



# ENERGY STAR® Program Requirements Product Specification for Displays

## Eligibility Criteria Final Draft Version 7.0

1 Following is the ENERGY STAR product specification (“specification”) for Displays. 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) Electronic Display (Display): A product with a display screen and associated electronics,  
6 often encased in a single housing, that as its primary function produces visual information  
7 from (1) a computer, workstation, or server via one or more inputs (e.g., VGA, DVI, HDMI,  
8 DisplayPort, IEEE 1394, USB), (2) external storage (e.g., USB flash drive, memory card), or  
9 (3) a network 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 **Note:** In Draft 2, EPA proposed distinguishing a signage display using three criteria: screen size,  
22 Maximum Reported Luminance, and pixel density. Given a stakeholder comment that there still may be  
23 overlap among two or more of these criteria, EPA is proposing a fourth criterion based on the physical  
24 configuration of a product to reflect the typical use cases for signage displays. Most signage displays are  
25 wall-mounted as opposed to stand-mounted like computer monitors. Therefore, EPA has added the  
26 additional criterion “ships without a mounting stand” to further delineate the product types. As such, EPA  
27 now proposes a set of four criteria, where a display would have to meet at least two to be classified as a  
28 signage display.

#### 29 B) Operational Modes:

30 1) On Mode: The mode in which the display has been activated, and is providing the primary  
31 function.

32 2) Sleep Mode: A low-power mode in which the display provides one or more non-primary protective  
33 functions or continuous functions.

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

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

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

42 C) Visual Characteristics:

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

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

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

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

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

54 4) Luminance: The photometric measure of the luminous intensity per unit area of light  
55 travelling in a given direction, expressed in candelas per square meter ( $\text{cd}/\text{m}^2$ ).

56 a) Maximum Reported Luminance: The maximum luminance the display may attain at  
57 an On Mode preset setting, and as specified by the manufacturer, for example, in the  
58 user manual.

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

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

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

65 Note: A display with a screen resolution of 1920 x 1080 (horizontal x vertical) would have a  
66 Native Vertical Resolution of 1080).

67 6) Screen Area: The visible area of the display that produces images.

68 Note: Screen Area is calculated by multiplying the viewable image width by the viewable  
69 image height. For curved screens, measure the width and height along the arc of the  
70 display.

71 D) Additional Functions and Features:

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

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

75 2) Full Network Connectivity: The ability of the display to maintain network presence while in  
76 Sleep Mode. Presence of the display, its network services, and its applications, is  
77 maintained even if some components of the display are powered down. The display can  
78 elect to change power states based on receipt of network data from remote network devices,  
79 but should otherwise stay in Sleep Mode absent a demand for services from a remote  
80 network device.

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

83 3) Occupancy Sensor: A device used to detect human presence in front of or in the area  
84 surrounding a display.

85 Note: An Occupancy Sensor is typically used to switch a Display between On Mode and  
86 Sleep Mode.

87 4) Touch Technology: Enables the user to interact with a product by touching areas on the  
88 Display screen.

89 5) Plug-in Module: A modular plugin device that provides one or more of the following functions  
90 without the explicit purpose of providing general computing function:

91 a) Display images, mirror remote content streamed to it, or otherwise render content on  
92 the screen from local or remote sources; or

93 b) Process touch signals.

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

96 E) Product Family: A group of product models that (1) are made by the same manufacturer, (2)  
97 share the same Screen Area, Resolution, and Maximum Reported Luminance, and (3) are of a  
98 common basic screen design. Models within a Product Family may differ from each other  
99 according to one or more characteristics or features. For displays, acceptable variations within a  
100 Product Family include:

101 1) External housing;

102 2) Number and types of interfaces;

103 3) Number and types of data, network, or peripheral ports; and

104 4) Processing and memory capability.

105 F) Representative Model: The product configuration that is tested for ENERGY STAR certification  
106 and is intended to be marketed and labeled as ENERGY STAR.

107 G) Power Source

108 1) External Power Supply (EPS): An external power supply circuit that is used to convert  
109 household electric current into dc current or lower-voltage ac current to operate a consumer  
110 product.

111 2) Standard dc: A method for transmitting dc power defined by a well-known technology  
112 standard, enabling plug-and-play interoperability.

113 Note: Common examples are USB and Power-over-Ethernet. Usually Standard dc includes  
114 both power and communications over the same cable, but as with the 380 V dc standard,  
115 that is not required.

## 116 2 SCOPE

### 117 2.1 Included Products

118 2.1.1 Products that meet the definition of a display as specified herein and are powered directly from ac  
119 mains, an External Power Supply, or Standard dc are eligible for ENERGY STAR certification,  
120 with the exception of products listed in Section 2.2. Typical products that would be eligible for  
121 certification under this specification include:

- 122 i. Monitors;
- 123 ii. Monitors with keyboard, video, and mouse (KVM) switch functionality;
- 124 iii. Signage Displays; and
- 125 iv. Signage Displays and Monitors with Plug-in Modules.

### 126 2.2 Excluded Products

127 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for  
128 certification under this specification including Televisions and Computers (Thin Clients,  
129 Slates/Tablets, Portable All-in-one Computers). The list of specifications currently in effect can be  
130 found at [www.energystar.gov/products](http://www.energystar.gov/products).

131 2.2.2 The following products are not eligible for certification under this specification:

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

## 139 3 CERTIFICATION CRITERIA

### 140 3.1 Significant Digits and Rounding

141 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.

142 3.1.2 Unless otherwise specified, compliance with specification requirements shall be evaluated using  
143 directly measured or calculated values without any benefit from rounding.

144 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR  
145 website shall be rounded to the nearest significant digit as expressed in the corresponding  
146 specification requirements.

147 **3.2 General Requirements for Monitors and Signage Displays**

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

152 i. Single- and Multiple-voltage EPSs shall include the Level VI or higher marking.

153 ii. Additional information on the Marking Protocol is available  
154 at <http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218>.

155 3.2.2 Power Management:

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

160 ii. Products that generate content for display from one or more internal sources shall have a  
161 sensor or timer enabled by default to automatically engage Sleep or Off Mode.

162 iii. For products that have an internal default delay time after which the product transitions  
163 from On Mode to Sleep Mode or Off Mode, the delay time shall be reported.

164 iv. Monitors shall automatically enter Sleep Mode or Off Mode within 5 minutes of being  
165 disconnected from a host computer.

166 3.2.3 Signage Displays shall have a true power factor in On Mode of 0.7 or greater per Part G of  
167 Section 5.2 in the ENERGY STAR Test Method.

168 **3.3 Energy Requirements for Computer Monitors**

169 3.3.1 The Total Energy Consumption (TEC) in kWh shall be calculated per Equation 1 based on  
170 measured values.

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

172  
173 
$$E_{TEC} = 8.76 \times (0.35 \times P_{ON} + 0.65 \times P_{SLEEP})$$

174 *Where:*

- 175 ▪  $E_{TEC}$  is the Total Energy Consumption calculation in kWh;
- 176 ▪  $P_{ON}$  is Measured On Mode Power in watts
- 177 ▪  $P_{SLEEP}$  is Measured Sleep Mode Power in watts; and
- 178 ▪ The result shall be rounded to the nearest tenth of a kWh for reporting.

179 3.3.2 The Maximum TEC ( $E_{TEC\_MAX}$ ) in kWh for Monitors shall be calculated per Equation 2.

180 **Equation 2: Calculation of Monitor Maximum TEC ( $E_{TEC\_MAX}$ ) in kWh**

181 
$$E_{TEC\_MAX} = 6.13 \times r + 89 \times \tanh(0.0016 \times [A - 59] + 0.085) + 9$$

182 *Where:*

- 183 ▪  $E_{TEC\_MAX}$  is the Maximum TEC requirement in kWh;
  - 184 ▪  $r$  is the screen resolution in megapixels;
  - 185 ▪  $A$  is the Screen Area in  $in^2$ ; and
  - 186 ▪  $\tanh$  is the hyperbolic tangent function.
- 187

188 **Note:** In this Final Draft, EPA has retained a Total Energy Consumption approach that recognizes the  
 189 current top performing 20 percent (241 out of 1179 models) of products in the market. EPA seeks to  
 190 ensure that ENERGY STAR remains a market differentiator for efficiency in monitors when the  
 191 specification takes effect in 2016.

192 3.3.3 For all Monitors, Calculated TEC ( $E_{TEC}$ ) in kWh shall be less than or equal the calculation of  
 193 Maximum TEC ( $E_{TEC\_MAX}$ ) with the applicable allowances and adjustments (applied at most once)  
 194 per Equation 3.

195 **Equation 3: Total Energy Consumption Requirement for Monitors**

$$E_{TEC} \leq (E_{TEC\_MAX} + E_{EP} + E_{ABC} + E_N + E_{OS}) \times eff_{AC\_DC}$$

196 |  
 197 *Where:*

- 198 ▪  $E_{TEC}$  is TEC in kWh calculated per Equation 1;
- 199 ▪  $E_{TEC\_MAX}$  is the Maximum TEC requirement in kWh calculated per Equation 2;
- 200 ▪  $E_{EP}$  is the enhanced performance display allowance in kWh per Section 3.3.4;
- 201 ▪  $E_{ABC}$  is the Automatic Brightness Control allowance in kWh per Equation 5;
- 202 ▪  $E_N$  is the Full Network Connectivity allowance in kWh per Table 2;
- 203 ▪  $E_{OS}$  is the Occupancy Sensor allowance in kWh per Table 3; and
- 204 ▪  $eff_{AC\_DC}$  is the standard adjustment for ac-dc power conversion losses that occur at the device  
 205 powering the Display, and is 1.0 for Ac-powered Displays and 0.85 for displays with Standard dc.

206 3.3.4 For Monitors meeting the enhanced performance display (EPD) requirements below, only one of  
 207 the following Table 1 allowances shall be used in Equation 3:

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

213 **Note:** Since the Draft 2, EPA received new feedback on the difficulty of achieving the contrast ratio of at  
 214 least 60:1 at a measurement of 85° on a curved screen. Based on the information, EPA proposes curved  
 215 computer monitor screens have a contrast ratio of at least 60:1 measured at a horizontal viewing angle of  
 216 at least at 83° to be eligible for the allowances outlined in Table 1 below.

217 **Table 1: Calculation of Energy Allowance for Enhanced Performance Displays**

Color Gamut Criteria	$E_{EP}$ (kWh) <i>Where:</i> <ul style="list-style-type: none"> <li>▪ <math>E_{TEC\_MAX}</math> is the Maximum TEC requirement in kWh; and</li> <li>▪ <math>r</math> is screen resolution in megapixels</li> </ul>
Color Gamut support is 32.9% of CIE LUV or greater.	$0.15 \times (E_{TEC\_MAX} - 6.13 \times r)$
Color Gamut support is 38.4% of CIE LUV or greater.	$0.65 \times (E_{TEC\_MAX} - 6.13 \times r)$

218 Note: A model supporting greater than 99% of the sRGB color space translates to 32.9% of CIE LUV  
 219 and a model supporting greater than 99% of Adobe RGB translates to 38.4% of CIE LUV.  
 220

221 **Note:** In Draft 2, EPA classified EPD models based on color gamut performance using the Version 6.0  
222 dataset. Since data were submitted using varying standards (NTSC, sRGB, Adobe RGB), EPA  
223 normalized the data to make it comparable by converting the percentage of the color space of each  
224 standard into percentage of the color space of the CIE standard. In this Final Draft, as reflected in the  
225 definition of color gamut, EPA maintains that manufacturers report their color gamut in terms of CIE LUV  
226 to allow for information to be standardized across models.

227 In further reviewing color gamut data, EPA found that nearly half of all monitors in the dataset cover the  
228 sRGB color gamut, indicating that this level of performance, as an isolated feature, is no longer limited to  
229 a small subset of premium models. Holding resolution and area constant, the data indicate that increased  
230 color gamut performance typically requires more power. Models supporting 32.9% of CIE LUV (99% or  
231 more of defined sRGB colors) indicate a need for additional power over models with a smaller color  
232 space. Models covering at least 38.4% of CIELUV (99% of Adobe RGB)—an even higher coverage—  
233 appear to require more power still.

234 EPA continues to propose a tiered allowance for EPDs based on color gamut, as proposed in Draft 2.  
235 After reviewing the most recent data, EPA has made a modest adjustment to the allowance for models  
236 meeting EPD criteria such that they are eligible for one of the following two allowances based on their  
237 color gamut:

238 **1) A 15% allowance for models meeting proposed EPD criteria with color gamut support greater**  
239 **than 32.9% of CIELUV (aka, 99% of sRGB).** In the Final Draft dataset, EPA identified nearly 40 models  
240 not categorized as Enhanced Performance Displays under the Version 6.0 specification that appear to  
241 meet the Final Draft color gamut criterion and also likely the contrast ratio criterion. By including these  
242 models, EPA expanded the set of models considered to be EPD to 76 which may include relatively more  
243 efficient models that did not necessarily need the EPD allowance under Version 6.0. With this set of  
244 models, EPA found that a 15% allowance for models with color gamut support greater than 32.9% of CIE  
245 LUV recognized a similar percentage of passing models the Draft 2 allowance of 25% applied to a  
246 relatively less efficient set of models. After substantial review of products in the marketplace, including  
247 those not qualified to the ENERGY STAR, EPA considers that its EPD dataset is reflective of the majority  
248 of the EPD market.

249 Or

250 **2) A 65% allowance for models meeting the current EPD criteria with color gamut support greater**  
251 **than 38.4% of CIELUV (aka, 99% of sRGB and at least 99% Adobe RGB).** In Draft 2, EPA proposed a  
252 65% allowance for models supporting a color gamut of at least 96% Adobe RGB. Upon final review of its  
253 dataset, EPA noted that nearly all of the models that support 96% or greater of Adobe RGB in fact  
254 support 99% or greater of Adobe RGB. EPA has therefore revised the CIE LUV criterion to be equivalent  
255 to 99% or greater of Adobe RGB.

256 With a 15% allowance for EPDs with at least 32.9% of CIELUV, 33% of models identified as meeting the  
257 EPD criteria qualify, whereas none of the higher color-gamut models do. With the addition of a 65%  
258 allowance for models with at least 38.4% of CIELUV (99% or greater Adobe RGB), 4 out of 16 models, or  
259 25% in the  $\geq 38.4\%$  CIELUV category, meet the proposed criteria.

260 Finally, EPA removed the additional  $E_{TEC\_MAX}$  resolution allowance of  $6.13 \times r$  from the EPD allowance  
261 because including it resulted in a multiplier effect on the resolution allowance, such that Ultra HD (UHD)  
262 EPD models would qualify at much higher rates than non-UHD EPD models. Removing this portion of the  
263 EPD allowance will ensure that the resolution allowance is applied only once against the On Mode power  
264 requirements.

265 3.3.5 For monitors with Automatic Brightness Control (ABC) enabled by default, an energy allowance  
266 ( $E_{ABC}$ ), as calculated per Equation 5, shall be added to  $E_{TEC\_MAX}$  in Equation 3, if the On Mode  
267 power reduction ( $R_{ABC}$ ), as calculated per Equation 4, is greater than or equal to 20%.

268

**Equation 4: Calculation of On Mode Reduction with ABC Enabled by Default**

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

269  
270  
271  
272  
273  
274  
275

Where:

- $R_{ABC}$  is the On Mode percent power reduction due to ABC;
- $P_{300}$  is the On Mode power in watts, as measured at an ambient light level of 300 lux in Section 6.4 of the Test Method; and
- $P_{12}$  is the On Mode power in watts, as measured at an ambient light level of 12 lux in Section 6.4 of the Test Method.

276

**Equation 5: Monitors ABC Energy Allowance ( $E_{ABC}$ ) for Monitors**

$$E_{ABC} = 0.05 \times E_{TEC\_MAX}$$

277  
278  
279  
280

Where:

- $E_{ABC}$  is the energy allowance for Automatic Brightness Control in kWh; and
- $E_{TEC\_MAX}$  is the Maximum TEC in kWh, per Equation 2.

281  
282

3.3.6 Products with Full Network Connectivity confirmed in Section 6.7 of the ENERGY STAR Test Method shall apply the allowance specified in Table 2.

283

**Table 2: Full Network Connectivity Energy Allowance ( $E_N$ ) for Monitors**

$E_N$ (kWh)
2.9

284

285

3.3.7 Products tested with an Occupancy Sensor active shall apply the allowance specified in Table 3.

286

**Table 3: Additional Functions Energy Allowance ( $E_{OS}$ ) for Monitors**

287

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

288

**3.4 On Mode Requirements for Signage Displays**

289

3.4.1 The Maximum On Mode Power ( $P_{ON\_MAX}$ ) in watts shall be calculated per Equation 6.

290

**Equation 6: Calculation of Maximum On Mode Power ( $P_{ON\_MAX}$ ) in Watts for Signage Displays**

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

291  
292  
293  
294  
295  
296  
297  
298

Where:

- $P_{ON\_MAX}$  is the Maximum on Mode Power, in watts;
- $A$  is the Screen Area in square inches;
- $\ell$  is the Maximum Measured Luminance of the display in candelas per square meter, as measured in Section 6.2 of the test method;
- $\tanh$  is the hyperbolic tangent function; and
- The result shall be rounded to the nearest tenth of a watt for reporting.



299 **Note:** Since the release of Draft 2, EPA identified very bright (2,500 cd/m<sup>2</sup>) signage displays in the  
300 smaller signage sizes (under 50 inches) that operate very efficiently. Therefore, in the Final Draft, EPA  
301 has adjusted the luminance allowance from  $7.5 \times 10^{-5}$  to  $4.0 \times 10^{-5}$  to allocate a greater proportion of  
302 power to area in Equation 6. Despite, the shift in the weight of the allowances, this Final Draft Maximum  
303 On Mode Power for Signage Displays continues to capture approximately 25 percent of signage products  
304 in EPA’s dataset. Measured On Mode Power ( $P_{ON}$ ) in watts shall be less than or equal to the calculation  
305 of Maximum On Mode Power ( $P_{ON\_MAX}$ ) with the applicable allowances and adjustments per Equation 7.

306 EPA also received feedback that very large models (>70 inches) intended for indoor operation were  
307 challenged to meet the proposed Draft 2 signage display criteria compared to their smaller counterparts  
308 (40–70 inches). EPA developed its proposal based on trends in efficiency seen in large TVs over the past  
309 three years. According to stakeholder feedback in Draft 2, signage displays intended for indoor use are  
310 manufactured to be very similar to TVs. As such, EPA estimates that efficiency trends should easily  
311 translate to signage displays. However, EPA will watch the energy use of displays larger than 70 inches  
312 that are intended for indoor use and is able to amend this specification in the future, if warranted. The  
313 Agency encourages manufacturers with an interest in very large models to share performance data with  
314 EPA to inform this ongoing analysis.

315 **Equation 7: On Mode Power Requirement for Signage Displays**

$$P_{ON} \leq P_{ON\_MAX} + P_{ABC}$$

316  
317 *Where:*

- 318 ▪  $P_{ON}$  is On Mode Power in watts, as measured in Section 6.3 or 6.4 of the Test Method;
- 319 ▪  $P_{ON\_MAX}$  is the Maximum On Mode Power in watts, per Equation 7; and
- 320 ▪  $P_{ABC}$  is the On Mode power allowance for ABC in watts, per Equation 8.

321 3.4.2 For Signage Displays with ABC enabled by default, a power allowance ( $P_{ABC}$ ), as calculated per  
322 Equation 8, shall be added to  $P_{ON\_MAX}$ , as calculated per Equation 7, if the On Mode power  
323 reduction ( $R_{ABC}$ ), as calculated per Equation 4, is greater than or equal to 20 percent.

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

$$P_{ABC} = 0.05 \times P_{ON\_MAX}$$

326  
327 *Where:*

- 328 ▪  $P_{ABC}$  is the Measured On Mode Power allowance for ABC in watts; and
- 329 ▪  $P_{ON\_MAX}$  is the Maximum On Mode Power requirement in watts.

330 **3.5 Sleep Mode Requirements for Signage Displays**

331 3.5.1 Measured Sleep Mode Power ( $P_{SLEEP}$ ) in watts shall be less than or equal the sum of the  
332 Maximum Sleep Mode Power Requirement ( $P_{ON\_MAX}$ ) and any allowances (applied at most once)  
333 per Equation 9.

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

$$P_{SLEEP} \leq P_{SLEEP\_MAX} + P_N + P_{OS} + P_T$$

335  
336 *Where:*

- 337 ▪  $P_{SLEEP}$  is Measured Sleep Mode Power in watts;
  - 338 ▪  $P_{SLEEP\_MAX}$  is the Maximum Sleep Mode Power requirement in watts per Table 4;
  - 339 ▪  $P_N$  is the Full Network Connectivity allowance in watts per Table 5;
  - 340 ▪  $P_{OS}$  is the Occupancy Sensor allowance in watts per Table 6; and
  - 341 ▪  $P_T$  is the Touch allowance in watts per Table 6.
- 342

343

**Table 4: Maximum Sleep Mode Power Requirement ( $P_{\text{SLEEP\_MAX}}$ ) for Signage Displays**

$P_{\text{SLEEP\_MAX}}$ (watts)
0.5

344

345 3.5.2 Products with Full Network Connectivity confirmed in Section 6.7 of the ENERGY STAR Test  
 346 Method and with the capability to transition from On Mode to Sleep Mode via a signal over an  
 347 Internet Protocol connection shall apply the allowance specified in Table 5.

348

**Table 5: Full Network Connectivity Allowance for Signage Displays**

$P_N$ (watts)
3.0

349

350 **Note:** Based on information from multiple stakeholders, EPA understands that signage displays and  
 351 televisions are built with the same, or similar, network connection circuitry. As such, EPA proposes a  
 352 3 watt allowance for signage displays to harmonize with the power allowance for network connectivity in a  
 353 television's Standby-active, Low mode under the Televisions Version 7.0 specification. EPA expects that  
 354 signage displays, similarly to televisions, will continue to reduce their power consumption in network-  
 355 connected low-power states. As such, EPA anticipates reducing this allowance in future revisions to the  
 356 specification.

357 At this time, EPA proposes to retain the Draft 2 TEC allowance for full network connectivity for computer  
 358 monitors, which in contrast to signage displays or televisions, have demonstrated lower-power network  
 359 connectivity.

360

361 3.5.3 Products tested with an Occupancy Sensor or Touch Technology active in Sleep Mode shall  
 362 apply the allowances specified in Table 6.

363

**Table 6: Additional Functions Sleep Mode Power Allowance for Signage Displays**

Type	Screen Size (in)	Allowance (watts)
<b>Occupancy Sensor</b> $P_{\text{OS}}$	All	0.3
<b>Touch Functionality</b> $P_T$ <i>(applicable only to signage displays where screen size is greater than 30 inches)</i>	$\leq 30$	0.0
	$> 30$	1.5

364 **Note:** Previously, EPA proposed removing touch functionality allowances given lack of data in the EPA  
 365 dataset indicating that touch functionality was either commonly employed or that it required additional  
 366 power in Sleep Mode. Since the release of Draft 2, EPA has received new feedback that touch  
 367 functionality used in larger displays requires more power than typically seen in monitors, and that this  
 368 touch technology is enabled in Sleep Mode to allow products to wake from sleep in response to a touch  
 369 and perform the requested work. Given this use case and the opportunity to encourage models to spend  
 370 more time in Sleep Mode while not in use and to be woken up effectively by users, EPA is proposing a  
 371 1.5 W allowance in Sleep Mode for signage displays. EPA proposes this allowance based on new  
 372 feedback and data received

373 **3.6 Off Mode Requirements for all Displays**

374 3.6.1 A product need not have an Off Mode to be eligible for certification. For products that do offer Off  
 375 Mode, measured Off Mode power ( $P_{OFF}$ ) shall be less than or equal to the Maximum Off Mode  
 376 Power Requirement ( $P_{OFF\_MAX}$ ) in Table 7.

377 **Table 7: Maximum Off Mode Power Requirement ( $P_{OFF\_MAX}$ )**

$P_{OFF\_MAX}$ (watts)
0.5

378 **3.7 Luminance Reporting Requirements**

379 3.7.1 Maximum Reported and Maximum Measured Luminance shall be reported for all products; As-  
 380 Shipped Luminance shall be reported for all products except those with ABC enabled by default.

381  
 382 Note: Products intended for sale in the US market are subject to minimum toxicity and recyclability  
 383 requirements. Please see ENERGY STAR® Program Requirements for Displays: Partner Commitments  
 384 for details.

385 **4 TEST REQUIREMENTS**

386 **4.1 Test Methods**

387 4.1.1 Test methods identified in Table 8 shall be used to determine certification for ENERGY STAR.

388 **Table 8: Test Methods for ENERGY STAR Certification**

Product Type	Test Method
All Product Types and Screen Sizes	Final Draft ENERGY STAR Test Method for Determining Display Energy – Rev. Jul-2015
Enhanced Performance Monitors	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

389 **4.2 Number of Units Required for Testing**

390 4.2.1 One unit of a Representative Model, as defined in Section 1, shall be selected for testing.

391 4.2.2 For certification of a Product Family, the product configuration that represents the worst-case  
392 power consumption for each product category within the Product Family shall be considered the  
393 Representative Model.

### 394 4.3 International Market Qualification

395 4.3.1 Products shall be tested for qualification at the relevant input voltage/frequency combination for  
396 each market in which they will be sold and promoted as ENERGY STAR.

## 397 5 USER INTERFACE

398 5.1.1 Manufacturers are encouraged to design products in accordance with the user interface standard,  
399 IEEE P1621: Standard for User Interface Elements in Power Control of Electronic Devices  
400 Employed in Office/Consumer Environments. For details, see <http://energy.lbl.gov/controls/>.

401 **Note:** EPA is reviewing the above User Interface requirements under this specification revision.  
402 In order to better track these data, EPA is proposing that EPA-recognized certification bodies  
403 report to EPA whether or not products they certify comply with the standard. The reporting  
404 requirement would be in the form of a “Yes/No.”

405

## 406 6 EFFECTIVE DATE

407 6.1.1 Effective Date: The Version 6.0 ENERGY STAR Display specification shall take effect on **April**  
408 **30, 2016**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR  
409 specification in effect on its date of manufacture. The date of manufacture is specific to each unit  
410 and is the date (e.g., month and year) on which a unit is considered to be completely assembled.

411 **Note:** EPA intends to finalize Version 7.0 in August 2015, where the specification would take  
412 effect on April 30, 2016.

413 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should  
414 technological and/or market changes affect its usefulness to consumers, industry, or the  
415 environment. In keeping with current policy, revisions to the specification are arrived at through  
416 stakeholder discussions. In the event of a specification revision, please note ENERGY STAR  
417 certification is not automatically granted for the life of a model

## 418 7 CONSIDERATIONS FOR FUTURE REVISIONS

419 7.1.1 On Mode DC Power Limit: EPA is interested in considering a separate On Mode Power  
420 Maximum requirement for Standard dc products that does not necessitate an ac-dc conversion  
421 calculation. EPA anticipates these products will become more popular on the market with the  
422 latest USB standard and looks forward to receiving additional direct dc-tested data for these  
423 products.

424

425

426