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ENERGY STAR®
Version 7.0 Draft 2 Displays
Stakeholder Webinar

May 7, 2015

Verena Radulovic, U.S. Environmental Protection Agency
Jeremy Dommu, U.S. Department of Energy

ENERGY STAR Products Labeling Program

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Webinar Details

- Webinar slides and related materials will be available on the Displays Product Development Web page:
  - www.energystar.gov/revisedspecs
  - *Follow link to "Version 7.0 is in Development" under "Displays"*
- Audio provided via teleconference:
  Call in: +1 (877) 423-6338 (U.S.)
  +1 (571) 281-2578 (International)
  Code: 198-920 #
  - Phone lines will remain open during discussion
  - Please mute line unless speaking
  - Press *6 to mute and *6 to un-mute your line

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Webinar Agenda

Time	Topic
11:00–11:15	Introduction & Test Method Update
11:15–11:45	Definitions, Scope, General Requirements
11:45–12:45	Monitors Total Energy Consumption
12:45–1:15	Signage Displays
1:15–2:00	Open Discussion, Next Steps

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Introductions

Verena Radulovic
U.S. Environmental Protection Agency

Matt Malinowski
ICF International

Rachel Unger
ICF International

Tom Bolioli
Terra Novum

Bruce Nordman
Lawrence Berkley National Laboratory

Jeremy Dommu
U.S. Department of Energy

Allen Tsao
Navigant Consulting

Kevin Morrissey
Navigant Consulting

Jonathan Wood
European Commission

Bob Harrison
European Commission

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Written Comments

In addition to making verbal comments during today's call, stakeholders are encouraged to submit written comments to displays@energystar.gov.

Comment Deadline
Friday, May 22, 2015

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ENERGY STAR Displays Overview

- First specification introduced in 1992
- 2002 – Agreement with EU and EPA to coordinate Office Equipment labeling
- 2009 – EPA and DOE ENERGY STAR Partnership
- Version 6.0 Displays Specification finalized September 2012 and effective **June 1, 2013**

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Version 6.0 Displays Today

- **1214** models certified to Version 6.0 from **57** ENERGY STAR Brand Owner Partners as of January 2015
  - Monitors:
    - Ac-powered (1050 models)
    - Dc-powered (7 models)
  - Signage: 157 models

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Version 7.0 Activities to Date

- **February 24, 2014:** Draft 1 Test Method Released & Data Call
- **November 18, 2014:** Draft 1 Specification and Draft 2 Test Method released to stakeholders
- **April 21, 2015:** Draft 2 Specification released
- **Today, May 7: Overview of Draft 2 Specification**

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Test Method Updates

- Version 7.0 Draft 2 Test Method based on Version 6.0
- Updates in Draft 1:
  - Updated test configuration for DC-powered Displays
  - Test language clarifications
- Updates following Draft 1:
  - New test for Full Network Connectivity
  - Clarifications based on stakeholder feedback from Draft 1
- No Draft 3 Test Method, but Final Draft Test Method will be released with Final Draft Specification

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Product Types

- In Draft 1, EPA proposed revised definitions based on pixel density where:
  - >5,000 pixels/in^2 is a Monitor; and
  - ≤5,000 pixels/in^2 is Signage
- Stakeholders commented that certain Signage, for example those with UHD resolution, could have >5,000 pixels/in^2

- In Draft 2, EPA is proposing a set of quantitative criteria to classify Monitors and Signage Displays including
  - Size;
  - Pixel Density; and
  - Luminance

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Product Types

- EPA is proposing the following language in Draft 2:

a) Monitor: An electronic display intended for one person to view in a desk based environment.

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

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

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

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

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Product Types

- EPA is also considering additional qualitative criteria to distinguish Signage from Monitors, such as:
  - Designed for wall installation or mounting on a stand
  - Ability to perform scaling for use in video walls;
  - Unique addressing;
  - Remote-control disabling;
  - Vertical and horizontal orientation;
  - Continuous use; and
  - Networking

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Color Gamut

- EPA received feedback that reporting of color gamut under Version 6.0 is inconsistent, making it difficult to compare performance
  - Some models are reported in the NSTC space
  - Other models are reported in terms of sRGB and Adobe®

- In Draft 2, EPA proposes:

3) Color Gamut: Color gamut area shall be reported in the CIE 1976 *u' v'* color space per Section 5.18 Gamut Area of the Information Display Measurements Standard Version 1.03.

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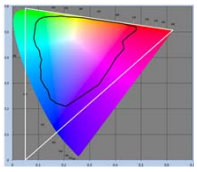
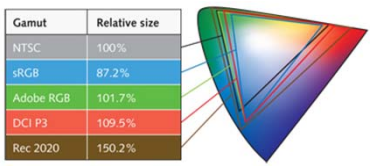
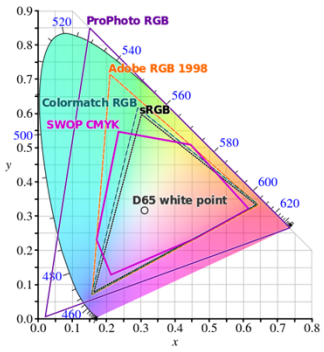
Color Gamut

- CIE 1976 (a.k.a. CIELUV or u' v') beneficial because it contains all perceptible colors and it is larger than the largest implementation of color management (ProPhoto).
- Use of CIELAB (a.k.a. CIE 1976 L*a*b*) and its 1994/2000 updates (typically denoted as CIE D50 in color matching profiles) is becoming more popular.



Gamut	Relative size
NTSC	100%
sRGB	87.2%
Adobe RGB	101.7%
DCI P3	109.5%
Rec 2020	150.2%





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Plug-In Module

- EPA has revised the Draft 1 definition of "Internal Processor" to "Plug-in Module"
  - Focuses on add-on modularity/plug-in enhancements for either rendering images or processing touch signals
  - Intended to exclude any processing capability that might meet the threshold of a computer for general computing including devices covered under the ENERGY STAR Program for Computers

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Plug-In Module

- EPA is proposing the following language in Draft 2:

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

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

b) Process touch signals.

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

Power Management

- In response to Draft 1, one stakeholder suggested the automatic power down time be revised from 15 minutes to 5 minutes which:
  - Is likely to have little impact on user experience;
  - Saves energy

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

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Monitors Dataset Overview

- EPA refreshed the dataset with all Version 6.0 certified models as of December 2014
  - 1050 models binned by diagonal screen size and resolution
  - 40 Enhanced Performance Displays

Bins	Total Resolution (Megapixels)									
	Res (MP)	0.48-1.049	1.296	1.311-1.44	1.764	2.074	2.765-3.686	4.954	8.294	All
Size (in.)	Bins	1.05	1.30	1.50	2.00	2.50	3.80	5.00	8.00	
<14	14	4	0	2	0	1	0	0	0	7
14 - 16	16	13	0	0	0	0	0	0	1	14
16 - 19	19	60	8	21	0	0	0	0	0	89
19 - 20	20	7	35	105	1	3	0	0	0	151
20 - 22	22	0	0	46	1	169	0	0	0	216
22 - 24	24	0	0	0	30	218	3	0	3	254
24 - 26	26	0	0	0	1	104	6	0	1	112
≥26	28	0	0	0	2	117	57	8	23	207
All		84	43	174	35	612	66	8	28	1050

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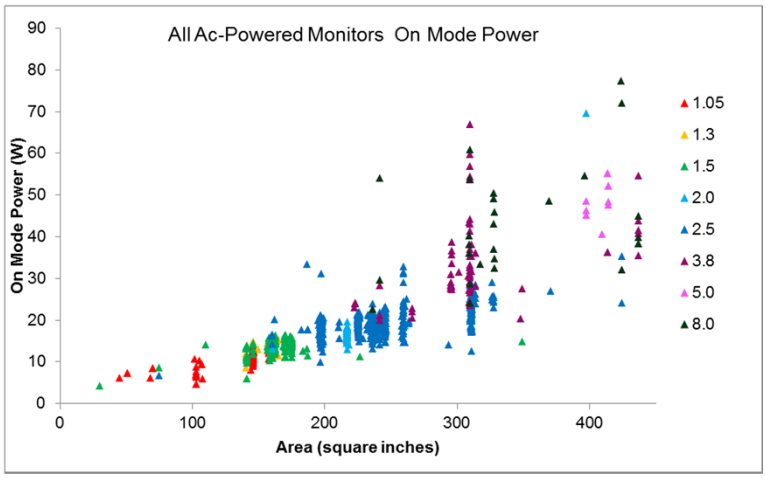
On Mode Power All Ac-Powered Monitors



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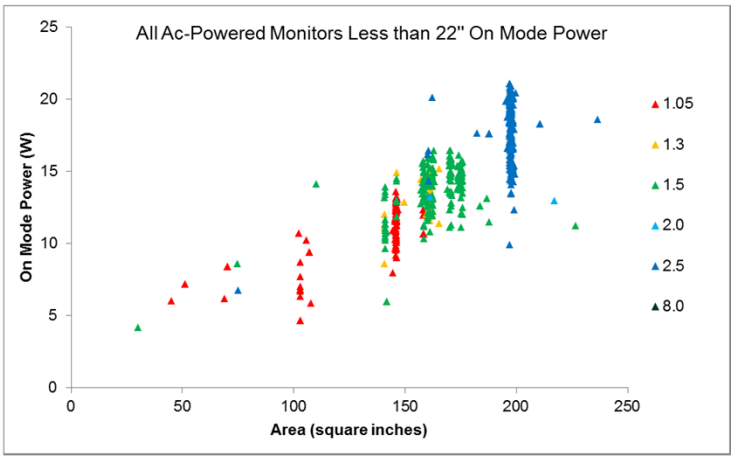
On Mode Power Ac-Powered Monitors Less than 22”



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Monitors Draft 1 On Mode Requirements

- In Draft 1, EPA proposed a single asymptotic On Mode Power requirement line w/ Area and Resolution
  - Accounts for flat component efficiency at larger screen sizes
  - Provides a cap on total power
  - Allows for fine adjustment and consistent approach across the size bins
  - Stakeholders were generally in agreement with this approach

Product Type	P_{ON} Max (watts) Where: A = Viewable screen area in in² r = Total screen resolution in megapixels
Monitors	$(2.0 \times r) + 17.1 \times tanh(0.0040 \times (A - 63.0) + 0.3$

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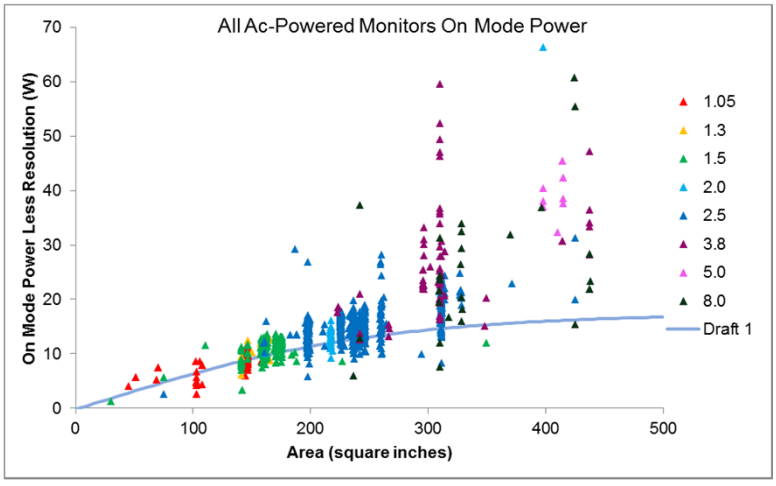
Monitors Draft 1 On Mode Requirements



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Total Energy Consumption (TEC) Overview

- In Draft 1, EPA proposed the TEC approach and has now incorporated it into Draft 2 for Monitors only
  - As new features and functionality come into the market and are enabled during Sleep Mode, allows for flexibility while still continuing to drive efficiency
  - Reduces the need to have a large number of relatively small sleep allowances
  - Lessens the criticality of the actual adder values for the ones that are included
  - EPA would continue to require reporting of On, Sleep, and Off Mode power levels, but the requirement for On and Sleep would be expressed in kWh per year

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Modal Assumptions

- Based on Computer modal assumptions – the time spent in On Mode corresponds to Computer Short Idle: **35% in On Mode, 65% in Sleep Mode**

Short Idle: The mode where the Computer has reached an Idle condition (i.e., 5 minutes after OS boot or after completing an active workload or after resuming from Sleep Mode), the screen is on, and Long Idle power management features have not engaged (e.g. HDD is spinning and the Computer is prevented from entering sleep mode).

Mode Weighting	Conventional	Full Network Connectivity			
		Base Capability	Remote Wake	Service Discovery/ Name Services	Full Capability
T_{OFF}	45%	40%	30%	25%	20%
T_{SLEEP}	5%	15%	28%	36%	45%
T_{LONG_IDLE}	15%	12%	10%	8%	5%
T_{SHORT_IDLE}	35%	33%	32%	31%	30%

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Modal to TEC Conversion

- Power in On Mode and Sleep Mode is converted to TEC:
  - On Mode: 35% x 365 days/year x 24 hr/day = 3,066 hr/year
  - Sleep Mode: 65% x 365 days/year x 24 hr/day = 5,694 hr/year

Equation 1: Total Energy Consumption Calculation

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

Where:

- *E_{TEC} is the Total Energy Consumption calculation in kWh;*
- *P_{ON} is Measured On Mode Power in watts; and*
- *P_{SLEEP} is Measured Sleep Mode Power in watts.*

- Example Calculation for a typical Monitor:

$$\begin{aligned} E_{TEC} &= 8.76 \times (0.35 \times 19\ W + 0.65 \times 0.3\ W) \\ &= 8.76 \times (6.65 + 0.195) \\ &= 60\ kWh/yr \end{aligned}$$

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Modal to TEC Conversion

- The resolution allowance is calculated as follows:
  - 2.0 W per Total Native Resolution (Megapixel) in On Mode
  - (2.0 W/MP x 3,066 hours)/1000 = 6.13 kWh/Megapixel

- The overall Maximum TEC equation was adjusted to recognize a similar percentage of models as the Draft 1 On Mode Criteria

Equation 2: Calculation of Monitor Maximum TEC (E_{TEC_MAX}) in kWh

$$E_{TEC\_MAX} = 6.13 \times r + 91 \times tanh(0.0016 \times [A - 59] + 0.085) + 9$$

Where:

- *r = Screen resolution in megapixels;*
- *A = Viewable screen area in in^2; and*
- *The result shall be rounded to the nearest tenth of a kWh for reporting.*

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TEC Minus Allowances

- For graphical representation, Monitor data are plotted as follows:

Calculated TEC – Resolution Allowance (6.13 kWh* MP) – Enhanced Performance Allowance – ABC and Sensor Incentives

- With the following limit applied:

Tanh Limit A = Screen Area
$91 \times tanh(0.0016 \times (A - 59) + 0.085) + 9$

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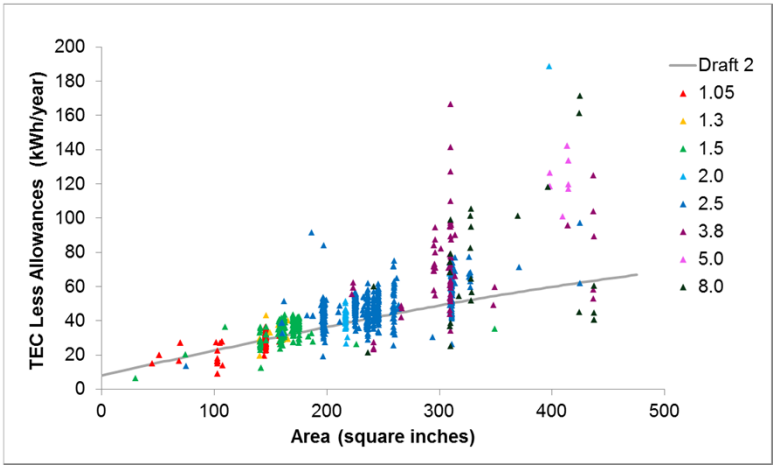
Draft 2 TEC Requirement



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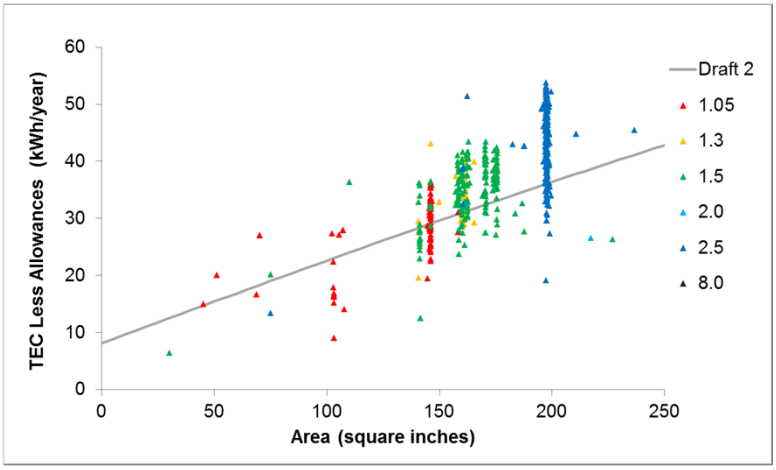
Draft 2 TEC Requirement (Less than 22")



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Draft 2 TEC Requirement

- Percentage of Monitors meeting the Total Energy Consumption requirement including allowances and incentives

Size (in)\Res (MP)	0.48-1.049	1.296	1.311-1.44	1.764	2.074	2.765-3.686	4.954	8.294	All
<14	25% (4)		50% (2)		100% (1)				43%
14 - 16	77% (13)							0% (1)	71%
16 - 19	37% (60)	50% (8)	57% (21)						43%
19 - 20	57% (7)	20% (35)	19% (105)	0% (1)	0% (3)				21%
20 - 22			9% (46)	100% (1)	12% (169)				12%
22 - 24				20% (30)	23% (218)	100% (3)		67% (3)	24%
24 - 26				0% (1)	23% (104)	17% (6)		0% (1)	22%
≥26				0% (2)	18% (117)	9% (57)	0% (8)	39% (23)	17%
All	44%	26%	21%	20%	19%	14%	0%	39%	22%

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Draft 2 Ac-Monitor Brand Partner Representation

Brand Partner Masked ID	# of Monitors Meeting Draft 2	Total Monitors	% Meeting
2	18	104	17%
1	30	101	30%
7	13	101	13%
56	15	82	18%
27	17	79	22%
32	21	77	27%
41	19	77	25%
46	11	67	16%
10	14	66	21%
49	14	63	22%
14	13	43	30%
40	3	30	10%
44	4	29	14%
9	5	28	18%
38	8	17	47%

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TEC Allowances and Incentives

- May only be applied once

Equation 3: Total Energy Consumption Requirement for Monitors

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

Where:

- E_{TEC} *is TEC in kWh calculated per Equation 1;*
- E_{TEC_MAX} *is the Maximum TEC requirement in kWh calculated per Equation 2;*
- E_{EP} *is the enhanced performance display allowance in kWh per Table 2;*
- E_{ABC} *is the Automatic Brightness Control allowance in kWh per Equation 5;*
- E_N *is the Full Network Connectivity allowance in kWh per Table 3;*
- E_{OS} *is the Occupancy Sensor allowance in kWh per Table 4; and*
- eff_{AC_DC} *is the standard adjustment for ac-dc power conversion losses that occur at the device powering the Display, and is 1.0 for Ac-powered Displays and 0.85 for displays with Standard dc; and The result shall be rounded to the nearest tenth of a kWh for reporting.*

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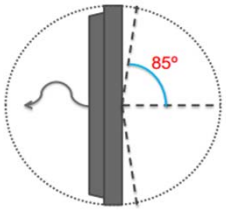
Version 6.0 Characteristics of Enhanced Performance Displays (EPDs)

Contrast ratio of at least 60:1 at horizontal viewing angles of at least 85 degrees + **Total Native Resolution greater than or equal to 2.3 megapixels (MP)** + **Color gamut of at least sRGB (IEC 61699 2 1)**



- In response to Draft 1, stakeholders commented that:
  - A majority of the market meets sRGB, so Adobe RGB should be the criterion
  - Models over 27 inches are typically higher-end, with better luminance and color performance
  - Draft 1 30% allowance is insufficient for AdobeRGB

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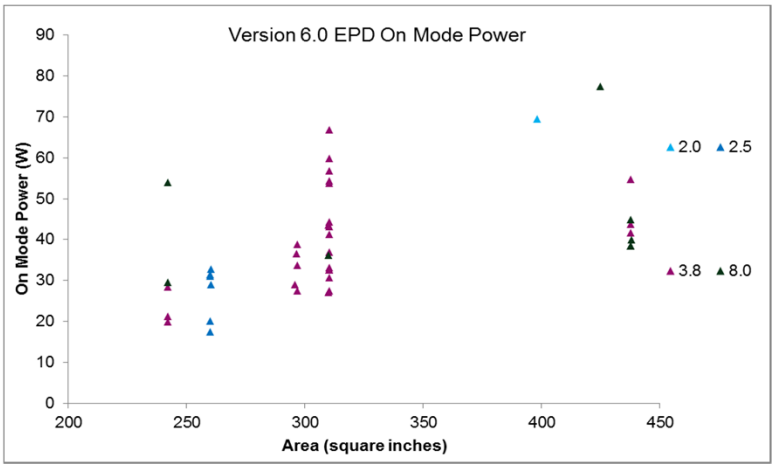
Enhanced Performance Displays



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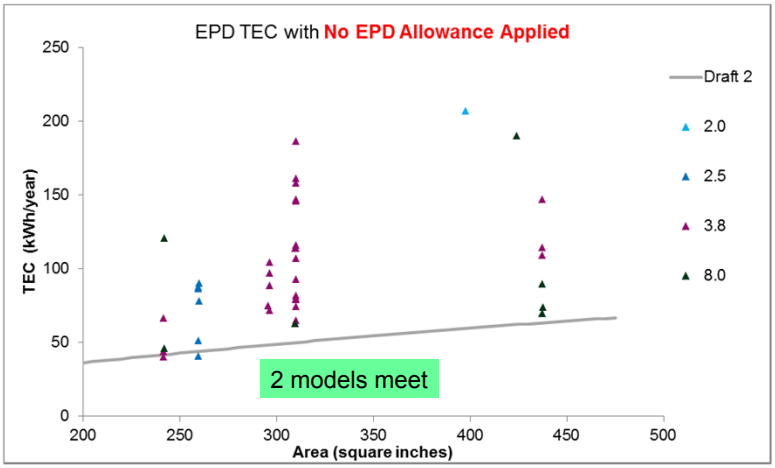
Enhanced Performance Displays



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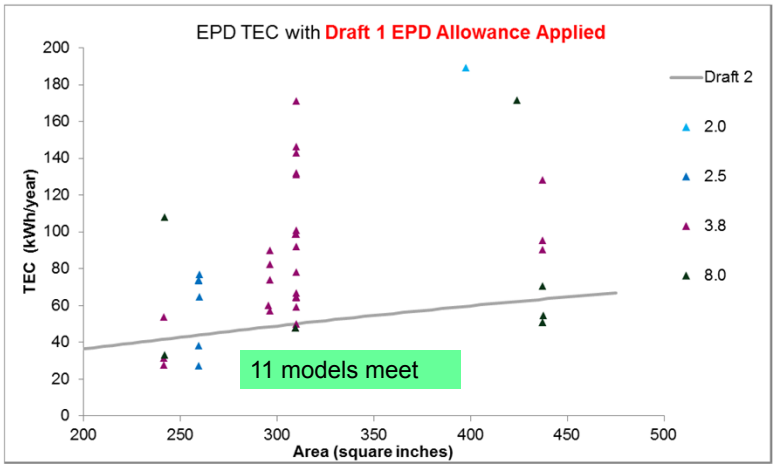
Enhanced Performance Displays



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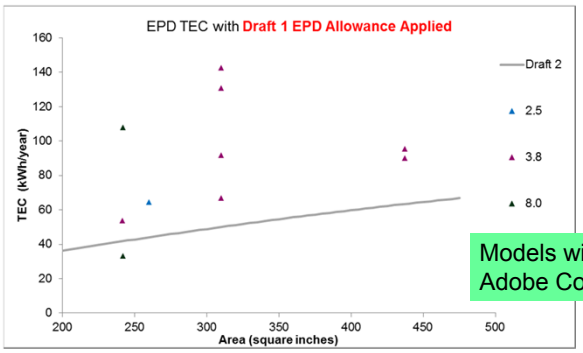
Enhanced Performance Displays

- EPA reviewed the dataset to identify models that offered color performance above 100% sRGB
  - Set a minimum of 96% of Adobe to create a higher performance bin (10 models based on Version 6.0 data)



Models with ≥96% Adobe Color Space

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Enhanced Performance Allowance

- In Draft 2, EPA is proposing a tiered allowance

Table 1: Calculation of Energy Allowance for Enhanced Performance Displays

Color Gamut Criteria	E_{EP} (kWh) *Where $E_{TEC\ MAX}$ is the Maximum TEC requirement in kWh.*
Color Gamut is sRGB or greater as defined by IEC 61966-2-1. Alternate color spaces are allowable as long as 99% or more of defined sRGB colors are supported.	$0.25 \times E_{TEC\_MAX}$
Color Gamut is 96% or greater of Adobe® RGB Version 2005-05.	$0.65 \times E_{TEC\_MAX}$

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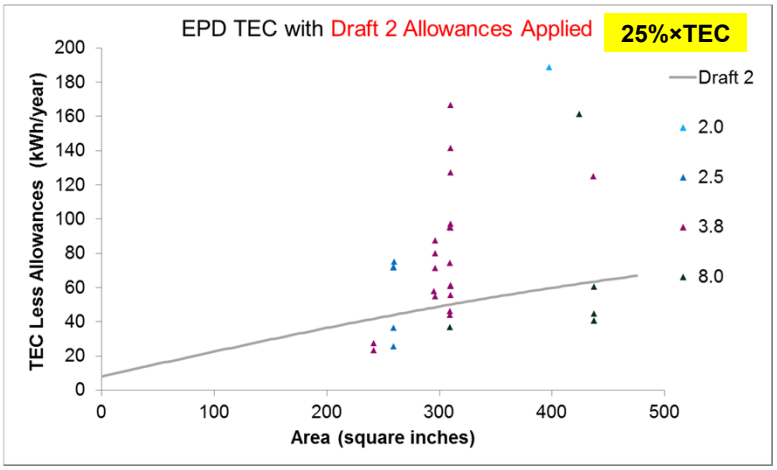
Enhanced Performance Allowance (≥99% sRGB)



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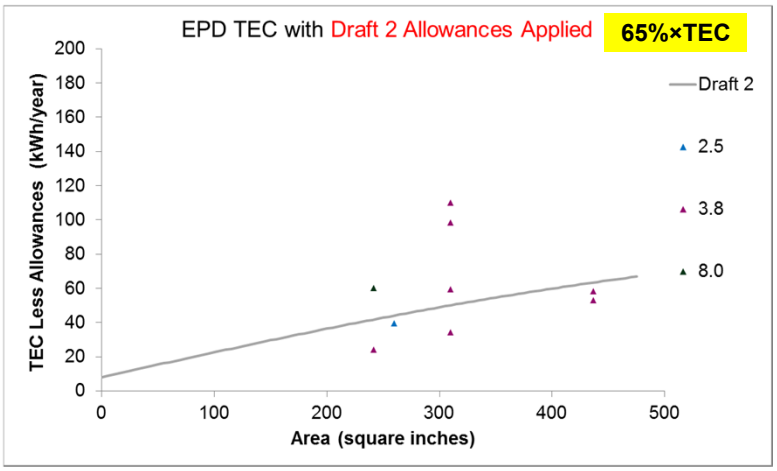
Enhanced Performance Allowance (≥96% Adobe)



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Draft 2 Enhanced Performance Passing

	≥ 99% sRGB				≥ 96% Adobe RGB				
Res (MP) / Size (in)	2.074	2.765-3.686	8.294	All	2.074	2.765-3.686	8.294	All	All EPD %
22 - 24		100% (2)		100%		100% (1)	50% (2)	67%	80% (4)
24 - 26	40% (5)			40%	100% (1)			100%	50% (3)
≥26		12% (17)	83% (6)	30%		50% (6)		50%	34% (10)
All	40%	21%	83%	37%	100%	57%	50%	60%	43% (17)

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Further Enhanced Performance Allowance Modifications

- To align the pass rate of EPDs with monitors as a whole, EPA is considering:
  - Reducing the allowances for ≥99%sRGB and especially 96% Adobe RGB
  - Excluding the resolution allowance before applying the EPD allowance:

$$E_{EP} = \begin{Bmatrix} 25\% \\ 65\% \end{Bmatrix} \times E_{TEC\_MAX}$$

$$= \begin{Bmatrix} 25\% \\ 65\% \end{Bmatrix} \times [6.13 \times r + 91 \times \tanh(0.0016 \times [A - 59] + 0.085) + 9]$$

$$E_{EP} = \begin{Bmatrix} 25\% \\ 65\% \end{Bmatrix} \times [91 \times \tanh(0.0016 \times [A - 59] + 0.085) + 9]$$

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Further Enhanced Performance Allowance Modifications

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

Equation 2: Calculation of Monitor Maximum TEC (E_{TEC_MAX}) in kWh

$$E_{TEC\_MAX} = 6.13 \times r + 91 \times \tanh(0.0016 \times [A - 59] + 0.085) + 9$$

Where:

- *r = Screen resolution in megapixels;*
- *A = Viewable screen area in in^2; and*
- *The result shall be rounded to the nearest tenth of a kWh for reporting.*

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

Equation 3: Total Energy Consumption Requirement for Monitors

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

Where:

- *E_{TEC} is TEC in kWh calculated per Equation 1;*
- *E_{TEC_MAX} is the Maximum TEC requirement in kWh calculated per Equation 2;*
- *E_{EP} is the enhanced performance display allowance in kWh per Table 2;*
- *E_{ABC} is the Automatic Brightness Control allowance in kWh per Equation 5;*
- *E_N is the Full Network Connectivity allowance in kWh per Table 3;*
- *E_{OS} is the Occupancy Sensor allowance in kWh per Table 4; and*
- *eff_{AC_DC} is the standard adjustment for ac-dc power conversion losses that occur at the device powering the Display, and is 1.0 for Ac-powered Displays and 0.85 for displays with Standard dc; and The result shall be rounded to the nearest tenth of a kWh for reporting.*

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Enhanced Performance Brand Representation

Brand Partner Masked ID	# of EPD Meeting Draft 2	Total EPD	% Meeting
10	4	8	50%
14	5	6	83%
32	1	5	20%
2	3	4	75%
46	3	4	75%
7	0	4	0%
9	0	3	0%
1	0	2	0%
6	0	2	0%
18	0	1	0%
49	0	1	0%
50	0	1	0%

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Enhanced Performance Questions

- Is there underreporting of models that meet EPD criteria in the Version 6.0 dataset? Many non-EPD models appear to meet ≥99% sRGB
- Is contrast ratio of 60:1 at 85° horizontal viewing angle still representative of high performance?
- Which delineation for Adobe performance is appropriate? 96%, 99%, 100%... other attributes to consider? What will be the post Adobe color space in common use?
- Should color or luminance uniformity be taken into consideration?
- Are there differences in enhanced performance features between models intended for home entertainment versus for professional image production? In other words, will there be EPD for the home/hobbyist market?

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Monitor ABC Incentive

- EPA is maintaining the Draft 1 ABC proposal

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

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

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.*

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

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

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.*

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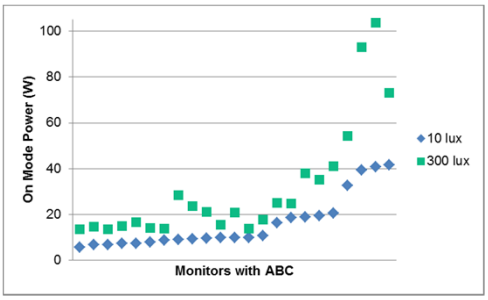
Monitor Ambient Light Conditions

- EPA seeks more data on the ambient light settings where Monitors typically operate
  - In particular: office and home conditions
- 23 ENERGY STAR certified models tested with ABC
  - 47% average difference between 300 lux and 10 lux



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Sleep Mode

- In Draft 1, EPA proposed the following Sleep Mode Allowance revisions:

Allowance Category	Type	Allowance (watts)
Bridging	~~USB 1.x~~	~~0.1~~
	~~USB 2.x~~	~~0.5~~
	~~USB 3.x, DisplayPort (non-video connection), Thunderbolt~~	~~0.7~~
Network	Wi-Fi	~~2~~ 0.5
	Fast Ethernet	~~0.2~~ 0.5
	Gigabit Ethernet	~~1.0~~ 0.5
Sensor	Occupancy Sensor	~~0.5~~ 0.3
Memory	~~Flash memory card/smart card readers, camera interfaces, PictBridge~~	~~0.2~~

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Connected Sleep Mode Data

- Existing data show bridging and network function are well below current V6 allowances
  - Small difference between connected and non-connected Sleep Mode measurements

Connection Type	Average of Measured Sleep Mode Power (W)	Average of Measured Non-Connected Sleep Mode Power (W)	Difference
DisplayPort	0.430	0.460	-0.030
Fast Ethernet	0.390	0.410	-0.020
Gigabit Ethernet	1.163	0.914	0.249
USB 2.x	0.344	0.256	0.088
USB 3.x	0.576	0.413	0.163
None	0.279	0.164	0.115
Other	0.281	0.190	0.091
ALL	**0.314**	**0.316**	**-0.002**

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Sleep Mode

- In Draft 2, EPA is proposing to only provide a TEC allowance for Full Network Connectivity if full network connectivity demonstrated using the test method
- The Draft 1 **0.5 W** allowance for Full Network Connectivity in Sleep Mode has been converted to **2.9 kWh/year** in the TEC allowance

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

E_N (kWh)
2.9

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Full Network Connectivity

- Version 6.0 data does not confirm whether the model supports Full Network Connectivity
  - The allowance was not used in the TEC pass rate analysis
- EPA is proposing allowance based on
  - Network-connected desktops and imaging equipment can Sleep with Wake-On-LAN below 2 W
  - Sep 2013 IEA 4E Standby Power Annex report "Power Requirements for Functions" notes the following power for requirements for efficient networking :

Ethernet link without Energy Efficient Ethernet	Idle Wi-Fi transceiver
0.373 to 0.583 W of ac power	0.036 to 0.250 W of ac power

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Ac-dc Loss Conversion Factors

- EPA is proposing a 85% efficiency conversion factor for dc-powered displays
  - Accounts for losses at the computer power supply and dc-dc conversions in the connected computer to permit a fair comparison with ac-powered Displays
  - Based on ENERGY STAR certified computer data
  - Applying On Mode efficiency conversion for TEC
- EPA did not receive significant comment on the Draft 1 proposal

Monitor Mode	Typical Computer Load	Factor
On Mode	30%	85%
Sleep Mode	6%	81%

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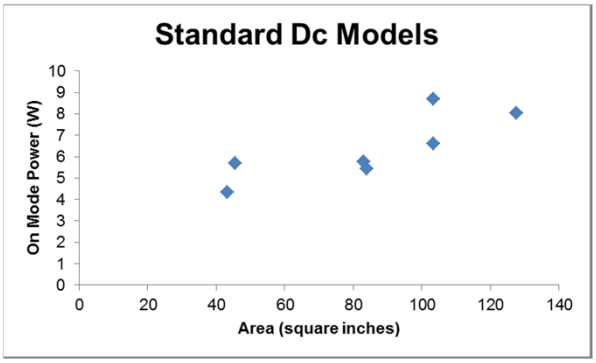
Standard dc Monitors

- Limited data – only seven V6 models tested with a USB hub with ac power losses subtracted



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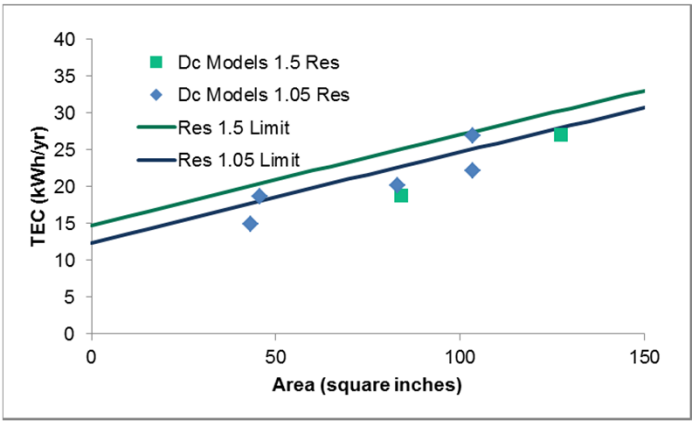
Standard dc Monitors

- 5 out of 7 Standard Dc models meet the Draft 2 TEC criteria



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Webinar Agenda

Time	Topic
11:00–11:15	Introduction & Test Method Update
11:15–11:45	Definitions, Scope, General Requirements
11:45–12:45	Monitors Total Energy Consumption
12:45–1:15	Signage Displays
1:15–2:00	Open Discussion, Next Steps

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Signage Displays

- There are 157 signage models from 19 manufacturers

Total Signage Models					
Bins	**Maximum Tested Luminance**				
Size (inches)	**<400**	**400-600**	**600-800**	**>800**	**All**
30-40	14	3	1	0	**18**
40-50	31	36	14	2	**83**
50-60	22	21	13	0	**56**
All	**67**	**60**	**28**	**2**	**157**

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Power Factor for Signage

- EPA is proposing a power factor requirement of 0.7 in On Mode for Signage Displays
  - Signage Displays are typically installed in commercial buildings with longer wiring runs
  - Signage Displays draw higher current than Monitors
  - Many Signage Displays are capable of meeting the requirement

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

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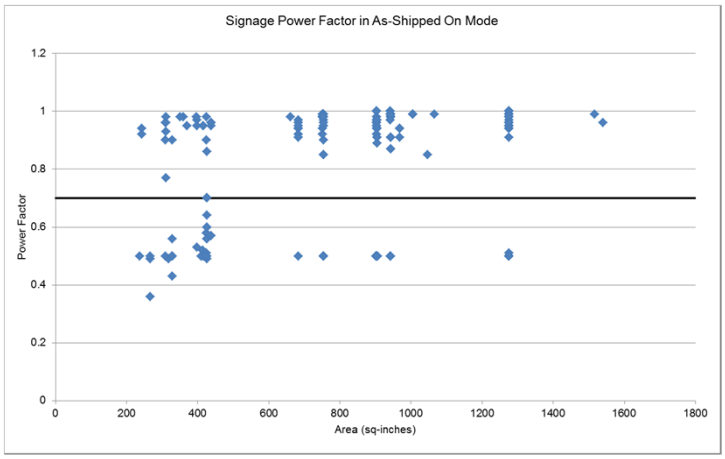
Power Factor for Signage



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Signage Displays

- EPA is maintaining the Draft 1 Signage On Mode Requirements for Draft 2
  - Correction made to the luminance allowance calculation
  - Stakeholders generally expressed support for the tanh and the level set in Draft 1

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

$$P_{ON\_MAX} = (7.5 \times 10^{-5} \times \ell \times A) + 82 \times tanh(0.001 \times (A - 200.0) + 0.1) + 6.0$$

Where:

- *A = Screen Area in square inches; and*
- *ℓ = Maximum Measured Luminance of the display in candelas per square meter, as measured in Section 6.2 of the test method.*

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Signage Displays Luminance

- EPA corrected the luminance power allowance in watts to the following calculation:

$$(7.5 \times 10^{-5} \times \ell \times A)$$

  - Luminance is **Maximum Measured Luminance** of the display in **candelas per square meter**, as measured in Section 6.2 of the test method
  - Area is **Screen Area** in **square inches**
  - Uses only **measured** values as reported per the test method – the **7.5 x 10^{-5} factor** takes into the **inches to meters** conversion

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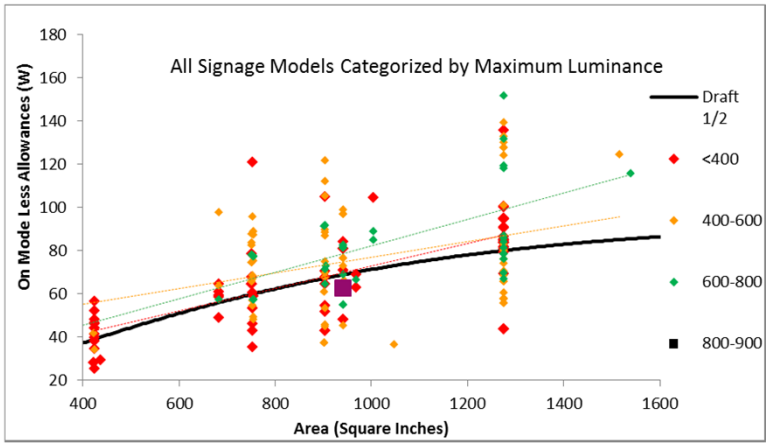
Signage Displays



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Signage Displays Meeting 0.7 Power Factor and On Mode Requirements

% Signage Meeting Draft 1 & 2					
Bins	Maximum Tested Luminance				
Size (inches)	<400	400-600	600-800	>800	All
30-40	0%	33%	0%		6%
40-50	32%	25%	43%	0%	30%
50-60	14%	29%	31%		23%
All	19%	27%	36%	0%	25%

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Signage Displays Meeting 0.7 Power Factor and On Mode Requirements

Brand Partner Masked ID	# Signage Meeting Draft 2 On Mode	# Total Signage	% Meeting
1	16	69	23%
27	11	38	29%
7	13	22	59%
14	4	12	33%
49	9	11	82%
9	10	10	100%
43	5	7	71%
23	0	4	0%
41	3	4	75%
10	3	3	100%
12	1	3	33%
15	3	3	100%
25	1	3	33%
5	3	3	100%
46	2	2	100%
22	0	1	0%
31	0	1	0%
32	1	1	100%
45	0	1	0%

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Signage Displays ABC

- EPA is proposing the same 5% Automatic Brightness Control incentive for both Monitors and Signage Displays

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

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

Where:

- P_{ABC} *is the Measured On Mode Power allowance for ABC in watts; and*
- P_{ON_MAX} *is the Maximum On Mode Power requirement in watts.*

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Signage Displays ABC

- To verify performance, EPA is proposing Signage with ABC be tested at the same ambient light levels (300 lux and 12 lux) as Monitors and demonstrate ≥ 20% difference in On Mode Power
  - Lack of data and feedback to date to support alternative levels
  - An ABC sensor should theoretically still perform in a similar manner at 12 and 300 lux despite intended operation in brighter or wider range of ambient light conditions
  - Seven V6 Signage models reported with ABC but not enabled

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

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

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.*

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Signage Displays Sleep Mode

- EPA is maintaining the Draft 1 Signage Sleep Mode Requirements with a Full Network Connectivity and Occupancy Sensor allowances
  - Stakeholders did not provide significant comment on the levels

Equation 9: Sleep Mode Power Requirement for Signage Displays

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

P_{SLEEP_MAX}	0.5 W
P_N	0.5 W
P_{OS}	0.3 W

Where:

- P_{SLEEP} *is Measured Sleep Mode Power in watts;*
- P_{SLEEP_MAX} *is the Maximum Sleep Mode Power requirement in watts per Table 4;*
- *PN is the Full Network Connectivity allowance in watts per Table 5;*
- *POS is the Occupancy Sensor allowance in watts per Table 6; and*
- *The result shall be rounded to the nearest tenth of a watt for reporting.*

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Webinar Agenda

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11:00–11:15	Introduction & Test Method Update
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Open Discussion

- DOE and EPA would now like to open up the line for any general comments from stakeholders.

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Written Comments

- In addition to making verbal comments during today's call, stakeholders are encouraged to submit written comments to displays@energystar.gov.

Comment Deadline
Friday, May 22, 2015

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Specification Development Timeline

- EPA is proposing the following Version 7.0 specification development timeline:

Event	Date
May 22, 2015	Draft 2 Comments Due
June 2015	Final Draft
July 2015	Final Specification
Quarter 1, 2016	Version 7.0 Effective

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Contact Information

Please send any additional comments to displays@energystar.gov.

For questions regarding the specification, you may contact Verena Radulovic at Radulovic.Verena@epa.gov or (202) 343-9845.

For questions regarding the test procedures, you may contact Jeremy Dommu at Jeremy.Dommu@ee.doe.gov or (202) 586-9870.

Thank you for participating!

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