



ENERGY STAR® Program Requirements Product Specification for Televisions

Eligibility Criteria Final Draft Version 6.0

1 Following is the Final Draft Version 6.0 ENERGY STAR Product Specification for Televisions. A product
2 shall meet all of the identified criteria if it is to earn the ENERGY STAR.

3 **1 DEFINITIONS**

4 A) Product Types:

5 1) Television (TV): A product designed to be powered primarily by mains power having a diagonal
6 screen size of fifteen inches or larger that is manufactured with a TV tuner, and that is capable of
7 displaying dynamic visual information 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; and/or

10 b) Display-specific data connections, such as Video Graphics Array (VGA), Digital Visual
11 Interface (DVI), High-Definition Multimedia Interface (HDMI), DisplayPort, used typically for a
12 computer or workstation that is not physically attached to the display; and/or

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

14 d) Network connections, usually using Internet Protocol, typically carried over Ethernet or WiFi.

15 A TV may contain, but is not limited to, one of the following display technologies: liquid crystal
16 display (LCD), light-emitting diode (LED), cathode-ray tube (CRT), and plasma display panel
17 (PDP).

18 2) Rear-projection TV: A television product in which the display device is a projector that focuses
19 images onto a screen located inside the TV enclosure.

20 3) Direct-view TV: A television product in which the display device emits light either directly from the
21 screen surface or transmits light from a source mounted directly behind the screen.

22 4) TV Combination Unit: A television product in which the TV and one or more additional devices
23 (e.g., DVD player, Blu-ray Disc player, Hard Disk Drive) are combined into a single enclosure,
24 and which meets all of the following criteria:

25 a) it is not possible to measure the power of the individual components without removing the
26 product housing; and

27 b) the product connects to a wall outlet via a single power cord.

28 5) Component Television: A television product composed of two or more separate components
29 (e.g., display device and tuner) that is marketed and sold as a television under a single model or
30 system designation. A component television may have more than one power cord.

31 6) Hospitality Television: A television product which includes the following features:

- 32 a) a control port for bi-directional communication (DB-9, RJ11, RJ12, RJ45, coaxial cable, or
33 HDMI-CEC);
- 34 b) activated hospitality protocol software (e.g., SmartPort, MPI, MTI, Serial Protocol) to provide
35 direct access to Video-On-Demand (VOD) systems or a digital media player designed for
36 hospitality-specific applications; and
- 37 c) a power state that meets the definition of Download Acquisition Mode.
- 38 7) Analog Television: A television product which has an NTSC, PAL, or SECAM tuner, and may
39 have analog video inputs (e.g., composite video, component video, S-video, RGB).
- 40 8) Digital Television: A television product which has at least one digital tuner or at least one digital
41 video input (e.g., HDMI). Products with an analog tuner and both analog and digital inputs are
42 considered digital products under this specification.
- 43 B) Additional Functions: Functions that are not required for the basic operation of the device. Additional
44 functions include, but are not limited to a VCR unit, a DVD unit, a HDD unit, a FM-radio unit, a
45 memory card-reader unit, or an ambient lighting unit.
- 46 C) Home Picture Setting (or default picture setting): The picture setting which is recommended by the
47 manufacturer from the initial set up menu or the mode that the television comes shipped in if no
48 setting is recommended.
- 49 D) Retail Picture Setting: The preset picture setting in which the TV produces the highest luminance
50 during the On Mode conditions.
- 51 E) Native Vertical Resolution: The physical pixel count for the vertical axis of the television (e.g., a
52 television with a screen resolution of 1920 x 1080 (horizontal x vertical) would have a native vertical
53 resolution of 1080).
- 54 F) Electronic Program Guide (EPG): An interactive on-screen menu of TV program information
55 downloaded from an external source (e.g., program time, date, descriptions).
- 56 G) External Power Supply (EPS): Also referred to as External Power Adapter. A component contained in
57 a separate physical enclosure external to the television casing, designed to convert line voltage ac
58 input from the mains to lower dc voltage(s) in order to provide power to the television. An EPS
59 connects to the television via a removable or hard-wired male/female electrical connection, cable,
60 cord or other wiring.
- 61 H) Point of Deployment (POD) Module: A conditional access module for digital cable signal reception.
- 62 I) Luminance: The photometric measure of the luminous intensity per unit area of light traveling in a
63 given direction, expressed in units of candelas per square meter (cd/m^2).
- 64 J) Automatic Brightness Control (ABC): The self-acting mechanism that controls the brightness of a
65 display as a function of ambient light.
- 66 K) Operational Modes:
- 67 1) On Mode: The power mode in which the product is connected to a mains power source, has been
68 activated, and is providing one or more of its principal functions.

- 69 a) Power Overhang State: A limited-duration power state within On Mode that is intended to
70 facilitate a product's rapid return to full On Mode functionality or provide time for the product
71 to perform functions required for safe shutdown (e.g., operation of cooling fans) after being
72 switched into a low power state by the user.
- 73 2) Standby-Passive Mode: The mode in which the TV is connected to a power source, produces
74 neither sound nor picture but can be switched into another mode with the remote control unit or
75 an internal signal.
- 76 3) Standby-Active, High Mode: The mode in which the TV is connected to a power source, produces
77 neither sound nor picture but can be switched into another mode with the remote control unit or
78 an internal signal, and with an external signal, and is exchanging/receiving data with/from an
79 external source.
- 80 a) Download Acquisition Mode (DAM): The power mode in which the product is connected
81 to a mains power source, produces neither sound nor picture, and is actively
82 downloading data. Data downloads may include channel listing information for use by an
83 electronic programming guide, TV setup data, channel map updates, firmware updates,
84 monitoring for emergency messaging/communications or other network communications.
- 85 4) Standby-Active, Low Mode: The mode in which the TV is connected to a power source, produces
86 neither sound nor picture but can be switched into another mode with the remote control unit or
87 an internal signal and can additionally be switched into another mode with an external signal.
- 88 5) Off Mode: The mode where the TV is connected to a power source, produces neither sound nor
89 picture and cannot be switched into any other mode with the remote control unit, an external or
90 internal signal.
- 91 L) Screen Area: The viewable screen area of the product, calculated by multiplying the viewable image
92 width by the viewable image height.
- 93 M) Product Family: A group of product models that are: (1) made by the same manufacturer; (2) subject
94 to the same ENERGY STAR qualification criteria; and (3) of a common basic design. Product models
95 within a family differ from each other according to one or more characteristics or features that either
96 (1) have no impact on product performance with regard to ENERGY STAR qualification criteria, or (2)
97 are specified herein as acceptable variations within a product family. For Televisions, acceptable
98 variations within a product family include:
- 99 1) Color, and
- 100 2) Housing.
- 101 N) Unit Under Test (UUT): The unit currently undergoing testing.
- 102 O) Local Area Network (LAN): Multiple clients interconnected in a geographical area.
- 103 P) Wide Area Network (WAN): Network that is not limited by geographical area, usually interconnecting
104 multiple local networks.

105 **2 SCOPE**

106 **2.1 Included Products**

107 2.1.1 Products that are: (1) marketed to the consumer as a television (e.g., television is the primary
108 function); (2) capable of being powered from either a wall outlet or a battery unit that is sold with
109 an external power supply; and (3) meet one of the following product type definitions, are eligible
110 for ENERGY STAR qualification, with the exception of products listed in Section 2.2:

- 111 i. Televisions
- 112 ii. Television Combination Units
- 113 iii. Component Televisions
- 114 iv. Hospitality Televisions
- 115 v. Products with a computer input port (e.g., VGA) that are marketed and sold primarily as
116 televisions.
- 117 vi. Dual-function televisions / computer monitors that are marketed and sold as dual-function
118 televisions / computer monitors.

119 2.2 Excluded Products

120 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for
121 qualification under this specification. The list of specifications currently in effect can be found at
122 www.energystar.gov/specifications.

123 2.2.2 Products that satisfy one or more of the following conditions are not eligible for ENERGY STAR
124 qualification under this specification:

- 125 i. Products with a computer input port (e.g., VGA) that are marketed and sold primarily as
126 computer monitors,
- 127 ii. Products that do not have a power state meeting the definition of Standby-Passive Mode
128 (e.g., Public Alert CEA-2009-A certified models which offer 24/7/365 active public alert
129 features), with the exception of Hospitality Televisions that meet the requirements specified in
130 Section 3.7.

131 3 QUALIFICATION CRITERIA

132 3.1 Significant Digits and Rounding

133 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.

134 3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using exact
135 values without any benefit from further rounding.

136 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
137 website shall be rounded to the nearest significant digit as expressed in the corresponding
138 specification limit.

139 3.2 General Requirements

140 3.2.1 External Power Supply (EPS): If the product is shipped with an EPS, the EPS shall meet the
141 level V performance requirements under the International Efficiency Marking Protocol and
142 include the level V marking. Additional information on the Marking Protocol is available
143 at www.energystar.gov/powersupplies.

144 i. External Power Supplies shall meet level V requirements when tested using the Test Method
145 for Calculating the Energy Efficiency of Single-Voltage External Ac-Dc and Ac-Ac Power
146 Supplies, Aug. 11, 2004.

147 3.2.2 User Information: The product shall ship with consumer informational materials located in either
148 (1) the hard copy or electronic user manual, or (2) a package or box insert. These materials shall
149 include:

- 150 i. Information about the ENERGY STAR program,
- 151 ii. Information on the energy consumption implications of changes to default as-shipped
152 television configuration and settings, and
- 153 iii. Notification that enabling certain optional features and functionalities (e.g., instant-on), may
154 increase energy consumption beyond the limits required for ENERGY STAR qualification, as
155 applicable.

156 3.2.3 Forced Menu: Any product that includes a forced menu upon initial start-up shall:

- 157 i. Provide users with a choice of “home” picture setting or “retail” picture setting. Partners may
158 use alternative terminology if approved by EPA.
- 159 ii. Upon selection of “retail” picture setting at initial start-up, either (1) display a second prompt
160 requiring the user to confirm the choice of “retail” picture setting, or (2) display information on
161 the start-up menu that the “home” picture setting is the setting in which the product qualifies
162 for ENERGY STAR. If option (2) is selected, additional detail about ENERGY STAR
163 qualification and energy consumption expectations shall be included in printed product
164 literature and on the product information page on the Partner’s website.
- 165 iii. Display a message each time any setting other than the “home” picture setting is selected to
166 inform the user that the “home” picture setting is the setting in which the product qualifies for
167 ENERGY STAR.

168 **Note:** In response to stakeholder concerns regarding possible negative impact on user experience of
169 double prompting the user anytime the television is taken out of the “home” picture setting, EPA has
170 revised the requirement to display only an informational message each time any setting other than the
171 “home” picture setting is selected. EPA aims to minimize impacts on user experience while ensuring that
172 the user is made aware that the “home” picture setting is the setting in which the product qualifies for
173 ENERGY STAR and that other picture settings may not deliver the same energy savings.

174 3.2.4 Component Televisions: For component television products, the total power of all components
175 shall be considered for evaluation against any power requirement in this specification.

176 3.3 On Mode Requirements

177 3.3.1 For products with Automatic Brightness Control (ABC) enabled by default and whose
178 performance is validated using the test method outlined in Section 4.3, On Mode power with
179 ABC disabled (P_{ON}), as measured per the ENERGY STAR test method shall be less than or
180 equal to the Maximum On Mode Power Requirement for Products with ABC Enabled by Default
181 (P_{ABC_MAX}), as calculated per Equation 1.

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183 **Equation 1: Calculation of Maximum On Mode Power for**
184 **Products with ABC Enabled by Default**

$$P_{ABC_MAX} = 1.1 \times P_{ON_MAX}$$

185
186 *Where:*

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Note: The DOE TV Test Procedure NOPR has changed the luminance test to require that luminance in the retail picture setting be measured before switching to the home picture setting. DOE has found that, during testing, some TVs do not provide the ability to switch into the “retail” picture setting once placed into the “home” picture setting. Stakeholders are encouraged to provide input on this change as part of the DOE public review process

228 **3.6 Download Acquisition Mode (DAM) Requirements**

229 3.6.1 A product may automatically exit Standby-Passive Mode and enter Download Acquisition Mode
230 according to a predefined schedule, in order to:

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

234 3.6.2 Measured DAM energy consumption for all DAM states (E_{DAM}) shall be less than or equal to 40
235 watt-hours per day (0.04 kWh/day).

236 **3.7 Hospitality Television Requirements**

237 3.7.1 Hospitality Television TEC (TEC_{HOSP}), as calculated per Equation 3, shall be less than or equal
238 to the Maximum Hospitality Television TEC Requirement (TEC_{HOSP_MAX}), as calculated per
239 Equation 4.

240 3.7.2 For Hospitality Televisions that feature an always-on DAM, measured DAM power (P_{DAM}) shall
241 be less than or equal to 1.0 W when tested per the Standby-Passive Mode test procedure.

242 **Equation 3: Calculation of TEC for Hospitality Televisions (TEC_{HOSP})**

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$$TEC_{HOSP} = (P_{ON} \times 5) + (P_{STANDBY-PASSIVE} \times 19) + E_{DAM}$$

244 *Where:*

- 245 ▪ TEC_{HOSP} is the calculated Hospitality Television TEC;
- 246 ▪ P_{ON} is the measured On Mode power;
- 247 ▪ $P_{STANDBY-PASSIVE}$ is the measured Standby-Passive Mode power; and
- 248 ▪ E_{DAM} is the measured DAM energy over a 24 hour period.

249 **Equation 4: Calculation of Maximum TEC Requirement for**
250 **Hospitality Televisions (TEC_{HOSP_MAX})**

251
$$TEC_{HOSP_MAX} = 500 \times \tanh(0.00085 \times (A - 140) + 0.052) + 129.5$$

252 *Where:*

- 253 ▪ TEC_{HOSP} is the calculated Hospitality Television TEC;
- 254 ▪ A is the viewable screen area of the product in square inches
- 255 ▪ \tanh is the hyperbolic tangent function

256
 257 **Note:** Products intended for sale in the US market are subject to minimum toxicity and recyclability
 258 requirements. Please see ENERGY STAR Program Requirements for Televisions: Partner Commitments
 259 for details.

260 **Note:** To ensure that product designers are aware of Partner Commitments specific to toxicity and
 261 recyclability, EPA has inserted the above note. Once final the Partner Commitments and Version 6.0
 262 Product Specification will be packaged into one Program Requirements document for stakeholder review
 263 and reference.

264 4 TESTING

265 **Note:** In January 2012, DOE published the Test Procedure for Television Sets Notice of Proposed
 266 Rulemaking (TV TP NOPR) (77 FR 2830), which is largely consistent with the Test Procedure historically
 267 referenced by the ENERGY STAR TV Version 5.3 specification. The ENERGY STAR Specification for
 268 Televisions will ultimately reference the DOE TV Test Procedure Final Rule once it is published and, in an
 269 effort to provide partners with continuity and honor the Agency’s intention to harmonize with the final DOE
 270 Test Procedure, this Final Draft continues to propose the use of the DOE TV TP NOPR, where applicable.
 271 This Final Draft also incorporates a test method for measuring the power consumption associated with
 272 network connections in Standby-Active, Low Mode.

273 Depending on the timing of the compliance date in the TV Test Procedure Final Rule, and the extent of
 274 any changes adopted for televisions sets when DOE publishes the final rule, EPA will work with
 275 manufacturers to assess the next steps for the ENERGY STAR specification. EPA may issue a
 276 modification (i.e., Version 6.1), referencing the final rule if it does not impact manufacturers’ ability to
 277 qualify products. Should DOE’s final rule differ significantly from the NOPR, EPA will consider
 278 accelerating the development of a Version 7.0 specification so the ENERGY STAR and regulatory test
 279 procedures for televisions sets are harmonized. More information on the DOE’s TV TP NOPR is available
 280 at: http://www1.eere.energy.gov/buildings/appliance_standards/residential/tv_sets.html

281 The DOE TV TP NOPR as published in the Federal Register is available at:
 282 <http://www.gpo.gov/fdsys/pkg/FR-2012-01-19/pdf/2012-687.pdf>

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284 4.1 On Mode, Standby-Passive Mode, Luminance, and DAM Testing

285 4.1.1 When testing On Mode, Luminance, and DAM for Television products, the test methods
 286 identified in Table 1 shall be used to determine ENERGY STAR qualification.

287 **Table 1: Test Method for ENERGY STAR Qualification**

Product Type	Test Method
Ac Mains-powered Televisions	The Notice of Proposed Rulemaking published in the Federal Register 77 FR 2864. Once effective, the DOE Test Procedure adopted will be found in 10 CFR § 430 Appendix H.
Battery-powered Televisions	ENERGY STAR Test Method for Televisions, Rev. Aug-2011

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289 **Note:** The DOE TV TP NOPR references test methods found in the ENERGY STAR TV Version 5.3
290 specification: *ENERGY STAR Test Methods for Televisions, Rev. Aug-2011*; *IEC 62087, Ed. 3.0:*
291 *Methods of Measurement for the Power Consumption of Audio, Video and Related Equipment*; *IEC*
292 *62301, Ed. 2.0: Household Electrical Appliances – Measurement of Standby Power*; *CEA: Procedure for*
293 *DAM Testing.*

294
295 Battery-powered televisions are excluded from the scope of the DOE TV TP NOPR. Therefore, EPA
296 proposes that the ENERGY STAR test method proposed under the Draft 1 of the Version 6.0 Televisions
297 specification (which is the same as the test method for Version 5.3) be used for these products.

298 **4.2 Standby-Active, Low Mode Testing**

299 4.2.1 UUT (Unit Under Test) Configuration and Control

300 i. Network Connection Capabilities:

301 a) Verify the UUT has network connection capabilities:

302 i) Network connections should be listed in the user manual. If no connections are
303 specified in the user manual, verify that the TV does not have network capabilities by
304 checking for the absence of physical connections or the absence of network settings
305 in the menu.

306 ii) If the UUT has the capabilities to be connected to a network but was not shipped with
307 a required piece of hardware (e.g. wireless adapter), that connection type shall not be
308 tested.

309 ii. Peripherals and Network Connections:

310 a) UUT connections shall be set up as follows:

311 i) If a physical network connection is present, network connectivity is listed in the TV
312 menu, or listed in the user manual; the UUT network capabilities shall be activated
313 and the UUT shall be connected to a Local Area Network (LAN) prior to being placed
314 into standby mode.

315 ii) The LAN shall allow devices to ping other devices on the network but will not allow
316 access to a wide area network (WAN).

317 Note: Limiting the connection to a LAN ensures that the UUT is in Standby-Active, Low
318 Mode, where it is connected to a network but does not receive external data. The LAN,
319 including wireless Radio Frequency (RF), shall support the highest and lowest data
320 speeds of the UUT's network function.

321 b) If the UUT has multiple network connections (e.g., Wi-Fi, Ethernet, other), the UUT shall
322 be configured and connected to a single network source in accordance with the hierarchy
323 of connections listed below¹, while maintaining a video signal connection (i.e., connected
324 to a video signal generating device).

325 i) Wi-Fi (Institution of Electrical and Electronics Engineers - IEEE 802.11- 20072).

326 ii) Ethernet (IEEE 802.3). If the UUT supports Energy Efficient Ethernet (IEEE 802.3az-
327 20103), then it shall be connected to a device that also supports IEEE 802.3az.

¹ This order of preference may change in future revisions

² IEEE 802 – Telecommunications and information exchange between systems – Local and metropolitan area networks – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

328 iii) Other

329 4.2.2 Power Measurement:

330 i. Measurement Procedure⁴:

331 a) After the TV is placed into Standby-Active, Low Mode, leave the UUT for a minimum of
332 30 minutes to allow Standby-Active, Low Mode power to stabilize.

333 b) Measure the average power consumed for a 10 minute period. Record the power for
334 Standby-Active, Low Mode.

335 4.3 ABC Sensor Validation Testing

336 4.3.1 The average power measured at 10 lux (P_{10}) shall increase by at least 5 % relative to
337 the average power measured at 50 lux (P_{50}), and the average power measured at 50
338 lux shall increase by at least 5 % relative to the average power measured at 100 lux
339 (P_{100}), as indicated in Equation 3.

340 Equation 3: ABC Sensor Validation Conditions

$$\frac{P_{100} - P_{10}}{P_{10}} \geq 5\% \quad , \quad \frac{P_{100} - P_{50}}{P_{50}} \geq 5\% \quad .$$

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342 Where:

343 ■ P_n is the Power consumed for On Mode with ABC enabled at n lux, with a direct light
344 source

345 4.4 Number of Units Required for Testing

346 4.4.1 Representative Models shall be selected for testing per the following requirements:

347 i. For qualification of an individual product model, a product configuration equivalent to that
348 which is intended to be marketed and labeled as ENERGY STAR is considered the
349 Representative Model;

350 ii. For qualification of a product family, any product configuration within the family may be
351 considered the Representative Model.

352 4.5 International Market Qualification

353 4.5.1 Products shall be tested for qualification at the relevant input voltage/frequency combination for
354 each market in which they will be sold and promoted as ENERGY STAR.

355 5 USER INTERFACE

356 5.1.1 Partners are encouraged to design products in accordance with the user interface standard
357 IEEE 1621: Standard for User Interface Elements in Power Control of Electronic Devices
358 Employed in Office/Consumer Environments. For details, see <http://eetd.LBL.gov/Controls>.

³ Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Amendment 5: Media Access Control Parameters, Physical Layers, and Management Parameters for Energy-Efficient Ethernet

⁴ Measurement procedure is based on Standby-Passive measurements in Section 8.6.5.8 of IEC 62087-2011

359 **6 EFFECTIVE DATE**

360 6.1.1 Effective Date: The Version 6.0 ENERGY STAR Televisions specification shall take effect on
361 May 15, 2013. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR
362 specification in effect on its date of manufacture. The date of manufacture is specific to each unit
363 and is the date on which a unit is considered to be completely assembled.

364 **Note:** At this time EPA anticipates finalizing Version 6.0 in August 2012, and the specification would
365 become effective in May 2013.

366 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
367 technological and/or market changes affect its usefulness to consumers, industry, or the
368 environment. In keeping with current policy, revisions to the specification are arrived at through
369 stakeholder discussions. In the event of a specification revision, please note that the ENERGY
370 STAR qualification is not automatically granted for the life of a product model.

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APPENDIX A: Sample Calculations

Viewable Diagonal Screen Size (inches)	Aspect Ratio	Viewable Screen Size, w x l (Inches)	Screen Area, A (sq-inches)	P _{ON_MAX} (watts)
20	16:9	17.4 x 9.8	170.9	21.9
32	16:9	27.9 x 15.7	437.6	43.7
42	16:9	36.6 x 20.6	753.8	65.9
50	16:9	43.6 x 24.5	1068.2	82.7
60	16:9	52.3 x 29.4	1538.3	98.7

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