



ENERGY STAR® Program Requirements Product Specification for Televisions

Eligibility Criteria Draft 1 Version 6.0

1 Following is the Draft 1 Version 6.0 ENERGY STAR Product Specification for Televisions. A product shall
2 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 commercially available electronic product designed primarily for the reception
6 and display of audiovisual signals received from terrestrial, cable, satellite, Internet Protocol TV
7 (IPTV), or other digital or analog sources. A TV consists of a tuner/receiver and a display
8 encased in a single enclosure. Liquid crystal display (LCD) and plasma display panel (PDP) are
9 examples of common display technologies.
- 10 2) Rear-projection TV: A television product in which the display device is a projector that focuses
11 images onto a screen located inside the TV enclosure.
- 12 3) Direct-view TV: A television product in which the display device emits light either directly from the
13 screen surface or transmits light from a source mounted directly behind the screen.
- 14 4) TV Combination Unit: A television product in which the TV and one or more additional devices
15 (e.g., DVD player, Blu-ray Disc player, Hard Disk Drive) are combined into a single enclosure,
16 and which meets all of the following criteria:
- 17 a) it is not possible to measure the power of the individual components without removing the
18 product housing; and
- 19 b) the product connects to a wall outlet via a single power cord.
- 20 5) Component Television: A television product composed of two or more separate components
21 (e.g., display device and tuner) that is marketed and sold as a television under a single model or
22 system designation. A component television may have more than one power cord.
- 23 6) Hospitality Television: A television product which includes the following features:
- 24 a) a control port for bi-directional communication (DB-9, RJ11, RJ12, RJ45, coaxial cable, or
25 HDMI-CEC);
- 26 b) activated hospitality protocol software (e.g., SmartPort, MPI, MTI, Serial Protocol) to provide
27 direct access to Video-On-Demand (VOD) systems or a digital media player designed for
28 hospitality-specific applications; and
- 29 c) a power state that meets the definition of Download Acquisition Mode.
- 30 7) Analog Television: A television product which has an NTSC, PAL, or SECAM tuner, and may
31 have analog video inputs (e.g., composite video, component video, S-video, RGB).

- 32 8) Digital Television: A television product which has at least one digital tuner or at least one digital
33 video input (e.g., HDMI). Products with an analog tuner and both analog and digital inputs are
34 considered digital products under this specification.
- 35 B) Native Vertical Resolution: The physical pixel count for the vertical axis of the television (e.g., a
36 television with a screen resolution of 1920 x 1080 (horizontal x vertical) would have a native vertical
37 resolution of 1080).
- 38 C) Electronic Program Guide (EPG): An interactive on-screen menu of TV program information
39 downloaded from an external source (e.g., program time, date, descriptions).
- 40 D) External Power Supply (EPS): Also referred to as External Power Adapter. A component contained in
41 a separate physical enclosure external to the television casing, designed to convert line voltage ac
42 input from the mains to lower dc voltage(s) in order to provide power to the television. An EPS
43 connects to the television via a removable or hard-wired male/female electrical connection, cable,
44 cord or other wiring.
- 45 E) Point of Deployment (POD) Module: A conditional access module for digital cable signal reception.
- 46 F) Luminance: The photometric measure of the luminous intensity per unit area of light traveling in a
47 given direction, expressed in units of candelas per square meter (cd/m²).
- 48 G) Automatic Brightness Control (ABC): The self-acting mechanism that controls the brightness of a
49 display as a function of ambient light.
- 50 H) Operational Modes:
- 51 1) On Mode: The power mode in which the product is connected to a mains power source, has been
52 activated, and is providing one or more of its principal functions. The common terms “active”, “in-
53 use” and “normal operation” also describe this mode.
- 54 a) Power Overhang State: A limited-duration power state within On Mode that is intended to
55 facilitate a product’s rapid return to full On Mode functionality or provide time for the product
56 to perform functions required for safe shutdown (e.g. operation of cooling fans) after being
57 switched into a low power state by the user.
- 58 2) Sleep Mode: The power mode, sometimes referred to as “Standby,” in which the product is
59 connected to a mains power source, is not providing a principal function, and offers one or more
60 of the following user oriented or protective functions, which may persist for an indefinite time:
- 61 a) to facilitate the activation of other modes (including activation or deactivation of On Mode) by
62 remote switch (including remote control), internal sensor, timer.
- 63 b) continuous function: information or status displays including clocks.
- 64 c) continuous function: sensor-based functions.
- 65 Sleep Mode is defined as the time when the product is connected to a power source, produces
66 neither sound nor picture, neither transmits nor receives program information and/or data
67 (excluding data transmitted to change the unit’s condition from Sleep Mode to On Mode), and is
68 waiting to be switched to On Mode by a direct or indirect signal from the consumer (e.g., with the
69 remote control).

- 70 3) Off Mode: The power mode, in which the product is connected to a mains power source, is not
71 providing any On Mode or Sleep Mode functions, and where the mode may persist for an
72 indefinite time. An indicator that only shows the user that the product is in the off position is
73 included within the classification of an Off Mode.
- 74 4) Download Acquisition Mode (DAM): The power mode in which the product is connected to a
75 mains power source, produces neither sound nor picture, and is actively downloading data. Data
76 downloads may include channel listing information for use by an electronic programming guide,
77 TV setup data, channel map updates, firmware updates, monitoring for emergency messaging /
78 communications or other network communications.
- 79 I) Screen Area: The viewable screen area of the product, calculated by multiplying the viewable image
80 width by the viewable image height.
- 81 J) Product Family: A group of product models that are (1) made by the same manufacturer, (2) subject
82 to the same ENERGY STAR qualification criteria, and (3) of a common basic design. Product models
83 within a family differ from each other according to one or more characteristics or features that either
84 (1) have no impact on product performance with regard to ENERGY STAR qualification criteria, or (2)
85 are specified herein as acceptable variations within a product family. For Televisions, acceptable
86 variations within a product family include:
- 87 1) Color, and
- 88 2) Housing.

89 2 SCOPE

90 2.1 Included Products

- 91 2.1.1 Products that are (1) marketed to the consumer as a television (e.g., television is the primary
92 function), (2) capable of being powered from either a wall outlet or a battery unit that is sold with
93 an external power supply, and (3) meet one of the following product type definitions, are eligible
94 for ENERGY STAR qualification, with the exception of products listed in Section 2.2:
- 95 i. Televisions
96 ii. Television Combination Units
97 iii. Component Televisions
98 iv. Hospitality Televisions
99 v. Products with a computer input port (e.g., VGA) that are marketed and sold primarily as
100 televisions.
101 vi. Dual-function televisions / computer monitors that are marketed and sold as dual-function
102 televisions / computer monitors.

103 **Note:** Under the ENERGY STAR Television Specification, EPA is proposing that products that are
104 explicitly marketed and sold as dual-function televisions / computer monitors meet the Television
105 requirements in order to earn the ENERGY STAR. EPA appreciates stakeholder comments on this
106 matter and will also seek comment in the Displays V6.0 specification process.

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108 **2.2 Excluded Products**

109 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for
110 qualification under this specification. The list of specifications currently in effect can be found at
111 www.energystar.gov/products.

112 2.2.2 Products that satisfy one or more of the following conditions are not eligible for ENERGY STAR
113 qualification under this specification:

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

119 **Note:** EPA is aware of a revised Public Alert specification, CEA-2009-B, and welcomes comment on any
120 differences between the two versions, and whether the above reference should be updated.

121 **3 QUALIFICATION CRITERIA**

122 **3.1 Significant Digits and Rounding**

123 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.

124 3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using exact
125 values without any benefit from further rounding.

126 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
127 website shall be rounded to the nearest significant digit as expressed in the corresponding
128 specification limit.

129 **3.2 General Requirements**

130 3.2.1 External Power Supply (EPS): If the product is shipped with an EPS, the EPS shall meet the level
131 V performance requirements under the International Efficiency Marking Protocol and include the
132 level V marking. Additional information on the Marking Protocol is available
133 at www.energystar.gov/powersupplies.

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

137 3.2.2 Power Management:

138 **Note:** EPA understands that manufacturers are developing and implementing innovative power
139 management functions for Televisions such as occupancy sensors, proximity sensors or timer
140 functions. EPA would like to better understand these technologies, their prevalence in the market,
141 and energy savings they offer consumers and, as appropriate, encourage their broader
142 application.

143 3.2.3 User Information: The product shall ship with consumer informational materials located in either
144 (1) the hard copy or electronic user manual, or (2) a package or box insert. These materials shall
145 include:

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

152 3.2.4 **Forced Menu:** Any product that includes a forced menu upon initial start-up shall:

- 153 i. Provide users with a choice of “home” picture mode or “retail” picture mode. Partners may
- 154 use alternative terminology if approved by EPA.
- 155 ii. Upon selection of “retail” picture mode at initial start-up, either (1) display a second prompt
- 156 requiring the user to confirm the choice of “retail” picture mode, or (2) display information on
- 157 the start-up menu that the “home” picture mode is the mode in which the product qualifies for
- 158 ENERGY STAR. If option (2) is selected, additional detail about ENERGY STAR qualification
- 159 and energy consumption expectations shall be included in printed product literature and on
- 160 the product information page on the Partner’s website.

161 **Component Televisions:** For component television products, the total power of all components shall be

162 considered for evaluation against any power requirement in this specification.

163 3.3 On Mode Requirements

164 3.3.1 For products with Automatic Brightness Control (ABC) enabled by default, On Mode power (P_{ON}),

165 as calculated per Equation 1, shall be less than or equal to the Maximum On Mode Power

166 Requirement (P_{ON_MAX}), as calculated per Table 1.

167 Equation 1: Calculation of On Mode Power for

168 Products with ABC Enabled by Default

$$169 P_{ON} = \frac{P_{BROADCAST}|_{10\text{ lux}} + P_{BROADCAST}|_{100\text{ lux}} + P_{BROADCAST}|_{150\text{ lux}} + P_{BROADCAST}|_{300\text{ lux}}}{4} + 25 \times \frac{P_{BROADCAST}|_{300\text{ lux}} - P_{BROADCAST}|_{10\text{ lux}}}{290}$$

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172 *Where:*

- 173 ▪ P_{ON} is the calculated On Mode power,
- 174 ▪ $P_{BROADCAST}|_{10\text{ lux}}$ is the measured On Mode power when tested
- 175 with a minimum ambient light level of 10 lux;
- 176 ▪ $P_{BROADCAST}|_{100\text{ lux}}$ is the measured On Mode power when tested
- 177 with a minimum ambient light level of 100 lux;
- 178 ▪ $P_{BROADCAST}|_{150\text{ lux}}$ is the measured On Mode power when tested
- 179 with a minimum ambient light level of 150 lux; and
- 180 ▪ $P_{BROADCAST}|_{300\text{ lux}}$ is the measured On Mode power when tested
- 181 with a minimum ambient light level of 300 lux.
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183 **Note:** EPA and the U.S. Department of Energy (DOE) are interested in improving the

184 measurement of On Mode power for televisions with ABC enabled by default. Both EPA and DOE

185 believe that the test conditions for room illuminance should be representative of consumer use.

186 EPA is proposing testing conditions for ABC enabled by default that have been recommended by

187 DOE. EPA will revise its television test method to be identical to the DOE test procedure within

188 180 days of publication of the final DOE test procedure.

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While assigning different weights according to usage patterns would yield the most representative results, little information exists in this area; therefore an average approach which assumes equal usage at each room illuminance level has been proposed. EPA welcomes feedback on the weights assigned to each of the room illuminance levels and also on testing televisions with ABC enabled by default at three room illuminance levels instead of four.

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This ABC proposal affects the calculation of On Mode power in the following way. In the Version 5.3 requirements for On Mode power for televisions with ABC enabled by default, the average illuminance was $(0.55 \times 300 \text{ lux} + 0.45 \times 0 \text{ lux}) = 165 \text{ lux}$. In the new proposed requirements for televisions with ABC, shown in Equation 1, the average illuminance is 140 lux.

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If the ABC function is implemented linearly, with On Mode power proportional to room illuminance, the above difference in average illuminance implies that the same television will have a lower On Mode power when tested under the new proposal. Therefore, a corrective term has been added to Equation 1, $25 \times (P_{BROADCAST|300\text{lux}} - P_{BROADCAST|10\text{lux}}) / 290$, to account for the likely

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difference in On Mode power between the Version 5.3 and Version 6.0 requirements and allow comparisons between televisions qualified according to both sets of requirements. EPA welcomes feedback on this approach.

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206 3.3.2 For products that do not offer ABC, or for which ABC is not enabled by default, On Mode power
207 (P_{ON}), as measured per the ENERGY STAR test method shall be less than or equal to the
208 Maximum On Mode Power Requirement (P_{ON_MAX}), as calculated per Table 1.

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Table 1: Calculation of Maximum On Mode Power

Viewable Screen Area, A (square inches)	P_{ON_MAX} (watts)
$A < 200.0$	$(0.055 \times A) + 13.0$
$200.0 \leq A \leq 1068.0$	$(0.070 \times A) + 10.0$
$A > 1068.0$	85.0

210 3.3.3 Measured Power Overhang state power shall be less than or equal to the Maximum On Mode
211 Power Requirement (P_{ON_MAX}), as calculated per Table 1.

212 **3.4 Sleep Mode Requirements**

213 3.4.1 Measured Sleep Mode power (P_{SLEEP}) shall be less than or equal to 1.0 W.

214 3.4.2 For products that offer more than one Sleep Mode, measured Sleep Mode power in any Sleep
215 Mode shall not exceed the Sleep Mode Requirement as stated in Section 2.6.2.

216 **3.5 Luminance Requirements**

217 3.5.1 Measured peak luminance in the "home" (or default, as-shipped) picture mode (L_{HOME}) shall be
218 greater than or equal to 65% of measured peak luminance in the "retail" (or brightest-selectable)
219 preset picture mode (L_{RETAIL}).

220 **3.6 Download Acquisition Mode (DAM) Requirements**

221 3.6.1 A product may automatically exit Sleep Mode and enter Download Acquisition Mode according to
222 a predefined schedule, in order to:

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

226 3.6.2 Measured DAM energy consumption for all DAM states (E_{DAM}) shall be less than or equal to 40
227 watt-hours per day (0.04 kWh/day).

228 **3.7 Hospitality Television Requirements**

229 3.7.1 Hospitality Television TEC (TEC_{HOSP}), as calculated per Equation 2, shall be less than or equal to
230 the Maximum Hospitality Television TEC Requirement (TEC_{HOSP_MAX}), as calculated per Table 2.

231 3.7.2 For Hospitality Televisions that feature an always-on DAM, measured DAM power (P_{DAM}) shall be
232 less than or equal to 1.0 W when tested per the Sleep Mode test procedures in the ENERGY
233 STAR Test Method for Televisions.

234 **Equation 2: Calculation of TEC for Hospitality Televisions (TEC_{HOSP})**

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

236 *Where:*

- 237 ▪ TEC_{HOSP} is the calculated Hospitality Television TEC;
- 238 ▪ P_{ON} is the measured On Mode power;
- 239 ▪ P_{SLEEP} is the measured Sleep Mode power; and
- 240 ▪ E_{DAM} is the measured DAM energy over a 24 hour period.

241 **Table 2: Calculation of Maximum TEC Requirement for**
242 **Hospitality Televisions (TEC_{HOSP_MAX})**

Screen Area, A (square inches)	TEC_{HOSP_MAX} (watt-hours)
$A < 200.0$	$(0.275 \times A) + 124.0$
$200.0 \leq A \leq 1068.0$	$(0.35 \times A) + 109.0$
$A > 1068.0$	484.0

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244 **4 TOXICITY AND RECYCLABILITY REQUIREMENTS**

245 Note: Consistent with the ENERGY STAR commitment to delivering energy efficiency along with
246 the product features and functions that consumers value, EPA expects to require that ENERGY
247 STAR qualified Televisions meet maximum toxicity requirements and are recyclable. Adding
248 these types of requirements extends a longstanding ENERGY STAR practice of addressing
249 issues like mercury in CFLs where existing standards can be leveraged. EPA requests
250 information on existing standards that address these environmental issues and how conformity is
251 assured.

252 **5 TESTING**

253 **5.1 Test Methods**

254 5.1.1 When testing Television products, the test methods identified in Table 3 shall be used to
255 determine ENERGY STAR qualification.

256 **Table 3: Test Methods for ENERGY STAR Qualification**

Operational Mode	Test Method
All	ENERGY STAR Test Method for Televisions, Rev. Aug-2011
On Mode	IEC 62087, Ed. 2.0: Methods of Measurement for the Power Consumption of Audio, Video and Related Equipment
Sleep Mode	IEC 62301, Ed. 2.0: Household Electrical Appliances – Measurement of Standby Power.
Download Acquisition Mode	CEA: Procedure for DAM Testing

257 **5.2 Number of Units Required for Testing**

- 258 5.2.1 Representative Models shall be selected for testing per the following requirements:
- 259 i. For qualification of an individual product model, a product configuration equivalent to that
260 which is intended to be marketed and labeled as ENERGY STAR is considered the
261 Representative Model;
 - 262 ii. For qualification of a product family, any product configuration within the family may be
263 considered the Representative Model.

264 **5.3 International Market Qualification**

265 5.3.1 Products shall be tested for qualification at the relevant input voltage/frequency combination for
266 each market in which they will be sold and promoted as ENERGY STAR.

267 **6 USER INTERFACE**

268 6.1.1 Partners are encouraged to design products in accordance with the user interface standard IEEE
269 1621: Standard for User Interface Elements in Power Control of Electronic Devices Employed in
270 Office/Consumer Environments. For details, see <http://eetd.LBL.gov/Controls>.

271 **7 EFFECTIVE DATE**

272 7.1.1 Effective Date: The Version 6.0 ENERGY STAR Televisions specification shall take effect on the
273 date specified in Table 4. To qualify for ENERGY STAR, a product model shall meet the
274 ENERGY STAR specification in effect on its date of manufacture. The date of manufacture is
275 specific to each unit and is the date (e.g., month and year) on which a unit is considered to be
276 completely assembled.

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278 **Table 4: Specification Effective Dates**

Effective Date
TBD

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280 7.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
281 technological and/or market changes affect its usefulness to consumers, industry, or the
282 environment. In keeping with current policy, revisions to the specification are arrived at through
283 stakeholder discussions. In the event of a specification revision, please note that the ENERGY
284 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	22.4
32	16:9	27.9 x 15.7	437.6	40.6
42	16:9	36.6 x 20.6	753.8	62.8
50	16:9	43.6 x 24.5	1068.2	85.0
60	16:9	52.3 x 29.4	1538.3	85.0

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