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ENERGY STAR®
Version 7.0 Draft 1 Displays Stakeholder Webinar

December 11, 2014

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 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: 456417#

  - 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
12:00–12:15	Introduction
12:15–12:45	Draft 2 Test Method
12:45–1:15	Definitions, Scope, General Requirements
1:15–1:30	Signage: Luminance & Viewing Environments
1:30–2:15	On Mode & Sleep Mode Requirements
2:15–2:45	Total Energy Consumption Proposal
2:45–3:00	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
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The ENERGY STAR Brand

- ENERGY STAR is an influential brand recognized by over 85% of Americans.
- Consumers prefer ENERGY STAR consumer electronics:
  - 64% of adults look for energy-efficient electronics when shopping.
  - 69% of consumers consider the environment when making purchasing decisions.
  - 71% of consumers are likely to recommend ENERGY STAR certified products to a friend.
- There is no sacrifice in quality or performance with ENERGY STAR

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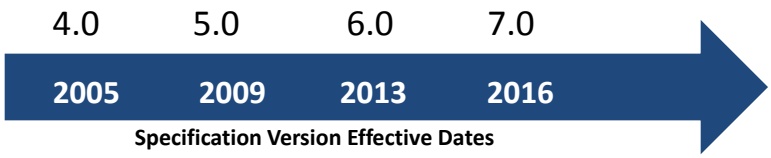
ENERGY STAR Displays Overview

- 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**



Specification Version Effective Dates

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Version 6.0 Displays Today

1299 Version 6.0 certified models

- Represent majority of monitors on the market today
- Represent a significant portion of signage displays under 60”

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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
- **Today, December 11: Overview of Draft 1 Specification and Draft 2 Test Method**

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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, January 16, 2014

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Test Method

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Updates from Version 6.0

- 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 in Draft 2
  - New test for Full Network Connectivity
  - Clarifications based on stakeholder feedback from Draft 1

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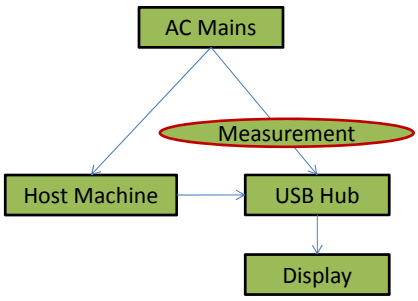
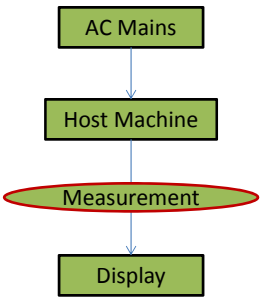
Version 7.0 Goals

- Measure DC-powered Displays directly between Display and Host Machine

Version 6.0



Version 7.0 Draft 2



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Testing USB Displays

- DOE performed testing to evaluate repeatable test setup options
- Tested 4 USB Displays in varying configurations:
  - Cable splice to interface with standard power meter
  - Direct USB power meters

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Comparison of DC Testing

Version 6.0	Version 7.0 Draft 2
Display powered by **USB hub**	Display powered by **Host Machine**
AC power measured	**DC power** measured
No custom cables necessary	May require a **spliced USB cable** to connect to power meter
Includes **USB hub** losses	**Direct measurement** of power used by Display

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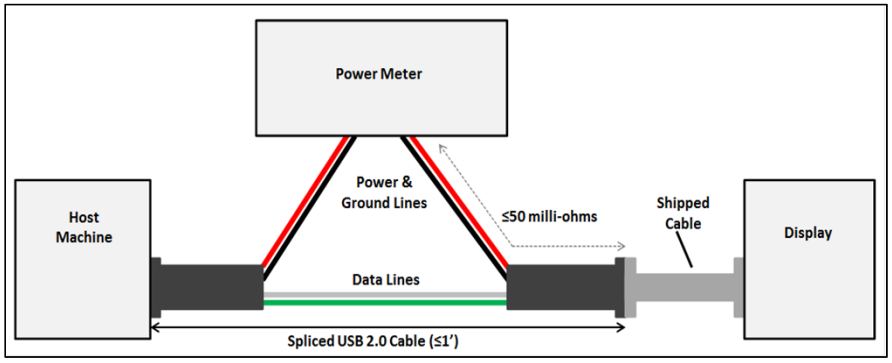
Version 7.0 Configuration

- Example of a spliced cable from Test Method



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Full Network Connectivity

- New test to detect Full Network Connectivity in Draft 2 Test Method
  - Corresponds to the new definition and energy allowance in the Draft 1 Specification
- Consistent with Draft 2 TVs Specification
  - References CEA-2037-A with additional guidance for Displays

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Speaker Volume

- Received question from lab about PC and speaker volume settings during testing
- IEC clip does have audio, so volume can impact measurement results for monitors with speakers
- Propose to disable audio on the PC/Host-machine, but leave the monitor speaker volume settings as-shipped

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Display Orientation

- Received question from lab on how to define vertical resolution if a Display is rotatable
- Propose to clarify that rotatable Displays should be tested in a horizontal orientation to be consistent between Displays

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Illuminance Level

- Received question from lab asking whether to use 12 or 10 lux illuminance for ABC testing
- Version 7.0 Draft 1 Specification requires a measurement at 12 lux, but Draft 2 Test Method specifies testing at 10 lux
- Propose to update this illuminance level to 12 lux in Test Method to be consistent with Specification

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Section	Change
All	Clarified requirements for using VESA static signals
3	Added definition for “Host Machine”
6.2.B)	Clarified usage of luminance meter
6.3.A)	Clarified Display luminance requirements
6.3.B)	Consolidated IEC procedure reference
6.5.A)	Clarified Sleep Mode test setup

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Section	Change
4.B)	Clarified testing of products powered by external power supply
4.C.3)	Included language for dc-powered Displays not shipped with power cable
4.C.4)	Added Clarification on cable resistance measurements
6.I)	Clarified requirements for luminance and illuminance meters

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Questions?

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Product Types

- EPA proposes revised definitions for **Monitors** and **Signage Displays** based on pixel density
  - Quantitative metric eliminates ambiguity
  - Does this demarcation align with the typical viewing environment for most products?
  - No definition for Digital Picture Frames (no models under V6), though not explicitly excluded from scope

Product Type	Monitor	Signage Display
Pixel Density *quantitative metric requirement*	>5,000 pixels/in^2	≤5,000 pixels/in^2
Viewing Environment *intended to describe the typical product but may not necessarily apply to all products*	desk-based environment, to be viewed primarily by one person	non-desk-based environment to be viewed primarily by multiple people

Full Network Connectivity

- EPA proposes the following definition for IP network functionality confirmed by the Test Method
  - Consistent with the TV, computer, and telephony ENERGY STAR specifications

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

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

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Touch Technology

- EPA proposes the following definition for touch functionality:

Touch Technology: Enables the user to interact with a product by touching areas on a screen or other surface.

  - Should definition be limited to the viewable Screen Area or inclusive of the bezel or accessories?
  - Should functionality be further specified (multi vs single touch)?

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Internal Processor

- EPA proposes a definition for processing capability
  - Intended to clarify scope of included products
  - Aims to exclude products that meet the definition of Computer (Thin Client and Integrated Desktop)
  - Applies to Product Family definition – do similar products of common design ship with varying processing capability or components?
  - Relates to Touch Technology capability

5) Internal Processor: An internal device that provides one or more of the specific 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.

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Product Family

- EPA proposes a more specific definition
  - Models within a Product Family would share a similar screen technology but could vary in other characteristics that do not have a large impact on the primary function

Product Family: A group of product models that are (1) made by the same manufacturer, (2) share the same Screen Area, Resolution, and Maximum Reported Luminance, and (3) of a common basic screen design. Models within a Product Family may differ from each other according to one or more characteristics or features. For Displays, acceptable variations within a Product Family include:
1) Color,
2) Housing;
3) Number and types of interfaces;
4) Number and types of data, network, or peripheral ports; and
5) Processing and memory capability.

Standard dc

- EPA is proposing a definition for dc-powered products to clarify the types of products included in scope

Standard dc: A method for transmitting dc power defined by a well-known technology standard, enabling plug-and-play interoperability, and available from multiple manufacturers.

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

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Scope: Included Products

- EPA proposed the following updates:

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

I. Monitors;
II. Monitors with keyboard, video, and mouse (KVM) switch functionality;
III. Signage Displays; and
IV. Signage Displays with Internal Processors.

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Scope: Excluded Products

2.2.2 The following products are not eligible for qualification under this specification:
~~i. Products with a viewable diagonal screen size greater than 61 inches;~~
i. Products with an integrated television tuner;
~~iii. Products that are marketed and sold as televisions, including products with a computer input port (e.g., VGA) that are marketed and sold primarily as televisions;~~
~~iv. Products that are component televisions.~~
~~v. Dual-function televisions / computer monitors that are marketed and sold as such;~~
~~vi. Mobile computing and communication devices (e.g., tablet computers, slates, electronic readers, smartphones);~~
ii. Displays designed to operate primarily with integrated or replaceable batteries without the support of ac mains or external dc power (e.g., electronic readers, some digital picture frames); and
iii. Products that must meet FDA specifications for medical devices that prohibit power management capabilities and/or do not have a power state meeting the definition of Sleep Mode.
viii. ~~Thin clients, ultra-thin clients, or zero clients.~~

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Scope: Products > 61 inches

- EPA is proposing to lift the limit on product size
  - Intended to include a range of Signage products
  - Allows for consistent marketing of ENERGY STAR across similar products (i.e. 50", 60", and 70")
  - Range of Signage products currently ENERGY STAR certified from 30" to 60"

Size	Models
30" - 40"	28
40" - 50"	72
50" - 60"	52
Total	**152**

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EPS Requirements

- EPA updated the requirements to be consistent with Federal energy conservation standards that take effect on February 10, 2016.

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

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

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Signage Environment

- EPA is requesting feedback on the typical illuminance of viewing environments for Signage Displays
  - Indoor: conference rooms, airports, retail, classrooms, hospitality, others?
  - Outdoor: conditions, time of day
  - Indoor/Outdoor Models: How large of a range?
- Data are needed to support development of appropriate ABC calculation and incentive
  - How prevalent is Automatic Brightness Control?

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Signage Power Management

- EPA is interested in understanding the existing power management features of Signage including:
  - Auto Power Down
  - Network initiated sleep
  - Timers
  - Occupancy Sensing

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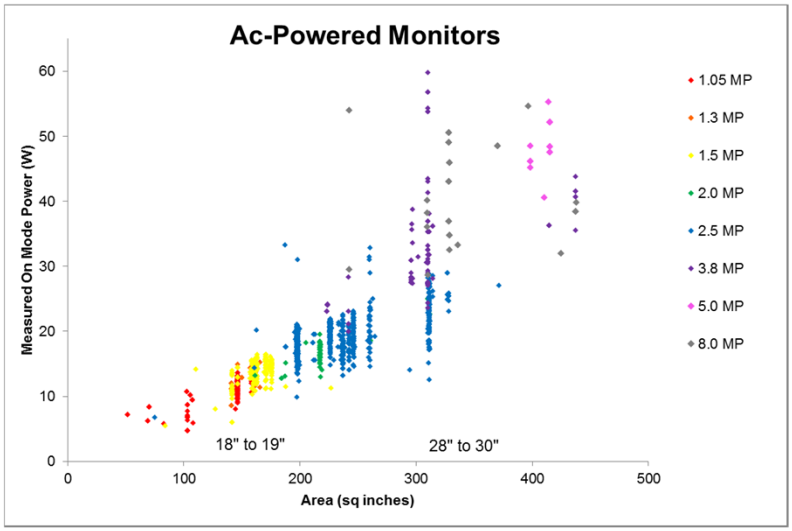

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Version 6.0 Max On Mode

- Linear segments with Resolution and Area variables categorized by pixel density and diagonal screen size

Table 1: Calculation of Maximum On Mode Power Requirements (P_{ON_MAX})

Product Type and Diagonal Screen Size, *d* (in inches)	P_{ON_MAX} where $D_p \leq 20{,}000$ pixels/in^2 (in watts) *Where:* ▪ *r = Screen resolution in megapixels* ▪ *A = Viewable screen area in in^2* ▪ *The result shall be rounded to the nearest tenth of a watt*	P_{ON_MAX} where $D_p > 20{,}000$ pixels/in^2 (in watts) *Where:* ▪ *r = Screen resolution in megapixels* ▪ *A = Viewable screen area in in^2* ▪ *The result shall be rounded to the nearest tenth of a watt*
$d < 12.0$	$(6.0 \times r) + (0.05 \times A) + 3.0$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.05 \times A) + 3.0)$
$12.0 \leq d < 17.0$	$(6.0 \times r) + (0.01 \times A) + 5.5$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.01 \times A) + 5.5)$
$17.0 \leq d < 23.0$	$(6.0 \times r) + (0.025 \times A) + 3.7$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.025 \times A) + 3.7)$
$23.0 \leq d < 25.0$	$(6.0 \times r) + (0.06 \times A) - 4.0$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.06 \times A) - 4.0)$
$25.0 \leq d \leq 61.0$	$(6.0 \times r) + (0.1 \times A) - 14.5$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.1 \times A) - 14.5)$
$30.0 \leq d \leq 61.0$ *(for products meeting the definition of a Signage Display only)*	$(0.27 \times A) + 8.0$	$(0.27 \times A) + 8.0$

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Monitors: Version 7.0 Proposed On Mode Equation

- For Version 7.0, EPA is proposing a single asymptotic On Mode Power requirement line
  - 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

Product Type	P_{ON} Max (watts) Where: A = Viewable screen area in in^2 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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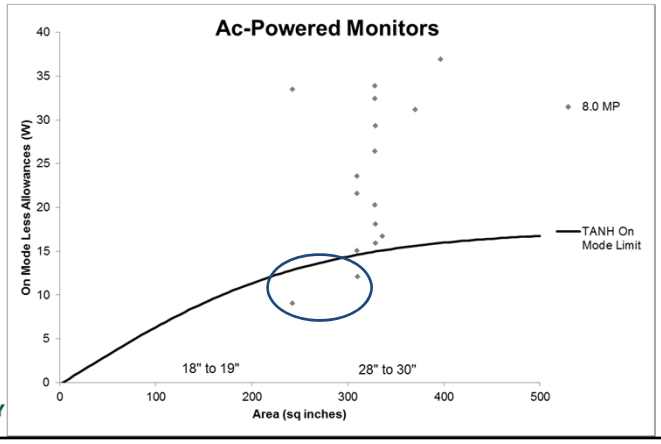
Monitors: Pixel Density

- EPA has eliminated separate criteria for Monitors with pixel density greater than 20,000 pixels/in^2
  - Simplifies the requirements while capturing efficient models
  - Models over 20,000 pixels/in^2 can meet the proposed criteria



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Monitors: Resolution

- Under V6, Monitors received 6 watts per megapixel
- Regression analysis indicates 3 watts per megapixel is the best fit of current dataset

Regression Analysis of All Monitors

Variable	Coefficient
Screen Area (sq in)	0.06
Total Native Resolution (MP)	3.07
Intercept	-1.19

- **EPA has proposed a resolution allowance of 2 watts per megapixel** under Draft 1 to capture the most energy efficient models and account for the additional allowance given for models meeting enhanced performance criteria

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Characteristics of Enhanced Performance Displays (EPDs)

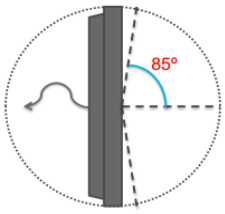
Contrast ratio of at least 60:1 at horizontal viewing angles of at least 85 degrees

+

Total Native Resolution greater than or equal to 2.3 megapixels (MP)

+

Color gamut of at least sRGB (IEC 61699 2-1)



- In Draft 1, EPA has maintained the characteristics of EPDs from V6
  - 60% of non-EPD monitors ≤2.3 MP report color gamut of at least sRGB
  - Is contrast ratio still a key distinguishing factor for EPDs?
  - Do characteristics of enhanced performance displays need updating?

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Enhanced Performance Allowance

- In Version 7, EPA is proposing a single allowance of 30% for all screen sizes
  - Color technologies such as quantum dots improve efficiency over standard models
  - Many models were able to meet the V6 criteria with a wide margin

Equation 2: Calculation of On Mode Power Allowance for Enhanced Performance Displays

$$P_{EP} = 0.30 \times P_{ON\_MAX}$$

Where:

- P_{EP} *is the On Mode power allowance in watts for an enhanced performance Display;*
- P_{ON_MAX} *is the Maximum On Mode Power requirement in watts; and*
- P_{ABC} *is the On Mode power allowance for ABC in watts.*

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ABC Allowance

- Power reduction between 300 lux and 12 lux must be at least 20%
  - EPA proposes reducing the allowance from 10% to 5% given that office ambient light conditions do not vary at a significantly wide range

Equation 3: Calculation of On Mode Power Reduction for Monitors 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 measured On Mode power in watts when tested with an ambient light level of 300 lux; and*
- P_{12} *is the measured On Mode power in watts when tested with an ambient light level of 12 lux.*

Equation 4: Calculation of On Mode Power Allowance for Monitors 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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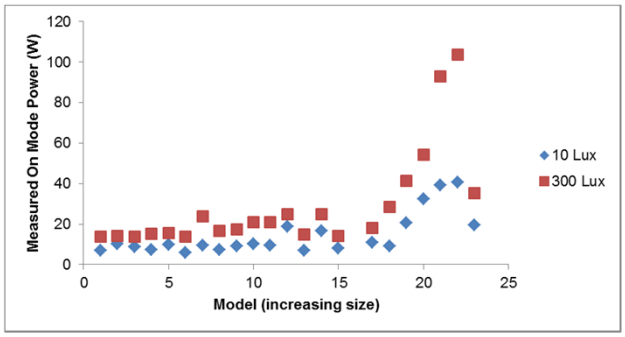
Version 6 ABC Data

- 24 ENERGY STAR certified models tested with ABC
- 47% average difference between 300 lux and 10 lux



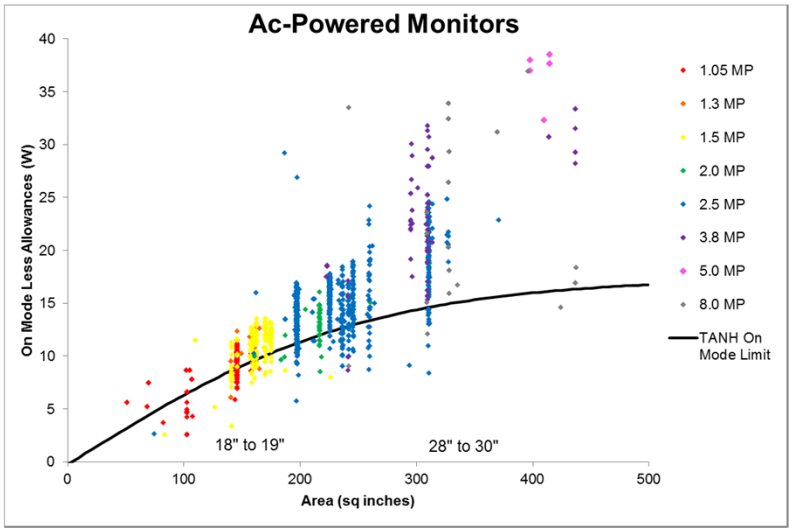
On Mode Minus Allowances

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

Measured On Mode Power at 200 nits – Resolution Allowance (2.0 W * Total MP) – Enhanced Performance Allowance (0.3 * P_{ONMAX}) – ABC Allowance (0.05 * P_{ONMAX})

- With the following limit applied:

Tanh Limit A = Screen Area
$17.1 \times tanh(0.0040 \times (A - 63.0) + 0.3$



Monitors in the EPA Dataset

- Categorized by Size and Total Resolution

Bins	Total Resolution (Megapixels)								
Size (inches)	0.48-1.049	1.296	1.311-1.44	1.764	2.074	2.765-3.686	4.954	8.294	All
<14	3				1				4
14 - 16	15	0	1						16
16 - 19	56	8	20						84
19 - 20	6	33	100	3	2				144
20 - 22			41	3	158				202
22 - 24				29	198	4		2	233
24 - 26				1	91	3		1	96
≥26		0		2	105	49	8	19	183
All	77	41	162	38	554	56	8	22	962

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Monitor Pass Rate

- Monitors from 28 Partners meet the proposed criteria

Bins	Total Resolution (Megapixels)								
Diagonal Screen Size (inches)	0.48-1.049	1.296	1.311-1.44	1.764	2.074	2.765-3.686	4.954	8.294	All
<14	0%				100%				25%
14 - 16	67%		100%						69%
16 - 19	36%	38%	55%						40%
19 - 20	50%	18%	17%	33%	0%				19%
20 - 22			7%	67%	14%				13%
22 - 24				24%	20%	50%		50%	21%
24 - 26				0%	16%	0%		0%	16%
≥26				0%	14%	0%	0%	11%	9%
All	43%	22%	20%	26%	17%	4%	0%	14%	19%

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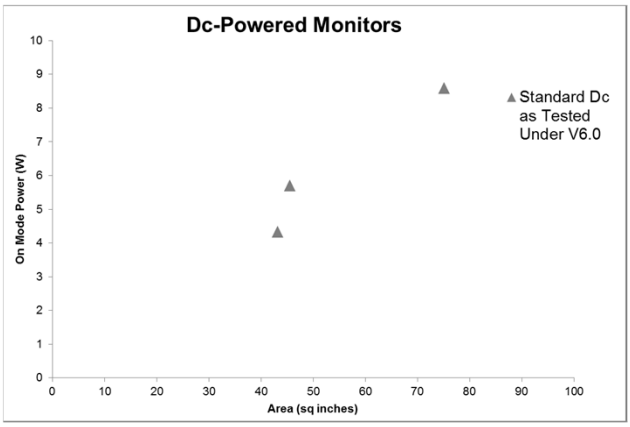
Standard dc Monitors

- Limited data – only 3 V6 models tested with a USB hub with ac power losses subtracted



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Ac-dc Loss Conversion Factors

- With the new direct dc test measurements, EPA proposes the following conversion factors for Standard dc Max Power requirements:
  - 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

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

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Signage: On Mode Limit

- Since Signage Displays ship at varying luminance but all have similar resolution, EPA is proposing a luminance allowance of 75.0 W per megacandela of total luminance
  - Similar to Monitors, a tanh limit is proposed capping the maximum power at larger screen sizes

Product Type	P_{ON} Max (watts) Where: A = Viewable screen area in in^2 l = Total luminance of display in megacandelas calculated as As-Shipped Luminance multiplied by Area The result shall be rounded to the nearest tenth of a watt
Signage	$(75.0 \times l) + 82.0 \times tanh(0.0010 \times (A - 200.0) + 0.1$

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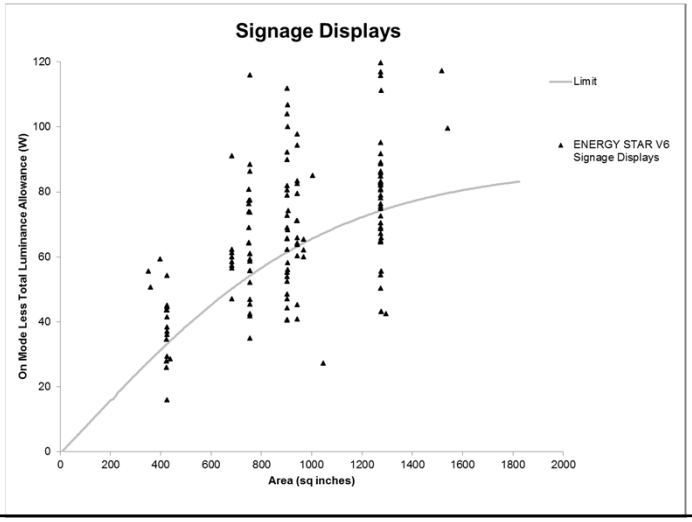
Signage: On Mode Limit



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Signage: Pass Rate

- Models from 13 Partners meet the proposed criteria

	Total Signage Models						
	As-Shipped Luminance (nits)						
Diagonal	**100**	**200**	**300**	**400**	**500**	**600**	**Total**
30" - 40"	1	11	7	1	0	0	**20**
40" - 50"	2	21	21	20	14	2	**80**
50 - 60"	2	8	21	8	9	4	**52**
All	**5**	**40**	**49**	**29**	**23**	**6**	**152**

	Pass Rate						
	As-Shipped Luminance (nits)						
Diagonal	**100**	**200**	**300**	**400**	**500**	**600**	**All**
30" - 40"	100%	45%	0%	0%			**30%**
40" - 50"	100%	38%	14%	25%	14%	50%	**26%**
50 - 60"	50%	50%	14%	25%	11%	25%	**23%**
All	**80%**	**43%**	**12%**	**24%**	**13%**	**33%**	**26%**

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Sleep Mode Limit

- EPA is proposing to maintain the V6 base Sleep Mode power limit

Table 2: Maximum Sleep Mode Power Requirement (P_{SLEEP_MAX})

P_{SLEEP_MAX} (watts)
0.5

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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 Allowances

- EPA proposes 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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Full Network Connectivity

- EPA is proposing a **0.5 W allowance for Full Network Connectivity**
  - Network-connected desktops and imaging equipment can Sleep with Wake-On-LAN below 2 W
  - From Sept 2013 IEA 4E Standby Power Annex report "Power Requirements for Functions" indicate efficient networking technology:

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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Webinar Agenda

Time	Topic
12:00–12:15	Introduction
12:15–12:45	Draft 2 Test Method
12:45–1:15	Definitions, Scope, General Requirements
1:15–1:30	Signage: Luminance & Viewing Environments
1:30–2:15	On Mode & Sleep Mode Requirements
2:15–2:45	Total Energy Consumption Proposal
2:45–3:00	Open Discussion, Next Steps

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Total Energy Consumption (TEC) Overview

- As new features and functionality come into the market and are enabled during Sleep Mode, a TEC approach can allow 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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TEC Going Forward

- At this time, EPA is only considering a TEC approach for Monitors, not Signage displays, given the lack of available data for typical duty cycles for signage displays
- EPA hopes to move forward with a TEC approach and further analysis in Draft 2, pending stakeholder comments

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Modal Assumptions

- Based on Computer modal assumptions – Monitor On Mode corresponds to Computer Short Idle
  - **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).

Table 3: Mode Weightings for Desktop, Thin Clients, and Integrated Desktop Computers

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

- EPA converted the proposed ENERGY STAR Version 7.0 specification modal power limits to a Total Energy Consumption requirement by multiplying the applicable On Mode and Sleep Mode requirements as follows:
  - On Mode: 35% x 365 days x 24 hr/day = 3,066 hours
  - Sleep Mode: 65% x 365 days x 24 hr/day = 5,694 hours

$E_{TEC\ MAX}$ (kWh)
Where: A = Viewable screen area in in^2 r = Screen resolution in megapixels The result shall be rounded to the nearest tenth of a kWh for reporting
$(6.13 \times r) + 52.4 \times tanh(0.004 \times (A - 63) + 0.22) + 3.77$

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TEC Limit and Allowances

- EPA is proposing similar allowances under TEC at this time

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 per Equation 1.

Equation 1: Total Energy Consumption Requirement for Monitors

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

Where:

- *E_{TEC} is Calculated TEC in kWh;*
- *E_{TEC_MAX} is the Maximum TEC requirement in kWh;*
- *E_{EP} is the enhanced performance display allowance in kWh per Equation 2;*
- *E_N is the Full Network Connectivity allowance in kWh specified in Table 2;*
- *E_T is the Touch Functionality allowance in kWh specified in Table 3;*
- *E_{OS} is the Occupancy Sensor allowance in kWh specified in Table -3;*
- *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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TEC Examples

- Below are the proposed TEC criteria applied to hypothetical examples

Model	Diagonal Screen Size (in)	Measured On Mode, P_{ON} (W)	Measured Sleep Mode, P_{SLEEP} (W)	TEC Calc, E_{TEC} (kWh)	Max TEC , E_{TEC_MAX} (kWh)	Applicable Allowances (kWh)	TEC Req. (kWh)
A	14.0	5.8	0.4	20.1	25.5	*None*	20.1 ≤ 25.5
B	17.0	10.9	0.2	34.3	37.4	*None*	34.3 ≤ 37.4
C	23.8	16.7	0.2	52.3	55.0	*None*	52.3 ≤ 55.0
D	23.8	21.1	0.3	66.1	64.8	$E_{EP=}$ 0.3*64.8	66.1 ≤ (64.4+19.5)
E	32.0	38.4	0.4	120.0	103.8	$E_{EP=}$ 0.3*103.8	120.0 ≤ (103.8+31.1)

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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, January 16, 2014

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Specification Development Timeline

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

Event	Date
January 16, 2014	Draft 1 Comments Due
Quarter 1, 2015	Draft 2 Released
Summer 2015	Final Specification Published
Quarter 2, 2016	Version 7.0 Effective

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Contact Information

Please send any additional comments to displays@energystar.gov or contact:

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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www.energystar.gov/productdevelopment