation.

294 **3.3 On Mode Requirements**

295 3.3.1 For all TV/HTDs, On Mode power, as determined per Section 7.1.2 *On Mode Test for TVs*  
296 *without ABC Enabled by Default* or Section 7.1.3.2 *On Mode Power Calculation* (for TVs with  
297 ABC Enabled by Default) in Appendix H shall be less than or equal to the Maximum On Mode  
298 Power Requirement ( $P_{ON\_MAX}$ ) and high resolution allowance, as shown in Equation 1, subject  
299 to the following requirement:

300 i. For TVs with ABC Enabled by Default: TVs with up to four Preset Picture Settings shall have  
301 only one or no Preset Picture Setting without ABC enabled by default, and TVs with more than  
302 four Preset Picture Settings shall have no more than two Preset Pictures Settings without ABC  
303 enabled by default. If the TV does not meet these requirements, a second test shall be  
304 performed, whereby ABC shall not be enabled during On Mode testing. For this second test,  
305 the TV shall be tested per Section 7.1.2 of Appendix H to Subpart B of 10 CFR 430, *On Mode*  
306 *Test for TVs without ABC Enabled by Default* and the resulting On Mode power shall be less  
307 than or equal to  $P_{ON\_MAX}$  and high resolution allowance, as shown in Equation 1. In TVs that  
308 offer both Home and Retail configurations, only the total number of Preset Picture Settings  
309 available under the Home configuration under test conditions shall be considered.

310 **Note:** For the Version 8.0 specification, for TVs that certify with ABC, EPA seeks to ensure its persistence  
311 across as many Preset Picture Settings as possible. As such, EPA proposes that, to qualify for the  
312 ENERGY STAR with ABC enabled, TVs with up to four Preset Picture Settings are permitted to have only  
313 one Preset Picture Setting without ABC enabled by default and TVs with more than four Preset Picture  
314 Settings are permitted no more than two Preset Pictures Settings without ABC enabled by default. TVs  
315 that do not meet this requirement would not be permitted to qualify with ABC enabled by default. EPA  
316 believes that this proposed approach both encourages the persistence of quality implementations of ABC  
317 to deliver energy savings and provides flexibility in implementing ABC. EPA understands, from  
318 stakeholder input, that implementing ABC is not feasible or is undesirable to the consumer experience in  
319 certain Preset Picture Settings. EPA proposes excluding the picture setting in the Retail configuration  
320 from the number of picture settings required to have ABC enabled by default in order to certify a product  
321 using ABC; Retail configurations are intended for non-home viewing environments.

322 EPA has also learned that in certain TVs, Preset Picture Settings dedicated to displaying true HDR  
323 content—not HDR upscaled content—appear to consumers only once the TV detects incoming true HDR  
324 content. In these TVs, such Preset Picture Settings do not appear when non-HDR content is displayed.  
325 Since the test clip used when certifying TVs to the ENERGY STAR contains non-HDR content, EPA  
326 proposes that the total number of Preset Picture settings to be considered under this requirement are  
327 those displayed with regular, non-HDR content.

328 **Equation 1: On Mode Power Requirement for All TV/HTDs**

329 
$$P_{ON} \leq P_{ON\_MAX} + P_{HR}$$

330 Where:

- 331 ▪  $P_{ON}$  is On Mode Power in watts;
  - 332 ▪  $P_{ON\_MAX}$  is the Maximum On Mode Power requirement in watts, calculated in Equation 2; and
  - 333 ▪  $P_{HR}$  is a high resolution allowance in watts, as applicable, calculated in Equation 3.
- 334  
335

336 3.3.2 The Maximum On Mode Power Requirement ( $P_{ON\_MAX}$ ) in watts shall be calculated per  
337 Equation 2.

338 **Equation 2: Maximum On Mode Power Requirement for All TV/HTDs**

339 
$$P_{ON\_MAX} = 78.5 \times \tanh[0.0005 \times (A - 140) + 0.038] + 14$$

340 Where:

- 341 ▪  $P_{ON\_MAX}$  is the maximum allowable On Mode Power consumption in watts;
- 342 ▪  $A$  is the viewable Screen Area of the product in square inches; and
- 343 ▪  $\tanh$  is the hyperbolic tangent function.

344 3.3.3 TV/HTDs with Native Vertical Resolution greater than or equal to 2160 lines are eligible for a  
345 high resolution On Mode Power Allowance ( $P_{HR}$ ) as calculated per Equation 3.

346 **Equation 3: Calculation of On Mode Power Allowance for TV/HTDs with Native Vertical Resolution**  
347 **Greater than or Equal to 2160 lines**  
348

349 
$$P_{HR} = 0.5 \times P_{ON\_MAX}$$

350 *Where:*

- 351 ▪  $P_{HR}$  is the high resolution On Mode Power Allowance in watts; and
- 352 ▪  $P_{ON\_MAX}$  is the maximum allowable On Mode Power consumption in watts, calculated in Equation 2.

353 **3.4 Standby-Passive Mode Requirements**

354 3.4.1 Standby-Passive Mode power ( $P_{STANDBY-PASSIVE}$ ), as measured per Section 7.3.2 *Standby-*  
355 *Passive Mode* of Appendix H, shall be less than or equal to 0.5 W.

356 **3.5 Standby-Active, Low Mode Requirements**

357 3.5.1 Standby-Active, Low Mode power ( $P_{STANDBY-ACTIVE-LOW}$ ), as measured per Section 7.3.3  
358 *Standby-Active, Low Mode* of Appendix H, shall be less than or equal to 3.0 W.

359 **3.6 Luminance Requirements**

360 3.6.1 For products with a luminance in the Brightest Selectable Preset Picture Setting (the greater  
361 value of  $L_{DEFAULT\_RETAIL}$  or  $L_{BRIGHTEST\_HOME}$ ) less than 350 cd/m<sup>2</sup>, luminance in the Default  
362 Picture Setting ( $L_{DEFAULT\_HOME}$ ) shall be greater than or equal to 65% of the luminance in the  
363 Brightest Selectable Preset Picture Setting.

364 3.6.2 For products with a luminance in the Brightest Selectable Preset Picture Setting greater than  
365 or equal to 350 cd/m<sup>2</sup>, luminance in the Default Picture Setting shall be greater than or equal  
366 to 228 cd/m<sup>2</sup>.

367 3.6.3 For products that certify to the On Mode requirements with ABC enabled by default, the  
368 average luminance at the illuminance conditions of 3, 12, 35, and 100 lux with ABC enabled  
369 shall be greater than or equal to 50% of the TV's luminance in the Brightest Selectable Preset  
370 Picture Setting.

371 3.6.4 For products that certify to the On Mode requirements with ABC enabled by default, the  
372 luminance at 3 lux in the Default Picture Setting, with ABC enabled, shall be greater than or  
373 equal to 150 cd/m<sup>2</sup>.

374 **Note:** EPA proposes two additional luminance requirements to ensure that the experience with ABC is a  
375 good one. The requirement that the average luminance at 3, 12, 35, and 100 lux with ABC enabled shall  
376 be greater than or equal to 50% of the TV's luminance in the Brightest Selectable Preset Picture Setting  
377 intends to ensure that the luminance in the Default Picture Setting is acceptable to users and the  
378 ENERGY STAR certified picture setting will persist in the home. EPA also proposes that the luminance at  
379 3 lux in the Default Picture Setting, with ABC enabled, should be greater than or equal to 150 nits, given  
380 that illuminance at 3 lux is similar to the illuminance of a dark room. The Imaging Science Foundation  
381 (ISF) advocates that ABC should not dim the TV's screen brightness below 150 nits in a dark room and  
382 "ISF Expert" dark room picture settings typically deliver a screen brightness of at least 150 nits.

383 EPA tested a number of TVs with ABC enabled by default with the luminance and average power in a 3  
384 lux illuminance condition, as shown below. EPA compared these results to the luminance of the picture  
385 setting that is optimized for viewing in a darkened room (e.g., Movie, Cinema, Theater, Calibrated Dark,  
386 ISF Expert, etc.).

387

	A2		A1		B2		E4		F1		C1		D1	
	Luminance (Nits)	Avg. Power (W)	Luminance (Nits)	Avg. Power (W)	Luminance (Nits)	Avg. Power (W)	Luminance (Nits)	Avg. Power (W)	Luminance (Nits)	Avg. Power (W)	Luminance (Nits)	Avg. Power (W)	Luminance (Nits)	Avg. Power (W)
3 lux	14.00	65.73	23.00	48.12	25.18	93.94	72.89	52.69	154.10	71.63	100.00	78.49	140.18	76.55
Darkened Room PPS	N/A	133.51	199.27	121.73	146.65	136.20	N/A	76.81	N/A	103.14	N/A	121.31	N/A	119.58

388  
389  
390  
391  
392  
393  
394  
395  
396

The results of this comparison demonstrate that models with ABC enabled in default are often much dimmer and use much less power when tested at 3 lux than they do when tested in the picture setting intended for a darkened room. In order to encourage users to maintain use of the Default Preset Picture Setting, EPA is proposing the above requirements to ensure that implementation of ABC is not too dim and thus result in users disabling ABC. EPA received input from the Imaging Science Foundation (ISF) that unnaturally dim performance with ABC enabled is the most common complaint that ISF calibrators currently face when adjusting TV settings in the field. EPA requests feedback from stakeholders on this proposed requirement and, specifically, if circumstances exist where the screen luminance at 3 lux must be dimmer than the screen luminance for the picture setting intended for a darkened room.

397

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

398  
399  
400  
401  
402

- 3.7.1 A product may automatically exit Standby-Passive Mode or Standby-Active, Low Mode and enter Download Acquisition Mode according to a predefined schedule, in order to:
- i. Download channel listing information for use by an electronic programming guide,
  - ii. Monitor for emergency messaging/communications, or
  - iii. Communicate via a network protocol.

403  
404

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

405  
406  
407  
408

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

409

## 4 TESTING

410

### 4.1 Test Methods

411

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

412

**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.

413

414

### 4.2 Additional Required Test for TV/HTDs with HDR Upscaling

415  
416  
417  
418  
419  
420

- 4.2.1 For products with HDR Upscaling, one of the following additional tests is required for ENERGY STAR certification:
- i. For products with HDR Upscaling as a Special Function selectable from within the Default Picture Setting, enable this feature and record the average power consumption value over a 10-minute period following the guidance in Section 7.1.2 of Appendix H to Subpart B of 10 CFR Part 430; or

- 421 ii. For products with a separate Preset Picture Setting with built-in HDR Upscaling that is not the  
 422 Default Picture Setting or Brightest Selectable Preset Picture Setting, choose that Preset  
 423 Picture Setting and record the average power consumption over a 10-minute period following  
 424 the guidance in Section 7.1.2 of Appendix H to Subpart B of 10 CFR Part 430 and record the  
 425 luminance following Sections 7.2.1.2 through 7.2.3 of Appendix H to Subpart B of 10 CFR  
 426 Part 430.

427 **4.3 Additional Required Test for TV/HTDs with Standby-Active, Low Mode**

428 4.3.1 The following method in Table 2 shall be used for TV/HTDs with a Standby-Active, Low mode:

429 **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

430

431 4.3.2 If the TV/HTD is network-enabled and tested in Standby-Active, Low per Appendix H, the  
 432 following additional test is required for ENERGY STAR certification:

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

441 **4.4 Additional Required Test for Hospitality TV/HTDs**

442 4.4.1 DAM energy consumption of Hospitality TV/HTDs shall be measured using the following  
 443 method in Table 3:

444 **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

445 **4.5 Number of Units Required for Testing**

- 446 4.5.1 One of the following sampling plans shall be used to test for ENERGY STAR certification:
- 447 i. A single representative unit shall be selected for testing the Basic Model;
  - 448 ii. Units shall be selected for testing per the sampling requirements defined in 10 CFR 429.25,
  - 449 which references 10 CFR 429.11.

450 **4.6 International Market Certification**

451 4.6.1 Products shall be tested for certification at the relevant input voltage/frequency combination for  
 452 each market in which they will be sold and promoted as ENERGY STAR.

## 453 5 USER INTERFACE

454 5.1.1 Partners are encouraged to design products in accordance with the user interface standard  
455 IEEE 1621: Standard for User Interface Elements in Power Control of Electronic Devices  
456 Employed in Office/Consumer Environments. For details, see <http://eetd.LBL.gov/Controls>.

## 457 6 EFFECTIVE DATE

458 6.1.1 Effective Date: The Version 8.0 ENERGY STAR Televisions specification shall take effect on  
459 **TBD, 2017**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR  
460 specification in effect on its date of manufacture. The date of manufacture is specific to each  
461 unit and is the date on which a unit is considered to be completely assembled.

462 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should  
463 technological and/or market changes affect its usefulness to consumers, industry, or the  
464 environment. In keeping with current policy, revisions to the specification are arrived at  
465 through stakeholder discussions. In the event of a specification revision, please note that the  
466 ENERGY STAR certification is not automatically granted for the life of a product model.

## 467 7 CONSIDERATIONS FOR FUTURE REVISIONS

468 7.1.1 Standby-Active, High Mode: EPA and DOE are interested in learning more about Standby-  
469 Active, High Mode. EPA anticipates exploring this issue and potential power limits and duty  
470 cycle requirements in the next specification revision.

471 7.1.2 Trends and Improvements in Energy Efficiency: EPA anticipates continued gains in energy  
472 efficiency to be achieved in the next few years with advances in technology such as LED  
473 efficacy, the addition of reflective polarizing film, power supply improvements, lower screen  
474 reflectance, improved backplanes (Low Temperature Polysilicon and Indium Gallium Zinc  
475 Oxide), quantum dot technology, and next generation Organic Light Emitting Diodes (OLED).  
476 As such, EPA anticipates an opportunity for proposing further limits on power consumption in  
477 future revisions.