



ENERGY STAR® Program Requirements Product Specification for Televisions

Eligibility Criteria Draft 2 Version 7.0

1 Following is the Version 7.0 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 information
7 from 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;

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

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

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

14 2) Hospitality Television: A TV product which includes the following features:

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

17 b) Activated hospitality protocol software (e.g., SmartPort, Meeting Professionals International
18 (MPI), Multiple Television Interface (MTI), Serial Protocol) to provide direct access to Video-
19 On-Demand (VOD) systems or a digital media player designed for hospitality-specific
20 applications.

21 B) Operational Modes:

22 1) On Mode²: The power mode in which the product is connected to a mains power source, has
23 been activated, and is providing one or more of its principal functions.

24 **Note:** Based on stakeholder feedback, EPA is removing the definition and power requirements for Power
25 Overhang State because EPA understands that the functions previously delivered in this state, including
26 quick start, are now delivered in one of the Standby modes as defined in this specification.

27 2) Standby-Passive Mode³: The mode in which the TV is connected to a power source, produces
28 neither sound nor picture, but can be switched into another mode with the remote control unit or
29 an internal signal.

1 10 CFR 430.2

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

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

30 3) Standby-Active, Low Mode⁴: The mode in which the TV is connected to a power source,
31 produces neither sound nor picture, but can be switched into another mode with the remote
32 control unit or an internal signal, and with an external signal, and is not exchanging/receiving data
33 with/from an external source.

34 4) Standby-Active, High Mode⁵: The mode in which the TV is connected to a power source,
35 produces neither sound nor picture, but can be switched into another mode with the remote
36 control unit or an internal signal, and with an external signal, and is exchanging/receiving data
37 with/from an external source.

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

43 **Note:** EPA has retained the definition for Download Acquisition Mode (DAM), having heard from
44 stakeholders that Hospitality TVs continue to make use of this mode.

45 5) Off Mode⁶: The mode where the TV is connected to a power source, produces neither sound nor
46 picture, and cannot be switched into any other mode with the remote control unit, an internal
47 signal, or an external signal.

48 C) Additional Functions⁷: Functions that are not required for the basic operation of the device. Additional
49 functions include, but are not limited to, a VCR unit, a DVD unit, an HDD unit, a FM-radio unit, a
50 memory card-reader unit, or an ambient lighting unit.

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

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

62 **Note:** EPA received no comments on this new Full Network Connectivity definition and thus has retained
63 it with no modifications in Draft 2. Under Draft 2, EPA has removed the following ‘Additional Function’
64 definitions included in Draft 1:

65 **Point of Deployment (POD) Module:** In response to Draft 1, stakeholders commented that the presence
66 of PODs or CableCARDS in TVs is rapidly declining such that these functions will likely be nonexistent
67 when this specification takes effect. Stakeholders relayed that conditional access will be provided through
68 software downloads in the future. Therefore EPA is proposing to drop the reporting requirement for POD
69 and to remove this definition.

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

70 **High Efficiency Video Processing:** Stakeholders commented that High Efficiency Video Processing
71 does not consume significantly more power than other TV decoder technologies. EPA also anticipates
72 that UHD TVs with Thin Client Capability will already include this technology, and therefore does not
73 propose highlighting the availability of this functionality on the ENERGY STAR Certified Products List.
74 Thus, EPA is removing the definition.

75 **Wake-on-LAN (WoL):** EPA is proposing to remove Wake-on-LAN and Wake-on-Wireless definitions
76 because these functionalities fall under Full Network Connectivity when applying the Standby-Active, Low
77 power requirements to a TV. EPA did not receive feedback that Wake-on-LAN or WoWLAN require
78 additional power, so for simplicity EPA will also exclude them from the Definitions section.

79 D) Special Functions⁸: Functions that are related to, but not required for, the basic operation of the
80 device. Special functions include, but are not limited to, special sound processing, power saving
81 functions (e.g., Automatic Brightness Control).

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

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

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

88 **Note:** EPA proposes to include the above human interface capability definitions for Gesture and Voice
89 Recognition so that Partners are able communicate these features to consumers. Partners would self-
90 report these features to certification bodies. EPA will continue to monitor the prevalence of these features
91 in the market and seek information regarding their energy consumption to determine if they should be
92 further addressed under future specification revisions. Based on discussions with stakeholders and
93 review of available information, it does not appear that gesture and voice recognition features require
94 significant additional power in On or Standby Modes. As a result, EPA does not propose testing or
95 providing additional allowances for these features under the Version 7.0 specification.

96 E) Television Settings and Menus:

97 1) Preset Picture Setting⁹: A preprogrammed factory setting obtained from the TV menu with pre-
98 determined picture parameters such as brightness, contrast, color, sharpness, etc. Preset picture
99 Settings can be selected within the Home or Retail Configurations.

100 2) Default Picture Setting¹⁰: The Preset Picture Setting that the TV enters into immediately after
101 making a selection from the Forced Menu. If the TV does not have a Forced Menu, this is the as-
102 shipped preset picture setting.

103 3) Brightest Selectable Preset Picture Setting¹¹: The Preset Picture Setting in which the TV
104 produces the highest screen luminance within either the Home or Retail Configuration.

105 4) Home Configuration¹²: The TV configuration selected from the Forced Menu which is designed
106 for typical consumer viewing and is recommended by the manufacturer for home environments.

8 10 CFR 430, Subpart B, Appendix H, Section 2.17

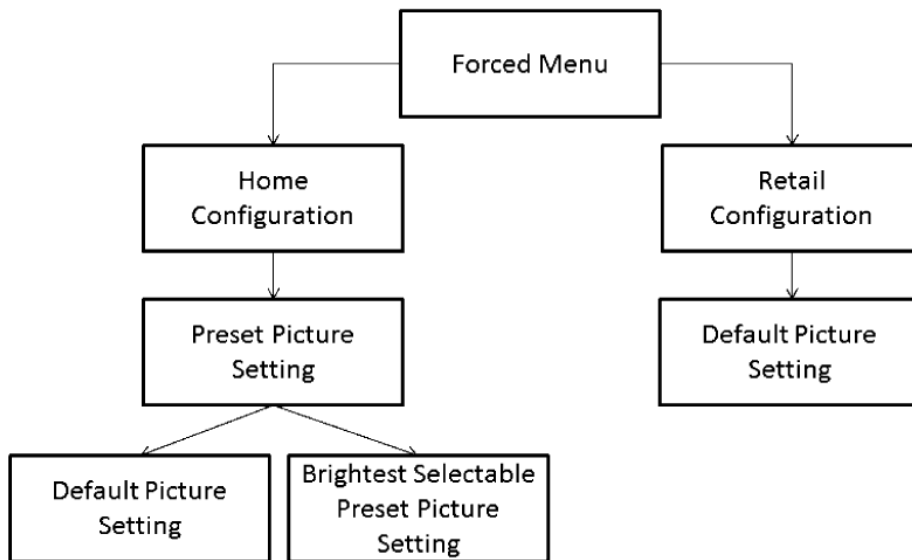
9 10 CFR 430, Subpart B, Appendix H, Section 2.15

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

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

- 107 5) Retail Configuration¹³: The TV configuration selected from the Forced Menu which is designed to
 108 highlight the TV's features in a retail environment. This configuration may display demos, disable
 109 configurable settings, or increase screen brightness in a manner which is not desirable for typical
 110 consumer viewing.
- 111 6) Forced Menu¹⁴: A series of menus which require the selection of initial settings before allowing
 112 the user to utilize primary functions. Within these menus contains an option to choose the viewing
 113 environment between Retail and Home Configurations.
- 114 7) Electronic Program Guide (EPG): An interactive on-screen menu of TV program information
 115 downloaded from an external source or embedded interstitially in broadcast video streams (e.g.,
 116 program time, date, and descriptions).

117 **Figure 1: Illustration of Picture Settings for TVs with a Forced Menu**¹⁵

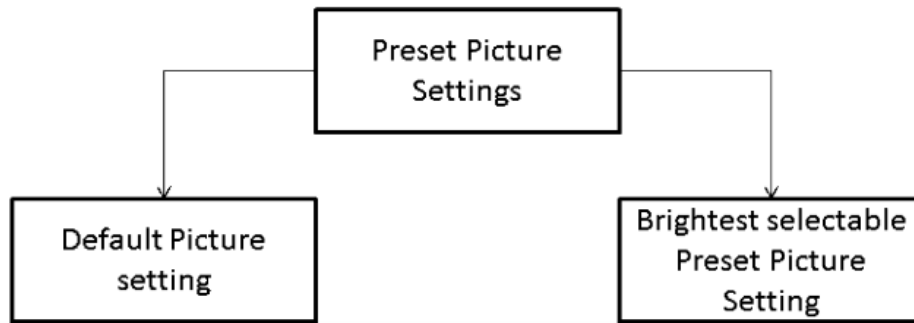


118

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

119

Figure 2: Illustration of Picture Settings for TVs without a Forced Menu¹⁶



120

121 F) Power Devices:

122 1) External Power Supply (EPS): Also referred to as External Power Adapter. A component
 123 contained in a separate physical enclosure external to the TV casing, designed to convert line
 124 voltage ac input from the mains to lower dc voltage(s) in order to provide power to the TV. An
 125 EPS connects to the TV via a removable or hard-wired male/female electrical connection, cable,
 126 cord or other wiring.

127 2) Main Battery¹⁷: A battery capable of powering the TV to produce dynamic video without the
 128 support of mains power.

129 G) Product Characteristics:

130 1) Luminance: The photometric measure of the luminous intensity per unit area of light traveling in a
 131 given direction, expressed in units of candelas per square meter (cd/m²).

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

135 3) Native Vertical Resolution: The number of visible physical pixels along the vertical axis of the TV
 136 (e.g., a TV with a screen resolution of 1920 x 1080 (horizontal x vertical) would have a Native
 137 Vertical Resolution of 1080).

138 **Note:** In Draft 2, EPA has made minor edits to the definition of Native Vertical Resolution to specify that
 139 the number of physical pixels counted should be visible and not obscured by the bezel or other
 140 components. EPA welcomes stakeholder feedback on the clarity and applicability of this change to the
 141 definition.

142 **Effective Vertical Resolution:** In Draft 1, EPA proposed the inclusion of a device-independent definition
 143 of resolution, "Effective Vertical Resolution," and referenced the Society for Information Displays (SID)
 144 Information Displays Measurement Standard Version 1.03 Section 7.8. This standard provides a means
 145 for determining effective resolution that does not rely on physical structure, and instead focuses on
 146 objective measurements of performance which relate to human visual perception. This approach uses an
 147 alternating high contrast band (>50% Michelson contrast ("contrast modulation") in both vertical and
 148 horizontal axes). <http://www.sid.org/Publications.aspx>

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, Subpart B, Appendix H, Section 2.12

149 In response, EPA received mixed feedback about the use of Native versus Effective Vertical Resolution to
150 categorize higher resolution TVs. As a result, EPA proposes to maintain Native Resolution to characterize
151 higher resolution TVs, since physical pixel count provides an established basis on which to compare the
152 energy performance of these TVs. EPA welcomes feedback on this approach.

153 H) **Basic Model**¹⁸: All units of a given type of product (or class thereof) manufactured by one
154 manufacturer, having the same primary energy source, and which have essentially identical electrical,
155 physical, and functional characteristics that affect energy consumption and energy efficiency.

156 I) **Multichannel Video Programming Distributor (MVPD)**: A person such as, but not limited to, a cable
157 operator, a multichannel multipoint distribution service, a direct broadcast satellite service, or a TV
158 receive-only satellite program distributor, who makes available for purchase, by subscribers or
159 customers, multiple channels of video programming.

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

161 **2 SCOPE**

162 **2.1 Included Products**

163 2.1.1 Products that are: (1) marketed to the consumer as a TV (i.e., TV is the primary function); (2)
164 capable of being powered from a wall outlet with an external power supply; and (3) meet one of
165 the following product type definitions, are eligible for ENERGY STAR certification, with the
166 exception of products listed in Section 2.2:

- 167 i. TVs
- 168 ii. Hospitality TVs

169 **2.2 Excluded Products**

170 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for
171 certification under this specification. The list of specifications currently in effect can be found at
172 www.energystar.gov/specifications.

173 2.2.2 Products that satisfy one or more of the following conditions are not eligible for ENERGY STAR
174 certification under this specification:

- 175 i. Televisions with a Main Battery that enables operation without connected mains power.

176 **Note:** In Draft 1, EPA proposed to remove Televisions with a Main Battery from the scope of the
177 specification. Given that EPA received no stakeholder feedback opposing this change, that there are no
178 ENERGY STAR-certified battery operated-TVs currently, and the inherent incentive for battery-operated
179 TVs to save energy, EPA retains the proposal to exclude TVs with Main Batteries in line with the scope of
180 the DOE Appendix H to Subpart B of 10 CFR Part 430.

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

18 10 CFR 430.2

184 **3 CERTIFICATION CRITERIA**

185 **3.1 Significant Digits and Rounding**

186 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.

187 3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using exact
188 values without any benefit from further rounding.

189 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
190 website shall be rounded to the nearest significant digit as expressed in the corresponding
191 specification limit.

192 **3.2 General Requirements**

193 3.2.1 External Power Supplies (EPSs): Single- and Multiple-voltage EPSs shall meet the level VI
194 performance requirements under the International Efficiency Marking Protocol when tested
195 according to the Uniform Test Method for Measuring the Energy Consumption of External Power
196 Supplies, Appendix Z to Subpart B of 10 CFR Part 430.

- 197 i. Single- and Multiple-voltage EPSs shall include the level VI marking.
- 198 ii. Additional information on the Marking Protocol is available
199 at <http://www.regulations.gov/#!documentDetail:D=EERE-2008-BT-STD-0005-0218>.

200 **Note:** EPA has updated the EPS requirements to reflect the energy conservation standards adopted by
201 DOE earlier this year, and which cover both single- and multiple-voltage. EPSs will take effect on
202 February 10, 2016.

203 3.2.2 General User Information: The product shall ship with consumer informational materials located in
204 either (1) the hard copy or electronic user manual, or (2) a package or box insert. These
205 materials shall include:

- 206 i. Information about the ENERGY STAR program,
- 207 ii. Information on the energy consumption implications of changes to default as-shipped
208 Television configuration and settings, and
- 209 iii. Notification that enabling certain optional features and functionalities (e.g., instant-on), may
210 increase energy consumption beyond the limits required for ENERGY STAR certification, as
211 applicable.

212 3.2.3 Forced Menu: Any product that includes a Forced Menu upon initial start-up shall:

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

221 3.2.4 Preset Picture Setting Menu: For any product where consumers have the option of selecting
222 different picture settings from a preset menu at any time:

- 223 i. The product shall display on-screen information that the Default Picture Setting (the Default
224 Picture Setting in Home Configuration for TVs with a Forced Menu) reflects the settings under
225 which the product qualifies for the ENERGY STAR. For example, such information may be
226 indicated by including the ENERGY STAR mark in the name or description of that picture
227 setting or in the form of a message displayed each time any setting other than the Default
228 Picture Setting is selected; and
- 229 ii. The product may optionally display on-screen information indicating that factory-configured
230 picture settings other than the Default Picture Setting meet ENERGY STAR if a TV in those
231 settings could also meet the Section 3.3 On Mode Requirements. For purposes of ENERGY
232 STAR certification, Partners shall report the presence of these settings to the EPA-
233 recognized certification body and maintain internal documentation. EPA reserves the right to
234 request this documentation at any time. The settings shall not be third-party tested or
235 reviewed during certification and verification processes.

236 **Note:** EPA received new stakeholder feedback that some picture settings other than the Default Picture
237 Setting can also qualify to the ENERGY STAR requirements and that some Partners may wish to
238 communicate this to consumers. As a result, EPA is proposing to allow Partners the option to indicate that
239 additional picture settings also meet ENERGY STAR requirements. For purposes of third-party
240 certification, additional picture settings that meet ENERGY STAR requirements shall be reported by the
241 partner to the certification body, however, documentation shall not be reviewed when products are
242 certified or during verification testing. EPA reserves the right to request this documentation at any time.
243 EPA welcomes stakeholder comment on this new provision.

244 3.2.5 Standby-Passive Mode and Standby-Active, Low Mode Settings: If users can select and enable
245 Standby-Passive Mode or Standby-Active, Low Mode functions from a display prompt in On
246 Mode or a settings menu other than a Forced Menu, and if these functions may alter power
247 consumption from the default, as-tested Home Configuration, the product shall:

- 248 i. Display on-screen information that enabling certain optional features and functionalities (e.g.,
249 instant-on) in Standby-Active, Low Mode other than those included in the Home Configuration
250 default as-tested settings may alter the ENERGY STAR certified configuration, or
- 251 ii. Display on-screen information that enabling the optional features and functionalities may
252 change the energy consumption of the product.

253 **Note:** In Draft 1, EPA proposed on-screen informational requirements for Standby-Passive Mode and
254 Standby-Active, Low Mode settings that may be altered by the consumer via a menu. Stakeholders
255 shared that settings in Standby Mode may include a wide variety of features (human interfaces,
256 applications, timers, network connections, etc.) that may be made available to users in a variety of ways
257 other than the traditional menu used for features like Picture Settings. Therefore, to allow for flexibility,
258 EPA is proposing that Partners may meet Standby Mode on-screen informational requirements by
259 including ENERGY STAR messaging next to the default as-shipped configuration or a more general
260 message such as "this selection may change the energy consumption of your product."

261 EPA received feedback on its Draft 1 proposal to require that consumers be prompted to select a discrete
262 time period within a 24-hr cycle for a particular setting, such as quick start, to be enabled. Stakeholders
263 identified difficulties in implementing such a feature across products since many TVs may not have an
264 internal clock. As a result of such challenges, EPA has reconsidered this approach. With more network
265 enabled and feature-rich TVs entering the market in the next couple of years, EPA expects that many TV
266 features such as quick start will be enabled by default or prompted in a Forced Menu and thus captured
267 under Standby-Active, Low and Standby-Passive Modes tests, ensuring that TVs with these features are
268 evaluated against ENERGY STAR requirements. For those features that are not enabled in the as-tested
269 configuration, EPA believes the above proposed on-screen requirements enable the consumer to
270 optimally use the TV in a way that reduces unnecessary energy waste.

271 3.2.6 Thin Client Capability and MVPD-ready Information: Products that meet with Thin Client
272 Capability or are otherwise MVPD-ready shall:

- 273 i. Report the presence of Thin Client Capability and supporting information including, but not
274 limited to, interoperability protocols, decryption, and decoding functions for display on the
275 ENERGY STAR certified products list; and
276 ii. Inform the consumer in the user manual and/or on-screen prompt that the TV may be
277 capable of operating without a set-top box from a MVPD.

278 **Note:** In response to stakeholder feedback in Draft 1, EPA is retaining the above Draft 1 proposal to
279 provide consumers, retailers, and energy efficiency program sponsors with basic information regarding
280 Thin Client Capability to increase awareness of its potential benefits. To assist stakeholders in seeing
281 how this proposed reporting requirement would be implemented, EPA has included with this Draft 2
282 specification a Draft Version 7.0 Qualified Product Exchange (QPX) template for stakeholder review.

283 3.2.7 Standby-Active, High Mode Capability: TVs with Standby-Active, High Mode shall automatically
284 return to the default as-tested Standby-Active, Low Mode or Standby-Passive Mode following a
285 manufacturer firmware update or other maintenance operation in Standby Active, High Mode
286 within a period less than or equal to 15 minutes from the completion of said update/maintenance
287 operation.

288 **Note:** EPA seeks to ensure that TVs return to a Standby-Active, Low or Standby-Passive Mode rather
289 than remaining in a higher power Standby-Active, High Mode following a firmware update or delivering
290 other functionality historically delivered during Power Overhang State, such as quick start. For
291 purposes of third-party certification, the time within which the TV returns to the default as-tested Standby
292 Active, Low mode shall be reported by the Partner to the EPA-recognized certification body however
293 documentation shall not be reviewed when products are certified or during verification testing. EPA
294 reserves the right to request this documentation at any time.

295 3.3 On Mode Requirements

296 3.3.1 For all TVs, On Mode power, as tested per Section 7.1.2 *On Mode Test for TVs without ABC*
297 *Enabled by Default* or Section 7.1.3.2 *On Mode Power Calculation* (for TVs with ABC Enabled by
298 Default) in Appendix H shall be less than or equal to the Maximum On Mode Power Requirement
299 (P_{ON_MAX}) and high resolution allowance, as shown in Equation 1.

300 Equation 1: On Mode Power Requirement for All TVs

$$P_{ON} \leq P_{ON_MAX} + P_{HR}$$

301 Where:

- 302
303
 - P_{ON} is On Mode Power in watts;
 - P_{ON_MAX} is the Maximum On Mode Power requirement in watts calculated in Equation 2; and
 - P_{HR} is a high resolution allowance in watts, as applicable, calculated in Equation 2.

307 3.3.2 The Maximum On Mode Power Requirement (P_{ON_MAX}) in watts shall be calculated per Equation
308 2.

309 Equation 2: Maximum On Mode Power Requirement

$$P_{ON_MAX} = 71 \times \tanh(0.0005 \times (A - 140) + 0.045) + 14$$

311 Where:

- 312
 - P_{ON_MAX} is the maximum allowable On Mode Power consumption in watts;
 - A is the viewable Screen Area of the product in square inches; and
 - \tanh is the hyperbolic tangent function.

315 3.3.3 TVs with Native Vertical Resolution greater than or equal to 2160 pixels and certified to ENERGY
316 STAR before May 1, 2017, are eligible for a high resolution On Mode Power Allowance (P_{HR}) as
317 calculated per Equation 3.

318 **Equation 3: Calculation of On Mode Power Allowance for TVs with Native Vertical Resolution**
319 **Greater than or Equal to 2160 pixels (Expires May 1, 2017)**
320

$$P_{HR} = 0.55 \times P_{ON_MAX}$$

322 *Where:*

- 323 ▪ P_{HR} is the high resolution On Mode Power Allowance in watts; and
 - 324 ▪ P_{ON_MAX} is the maximum allowable On Mode Power consumption in watts.
- 325

326 **Note:** In response to the On Mode Power levels for HD TVs in EPA's Draft 1 proposal, a few stakeholders
327 stated, with supporting data, that EPA's estimated On Mode power of Version 6.0 ABC models,
328 calculated through linear interpolation of power measurements at the NOPR illuminance test points (0,
329 10, 50, 100, and 300 lux) to approximate power at the Final Rule illuminance test points (3, 12, 35, and
330 100 lux), was too low. Thus, for Draft 2, EPA conducted new analyses of its dataset removing the
331 interpolated ABC models. The revised dataset represents 764 unique models and includes 112 ABC
332 models certified to Version 6.1 and tested to the Final Rule DOE Test Procedure with the remainder non-
333 ABC models certified to both Version 6.0 and 6.1, since the reported power values of non-ABC models
334 were not affected by the Final Rule DOE Test Procedure.

335 Sixteen percent of TVs in EPA's revised dataset meet the revised On Mode requirements. At least 10
336 major manufacturers have one or more models meeting the new proposed criteria. Based on the market
337 response to past revisions of the TV specification and how rapidly the television market evolves, EPA
338 anticipates a more than adequate selection of ENERGY STAR certified models by the time the
339 specification takes effect in 2015.

340 **Ultra High Definition (UHD)**

341 In response to questions posed in Draft 1, EPA obtained data on 63 current and forthcoming UHD models
342 from a few stakeholders and the California Energy Commission database. Data indicate that while most
343 UHD models consume considerably more energy than HD models, a few stand out as being significantly
344 more efficient than their counterparts. EPA seeks to recognize only top performing UHD models, aiming
345 to incentivize improvements in efficiency across other models in the near future. The data further indicate
346 that UHD TV On Mode Power increases with screen size in a similar manner as for HD TVs. Therefore to
347 capture the most efficient UHD TVs, EPA proposes an adder of 55% of the maximum On Mode Power
348 requirement. EPA proposes this adder be proportional to On Mode power as calculated based on screen
349 area, recognizing that the UHD impact on energy use will be experienced across the total screen area.

350 With this adder, three manufacturers have products that would be eligible for the ENERGY STAR.
351 Recognizing that UHD is new to the market, and TV partners have an impressive record of dialing back
352 the power use of new features, EPA proposes that the adder expire on May 1, 2017. Existing Version 7.0
353 products certified with the adder would remain on the ENERGY STAR Certified Products List until Version
354 8.0 is effective. Any product certified to Version 7.0 on or after the date would not be eligible to receive
355 the adder to meet the On Mode Requirements.

356 In response to stakeholder feedback during the Draft 1 webinar on the energy use of UHD models, EPA
357 and DOE are still interested in understanding differences in power consumption due to the processing
358 power needed to upscale 2K content to 4K content. EPA and DOE encourage stakeholders to provide
359 additional data as they become available.

360 **3.4 Standby-Passive Mode Requirements**

361 3.4.1 Standby-Passive Mode power ($P_{\text{STANDBY-PASSIVE}}$), as measured per Section 7.3.3 Standby-Passive
362 Mode of Appendix H, shall be less than or equal to 0.5 W.

363 **3.5 Standby-Active, Low Mode Requirements**

364 3.5.1 Standby-Active, Low Mode, as measured per Section 7.3.3 Standby-Active, Low Mode of
365 Appendix H, shall be less than or equal to 3.0 W.

366 **Note:** Based on stakeholder comments, EPA has removed the distinction proposed in Draft 1 for TVs with
367 Full Network Connectivity since EPA has confirmed that the definition of Standby-Active, Low Mode
368 inherently implies the TV can provide the functions defined under Full Network Connectivity.

369 In Draft 1, EPA proposed a maximum Standby-Active, Low Mode power requirement of 1.0 W after
370 examining the energy consumption of other electronics products in network connected low power states
371 to understand the possibilities that could carry over into TVs. In response, stakeholders suggested that a
372 range of 3.0 to 6.0 W more accurately reflects projected TV efficiencies in Standby-Active Low Mode,
373 though existing product data are not yet widely available.

374 Given the lack of TVs currently tested with Full Network Connectivity, EPA reviewed other consumer
375 products with Wi-Fi, including printers with Wi-Fi connections that had measured Standby around 2.5 to
376 3.5 W in 2011. EPA believes also there have been significant improvements in Standby network power
377 given the need to save battery power in mobile network devices such as tablets and cell phones. In
378 September 2013, the International Energy Agency 4E Standby Power Annex released a report titled
379 "Power Requirements for Functions" which includes data on the power consumption of the latest Ethernet
380 controllers, Ethernet ports, and Wi-Fi transceivers, as well as information such as ac-dc power supply and
381 dc-dc component conversion efficiency assumptions. The report states, for example, that an idle Ethernet
382 link without Energy Efficient Ethernet enabled requires 0.373 to 0.583 W of ac power, while an Idle Wi-Fi
383 transceiver requires 0.036 to 0.250 W of ac power. The latest Institute of Electrical and Electronics
384 Engineers (IEEE) 802.11 standard for Wi-Fi includes power management features that can be integrated
385 into products to deliver significant power savings. Finally, in 2011 the European Union set mandatory
386 standards for Network Standby targeting a level of 3.0 W for TVs by 2017. Given already existing drivers,
387 EPA is now proposing a limit of 3.0 W in Draft 2.

388 EPA will continue to monitor the market, looking for products that deliver greater efficiency for less.
389 Recognizing that network functions of TVs are ever-evolving, EPA continues to welcome both component
390 and product power data in Standby-Active, Low Mode.

391 **3.6 Luminance Requirements**

392 3.6.1 For products with a luminance in the Brightest Selectable Preset Picture Setting (the greater
393 value of $L_{\text{DEFAULT_RETAIL}}$ or $L_{\text{BRIGHTEST_HOME}}$) less than 450 cd/m^2 , luminance in the Default Picture
394 Setting ($L_{\text{DEFAULT_HOME}}$) shall be greater than or equal to 65% of the luminance in the Brightest
395 Selectable Preset Picture Setting.

396 3.6.2 For products with a luminance in the Brightest Selectable Preset Picture Setting greater than or
397 equal to 450 cd/m^2 , luminance in the Default Picture Setting shall be greater than or equal to
398 293 cd/m^2 .

399 **Note:** EPA received mixed feedback on whether the 65% luminance requirement is still representative of
400 how products are shipped and used by consumers in the home. Some stakeholders noted that the
401 existing luminance requirements limit the Partners' ability to deliver a more optimal viewing experience for
402 consumers at home, whereas others support them if they continue to meet consumer expectations and
403 guard against shipping dim products in order to meet the ENERGY STAR criteria.

404 While most TVs have Brightest Selectable Preset Picture Setting luminance between 200 and 400 cd/m²,
405 there are some that are brighter. According to some stakeholders, a Default Picture Setting luminance
406 that is 65% of the Brightest Selectable Preset Picture Setting luminance would be too bright for user
407 comfort in these very bright TVs. EPA is therefore proposing that for products with Brightest Selectable
408 Preset Picture Setting luminance of at least 450 cd/m², the luminance in the Default Picture Setting can
409 be no more than 293 cd/m² (which is 65% of 450 cd/m²).

410 Approximately 95% of EPA's dataset has Brightest Selectable Preset Picture Setting luminance below
411 450 cd/m², and therefore this new proposal would only apply to a small subset of currently certified
412 models. This proposal is intended to still guard against TVs being shipped too dim, while permitting
413 products with brighter maximum screen luminance to be optimized for home use. EPA seeks feedback on
414 this proposal.

415 3.7 Download Acquisition Mode (DAM) Requirements for Hospitality TVs

416 3.7.1 A product may automatically exit Standby-Passive Mode or Standby-Active, Low Mode and enter
417 Download Acquisition Mode according to a predefined schedule, in order to:

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

421 3.7.2 DAM energy consumption for all DAM states (E_{DAM}), as measured per the CEA Procedure for
422 DAM Testing, shall be less than or equal to 40 watt-hours per day (0.04 kWh/day).

423 **Note:** Since EPA proposes retaining the definition of Hospitality TVs, EPA also proposes retaining the
424 Download Acquisition Mode (DAM) test. Under Version 7.0, EPA seeks to ensure that all TVs meeting the
425 definition for Hospitality TVs be tested in DAM for certification if they are capable of doing so. EPA found
426 that under Version 6.0/6.1, many Hospitality TVs were tested as consumer models instead. Some
427 Hospitality TVs do resemble consumer models in that they contain Ethernet capability. To ensure that the
428 specification captures the full functions of Hospitality TVs, EPA and DOE propose that, where applicable,
429 Hospitality TVs that have Ethernet capability test for Full Network Connectivity, according to the test
430 method in Section 4.2.2 in addition to the Download Acquisition Mode test. EPA seeks additional
431 stakeholder feedback on this proposed approach.

432 The Version 6 specification currently has the following standby requirement applicable to Hospitality TVs:

433 *For Hospitality Televisions that feature an always-on DAM, measured DAM power (P_{DAM}) shall be less*
434 *than or equal to 1.0 W when tested per the Standby-Passive Mode test procedure.*

435 EPA proposes to replace this above requirement with the Section 3.5 Standby Active, Low Mode
436 requirements for all TVs because it includes Full Network Connectivity which serves similar functionality
437 to always-on DAM. EPA requests comment on this approach.

438 **Note:** Products intended for sale in the US market are subject to minimum toxicity and recyclability
439 requirements. Please see ENERGY STAR Program Requirements for Televisions: Partner Commitments
440 for details.
441

442 4 TESTING

443 **4.1 Test Methods**

444 4.1.1 Test methods identified in Table 1 shall be used for certification as applicable.

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

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

446

447 **4.2 Additional Required Test for TVs with Standby-Active, Low Mode**

448 4.2.1 The following method in Table 2 shall be used for TVs with a Standby-Active, Low mode:

449 **Table 2: Methods for TVs with Standby-Active, Low**

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

450

451 4.2.2 If the TV is network enabled and tested in Standby-Active, Low per Appendix H, the following
452 additional test is required for ENERGY STAR certification:

- 453 i. Perform all procedures specified in Section 6.7.5 Standby-active, Low of CEA-2037-A with
454 the additional preconditions:
- 455 1) Place the UUT in the On Mode as tested per Appendix H and momentarily press the
456 power button on the remote control; and
 - 457 2) Wait 5 minutes after pressing the power button before beginning the Section 6.7.5
458 procedures in CEA-2037-A.
- 459 ii. TVs, for which availability can be confirmed with one of the methods in Section 6.7.5.2
460 Availability of CEA-2037-A, shall be reported as having Full Network Connectivity.

461 **Note:** EPA and DOE received stakeholder support for including the above additional test would only be
462 used to confirm the presence of Full Network Capability in Standby-Active, Low Mode. EPA and DOE
463 have made one minor edit: in Draft 1 the test referred to Section 6.6.5 of CEA-2037-A. This was incorrect
464 and has been updated to Section 6.7.5.

465 **4.3 Additional Required Test for Hospitality TVs**

466 4.3.1 DAM energy consumption of Hospitality TVs shall be measured using the following method in
467 Table 3:

468 **Table 3: Method for Hospitality TVs**

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

469 **4.4 Number of Units Required for Testing**

- 470 4.4.1 One of the following sampling plans shall be used to test for ENERGY STAR certification:
- 471 i. A representative unit shall be selected for testing the Basic Model;
- 472 ii. Units shall be selected for testing per the sampling requirements defined in 10 CFR 429.25,
- 473 which references 10 CFR 429.11.

474 **4.5 International Market Certification**

- 475 4.5.1 Products shall be tested for certification at the relevant input voltage/frequency combination for
- 476 each market in which they will be sold and promoted as ENERGY STAR.

477 **5 USER INTERFACE**

- 478 5.1.1 Partners are encouraged to design products in accordance with the user interface standard IEEE
- 479 1621: Standard for User Interface Elements in Power Control of Electronic Devices Employed in
- 480 Office/Consumer Environments. For details, see <http://eetd.LBL.gov/Controls>.

481 **6 EFFECTIVE DATE**

- 482 6.1.1 Effective Date: The Version 7.0 ENERGY STAR Televisions specification shall take effect on **XX**
- 483 **XX**, 2015. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR
- 484 specification in effect on its date of manufacture. The date of manufacture is specific to each unit
- 485 and is the date on which a unit is considered to be completely assembled.

486 **Note:** EPA anticipates finalizing this specification revision in late 2014, where the specification would take

487 effect in late Summer 2015.

- 488 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
- 489 technological and/or market changes affect its usefulness to consumers, industry, or the
- 490 environment. In keeping with current policy, revisions to the specification are arrived at through
- 491 stakeholder discussions. In the event of a specification revision, please note that the ENERGY
- 492 STAR certification is not automatically granted for the life of a product model.

493 **7 CONSIDERATIONS FOR FUTURE REVISIONS**

- 494 7.1.1 Standby-Active, High Mode: EPA and DOE are interested in learning more about Standby-Active,
- 495 High Mode. EPA anticipates exploring this issue and potential power limits and duty cycle
- 496 requirements in the next specification revision.

497 **Note:** EPA anticipates reviewing and addressing Standby-Active, High Mode during a future revision to

498 the specification, for reasons mentioned in Section 3.2.7.

- 499 7.1.2 Trends and Improvements in Energy Efficiency: EPA anticipates continued gains in energy
- 500 efficiency to be achieved in the next few years with advances in technology such as LED efficacy,
- 501 the addition of reflective polarizing film, power supply improvements, lower screen reflectance,
- 502 improved backplanes (Low Temperature Polysilicon and Indium Gallium Zinc Oxide), quantum
- 503 dot technology, and next generation Organic Light Emitting Diodes (OLED). As such, EPA
- 504 anticipates an opportunity for proposing further limits on power consumption in future revisions.