



ENERGY STAR® Program Requirements Product Specification for Displays

Eligibility Criteria Draft 1 Version 8.0

1 Following is the Version 8.0 ENERGY STAR product specification for Displays. A product shall meet all of
2 the identified criteria if it is to earn the ENERGY STAR.

3 **1 DEFINITIONS**

4 A) Product Types:

5 1) Electronic Display (Display): A product with a display screen and associated electronics, often
6 encased in a single housing, that as its primary function produces visual information from (1)
7 a computer, workstation, or server via one or more inputs (e.g., VGA, DVI, HDMI, DisplayPort,
8 IEEE 1394, USB), (2) external storage (e.g., USB flash drive, memory card), or (3) a network
9 connection.

10 a) Monitor: An Electronic Display intended for one person to view in a desk based
11 environment.

12 b) Signage Display: An Electronic Display intended for multiple people to view in non-
13 desk based environments, such as retail or department stores, restaurants,
14 museums, hotels, outdoor venues, airports, conference rooms or classrooms. For the
15 purposes of this specification, a Display shall be classified as a Signage Display if it
16 meets two or more criteria listed below:

17 (1) Diagonal screen size is greater than 30 inches;

18 (2) Maximum Reported Luminance is greater than 400 candelas per square meter;

19 (3) Pixel density is less than or equal to 5,000 pixels per square inch; or

20 (4) Ships without a mounting stand.

21 B) Operational Modes:

22 1) On Mode: The mode in which the Display has been activated, and is providing the primary
23 function.

24 2) Sleep Mode: A low-power mode in which the Display provides one or more non-primary
25 protective functions or continuous functions.

26 Note: Sleep Mode may serve the following functions: facilitate the activation of On Mode via
27 remote switch, Touch Technology, internal sensor, or timer; provide information or status
28 displays including clocks; support sensor-based functions; or maintain a network presence.

29 3) Off Mode: The mode where the Display is connected to a power source, produces no visual
30 information, and cannot be switched into any other mode with the remote control unit, an
31 internal signal, or an external signal.

32 Note: The Display may only exit this mode by direct user actuation of an integrated power
33 switch or control. Some products may not have an Off Mode.

34 C) Visual Characteristics:

35 1) Ambient Light Conditions: The combination of light illuminances in the environment
36 surrounding a Display, such as a living room or an office.

37 2) Automatic Brightness Control (ABC): The self-acting mechanism that controls the brightness
38 of a Display as a function of Ambient Light Conditions.

39 Note: ABC functionality must be enabled to control the brightness of a Display.

40 3) Color Gamut: Color gamut area shall be reported as a percentage of the CIE LUV 1976 $u' v'$
41 color space and calculated per Section 5.18 Gamut Area of the Information Display
42 Measurements Standard Version 1.03.

43 Note: Any gamut support in non-visible/invisible color areas is not to be counted. The
44 gamut's size must be expressed as a percentage of area of the visible CIE LUV color space
45 only.

46 4) Luminance: The photometric measure of the luminous intensity per unit area of light
47 travelling in a given direction, expressed in candelas per square meter (cd/m^2).

48 a) Maximum Reported Luminance: The maximum luminance the Display may attain at
49 an On Mode preset setting, and as specified by the manufacturer, for example, in the
50 user manual.

51 b) Maximum Measured Luminance: The maximum measured luminance the Display
52 may attain by manually configuring its controls, such as brightness and contrast.

53 c) As-shipped Luminance: The luminance of the Display at the factory default preset
54 setting the manufacturer selects for normal home or applicable market use.

55 5) Native Vertical Resolution: The number of physical lines along the vertical axis of the
56 Display within the visible area of the Display.

57 Note: A Display with a screen resolution of 1920 x 1080 (horizontal x vertical) would have a
58 Native Vertical Resolution of 1080.

59 6) Screen Area: The visible area of the Display that produces images.

60 Note: Screen Area is calculated by multiplying the viewable image width by the viewable
61 image height. For curved screens, measure the width and height along the arc of the
62 Display.

63 D) Additional Functions and Features:

64 1) Bridge Connection: A physical connection between two hub controllers (i.e., USB, FireWire).

65 Note: Bridge Connections allow for expansion of ports typically for the purpose of relocating
66 the ports to a more convenient location or increasing the number of available ports.

67 2) Full Network Connectivity: The ability of the Display to maintain network presence while in
68 Sleep Mode. Presence of the Display, its network services, and its applications, is
69 maintained even if some components of the Display are powered down. The Display can
70 elect to change power states based on receipt of network data from remote network devices,
71 but should otherwise stay in Sleep Mode absent a demand for services from a remote
72 network device.

73 Note: Full Network Connectivity is not limited to a specific set of protocols. Also referred to
74 as "network proxy" functionality and described in the Ecma-393 standard.

75 3) Occupancy Sensor: A device used to detect human presence in front of or in the area
76 surrounding a Display.

77 Note: An Occupancy Sensor is typically used to switch a Display between On Mode and
78 Sleep Mode by detecting human presence or a combination of human presence and a
79 signaling device such as Bluetooth device.

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Note: In response to a stakeholder query in the Version 7.1 ENERGY STAR display specification, EPA is proposing a minor clarification to the definition of Occupancy Sensor noting that a combination of human presence and a signaling device could be used to switch a Display between On Mode and Sleep Mode.

- 4) Touch Technology: Enables the user to interact with a product by touching areas on the Display screen.
- 5) Plug-in Module: A modular plugin device that provides one or more of the following functions without the explicit purpose of providing general computing function:
 - a) Display images, mirror remote content streamed to it, or otherwise render content on the screen from local or remote sources; or
 - b) Process touch signals.

Note: Modules providing any other additional input options are not considered Plug-in Modules for the purposes of this specification.

- E) Product Family: A group of product models that (1) are made by the same manufacturer, (2) share the same Screen Area, Resolution, and Maximum Reported Luminance, and (3) are of a common basic screen design. Models within a Product Family may differ from each other according to one or more characteristics or features. For Displays, acceptable variations within a Product Family include:
 - 1) External housing;
 - 2) Number and types of interfaces;
 - 3) Number and types of data, network, or peripheral ports; and
 - 4) Processing and memory capability.
 - F) Representative Model: The product configuration that is tested for ENERGY STAR certification and is intended to be marketed and labeled as ENERGY STAR.
 - G) Power Source
 - 1) External Power Supply (EPS): An external power supply circuit that is used to convert household electric current into dc current or lower-voltage ac current to operate a consumer product.
 - 2) Standard dc: A method for transmitting dc power defined by a well-known technology standard, enabling plug-and-play interoperability.
- Note: Common examples are USB and Power-over-Ethernet. Usually Standard dc includes both power and communications over the same cable, but as with the 380 V dc standard, that is not required.

2 SCOPE

2.1 Included Products

2.1.1 Products that meet the definition of a Display as specified herein and are powered directly from ac mains, an External Power Supply, or Standard dc are eligible for ENERGY STAR certification, with the exception of products listed in Section 2.2. Typical products that would be eligible for certification under this specification include:

- 119 i. Monitors;
- 120 ii. Signage Displays; and
- 121 iii. Signage Displays and Monitors with Plug-in Modules.

122 **2.2 Excluded Products**

123 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for
124 certification under this specification including Televisions and Computers (Thin Clients,
125 Slates/Tablets, Portable All-in-one Computers, Integrated Desktops). The list of specifications
126 currently in effect can be found at www.energystar.gov/products.

127 2.2.2 The following products are not eligible for certification under this specification:

- 128 i. Products with an integrated television tuner;
- 129 ii. Displays with integrated or replaceable batteries designed to support primary operation
130 without ac mains or external dc power, or device mobility (e.g., electronic readers, battery-
131 powered digital picture frames); and
- 132 iii. Products that must meet Food and Drug Administration specifications for medical devices
133 that prohibit power management capabilities and/or do not have a power state meeting the
134 definition of Sleep Mode.
- 135 iv. Monitors with keyboard, video, and mouse (KVM) switch functionality;

136 **3 CERTIFICATION CRITERIA**

137 **3.1 Significant Digits and Rounding**

- 138 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.
- 139 3.1.2 Unless otherwise specified, compliance with specification requirements shall be evaluated using
140 directly measured or calculated values without any benefit from rounding.
- 141 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
142 website shall be rounded to the nearest significant digit as expressed in the corresponding
143 specification requirements.

144 **3.2 General Requirements for Monitors and Signage Displays**

145 3.2.1 External Power Supplies (EPSs): Single- and Multiple-voltage EPSs shall meet the Level VI or
146 higher performance requirements under the International Efficiency Marking Protocol when tested
147 according to the Uniform Test Method for Measuring the Energy Consumption of External Power
148 Supplies, Appendix Z to 10 CFR Part 430.

- 149 i. Single- and Multiple-voltage EPSs shall include the Level VI or higher marking.
- 150 ii. Additional information on the Marking Protocol is available
151 at <http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218>.

152 3.2.2 Power Management:

- 153 i. Products shall offer at least one power management feature that is enabled by default, and
154 that can be used to automatically transition from On Mode to Sleep Mode either by a
155 connected host device or internally (e.g., support for VESA Display Power Management
156 Signaling (DPMS), enabled by default).

- 157 ii. Products that generate content for display from one or more internal sources shall have a
158 sensor or timer enabled by default to automatically engage Sleep or Off Mode.
- 159 iii. For products that have an internal default delay time after which the product transitions from
160 On Mode to Sleep Mode or Off Mode, the delay time shall be reported.
- 161 iv. Monitors shall automatically enter Sleep Mode or Off Mode within 5 minutes of being
162 disconnected from a host computer.
- 163 3.2.3 Signage Displays shall have a true power factor in On Mode of 0.7 or greater per Section 5.2.F)
164 in the ENERGY STAR Test Method.

165

166 **Note:** As in the recent Version 8.0 Television specification, EPA is considering including a requirement
167 that the Display alert the user that energy consumption will increase when selecting a Preset Picture
168 Setting that does not have ABC enabled by default or when more energy consumptive features are
169 activated, such as HDR upscaling. EPA considers that such requirements may help consumers better
170 understand the energy impacts of Displays when selecting non default picture settings and functions.

171 EPA seeks data that reflects frequency with which Displays leave the default setting or other information
172 that would shed light on the frequency of displays operating outside of the default mode. EPA also seeks
173 data regarding the use of HDR upscaling and other features that increase energy use that are not found
174 in the default mode, including the prevalence of this feature, the frequency of its use, and how it is
175 activated. Lastly, EPA seeks feedback on the persistence of energy saving features like ABC when
176 screen brightness and contrast ratio may be manually adjusted.

177 **3.3 Energy Requirements for Computer Monitors**

178 3.3.1 The Total Energy Consumption (TEC) in kWh shall be calculated per Equation 1 based on
179 measured values.

180 **Equation 1: Total Energy Consumption Calculation**

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$$182 E_{TEC} = 8.76 \times (0.35 \times P_{ON} + 0.65 \times P_{SLEEP})$$

183

184 *Where:*

- 185 ▪ *E_{TEC} is the Total Energy Consumption calculation in kWh;*
- 186 ▪ *P_{ON} is Measured On Mode Power in watts*
- 187 ▪ *P_{SLEEP} is Measured Sleep Mode Power in watts; and*
- 188 ▪ *The result shall be rounded to the nearest tenth of a kWh for reporting.*

189 3.3.2 The Maximum TEC (E_{TEC_MAX}) in kWh for Monitors shall be calculated per Table 1.

190 **Table 1: Calculation of Maximum TEC (E_{TEC_MAX}) for Monitors in kWh**

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Area (in ²)	E _{TEC} Max (kWh)
	Where: A = Viewable screen area in in ² r = Screen resolution in megapixels The result shall be rounded to the nearest tenth of a kWh for reporting
A < 171	(3.99 × r) + (0.123 × A) + 8.78
171 ≤ A < 226	(3.99 × r) + (0.123 × A) + 10.01
226 ≤ A < 385	(3.99 × r) + (0.123 × A) + 8.48
A ≥ 385	(3.99 × r) + (0.123 × A) + 15.53

192 **Note:** Based on a preliminary assessment of 2017 shipments, EPA estimates that market share for
 193 ENERGY STAR monitors could be as as high as 90%. As such, EPA considers its dataset of ENERGY
 194 STAR certified models to be representative of the market. In addition, the trend towards higher
 195 efficiencies reflected in the data represents an opportunity for the ENERGY STAR program to further
 196 differentiate among the highly efficient monitors on the market, helping to ensure that the ENERGY STAR
 197 label remains an effective tool for consumers. With this Draft 1, EPA analyzed the ENERGY STAR
 198 dataset of 776 unique models, and is proposing energy requirements that recognize a diverse selection of
 199 models across all common sizes from 23 monitor brands. EPA continues to propose an allowance for
 200 resolution, as a higher resolution, all other things being equal, requires additional power in On Mode.
 201 Regression analysis of monitor On Mode power indicates that for every megapixel of screen resolution,
 202 the Monitor uses 1.3 W power on average. Therefore, EPA proposes lowering the 6.13 kWh per
 203 megapixel allowance in Version 7.1 to 3.99 kWh, which is roughly equivalent to 1.3 W per megapixel in
 204 On Mode. EPA proposes an area coefficient of 0.123 kWh per square inch for all size categories. Within
 205 the TEC limit, an allowance for Sleep Mode is included, roughly equivalent to dataset average Sleep
 206 Mode power demand of 0.25 W. EPA's data package including the ENERGY STAR Version 7 dataset
 207 used to develop these levels and associated scatter plots accompanies this proposal. EPA welcomes
 208 feedback on this proposal.

209 3.3.3 For all Monitors, Calculated TEC (E_{TEC}) in kWh shall be less than or equal the calculation of
 210 Maximum TEC (E_{TEC_MAX}) with the applicable allowances and adjustments (applied at most once)
 211 per Equation 2.

212 **Equation 2: Total Energy Consumption Requirement for Monitors**

$$E_{TEC} \leq (E_{TEC_MAX} + E_{EP} + E_{ABC} + E_N + E_{OS} + E_T) \times eff_{AC_DC}$$

213
 214
 215 Where:

- 216 ▪ E_{TEC} is TEC in kWh calculated per Equation 1;
- 217 ▪ E_{TEC_MAX} is the Maximum TEC requirement in kWh calculated per Table 1;
- 218 ▪ E_{EP} is the enhanced performance display allowance in kWh per Section 3.3.4;
- 219 ▪ E_{ABC} is the Automatic Brightness Control allowance in kWh per Equation 4;
- 220 ▪ E_N is the Full Network Connectivity allowance in kWh per Table 3;
- 221 ▪ E_{OS} is the Occupancy Sensor allowance in kWh per Table 4;
- 222 ▪ E_T is the Touch Technology allowance in kWh per Equation 5; and
- 223 ▪ eff_{AC_DC} is the standard adjustment for ac-dc power conversion losses that occur at the device
 224 powering the Display, and is 1.0 for Ac-powered Displays and 0.85 for Displays with Standard dc.
 225

226 3.3.4 For Monitors meeting the enhanced performance display (EPD) requirements below, only one of
 227 the following Table 2 allowances shall be used in Equation 2:

- 228 i. Contrast ratio of at least 60:1 measured at a horizontal viewing angle of at least 85° from the
229 perpendicular on a flat screen and at least 83° from the perpendicular on a curved screen,
230 with or without a screen cover glass;
- 231 ii. A native resolution greater than or equal to 2.3 megapixels (MP); and
- 232 iii. Color Gamut greater than or equal to 32.9% of CIE LUV.

233 **Table 2: Calculation of Energy Allowance for Enhanced Performance Displays**

Color Gamut Criteria, Per Section 5.18 of the Information Display Measurements Standard	E_{EP} (kWh) <i>Where:</i> ▪ E_{TEC_MAX} is the Maximum TEC requirement in kWh;
Color Gamut support is 32.9% of CIE LUV or greater.	$0.05 \times E_{TEC_MAX}$
Color Gamut support is 38.4% of CIE LUV or greater.	$0.15 \times E_{TEC_MAX}$

234 Note: A model supporting greater than 99% of the sRGB color space translates to 32.9% of CIE LUV
235 and a model supporting greater than 99% of Adobe RGB translates to 38.4% of CIE LUV.
236

237 **Note:** Given technological advances and trends reflected in the dataset, EPA proposes revising the
238 allowances for Enhanced Performance Displays. For EPD models with Color Gamut support of 32.9% of
239 CIE LUV or greater, the allowance has been decreased from 15% to 5% of the E_{TEC_MAX} . For models
240 supporting Color Gamut of 38.4% of CIE LUV or greater, the allowance has been decreased from 65% to
241 15% of E_{TEC_MAX} . Of the total 776 monitor models, 92 and 17 monitors qualify for EPD1 and EPD2
242 allowances, respectively. For greater simplicity in the expression of the requirements for E_{EP} , EPA
243 proposes to apply the allowance to the entirety of E_{TEC_MAX} (under Version 7.0, the resolution allowance
244 was first subtracted from E_{TEC_MAX} , reducing the size of the E_{EP} allowance). This proposed change has a
245 modest effect on the stringency of the E_{EP} allowance.

246 Per stakeholder request, EPA has also clarified that color gamut support is measured per Section 5.18,
247 Color Gamut Area, of the Information Display Measurements Standard.

248 Worldwide there is high demand for gaming monitors with large-format screens (24 inches and above)
249 with high and variable refresh rates, GPU synchronization, or curved screens.¹ To date, monitors
250 intended for gaming applications are covered under the scope of the ENERGY STAR Display
251 specification. Due to the growing market of gaming monitors and stakeholders interest in these monitors,
252 EPA is evaluating additional data for these products that may not currently be included in the existing
253 Version 7.0 ENERGY STAR dataset. EPA seeks feedback and data to support feedback on the following
254 questions:

- 255 • If a monitor is marketed as a 'gaming monitor,' what are the features that distinguish it from a non-
256 gaming monitor including information on their features, power consumption, and usage patterns?
- 257 • Does the 'gaming monitor' require incremental hardware-based assistance?
- 258 • Is the 'gaming monitor' capable of adjusting refresh rate with the frame rate of video content?

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¹ GfK. (2017, August 30). *PC Gaming Still on the Rise* [Press Release]. Retrieved from
<http://www.gfk.com/insights/press-release/pc-gaming-still-on-the-rise/>

260 3.3.5 For monitors with Automatic Brightness Control (ABC) enabled by default, an energy allowance
 261 (E_{ABC}), as calculated per Equation 4, shall be added to E_{TEC_MAX} in Equation 2, if the On Mode
 262 power reduction (R_{ABC}), as calculated per Equation 3, is greater than or equal to 20%.

263 **Equation 3: Calculation of On Mode Reduction with ABC Enabled by Default**

264
$$R_{ABC} = 100\% \times \left(\frac{P_{300} - P_{12}}{P_{300}} \right)$$

- 265 Where:
- 266 ▪ R_{ABC} is the On Mode percent power reduction due to ABC;
 - 267 ▪ P_{300} is the On Mode power in watts, as measured at an ambient light level of 300 lux in Section 6.4 of
 268 the Test Method; and
 - 269 ▪ P_{12} is the On Mode power in watts, as measured at an ambient light level of 12 lux in Section 6.4 of
 270 the Test Method.
- 271

272 **Equation 4: Monitors ABC Energy Allowance (E_{ABC}) for Monitors**

273
$$E_{ABC} = 0.05 \times E_{TEC_MAX}$$

- 274 Where:
- 275 ▪ E_{ABC} is the energy allowance for Automatic Brightness Control in kWh; and
 - 276 ▪ E_{TEC_MAX} is the Maximum TEC in kWh, per Table 1.
- 277

278 3.3.6 Products with Full Network Connectivity confirmed in Section 6.7 of the ENERGY STAR Test
 279 Method shall apply the allowance specified in Table 3.

280 **Table 3: Full Network Connectivity Energy Allowance (E_N) for Monitors**

E_N (kWh)
2.9

281

282 3.3.7 Products tested with an Occupancy Sensor active shall apply the allowance specified in Table 4.

283 **Table 4: Additional Functions Energy Allowance (E_{OS}) for Monitors**

Type	Allowance (kWh)
Occupancy Sensor E_{OS}	1.7

284

285 3.3.8 Products tested with Touch Technology active in On Mode shall apply the allowance specified in
 286 Equation 5.

287 **Equation 5: Energy Allowance for Touch Technology (E_T) for Monitors**

288
$$E_T = 0.20 \times E_{TEC_MAX}$$

289 *Where:*

- 290
 - E_T is the energy allowance for Touch Technology in kWh; and
 - E_{TEC_MAX} is the Maximum TEC in kWh, per Table 1.

292 **Note:** EPA proposes to increase the energy allowance for monitors with touch technology from the
293 current 15% percent to 20% of E_{TEC_MAX} . A 5% increase in touch allowance will provide greater
294 selection of ENERGY STAR certified monitors with touch technology in different size ranges.

295 **3.4 On Mode Requirements for Signage Displays**

296 **Note:** EPA is not currently proposing any change to the requirements for signage displays in Draft 1, as
297 ENERGY STAR market penetration remains low. EPA is focused on expanding participation among
298 signage display manufacturers/brand owners and requests feedback on the following:

- 299
 - Do the criteria appropriately address typical use cases (24/7 operation vs business hours),
300 installations (video walls vs. standalone), and applications (retail, education, hospitality, etc.)?
 - Is there a wide range of signage display models in terms of size, brightness, and additional features
301 that can meet the current criteria? If so, what steps can the EPA take to incentivize participation in the
302 program? Increasing interest by buyers? Activating utility interest?

304
305 3.4.1 The Maximum On Mode Power (P_{ON_MAX}) in watts shall be calculated per Equation 6.

306 **Equation 6: Calculation of Maximum On Mode Power (P_{ON_MAX}) in Watts for Signage Displays**

307
$$P_{ON_MAX} = (4.0 \times 10^{-5} \times \ell \times A) + 119 \times \tanh(0.0008 \times (A - 200.0) + 0.11) + 6$$

308 *Where:*

- 309
 - P_{ON_MAX} is the Maximum on Mode Power, in watts;
 - 311 - A is the Screen Area in square inches;
 - 312 - ℓ is the Maximum Measured Luminance of the Display in candelas per square meter, as measured in
Section 6.2 of the test method;
 - 314 - \tanh is the hyperbolic tangent function; and
 - 315 - The result shall be rounded to the nearest tenth of a watt for reporting.

316
317 **Equation 7: On Mode Power Requirement for Signage Displays**

318
$$P_{ON} \leq P_{ON_MAX} + P_{ABC}$$

319 *Where:*

- 320
 - 321 - P_{ON} is On Mode Power in watts, as measured in Section 6.3 or 6.4 of the Test Method;
 - 322 - P_{ON_MAX} is the Maximum On Mode Power in watts, per Equation 6; and
 - 323 - P_{ABC} is the On Mode power allowance for ABC in watts, per Equation 8.

324
325 3.4.2 For Signage Displays with ABC enabled by default, a power allowance (P_{ABC}), as calculated per
326 Equation 8, shall be added to P_{ON_MAX} , as calculated per Equation 6, if the On Mode power
327 reduction (R_{ABC}), as calculated per Equation 3, is greater than or equal to 20 percent.

328 **Equation 8: Calculation of On Mode Power Allowance for Signage Displays with ABC Enabled by**
 329 **Default**

330
$$P_{ABC} = 0.05 \times P_{ON_MAX}$$

- 331 *Where:*
- 332 ▪ P_{ABC} is the Measured On Mode Power allowance for ABC in watts; and
 - 333 ▪ P_{ON_MAX} is the Maximum On Mode Power requirement in watts.
- 334

335 **3.5 Sleep Mode Requirements for Signage Displays**

336 3.5.1 Measured Sleep Mode Power (P_{SLEEP}) in watts shall be less than or equal the sum of the
 337 Maximum Sleep Mode Power Requirement (P_{SLEEP_MAX}) and any allowances (applied at most
 338 once) per Equation 9.

339 **Equation 9: Sleep Mode Power Requirement for Signage Displays**

340
$$P_{SLEEP} \leq P_{SLEEP_MAX} + P_N + P_{OS} + P_T$$

- 341 *Where:*
- 342 ▪ P_{SLEEP} is Measured Sleep Mode Power in watts;
 - 343 ▪ P_{SLEEP_MAX} is the Maximum Sleep Mode Power requirement in watts per Table 5;
 - 344 ▪ P_N is the Full Network Connectivity allowance in watts per Table 6;
 - 345 ▪ P_{OS} is the Occupancy Sensor allowance in watts per Table 7; and
 - 346 ▪ P_T is the Touch allowance in watts per Table 7.
- 347
348

349 **Table 5: Maximum Sleep Mode Power Requirement (P_{SLEEP_MAX}) for Signage Displays**

P_{SLEEP_MAX} (watts)
0.5

350

351 3.5.2 Products with Full Network Connectivity confirmed in Section 6.7 of the ENERGY STAR Test
 352 Method shall apply the allowance specified in Table 6.

353 **Table 6: Full Network Connectivity Allowance for Signage Displays**

P_N (watts)
3.0

354

355 3.5.3 Products tested with an Occupancy Sensor or Touch Technology active in Sleep Mode shall
 356 apply the allowances specified in Table 7.

357 **Table 7: Additional Functions Sleep Mode Power Allowance for Signage Displays**

Type	Screen Size (in)	Allowance (watts)
Occupancy Sensor P_{OS}	All	0.3
Touch Functionality P_T	≤ 30	0.0

<i>(applicable only to Signage Displays where screen size is greater than 30 inches)</i>	> 30	1.5
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358 **3.6 Off Mode Requirements for all Displays**

359 3.6.1 A product need not have an Off Mode to be eligible for certification. For products that do offer Off
 360 Mode, measured Off Mode power (P_{OFF}) shall be less than or equal to the Maximum Off Mode
 361 Power Requirement (P_{OFF_MAX}) in Table 8.

362 **Table 8: Maximum Off Mode Power Requirement (P_{OFF_MAX})**

P_{OFF_MAX} (watts)
0.5

363
 364 **3.7 Luminance Reporting Requirements**

365 3.7.1 Maximum Reported and Maximum Measured Luminance shall be reported for all products; As-
 366 Shipped Luminance shall be reported for all products except those with ABC enabled by default.

367
 368 Note: Products intended for sale in the US market are subject to minimum toxicity and recyclability
 369 requirements. Please see ENERGY STAR® Program Requirements for Displays: Partner Commitments
 370 for details.

371 **4 TEST REQUIREMENTS**

372 **4.1 Test Methods**

373 4.1.1 Test methods identified in Table 9 shall be used to determine certification for ENERGY STAR.

374 **Table 9: Test Methods for ENERGY STAR Certification**

Product Type	Test Method
All Product Types and Screen Sizes	ENERGY STAR Test Method for Determining Display Energy – Rev. Nov-2017
Enhanced Performance Displays	International Committee for Display Metrology (ICDM) Information Display Measurements Standard – Version 1.03
Displays Claiming Full Network Connectivity	CEA-2037-A, Determination of Television Set Power Consumption

375

376 **4.2 Number of Units Required for Testing**

377 4.2.1 One unit of a Representative Model, as defined in Section 1, shall be selected for testing.

378 4.2.2 For certification of a Product Family, the product configuration that represents the worst-case
 379 power demand for each product category within the Product Family shall be considered the
 380 Representative Model.

381 **4.3 International Market Qualification**

382 4.3.1 Products shall be tested for qualification at the relevant input voltage/frequency combination for
383 each market in which they will be sold and promoted as ENERGY STAR.

384 **5 USER INTERFACE**

385 5.1.1 Manufacturers are encouraged to design products in accordance with the user interface standard,
386 IEEE P1621: Standard for User Interface Elements in Power Control of Electronic Devices
387 Employed in Office/Consumer Environments. For details, see <http://energy.lbl.gov/controls/>.

388 **6 EFFECTIVE DATE**

389 6.1.1 Effective Date: The Version 8 ENERGY STAR Display specification shall take effect on **TBD**. To
390 qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect
391 on its date of manufacture. The date of manufacture is specific to each unit and is the date on
392 which a unit is considered to be completely assembled.

393 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
394 technological and/or market changes affect its usefulness to consumers, industry, or the
395 environment. In keeping with current policy, revisions to the specification are arrived at through
396 stakeholder discussions. In the event of a specification revision, please note ENERGY STAR
397 certification is not automatically granted for the life of a model.

398