



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)¹: 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

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 Mode²: 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 Mode³: 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 Mode⁴: 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 Mode⁵: 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 Mode⁶: 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 Functions⁷: 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.

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 Functions⁸: 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 Setting⁹: 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 Setting¹⁰: 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 Setting¹¹: 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 Configuration¹²: 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 Configuration¹³: 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.

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

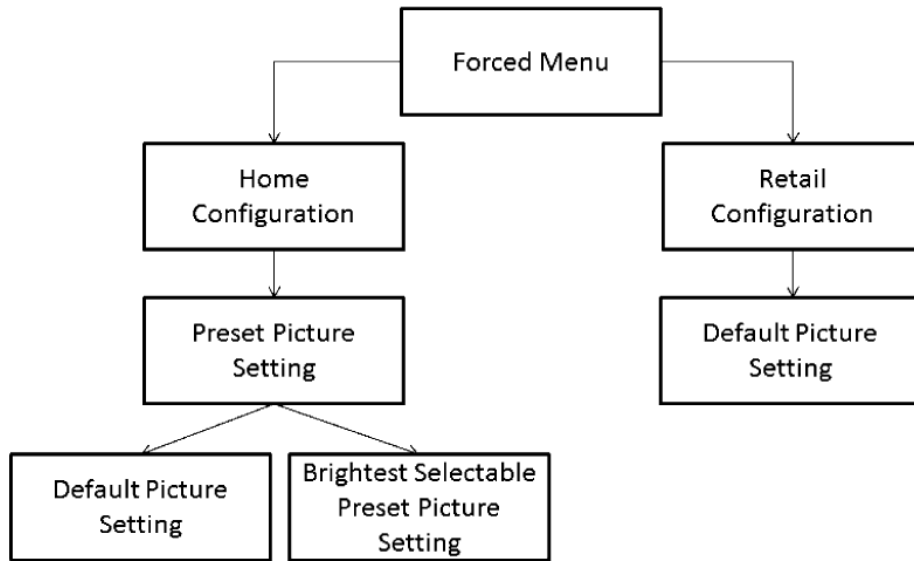
11 10 CFR 430, Subpart B, Appendix H, Section 2.3

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

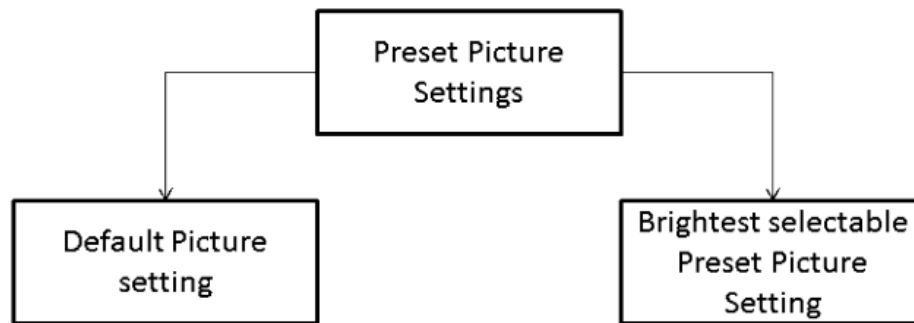
13 10 CFR 430, Subpart B, Appendix H, Section 2.16

- 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 Menu¹⁴: 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** ¹⁵



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



109 ¹⁴ 10 CFR 430, Subpart B, Appendix H, Section 2.5

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.

110 F) Power Devices:

111 1) External Power Supply (EPS)¹⁷: 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 Battery¹⁸: 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) Luminance¹⁹: 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/m²).

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 Model²⁰: 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)²¹: 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

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.

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/m². Two manufacturers commented that 150 cd/m² 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/m². 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/m² 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/m² at 3 lux. One stakeholder cited 100 cd/m² as the minimum screen brightness
 367 recommended in the TCO Displays standard, whereas another manufacturer confirmed that the 150
 368 cd/m² 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/m² 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/m² in dark rooms for LCD TVs. Balancing
 373 stakeholder input, EPA proposes setting a minimum screen luminance of 125 cd/m² 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.