



# ENERGY STAR® Program Requirements for Displays

## Table of Contents

6

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9

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14 **Partner Commitments**.....2

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### 16 **HP Comments on Second Draft v 5.0 Display Spec.**

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18

19 **1. Regarding the proposal to require use of formally accredited labs for product qualification testing (lines**

20 **#372 - #379): HP sees no value in requiring manufacturers to use accredited labs for product testing as this**

21 **will slow down manufacturers' compliance testing processes, add additional expense to product development**

22 **with no end user benefit. This input is consistent with the input HP and ITI provided on provided on the**

23 **final PC specification (ITI letter dated November 6, 2008).**

24

25

26 **2. Regarding the possibility of expanding the scope of ENERGY STAR product specifications to include**

27 **restrictions or controls on chemicals used in product manufacturing processes (Section 7 Future Spec.**

28 **Revisions): HP is opposed to the idea of expanding the ENERGY STAR program scope in this area for a**

**number of reasons.**

**First, chemical restrictions in products and manufacturing processes are regulated by other regulations and**

**industrial standards. Second, almost all displays are not manufactured in the US. The display**

**manufacturers are already obligated to comply with all regulations and workplace standards in the countries**

**where the displays are manufactured.**

**Secondly, the strength of the ENERGY STAR program in the past has been the fact that it focused solely on**

**the energy consumption of the product in the use phase, which can be measured and verified, and lower**

**power can benefit the purchaser through lower energy bills. We feel that it is inappropriate to consider**

**expanding the scope of the ENERGY STAR program beyond product energy efficiency into areas that can**

**not be definitively measured and verified. E.g., GHG emitting chemistry / gasses potentially used and**

**controlled in manufacturing processes.**

**We believe that the ENERGY STAR program should stick to the energy consumption of the product itself**

**during use which can be verified (just like the mpg fuel efficiency rating looks at the vehicle efficiency and**

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not manufacturing or other lifecycle stages or attributes that are difficult to measure and control). If the EPA decides to expand the scope of the ENERGY STAR program beyond product energy consumption in use, this potentially opens up everything -- manufacturing, distribution, end of life, etc. which would add additional complexity and uncertainty (un-measurable, can not be verified, etc.).

3. Additional specific comments are noted in the body of this draft specification.

Commitment .....	2
Performance for Special Distinction .....	3
<b>Eligibility Criteria .....</b>	<b>5</b>
1) Definitions .....	5
2) Qualifying Products .....	6
3) Energy-Efficiency Criteria .....	6
<u>4) Test Method .....</u>	<u>10</u>
5) User Interface.....	16
6) Effective Date.....	16
7) Future Specification Revisions .....	17

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# ENERGY STAR® Program Requirements Displays Commitments

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## 37 Commitment

The following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacturing of ENERGY STAR qualified displays. The ENERGY STAR Partner must adhere to the following program requirements:

- 38  
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40 • comply with current ENERGY STAR Eligibility Criteria, defining the performance criteria that must  
41 be met for use of the ENERGY STAR certification mark on displays and specifying the testing  
42 criteria for displays. EPA may, at its discretion, conduct tests on products that are referred to as  
43 ENERGY STAR qualified. These products may be obtained on the open market, or voluntarily  
44 supplied by Partner at EPA's request;
- 45  
46 • comply with current ENERGY STAR Identity Guidelines, describing how the ENERGY STAR  
47 name and mark may be used. Partner is responsible for adhering to these guidelines and for  
48 ensuring that its authorized representatives, such as advertising agencies, dealers, and  
49 distributors, are also in compliance;
- 50  
51 • qualify at least one ENERGY STAR qualified display model within six months of activating the  
52 display portion of the agreement. When Partner qualifies the product, it must meet the  
53 specification (e.g., Tier 1 or 2) in effect at that time;
- 54  
55 – provide clear and consistent labeling of ENERGY STAR qualified displays. The ENERGY STAR  
56 mark must be clearly displayed:
  - 57 1. On the top or front of the product. Labeling on the top or front of the product may be permanent or  
58 temporary. All temporary labeling must be affixed to the top or front of the product with an  
59 adhesive or cling-type application;  
60  
61 Electronic Labeling Option: Partners have the option of using an alternative electronic labeling  
62 approach in place of this product labeling requirement, as long it meets the following  
63 requirements:
    - 64 – The ENERGY STAR mark in cyan, black, or white (as described in "The ENERGY STAR  
65 Identity Guidelines" available at [www.energystar.gov/logos](http://www.energystar.gov/logos)) appears at system start-up. The  
66 electronic mark must display for a minimum of 5 seconds;
    - 67 – The ENERGY STAR mark must be at least 10% of the screen by area, may not be smaller  
68 than 76 pixels x 78 pixels, and must be legible.
  - 69 EPA will consider alternative proposals regarding approach, duration, or size for electronic  
70 labeling on a case-by-case basis.
- 71  
72 2. In product literature (i.e., user manuals, spec sheets, etc.);
- 73  
74 3. On product packaging for products sold at retail; and
- 75  
76 4. On the Partner's Internet site where information about ENERGY STAR qualified models is  
77 displayed;
- 78  
79

80 – If information concerning ENERGY STAR is provided on the Partner Web site, as specified by the  
81 ENERGY STAR Web Linking Policy (this document can be found in the Partner Resources  
82 section on the ENERGY STAR Web site at  
83 [www.energystar.gov](http://www.energystar.gov)), EPA may  
provide links where appropriate to the Partner Web site;

**Note:** EPA has removed the 'labeling through advertising' option under this Draft 2 Version 5.0 specification because, to EPA's knowledge, no Partners have elected to use this option as a substitute for placing either a permanent, temporary, or electronic label on their products since the Version 4.0 specification took effect in January 2005. Additionally, EPA has removed language indicating that the labeling requirements were deferred until July 1, 2006.

In this Draft 2 Version 5.0 specification, in order to increase harmonization between specifications, EPA has replaced the product labeling language in the Version 4.1 Monitors specification with the language in Version 5.0 of the ENERGY STAR Computers specification. As a result, the language here confirms EPA will consider alternative proposals regarding approach, duration, or size for electronic labeling on a case-by-case basis.

- 84
- 85 • include information on the importance of power management in either the product manual  
86 or as a box insert for displays intended for use with computers. This information  
87 should include a reference to the energy saving and environmental benefits of power  
88 management for both the display and computer. In addition, a link should be made  
89 available to [www.energystar.gov/powermanagement](http://www.energystar.gov/powermanagement) from computer product pages,  
90 product specifications, and related content pages. At the Partner's request, EPA will  
91 supply suggested facts and figures related to the above criteria, template elements, or a  
92 complete template suitable for use in user guides or box inserts. **This is new (similar to  
93 the requirements in the PC spec, we implemented over 1 year ago. We would need to  
94 develop a standard statement for product user manuals referring to PCs with power  
95 management capabilities as the PCs control power management – not typically the  
96 Displays themselves.**  
97 provide to EPA, on an annual basis, an updated list of ENERGY STAR qualifying display models. Once the  
98 Partner submits its first list of ENERGY STAR qualified display models, the Partner will be listed as an  
99 ENERGY STAR Partner. Partner must provide annual updates in order to remain on the list of participating  
100 product Partners; **As previously discussed (and noted in the input for the final PC spec.), the requirements  
101 should be modified to note that listing products via the OPS tool satisfies the requirement of updating the  
102 EPA with models that qualify. Additionally, we had reached agreement with ICFI and the EPA to use a  
103 standard product life cycle time period for each type of product, after which time products are removed  
104 from the list of qualified products (based on the date the product was listed).**  
105  
106  
107  
108  
109
  - 110 • provide to EPA, on an annual basis, unit shipment data or other market indicators to assist  
111 in determining the market penetration of ENERGY STAR. Specifically, Partner must submit  
112 the total number of ENERGY STAR qualified displays shipped (in units by model) or an  
113 equivalent measurement as agreed to in advance by EPA and Partner. Partner is also  
encouraged to provide ENERGY STAR qualified unit shipment data segmented by  
meaningful product characteristics (e.g., capacity, size, speed, or other as relevant), total unit  
shipments for each model in its product line, and percent of total unit shipments that qualify as  
ENERGY STAR. The data for each calendar year should be submitted to EPA, preferably in  
electronic format, no later than the following March and may be provided directly from the Partner or  
through a third party. The data will be used by EPA only for program evaluation purposes and will  
be closely controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that  
the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the  
Partner;

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- notify EPA of a change in the designated responsible party or contacts for displays within 30 days.

114 **Performance for Special Distinction**

115 In order to receive additional recognition and/or support from EPA for its efforts within the  
116 Partnership, the ENERGY STAR Partner may consider the following voluntary measures and should keep  
117 EPA informed on the progress of these efforts:

- 118  
119 consider energy efficiency improvements in company facilities and pursue the ENERGY STAR  
120 label for buildings;

- 122 • purchase ENERGY STAR qualified products. Revise the company purchasing or procurement  
123 specifications to include ENERGY STAR. Provide procurement officials' contact information to  
124 EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product  
125 information to employees for use when purchasing products for their homes;  
126
- 127 • ensure the power management feature is enabled on all ENERGY STAR qualified displays in use in  
128 company facilities, particularly upon installation and after service is performed;  
129
- 130 • provide general information about the ENERGY STAR program to employees whose jobs are  
131 relevant to the development, marketing, sales, and service of current ENERGY STAR qualified  
132 product models;  
133
- 134 • feature the ENERGY STAR mark on Partner Web site and in other promotional materials. If  
135 information concerning ENERGY STAR is provided on the Partner Web site as specified by the  
136 ENERGY STAR Web Linking Policy (this document can be found in the Partner Resources  
137 section on the ENERGY STAR Web site at [www.energystar.gov](http://www.energystar.gov)), EPA may provide links where  
138 appropriate to the Partner Web site;  
139
- 140 • provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the  
141 program requirements listed above. By doing so, EPA may be able to coordinate, communicate,  
142 and/or promote Partner's activities, provide an EPA representative, or include news about the  
143 event in the ENERGY STAR newsletter, on the ENERGY STAR Web pages, etc. The plan may  
144 be as simple as providing a list of planned activities or planned milestones that Partner would like  
145 EPA to be aware of. For example, activities may include: (1) increase the availability of ENERGY  
146 STAR qualified products by converting the entire product line within two years to meet ENERGY  
147 STAR guidelines; (2) demonstrate the economic and environmental benefits of energy efficiency  
148 through special in-store displays twice a year; (3) provide information to users (via the Web site  
149 and user's manual) about energy-saving features and operating characteristics of ENERGY STAR  
150 qualified products, and (4) build awareness of the ENERGY STAR Partnership and brand  
151 identity by collaborating with EPA on one print advertorial and one live press event;  
152
- 153 • provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase  
154 availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR  
155 and its message.  
156

157 **Note:** EPA proposes the following additions to the "Performance for Special Distinction" section of the  
158 Partner Commitments for Display Partners:  
159

- Join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. SmartWay Transport works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit [www.epa.gov/smartway](http://www.epa.gov/smartway);
- Join EPA's Climate Leaders Partnership to inventory and reduce greenhouse gas emissions. Through participation, companies create a credible record of their accomplishments and receive EPA recognition as corporate environmental leaders. For more information on Climate Leaders, visit [www.epa.gov/climateleaders](http://www.epa.gov/climateleaders);
- Join EPA's Green Power partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities, visit <http://www.epa.gov/grnpower/>.



187 display casing and designed to convert line voltage ac input from the mains to lower dc voltage(s)  
188 for the purpose of powering the display. An external power supply must connect to the display via  
189 a removable or hard-wired male/female electrical connection, cable, cord or other wiring.



**Note:** EPA has included a definition for external power supplies in this Draft 2 specification because of the inclusion of external power supply requirements under Section 3, Energy Efficiency Specifications for Qualifying Products.

- C. On Mode: The product is connected to a power source and produces an image.
- D. Sleep Mode: The reduced power state the display enters after receiving instructions from a content source (e.g. computer, game console, or set-top box), or via other functions (e.g. timers or sensors). A blank screen and reduction in power consumption characterize this mode. The display returns to On Mode with full operational capability upon sensing a signal from a source or function that can initiate that can initiate the reduced power state.

**Note:** EPA has modified the definition of Sleep Mode in order to reflect the fact that the specification now encompasses a greater variety of displays than only computer monitors.

- E. Off Mode: The reduced power state the display is in when it is connected to a power source, produces no images, and is waiting to be switched to On Mode by a direct signal from a user (e.g., user pushes power switch). It is engaged by a power switch. If there is more than one such switch, the tester shall use the most readily available switch.

**Note:** EPA has clarified the definition of Off Mode to respond to confusion concerning hard off and soft off modes. Recognizing a display may have more than one off switch, EPA specifies here that the tester is to engage the Off Mode via the switch the user is most likely to use by virtue of its ease of access relative to other off switches the display may have. We would prefer that the vacation switch is allowed for off mode independently of other switches

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**2) Qualifying Products:** In order to qualify as ENERGY STAR, a display model must meet the definition in Section 1.A and the specification requirements provided in Section 3, below. As explained in Section 1, this specification does not cover products with computer capability that are marketed and sold as televisions.

**3) Energy-Efficiency Criteria:** Only those products listed in Section 2 that meet the following criteria may qualify as ENERGY STAR. Effective dates for Tiers 1 and 2 are provided in Section 6 of this specification.

A. On Mode Requirements

1. Tier 1: To qualify as ENERGY STAR, display models must not exceed the maximum On Mode power consumption (P) found from the equations provided in Table 1, based on the unit's resolution and viewable screen area. The maximum On Mode power consumption is expressed in watts and rounded up to one decimal place. In the following equations, MP is the number of megapixels in decimal form (e.g., 1,920,000 pixels = 1.92 megapixels), and A is the viewable screen area of the product rounded to the nearest whole number, found by multiplying the viewable display width by the viewable display height.

**Table 1. Tier 1 On Mode Power Consumption Requirements for Displays**

Display Category	Maximum On Mode Power Consumption
Less than 30" viewable diagonal screen size and less than or equal to 1.1 MP resolution	$P = 6*(MP) + 0.05*(A) + 3$
Less than 30" viewable diagonal screen size and greater than 1.1 MP resolution	$P = 9*(MP) + 0.05*(A) + 3$
Greater than or equal to 30" viewable diagonal screen size	$P = 35*(MP) + 0.12*(A) + 4$

For example, the maximum power consumption for a display with 1440 x 900 resolution, or

226 1,296,000 pixels, a 19 inch viewable diagonal screen size and a viewable screen area of 162  
227 square inches, would be:  $((9 \times 1.296) + (0.05 \times 162)) + 3 = 22.8$  watts when rounded to one  
228 decimal place. Under these metrics, maximum allowed power consumption for displays with  
229 various resolutions and screen sizes is provided below in Table 2.

230  
231

**Table 2. Sample Tier 1 On Mode Maximum Power Levels**

<b>Viewable Diagonal Screen Size (Inches)</b>	<b>Resolution</b>	<b>Total Megapixels</b>	<b>Viewable Screen Size in Inches</b>	<b>Screen Area in Square Inches</b>	<b>Maximum On Mode Power Use (Watts)</b>
7	800 x 480	0.384	5.9 x 3.5	21	6.4
15	1024 x 768	0.786	12 x 9	108	13.1
19	1440 x 900	1.296	16.07 x 10.05	162	22.8
46	1366 x 768	1.049	40.1 x 22.5	902	149
54	1920 x 1080	2.074	47 x 26.4	1,241	225.5

**Note:** EPA established the On Mode power requirements in Table 1, above, using the prescribed luminance levels in Table 4, below. For units to be tested at 175 cd/m<sup>2</sup>, EPA used manufacturer submitted data corresponding to the On Mode power testing results under the luminance setting prescribed in Version 4.1 of the ENERGY STAR Monitors specification (175 cd/m<sup>2</sup>). This applies to all models of less than 30 inches viewable diagonal screen size and less than 1.1 megapixel. For models with greater than or equal to 1.1 MP resolution or of greater than or equal to 30" viewable diagonal screen size, EPA used the manufacturer's four submitted data points (175 cd/m<sup>2</sup>, minimum luminance, default luminance, and maximum luminance) to determine a luminance to On Mode power relationship. EPA used this relationship on a model-by-model basis to adjust the On Mode power consumption to the appropriate prescribed luminance level. EPA checked the accuracy of the estimated relationship by calculating On Mode power at the current ENERGY STAR prescribed setting and then checking this estimate against manufacturer-submitted On Mode power data. EPA found high levels of consistency with a +2% difference in predicted vs. actual On Mode power consumption across the entire dataset, meaning that overall, there was a greater tendency to overestimate as opposed to underestimate industry power levels. The plasma displays in EPA's dataset currently have luminance settings significantly lower than the proposed 350 nits (see Table 4, below); therefore, EPA would like to receive additional data on plasma displays to further review this effect. **here are no plasma displays, only plasma TV**

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In conducting a statistical analysis on the data submitted by manufacturers, EPA found that both screen resolution and screen size play a role in determining a display's On Mode power consumption. For standard LCD displays, EPA found that On Mode power consumption (at default luminance setting) was most strongly correlated to resolution. However, for displays of the same resolution, screen size was clearly an important variable for determining On Mode power consumption. For very small screen models, EPA found On Mode power consumption to be most strongly correlated to resolution. For very large screen models, EPA found On Mode power consumption to be most strongly correlated to screen area. EPA determined it was feasible to integrate both variables into a single equation for determining On Mode performance levels. Market research also indicates that both screen area and resolution are key variables consumers look for when purchasing display products. This approach allows us to address the power consumption of models with the same resolution but different viewable screen sizes and conversely, the power consumption of models with the same viewable screen size but different resolutions. The approach also creates more consistency with the Version 3.0 ENERGY STAR TV specification, which will facilitate addressing convergence under Tier 2 for both televisions and displays. Including both resolution and screen area as independent variables explained over 70% of the variance in On Mode power consumption for LCD displays.

*Continued on next page...*

**Note continued:**

As a result of including both screen size and resolution, On Mode requirements proposed under this Draft 2 Version 5.0 specification indicate reduced power consumption allowances for low resolution, smaller screen sizes and increased power consumption allowances for higher resolution and/or larger screen sizes. Sample Tier 1 maximum on mode power consumption levels are provided in Table 2 for a variety of display resolutions/sizes.

271 Per EPA's preliminary analysis of monitor unit shipment data collected for calendar year 2007, market  
272 penetration of ENERGY STAR qualified monitors is estimated to be at over 90%. Based on EPA's  
273 current dataset, approximately 23% of display models would be able to meet the Tier 1 On Mode  
274 requirements proposed in this Draft 2 Version 5.0 displays specification.  
275

- 276
- 277 2. Tier 2: To qualify as ENERGY STAR, display models must not exceed the following maximum  
278 On Mode consumption equations: TBD.

279 To qualify a display as ENERGY STAR, it must be tested according to the protocol outlined in  
280 Section 4, Test Method.  
281

282 **Note:** EPA has left Tier 2 requirements under this Draft 2 Version 5.0 displays specification as TBD.  
283 However, it is EPA's intent to engage in dialogue with industry during the Tier 2 development process  
284 to discuss potential Tier 2 requirements that contribute to EPA's goal of pursuing convergence with the  
285 ENERGY STAR TV specification, and take into account energy-saving features for displays, such as (i)  
286 modulating backlights, (ii) automatic brightness control, (iii) polarizing films, (iv) timers/occupancy  
287 sensors, etc. **Approximately 24%** **(seems quite high)** of EPA's current displays dataset incorporates  
288 automatic brightness control, and it is anticipated that this feature, along with the others listed here, will  
289 increase in prevalence over the next several years.  
290

291 For those products that already incorporate automatic brightness control, it is EPA's intent under Tier 1  
292 of this proposed Version 5.0 specification to request manufacturers to submit On Mode power  
293 consumption data under both low and average ambient light conditions. EPA will subsequently use this  
294 data as part of the development process for determining Tier 2 levels.  
295

296 EPA developed the proposed requirements for Tier 1 of this Draft 2 Version 5.0 specification to allow  
297 display models with added functionality such as built-in speakers or USB ports to qualify. Similarly,  
298 when developing Tier 2 requirements EPA is committed to recognizing full-featured products.  
299

300 EPA is beginning review of other energy and safety related impacts associated with this product  
301 category for discussion with stakeholders for possible inclusion in Tier 2 of this specification. EPA is  
302 interested in receiving input on means to address this interest in a way that aligns with ENERGY  
303 STAR's guiding principles, and fully expects to engage stakeholder input during this process.  
304

- 305
- 306 3. **Displays with Automatic Brightness Control:** EPA has noted a substantial increase in the  
307 default luminance settings of displays, and a near 1:1 relationship between increasing  
308 luminance and increasing power consumption. Hence, while EPA recognizes the benefit in  
309 offering the consumer full-featured products, higher luminance settings tend to offset power  
310 consumption reductions achieved through improved component efficiency. The use of  
311 displays in conditions where ambient light tends to vary offers an opportunity to offset this  
312 effect by matching delivered luminance to "needed" luminance through the implementation of  
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Automatic Brightness Control (ABC). In addition to offering significant energy savings, this feature can also improve the user viewing experience. As such, EPA is recognizing products shipped with ABC enabled by default both as a means to deliver energy savings and to advance harmonization with the ENERGY STAR TV specification.

317 To account for the power savings achieved through ABC, where the feature is activated by  
318 default when shipped, On Mode power consumption shall be determined as follows:  
319  $P_{a1} = 0.8 * P_o + 0.2 * P_{abc}$ , where  $P_{a1}$  is the average On Mode power consumption in watts and  
320 rounded to the nearest whole number, taking into consideration that the display will be in low  
321 ambient light level conditions 20% of the time;  $P_o$  is the On Mode power consumption in watts  
322 and rounded to the nearest whole number when tested with a minimum ambient light level of  
323 300 lux entering directly into the sensor; and  $P_{abc}$  is the On Mode power consumption in watts  
324 and rounded to the nearest whole number when tested with an ambient light level of 0 lux  
325 entering directly into the sensor. (See Section 4.J. Test Method, below, for further information  
326 on how to test displays with Automatic Brightness Control to determine ENERGY STAR  
327 qualification.) When determining ENERGY STAR qualification, products that ship with  
328 automatic brightness control enabled should compare their On Mode power consumption  
329 ( $P_{a1}$ ), found using the equation above, to the maximum On Mode power consumption allowed  
330 (P), determined using the equations in Table 1, above.  
331

**Note:** Recognizing the growing use of Automatic Brightness Control in Displays, and bringing this specification further in line with the TV specification, EPA has incorporated from the TV specification 3.0 the procedure for determining an alternative power consumption value for products that ship with automatic brightness control enabled. EPA intends for this power consumption value to be compared to the model's power consumption limit as determined by the appropriate equation in Table 1 in order to determine ENERGY STAR qualification.

332  
333 B. Display Products Using an External Power Supply: To qualify, the external power supply must be  
334 ENERGY STAR qualified or meet the no-load and active mode efficiency levels provided in the  
335 ENERGY STAR Program Requirements for Single Voltage Ac-Ac and Ac-Dc External Power  
336 Supplies. The ENERGY STAR specification and qualified product list can be found at  
337 [www.energystar.gov/powersupplies](http://www.energystar.gov/powersupplies).  
338

**Note:** EPA has incorporated external power supply requirements for displays in this Draft 2 Version 5.0 ENERGY STAR displays specification. The inclusion of external power supply requirements is consistent with EPA's approach to other electronics product specifications developed/revised since the launch of the ENERGY STAR specification for single voltage ac-ac and ac-dc external power supplies, e.g., computers, set-top boxes, and televisions, whereby products must meet their respective energy-efficiency requirements and when coupled with external power supplies, those power supplies must also meet ENERGY STAR requirements.





C. Sleep and Off Modes

1. Tiers 1 and 2: Maximum power consumption levels for Sleep and Off Modes are provided in Tables 3a and 3b below. Displays capable of multiple Sleep Modes (i.e., Sleep and Deep Sleep) shall meet the Sleep Mode requirement below in all such modes. For example, a display of greater than or equal to 30" viewable diagonal screen size tested at 5 watts in Sleep and 4 watts in Deep Sleep would not qualify because one of the Sleep Modes exceeded 4 watts.

**Table 3a. Tier 1 Ener<sup>gy</sup>-Efficienc<sup>y</sup> Criteria for Slee<sup>p</sup> and Off Modes**

Product Type	Sleep Mode (W)	Off Mode (W)
Less than 30" viewable diagonal screen size	~ 2	~ 1
Greater than or equal to 30" viewable diagonal screen size	~ 4	~ 2

351

352

**Table 3b. Tier 2 Ener<sup>gy</sup>-Efficienc<sup>y</sup> Criteria for Slee<sup>p</sup> and Off Modes**

Product Type	Sleep Mode (W)	Off Mode (W)
All displays	~ 1	~ 1

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340  
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344  
345  
346  
347  
348  
349  
350

**Note:** Under this Draft 2 Version 5.0 specification, EPA has replaced the Tier 1 Sleep and Off Mode requirements that were present in Draft 1 and applied to all displays regardless of screen area or resolution, with Tier 1 Sleep and Off Mode requirements that vary depending on screen area and resolution (Table 3a). EPA suggests this modification in order to address the pass rate of large screen area products that are typically employed as professional displays, which under Draft 1 was significantly below EPA's goal of 25%. Tier 2 (Table 3b) under this Draft 2 specification remains unchanged from Draft 1. Hence, consistent with Draft 1, EPA is proposing to lower the Sleep Mode requirement under Tier 2 to  $\leq 1$  watt. This proposal would allow consistency between Tier 2 displays

353 criteria and other ENERGY STAR specifications, such as the TV specification.  
354  
355 2. **Power Management Requirements:** Displays must have at least one mechanism enabled by default that  
356 allows the display to automatically enter Sleep or Off Mode. For instance, any data or network connection  
357 must support powering down the display according to standard mechanisms, such as Display Power  
358 Management Signaling, while displays generating their own content must have a sensor or timer enabled by  
359 default to automatically engage Sleep or Off Mode.  
360

**Note:** In this Draft 2 specification, EPA has substituted the section titled "Sleep Mode Exception" in the Version 4.1 Monitor specification with the section above, "Power Management Requirements," to clarify EPA's approach to the management of Sleep and Off modes under this specification, noting that displays must have at least one mechanism enabled by default that allows the display to automatically enter Sleep or Off Mode. EPA notes that over 50% of the digital picture frames (DPFs) in its dataset were reported as having a Sleep Mode, and would like to receive further information from DPF Partners regarding whether their DPF products have a Sleep Mode, and how these products engage this mode.

361  
362 4) **Test Method**  
363

364 **Product Testing Set-up, Method, and Documentation:** EPA utilizes, where possible, widely-accepted industry  
365 practices for measuring product performance and power use under normal or typical operating conditions.  
366 The testing and measurement methods below reference published specifications from the Video Electronics  
367 Standards Association (VESA) Display Metrology Committee and the International Electrotechnical  
368 Commission (IEC), and supplement those guidelines where necessary with methods developed in  
369 cooperation with the display industry.  
370

371 Partners are required to perform tests and self-certify those product models that meet the ENERGY STAR  
372 guidelines. In order to conduct testing in support of qualification for ENERGY STAR, the display must be tested  
373 in a laboratory that is accredited by an accreditation body that is a signatory, in good standing, to a mutual  
374 recognition arrangement of a laboratory accreditation cooperation (i.e. ILAC, APLAC, etc.) that verifies, by  
375 evaluation and peer assessment, that its signatory members are in full compliance with ISO/IEC 17011 and that  
376 their accredited laboratories comply with ISO/IEC 17025. Laboratories must be specifically qualified to carry out  
377 tests to determine whether displays meet key product criteria for displays as outlined in this document. A  
378 laboratory's Scope of Accreditation must reflect its specific competence to carry out the test procedures as  
379 outlined in the ENERGY STAR Program Requirements for Displays. Same comments as earlier – do not  
380 want the expense and delay of limiting the labs. As an alternative, we want at least 5 accredited labs identified  
381 in both Taiwan and China prior to the effectivity of ES 5.0.

**Note:** EPA is proposing applying the accreditation requirements above to laboratories associated with product qualification. It is EPA's intention to apply these requirements to all relevant product specifications.

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384 Families of display models that are built on the same chassis and are identical in every respect but housing  
385 and color may be qualified through submission of test data for a single, representative model. Likewise,  
386 models that are unchanged or that differ only in finish from those sold in a previous year may remain  
387 qualified without the submission of new test data, assuming the specification remains unchanged.  
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389 Power shall be measured from the outlet or power source to the product under test. The average true  
 390 power consumption of the display shall be measured during On Mode, Sleep Mode, and Off Mode.  
 391 When performing measurements to self-certify a product model, the product being tested must initially  
 392 be in the same condition (e.g., configuration and settings) as when shipped to the customer, unless  
 393 adjustments need to be made pursuant to instructions below. If a product's electrical power comes  
 394 from Mains, USB, IEEE1394, Power-over-Ethernet, telephone system, or any other means or  
 395 combinations of means, the net AC electrical power consumed by the product (taking into account ac-  
 396 to-dc conversion losses) must be used for qualification.  
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398 To ensure a consistent means for measuring the power consumption of electronics products, the  
 399 following protocol must be followed, which has three main components:  
 400 • Product Testing Set-up and Conditions

- 401 • Product Testing Method
- 402 • Product Testing Documentation

403 This protocol ensures that outside factors do not adversely affect the test results and that the test  
 404 results can be consistently reproduced. Partners may elect to use an in-house or independent  
 405 laboratory to provide the test results.  
 406

**Product Testing Set-up and Conditions**

A. Test Conditions:

<b>Supply Voltage:</b>	North America/Taiwan:	115 (± 1%) Volts AC, 60 Hz (± 1%)
	Europe/Australia/New Zealand:	230 (± 1%) Volts AC, 50 Hz (± 1%)
	Japan:	100 (± 1%) Volts AC, 50 Hz (± 1%)/60 Hz (± 1%)
		<i>Note: For products rated for &gt; 1.5 kW maximum power, the voltage range is ± 4%</i>
<b>Total Harmonic Distortion (THD) (Voltage):</b>	< 2% THD (< 5% for products which are rated for > 1.5 kW maximum power)	
<b>Ambient Temperature:</b>	23°C ± 5°C	
<b>Relative Humidity:</b>	10 – 80 %	

411 (Reference IEC 62301 Ed 1.0: Household Electrical Appliances – Measurement of Standby Power, Sections 4.2,  
412 4.3)

413  
414 B. Models Capable of Operating at Multiple Voltage/Frequency Combinations: Partners shall test  
415 their products based on the market(s) in which the models will be sold and promoted as ENERGY  
416 STAR qualified. For products that are sold as ENERGY STAR in multiple international markets  
417 and, therefore, rated at multiple input voltages, the Partner must test at and report the required  
418 power consumption or efficiency values at all relevant voltage/frequency combinations. For  
419 example, a Partner that is shipping the same model to the United States and Europe must  
420 measure, meet the specification, and report test values at both 115 Volts/60 Hz and 230 Volts/50  
421 Hz in order to qualify the model as ENERGY STAR in both markets. If a model qualifies as  
422 ENERGY STAR at only one voltage/frequency combination (e.g., 115 Volts/60 Hz), then it may  
423 only be qualified and promoted as ENERGY STAR in those regions that support the tested  
424 voltage/frequency combination (e.g., North America and Taiwan).

**Note:** EPA has updated the Test Conditions in Draft 2 to be consistent with language related to qualifying products capable of operating at multiple voltage/frequency combinations in other recently developed/revised ENERGY STAR specifications, e.g., computers, set-top boxes, and TVs. The test conditions are based on IEC 62301, Ed 1.0. The intent of this language is identical to that of the text included in the Version 4.1 specification under the heading, “**Supply Voltage**,” whereby models must be tested at the voltage/frequency combination for each region where the manufacturer intends to sell the model as ENERGY STAR qualified.

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- C. Dark Room Conditions: When performing light measurements, the display shall be located in a dark room condition. The display screen illuminance measurement (E) when in Off Mode must be 1.0 Lux or less. Measurements should be made at a point perpendicular to the center of the screen using a Light Measuring Device (LMD) with the display in Off Mode (Reference VESA FPDM Standard 2.0, Section 301-2F).
- D. Color Controls and Peripherals: All color controls (hue, saturation, gamma, etc.) shall be placed at their factory default settings. No external devices shall be connected to any included Universal Serial Bus (USB) hubs or ports. Any built-in speakers, TV tuners, etc. may be placed in their minimum power configuration, as adjustable by the user, to minimize power use not associated with the display itself. Circuit removal or other actions not under user control may not be taken to minimize power use.
- E. Power Measurement Test Conditions: For LCDs and other fixed pixel technologies, pixel format shall be set to the native level. LCD refresh rate shall be set to 60 Hz, unless a different refresh rate is specifically recommended by the Partner, in which case that rate shall be used. CRT pixel format shall be set at the preferred pixel format with the highest resolution that is intended to be driven at a 75 Hz refresh rate. A VESA Discrete Monitor Timing (DMT) or newer industry standard pixel format timing must be used for the test. The CRT display must be capable of meeting all its Partner-stated quality specifications in the tested format.
- F. Power Measurement Protocols: Display power consumption shall be measured in watts with an imposed test pattern. Warm-up time shall be a minimum of a 20-minute period (Reference VESA FPDM Standard 2.0, Section 301 -2D or 305-3 for warm-up test). A true RMS power meter with a crest factor of at least three shall be used to measure the power use of each randomly chosen unit at one or more, as appropriate, of the voltage/frequency combinations provided in Section 4.A (Reference VESA Standard: Display Specifications and Measurement Procedures, Version 1.0, Revision 1.0, Section 8.1.3). Measurements shall be taken after wattage values are stable over a three-minute period. Measurements are considered stable if the wattage reading does not vary more than 1% over the three-minute period (Reference IEC 4.3.1). (Testers shall ignore the input sync signal check cycle when metering the model in Sleep Mode and Off Mode.) Testers shall use calibrated measuring equipment capable of measurements accurate to one-tenth of a watt or better.

**Note:** To bring this specification further into alignment with the TV specification, EPA has changed the required minimum crest factor of the power meter from five to three, after IEC 62301 Ed 1.0: Household Electrical Appliances – Measurement of Standby Power.

Also, in light of the fact that the definition of “Electronic Display” in section 1.A. above, allows for the qualification of displays capable of being powered by a data or network connection, EPA has added the methodology above to measure the power consumption of products powered by a standard low voltage dc supply.

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Products powered by a standard low voltage dc supply (e.g., USB, USB PlusPower, IEEE 1394, and Power Over Ethernet) shall utilize a suitable ac-powered source of the dc power. This ac-powered source’s energy consumption shall be measured and recorded as the power consumption of the display under test. For a display powered by USB, a powered hub serving only the display being tested shall be used. For a display powered by Power Over Ethernet or USB PlusPower, it is acceptable to measure the power distribution device with and without the display connected, and record the difference between the two readings as the display’s power consumption. The tester should confirm that this reasonably reflects the unit’s dc consumption plus some allowance for power supply and distribution inefficiency. Any product with both ac and standard low-voltage dc capability should be tested only at ac.

473 G. Number of Units Required for Testing: Borrowing from European Norm 50301 (Reference BSI 03-  
474 2001, BS EN 50301:2001, Methods of Measurement for the Power Consumption of Audio, Video,  
475 and Related Equipment, Annex A), EPA has established a test procedure where the number of  
476 units required for test depends on the test results for the first unit. If a tested display uses at least  
477 15% less power (i.e., greater than or equal to 15%) than the ENERGY STAR specification in all  
478 three operating modes (On Mode, Sleep Mode, and Off Mode), then it only has to be tested once.  
479 However, if a tested display is within 15% of the ENERGY STAR specification in any of the three  
480 operating modes, then two more units must be tested, and their test results reported to EPA via  
481 the Online Product Submittal tool along with the average On, Sleep, and Off Mode values for that  
482 model based on the three units tested. None of the test values may exceed the ENERGY STAR  
483 specification for the model to be ENERGY STAR qualified.

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485 The following example further illustrates this approach:

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487 **EXAMPLE:** For simplicity, assume the specification is **100 watts or less and only applies to one**  
488 **operational mode. 85 watts would represent the 15% threshold...**

- 489 • If the first unit is measured at **80 watts, no more testing** is needed and the model qualifies  
490 (80 watts is at least 15% more efficient than the specification and is “outside” the 15%  
491 threshold).
- 492 • If the first unit is measured at **85 watts, no more testing** is needed and the model qualifies  
493 (85 watts is exactly 15% more efficient than the specification).
- 494 • If the first unit is measured at **90 watts**, then **two more units** must be tested to determine  
495 qualification (90 watts is only 10% more efficient than the specification and is “within” the 15%  
496 threshold).
- 497 • If three units are tested at **90, 98, and 105 watts**, the model **does not qualify** as ENERGY  
498 STAR—even though the average is 98 watts— because one of the values (105) exceeds the  
499 ENERGY STAR specification.

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501 H. Luminance Test Patterns and Procedures: **For all fixed pixel displays (e.g., LCDs and others),**  
502 test pattern (VESA FPDM Standard 2.0, A1 1 2-2F, SET01 K) shall be displayed that provides eight  
503 shades of gray from full black (0 volts) to full white (0.7 volts).<sup>1</sup> Input signal levels shall conform to  
504 VESA Video Signal Standard (VSIS), Version 1.0, Rev. 2.0, December 2002. With the brightness  
505 and contrast controls at maximum, the technician shall check that, at a minimum, the white and  
506 near white gray levels can be distinguished. If white and near white gray levels cannot be  
507 distinguished, then contrast shall be adjusted until they can be distinguished. The technician shall  
508 next display a test pattern (VESA FPDM Standard 2.0, A1 12-2H, L80) that provides a full white  
509 (0.7 volts) box that occupies 80% of the image. The technician shall then adjust the brightness  
510 control until the white area of the screen is set at the correct luminance setting as described in  
511 Table 4, below, measured according to VESA FPDM Standard 2.0, Section 302-1. The luminance  
512 value shall be reported to EPA with other required testing documentation.

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514 **For CRT displays,** the technician shall initiate the AT01 P (Alignment Target 01 Positive Mode)  
515 pattern (VESA FPDM Standard 2.0, A1 1 2-2F, AT01 P) for screen size and use it to set the display  
516 to the Partner’s recommended image size, which is typically slightly smaller than maximum  
517 viewable screen size. Then, test pattern (VESA FPDM Standard 2.0, A1 1 2-2F, SET01 K) shall be

518  
519 displayed that provides eight shades of gray from full black (0 volts) to full white (0.7 volts).<sup>1</sup> Input  
520 signal levels shall conform to VESA Video Signal Standard (VSIS), Version 1.0, Rev. 2.0,  
521 December 2002. The technician shall adjust (where feasible) the display brightness control  
522 downward from its maximum until the lowest black bar luminance level is just slightly visible  
523

<sup>1</sup> Corresponding voltage values for digital only interface displays that correspond to the brightness of the image (0 to 0.7 volts) are:

0 volts (black) = a setting of 0

0.1 volts (darkest shade of gray analog) = 36 digital gray

0.7 volts (full white analog) = 255 digital gray

Please note that future digital interface specifications may widen this range, but in all cases, 0 volts shall correspond

**DRAFT 2 ENERGY STAR Program Requirements for Displays (Version 5.0)**

to black and the maximum value shall correspond to white, with 0.1 volts corresponding to one-seventh of the maximum value.

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(VESA FPDM Standard 2.0, Section 301-3K). The technician shall then display a test pattern (VESA FPDM Standard 2.0, A1 12-2H, L80) that provides a full white (0.7 volts) box that occupies 80% of the image. The technician shall then adjust the contrast control until the white area of the screen is set at the correct luminance setting as described in Table 4, below, measured according to VESA FPDM Standard 2.0, Section 302-1. The luminance value shall be reported to EPA with other required testing documentation.

**Table 4. Luminance Settings for Testing Displays**

Product	Cd/m <sup>2</sup>
All CRTs	100
Less than 30" viewable diagonal screen size and less than or equal to 1.1 MP resolution	175
Less than 30" viewable diagonal screen size and greater than 1.1 MP resolution	<del>disagree. Higher resolution displays are not TV and are operated at same conditions as other monitors. 175 nits.</del>
Greater than or equal to 30" viewable diagonal screen size	350 too high for 30" monitor. LP3085 max is 370 typical. Many less

**Note:** While Draft 1 of this specification revision called for testing displays at default, as-shipped luminance settings, EPA has updated the luminance settings in this Draft 2 Version 5.0 specification to specify that manufacturers must test their displays at prescribed luminance settings to determine ENERGY STAR qualification. EPA has made this change to align the specification with luminance values that are closer to actual usage than the 175 candelas/square meter called for in the Version 4.1 specification.

Currently, the plasma displays in the dataset have luminance settings significantly lower than the proposed 350 nits. EPA would like to receive additional data on plasma displays to further improve

Table 4.

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I. Light Measurement Protocols: When light measurements, such as illuminance and luminance, need to be made, an LMD shall be used with the display located in dark room conditions. The LMD shall be used to take measurements at the center of and perpendicular to the display screen (Reference VESA FPDM Standard 2.0, Appendix A1 15). The screen surface area to be measured shall cover at least 500 pixels, unless this exceeds the equivalent of a rectangular area with sides of length equal to 10% of the visible screen height and width (in which case this latter limit applies). However, in no case may the illuminated area be smaller than the area the LMD is measuring (Reference VESA FPDM Standard 2.0, Section 301-2H).

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**Note:** EPA has removed the Display Set-Up and Characterization section after determining that it represented only a small subset of the information the Online Product Submittal (OPS) tool for Displays requires Partners to submit when qualifying a product. Rather than reproduce the entire set of OPS fields here, which would differ from what is done in other ENERGY STAR specifications, EPA decided to remove this section and direct Partners to the OPS tool for Displays should they wish to consult the informational fields they will be required to complete when submitting a product for qualification.



**Testing Method**

J. Test Method: Following are the test steps for measuring the true power requirements of the test unit in On Mode, Sleep Mode, and Off Mode. Partners are required to test their displays using the analog interface, except in those cases where one is not provided (i.e., digital interface monitors, which for the purposes of this test method are defined as having only a digital interface). For digital interface displays, please see Footnote 1 on page 14 for voltage information, and follow the test method below using a digital signal generator.

**On Mode**

1. Connect the test sample to the outlet or power source and test equipment. For displays shipped with an external power supply, the external power supply (as opposed to a reference

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- 555 power supply) must be used in the test.
- 556 2. Power on all test equipment and properly adjust power source voltage and frequency.
- 557 3. Check for normal operation of the test unit and leave all customer adjustments set to factory
- 558 default settings.
- 559 4. Bring the test unit into On Mode either by using the remote control device or by using the
- 560 ON/OFF switch on the test unit cabinet. Allow the unit under test to reach operating
- 561 temperature (approximately 20 minutes).
- 562 5. Set the proper display mode. Refer to Section E, Power Measurement Test Conditions.
- 563 6. Provide dark room conditions. See Sections I, Light Measurement Protocols, and C, Dark
- 564 Room Conditions.
- 565 7. Set size and luminance. Refer to Section H, Luminance Test Patterns and Procedures for
- 566 CRT or Fixed Pixel displays. Once luminance is set, dark room conditions are no longer
- 567 needed.
- 568 (Note, if the test sample is equipped with Automatic Brightness Control, and this feature is
- 569 enabled by default, then substitute points 6 and 7 above with the procedure for testing such
- 570 models as described in Section 3.A.3, testing the sample at ambient light levels of 0 and 300
- 571 lux, and continuing with steps 8 through 13, below.)
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- 574 8. Either verify that the wall outlet power is within specifications or adjust the AC power source
- 575 output as described in Section A (e.g., 1 15V ± 1%, 60Hz ± 1%).
- 576 9. Set the power meter current range. The full-scale value selected multiplied by the crest factor
- 577 rating (I<sub>peak</sub>/I<sub>rms</sub>) of the meter must be greater than the peak current reading from the
- 578 oscilloscope.
- 579 10. Allow the readings on the power meter to stabilize and then take the true power reading in
- 580 watts from the power meter. Measurements are considered stable once the wattage reading
- 581 does not vary more than 1% over a three-minute period. See Section F, Power Measurement
- 582 Protocols.
- 583 11. Power consumption shall be recorded, as well as total pixel format (horizontal x vertical pixels
- 584 displayed), to calculate pixels/watt.
- 585 12. Record the test conditions and test data.
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**Note:** In light of the addition of Automatic Brightness Control to Section 3.A.3. of this Draft 2 of Version 5.0 of the Displays specification, EPA has modified the On Mode Testing Method above to allow the tester to substitute steps 6 and 7 of this method, "Provide dark room conditions," and "Set size and luminance," respectively, with the procedure for testing ABC models as described in Section 3.A.3.

**Sleep Mode (Power Switch On, No Video Signal)**

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- 589 1. At the conclusion of the On Mode test, initiate the display's Sleep Mode. The method of
- 590 adjustment shall be documented along with the sequence of events required to reach the
- 591 Sleep Mode. Power on all test equipment and properly adjust operation range.
- 592 2. Allow the display to remain in Sleep Mode until stable power readings are measured.
- 593 Measurements are considered stable once the wattage reading does not vary more than 1%
- 594 over a three-minute period. Tester shall ignore the input sync signal check cycle when
- 595 metering the unit in Sleep Mode.
- 596 3. Record the test conditions and test data. The measurement time shall be sufficiently long to
- 597 measure the correct average value (i.e., not peak or instantaneous power). If the device has
- 598 different Sleep Modes that can be manually selected, the measurement should be taken with
- 599 the device in the most energy consumptive of those modes. If the modes are cycled through
- 600 automatically, the measurement time should be long enough to obtain a true average that
- 601 includes all modes.
- 602

**Off Mode (Power Switch Off)**

- 603
- 604 1. At the conclusion of the Sleep Mode test, initiate the display's Off Mode using the power
- 605 switch ~~that reduces the power consumption the most~~. The method of adjustment shall
- 606 be documented along with the sequence of events required to reach the Off Mode. Power on all
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- test equipment and properly adjust operation range.
2. Allow the display to remain in Off Mode until stable power readings are measured.

609 Measurements are considered stable once the wattage reading does not vary more than 1% over a  
610 three-minute period. Tester shall ignore the input sync signal check cycle when metering the model in Off  
611 Mode.

612 3. Record the test conditions and test data. The measurement time shall be sufficiently long to measure the  
613 correct average value (i.e., not peak or instantaneous power).

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615 **Product Testing Documentation**

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617 K. Submittal of Qualified Product Data to EPA: Partners are required to self-certify those product models  
618 that meet the ENERGY STAR guidelines and report information to EPA through the Online Product  
619 Submittal tool. ENERGY STAR qualifying product data, including information about new as well as  
620 discontinued models, must be provided on an annual basis, or more frequently if desired by the Partner.

621 This is outdated language that must be updated to reflect the agreement reached with the EPA/ICFI to  
622 simply remove qualified displays from the list of qualified products x months after the product was listed  
623 There is no reason to add additional burden requiring manufacturers to go back into the OPS tool and  
624 de-list products that may no longer be sold.

625

626 5) **User Interface:** Partners are strongly recommended to design products in accordance with the user  
627 interface standard IEEE P1621: Standard for User Interface Elements in Power Control of Electronic  
628 Devices Employed in Office/Consumer Environments. The Power Management Controls project  
629 developed this standard to make power controls more consistent and intuitive across all electronic  
630 devices. For details, see <http://eetd.lbl.gov/Controls>.

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632 6) **Effective Date:** The date that Partners may begin to qualify products as ENERGY STAR, under the  
633 Version 5.0 specification, will be defined as the effective date of the agreement. Any previously  
634 executed agreement on the subject of ENERGY STAR qualified displays shall be terminated effective  
635 October 20, 2009.

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637 A. Qualifying Products Under Tier 1 of the Version 5.0 Specification: Tier 1 of the Version 5.0  
638 specification shall commence on **October 21, 2009**. All products, including models originally  
639 qualified under Version 4.1, with a **date of manufacture** on or after **October 21, 2009**, must meet  
640 the new (Version 5.0) requirements in order to qualify for ENERGY STAR (including additional  
641 shipments of models originally qualified under Version 4.1). The **date of manufacture** is specific  
642 to each unit and is the date (e.g., month and year) of which a unit is considered to be completely  
643 assembled.

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645 B. Qualifying Products Under Tier 2 of the Version 5.0 Specification: The second phase of this  
646 specification, Tier 2, shall commence on **October 21, 2011**. Specifications for Tier 2 shall apply to  
products with a date of manufacture on or after **October 21, 2011**. For example, a unit with a date  
of manufacture of October 21, 2011 must meet the Tier 2 specification in order to qualify as  
ENERGY STAR.

**Note:** EPA anticipates finalizing the Version 5.0 ENERGY STAR displays specification in January  
2009. The proposed effective date of October 21, 2009 would allow industry the typical nine months  
transition time prior to the revised specification taking effect. At the September 25, 2008 stakeholder  
meeting, in response to a stakeholder request EPA indicated it would investigate the impact of  
manufacturer design cycles on the effective date of the specification. EPA spoke with several  
manufacturers and other stakeholders with regards to this issue, and concluded there is no consistent  
design cycle for displays across manufacturers, and that instead, design cycles tend to vary across the  
calendar.

EPA has subsequently allowed two years prior to Tier 2 requirements taking effect in October 2011.

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648 C. Elimination of Grandfathering: EPA will not allow grandfathering under this Version 5.0 ENERGY STAR  
650 specification. **ENERGY STAR qualification under Version 4.1 is not automatically granted for the life of**  
651 **the product model.** Therefore, any product sold, marketed, or identified by the manufacturing partner as  
652 ENERGY STAR must meet the current specification in effect at the time of manufacture of the product.

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656 7) **Future Specification Revisions:** EPA reserves the right to change the specification should  
657 technological and/or market changes affect its usefulness to consumers, industry, or the environment. In  
658 keeping with current policy, revisions to the specification are arrived at through stakeholder discussions.

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660 EPA will periodically assess the market in terms of energy efficiency and new technologies. As always,  
661 stakeholders will have an opportunity to share their data, submit proposals, and voice any concerns. EPA  
662 will strive to ensure that the Tier 1 and 2 specifications recognize the most energy-efficient models in the  
663 marketplace and reward those Partners who have made efforts to further improve energy efficiency.

664 **Greenhouse Gas Emissions**

665 EPA is interested in working with LCD industry stakeholders through the ENERGY STAR program to reduce  
666 the emission of high global warming potential gases associated with LCD production, specifically NF3,  
667 SF6, and CF4. This area of concern presents an opportunity to significantly reduce emissions beyond product  
668 use-phase and to engage our partners in achieving significant, measurable greenhouse gas and energy  
669 reductions from the other phases of the product lifecycle.  
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671  
672 **Note:** At the September 25, 2008 stakeholder meeting, EPA briefly presented its thoughts on how to address  
673 these GHGs, and agreed to craft a more detailed description of it rational and a proposed path forward (to include  
hosting a series of web meetings to discuss and work through the proposals). EPA is interested in receiving  
input from stakeholders on ways to address these high global warming potential gases. Initial thoughts  
include limiting the amount of emissions associated with LCD panels by either requiring the use of control  
technologies or by setting a limit on the amount of emissions per area of LCD panels produced.  
Manufacturers would then be responsible for working with their suppliers to track these emissions for LCD  
panels used in ENERGY STAR qualified displays. EPA will distribute an invitation to the first web meeting by  
early November 2008. HP opposes this change. Refer to comments at the beginning of the draft standard.

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