

A horizontal collage of six images: a group of diverse people smiling, a field of red poppies, a construction worker on a roof, a hand holding a yellow maple leaf, a woman hugging a young boy, and two men in suits standing in front of a building.

# ENERGY STAR Displays Version 6.0 Kickoff Webinar

February 24, 2011

Christopher Kent  
Verena Radulovic

US Environmental Protection Agency  
ENERGY STAR Program



# Agenda



- Introductions
- Status of current Version 5.1 ENERGY STAR Displays specification
- Review of December 2010 Discussion Guide topics
  - Scope
  - Novel products and technologies
  - GHG emissions
- Next Steps

# ENERGY STAR



- ENERGY STAR is the government-backed national symbol for energy efficiency
  - Started in 1992
  - Identifies products in almost 60 categories that use less energy without sacrificing quality or performance
- For office equipment, specifications (new and revised) are developed jointly between the US EPA and European Commission
- GOAL: Reduce greenhouse gas emissions through large win-win-win opportunities with today's energy efficient technologies and practices



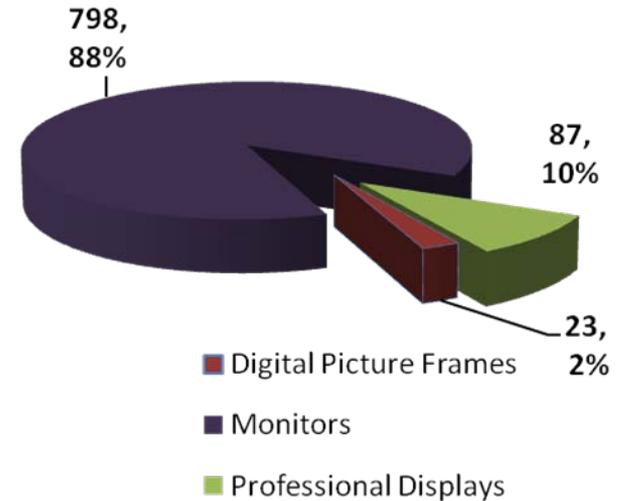
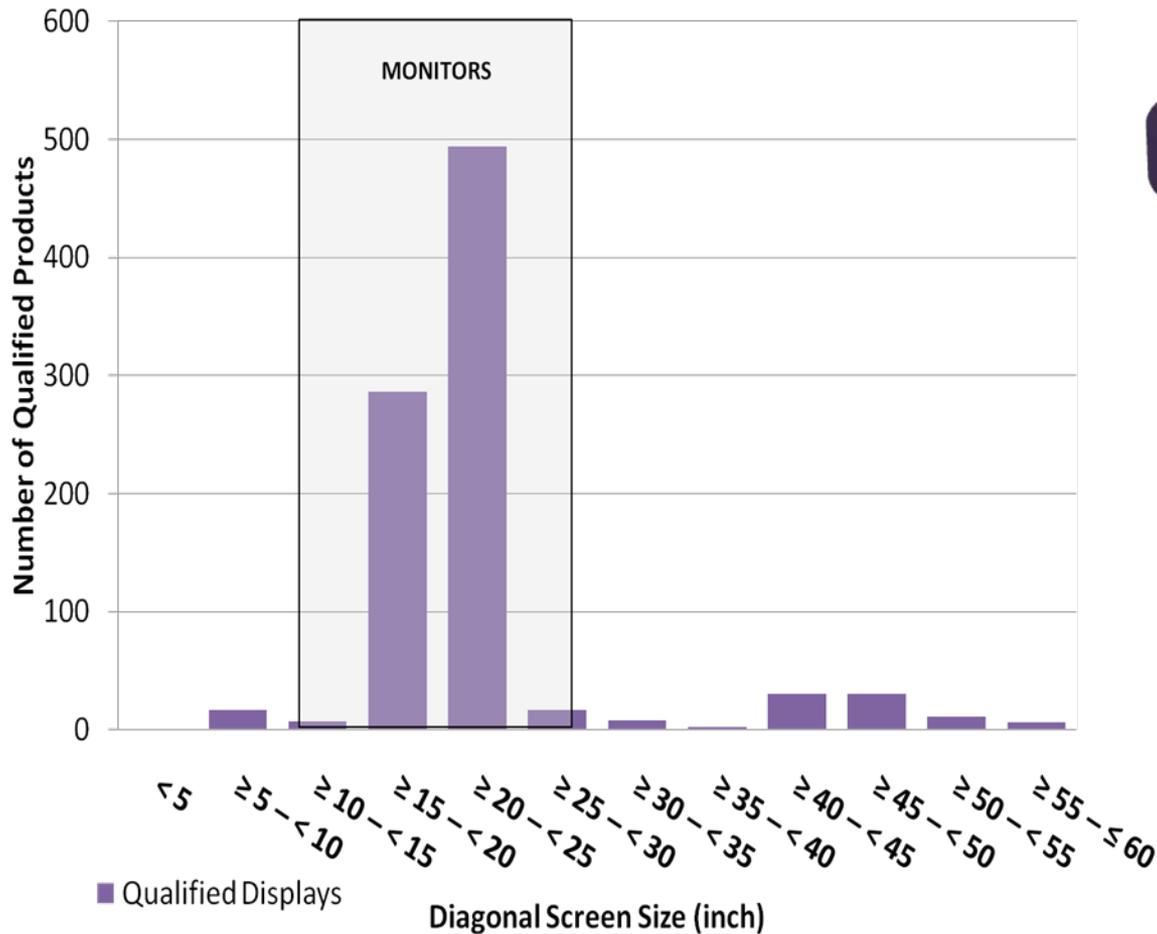
# Current Specification



- The Version 5 ENERGY STAR Displays specification was published on March 30, 2009
  - Requirements for displays less than 30” became effective October 30, 2009
  - Requirements for displays 30” to 60” became effective January 30, 2010
  - Version 5.1 was published on January 1, 2011 to incorporate ENERGY STAR Third-party Certification requirements and other necessary changes.
- 28 manufacturing partners have qualified over 900 models
- Continuously increasing product qualification rate



# ENERGY STAR Qualified Displays

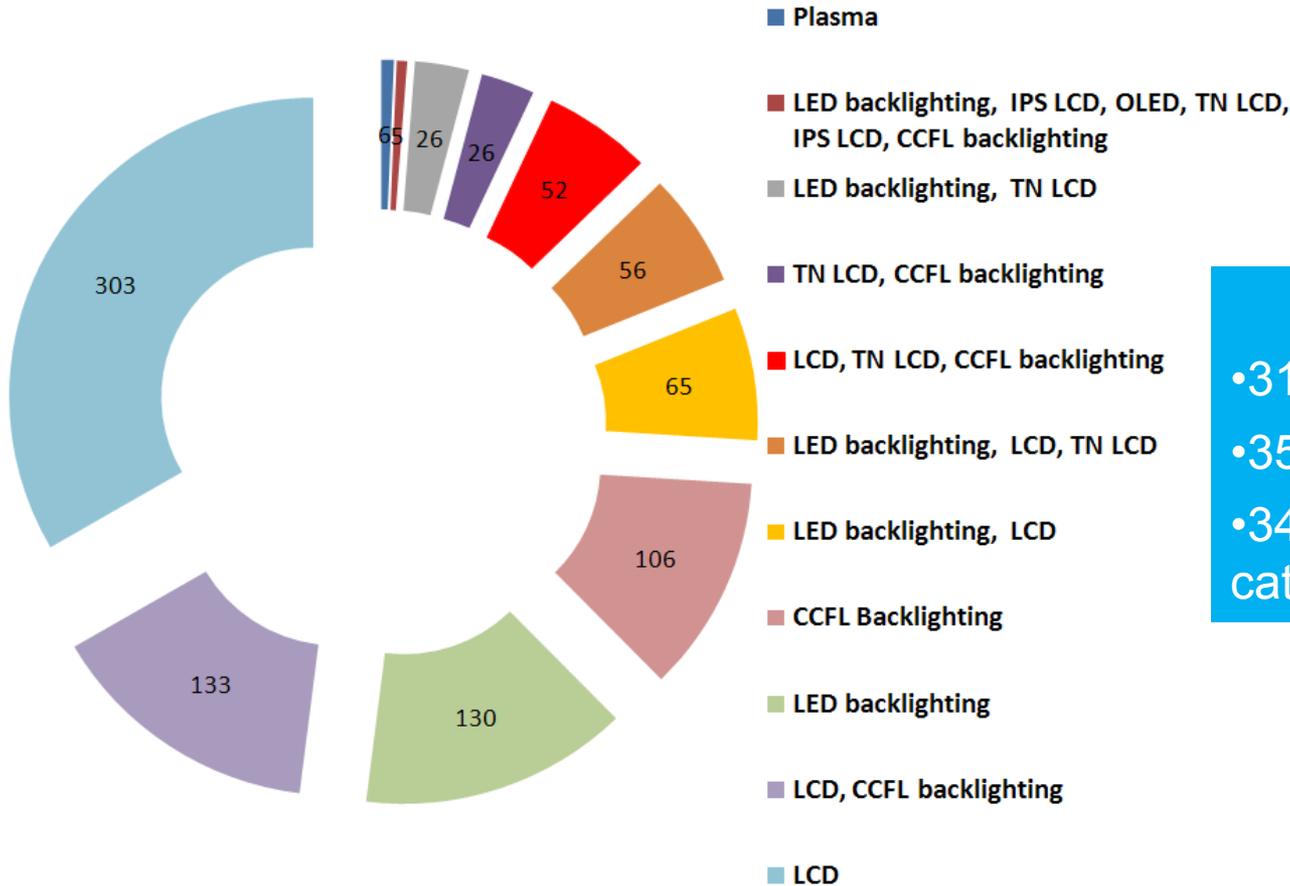


• Over 750 of the monitors qualified spread over the 15-25inch range

• All of the displays over 30" qualified under V5.1



# ENERGY STAR Qualified Display Technology



Backlighting

- 31% LED backlighting
- 35% CCFL backlighting
- 34% No backlighting categorization

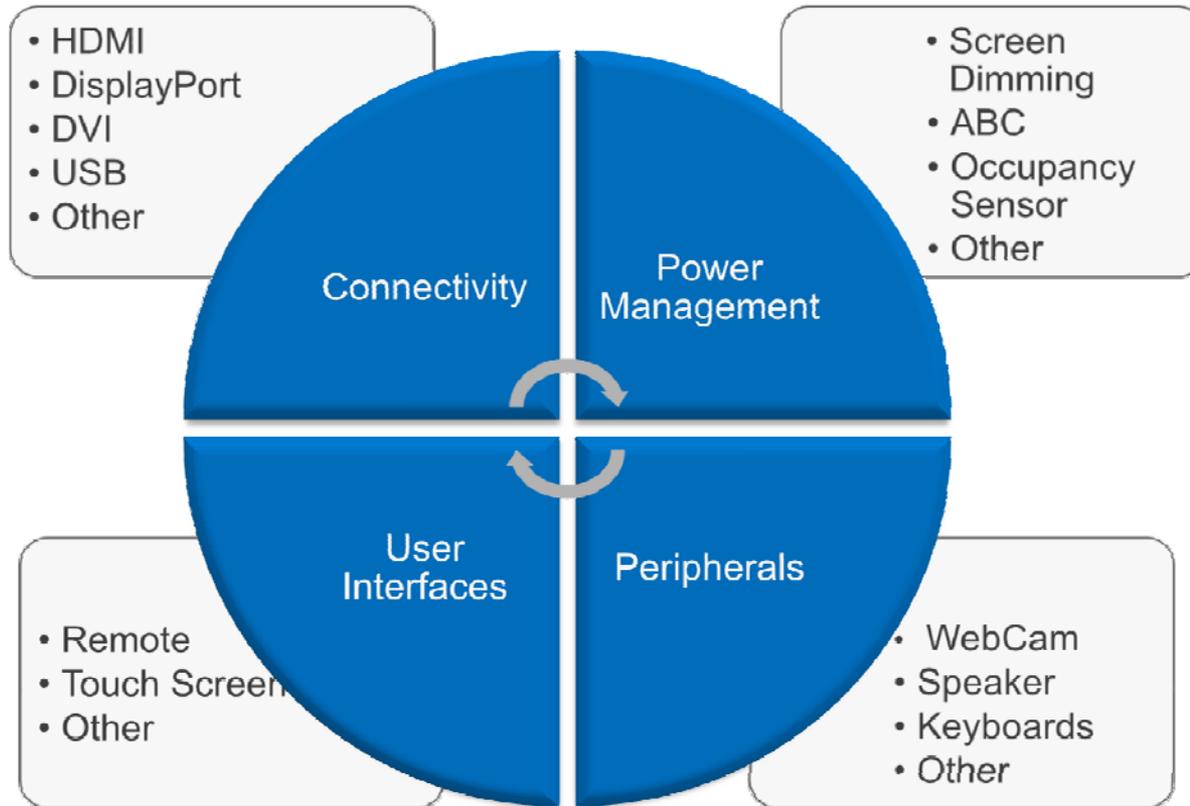


# Comparison with TV specification



ENERGY STAR Requirement	Displays Version 5.1	Televisions Version 5.3
<b>On Mode Power</b>	<ul style="list-style-type: none"> <li>•Diagonal Screen Size &lt; 30 inches Resolution &lt;= 1.1 MP; <math>P_{max} = 6*(MP) + 0.05*(A) + 3</math> Resolution &gt; 1.1 MP; <math>P_{max} = 9*(MP) + 0.05*(A) + 3</math></li> <li>•Diagonal Screen Size 30–60 inches All Resolutions; <math>P_{max} = 0.27*(A) + 8</math></li> </ul>	<ul style="list-style-type: none"> <li>•Viewable Screen Area (A) &lt; 275.0 <math>PON_{MAX}=(0.130 \times A) + 5.0</math></li> <li>•<math>275.0 \leq</math> Viewable Screen Area (A) <math>\leq 1068.0</math> <math>PON_{MAX}= (0.084 \times A) + 18.0</math></li> <li>•Viewable Screen Area (A) &gt; 1068.0 <math>PON_{MAX}=108.0</math></li> </ul>
<b>Sleep Mode Power</b>	Less than or equal to 2.0 W.	Less than or equal to 1.0 W.
<b>Off Mode Power</b>	Less than or equal to 1.0 W.	N/A
<b>Test Luminance</b>	<ul style="list-style-type: none"> <li>•Diagonal Screen Size &lt; 30 inches Resolution &lt;= 1.1 MP 175Cd/m<sup>2</sup> Resolution &gt; 1.1 MP 200Cd/m<sup>2</sup></li> <li>•Diagonal Screen Size 30–60 inches= “As- Shipped Luminance”</li> </ul>	Greater than or equal to 65% of measured peak luminance in the “retail” (or brightest-selectable) preset picture mode.
<b>Test Protocol</b>	<ul style="list-style-type: none"> <li>•ENERGY STAR Test Method for Displays, Rev. Aug-2010               <ul style="list-style-type: none"> <li>•VESA Flat Panel Display Measurements (FPDM) Standard, Version 2.0</li> <li>•IEC 62087, Ed 2.0</li> <li>•IEC 62301, Ed 1.0</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• ENERGY STAR Test Method for Televisions, Rev. Aug-2010               <ul style="list-style-type: none"> <li>•CEA-2037: Determination of Television Average Power Consumption</li> <li>•IEC 62087, Ed 2.0</li> <li>•IEC 62301, Ed 1.0</li> </ul> </li> </ul>

# Display Product Complexity



Displays are evolving into highly integrated and complex products. Testing issues and power allowances will be addressed and evaluated during the specification revision

---

# Discussion Topics Overview

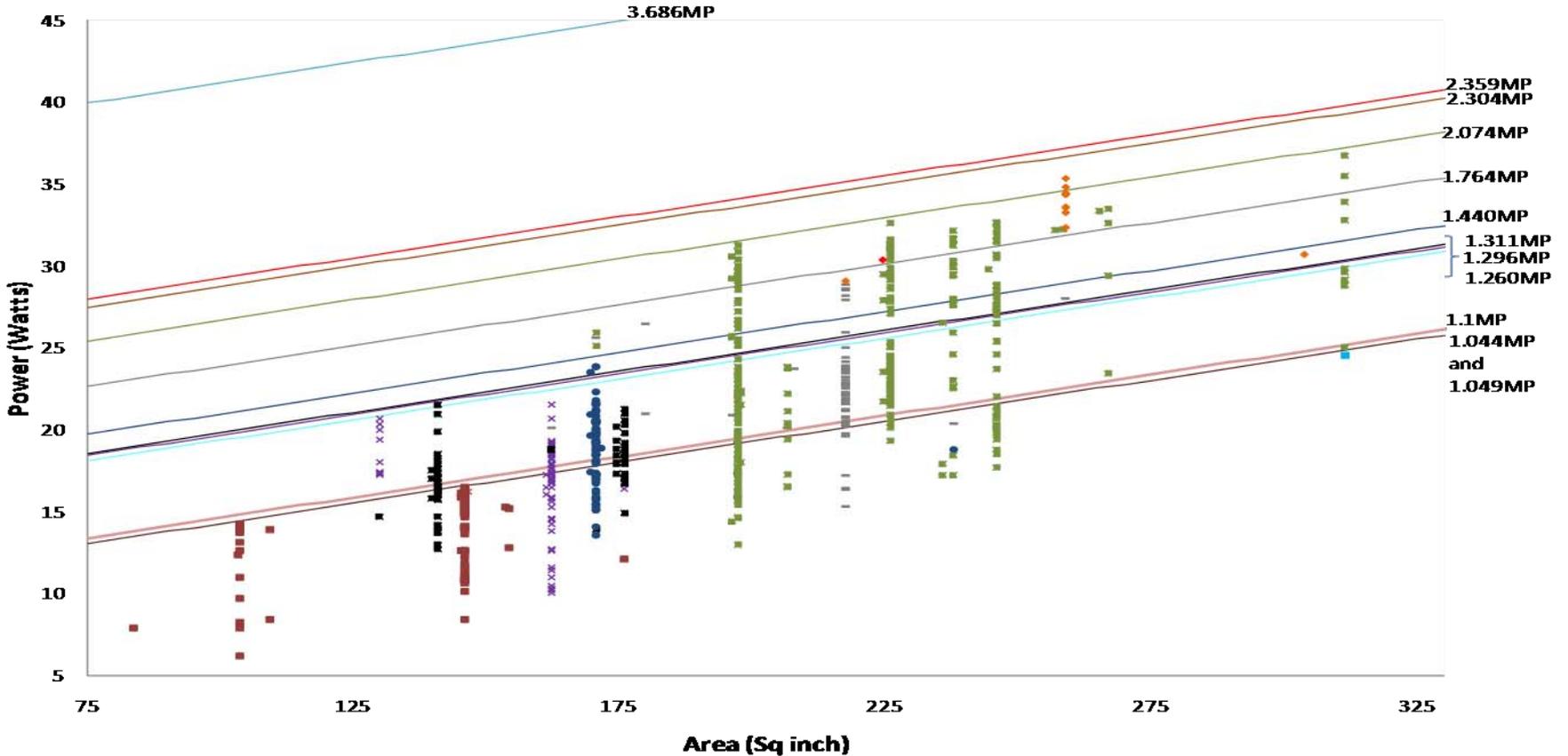
# Resolution and Screen Area



- Assess whether resolution can be removed as a factor in determining power allowances to make the ENERGY STAR Displays and Televisions requirements more consistent
- Analysis suggests that it is feasible to remove resolution as a factor
  - Evaluated predicted power consumption as a function of screen area vs. as a function of both screen area and resolution
  - Variation was approximately 2%. Mean absolute error of 0.05 watts

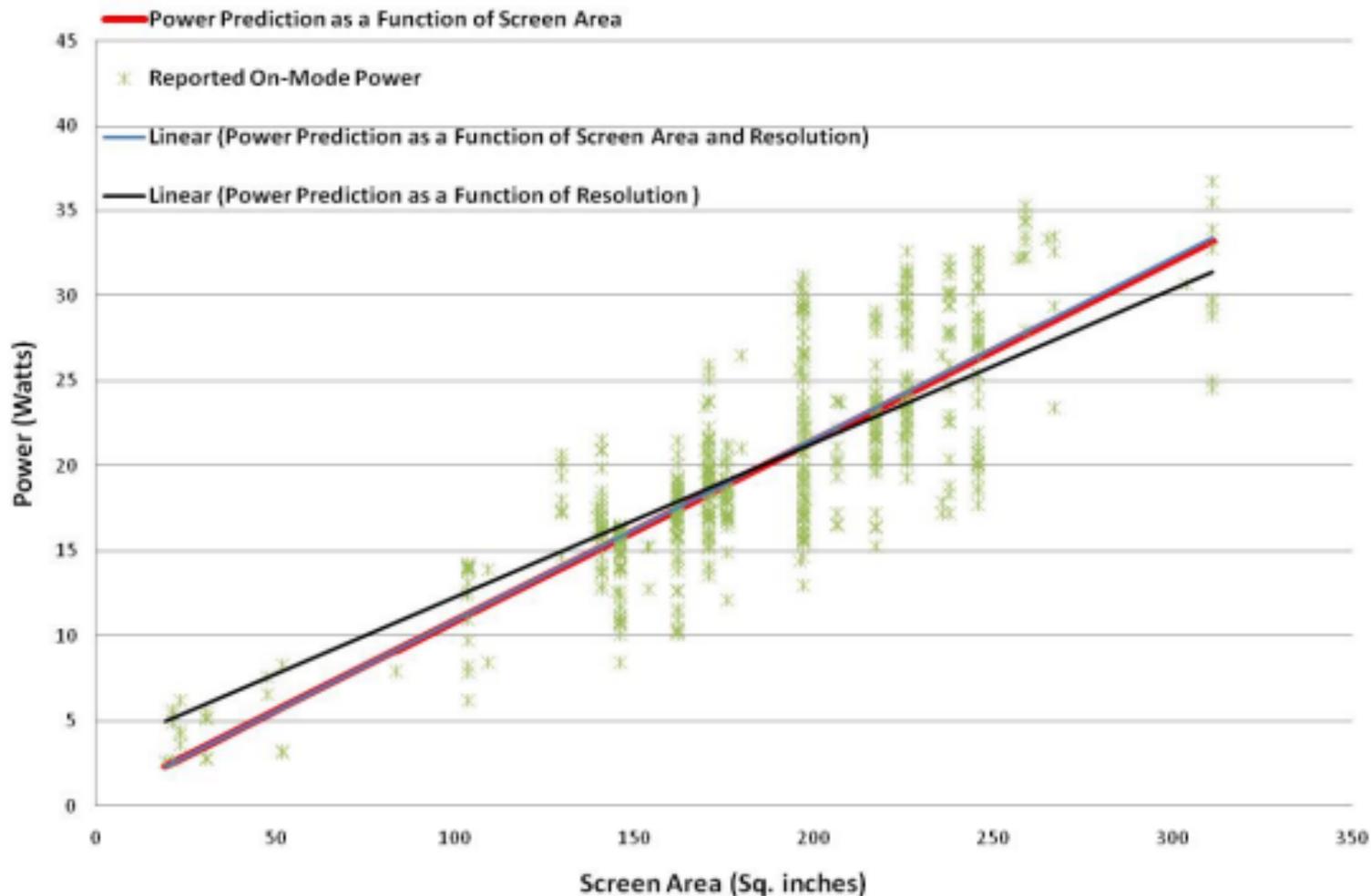


# Power Consumption for Qualified Displays Less than 30"



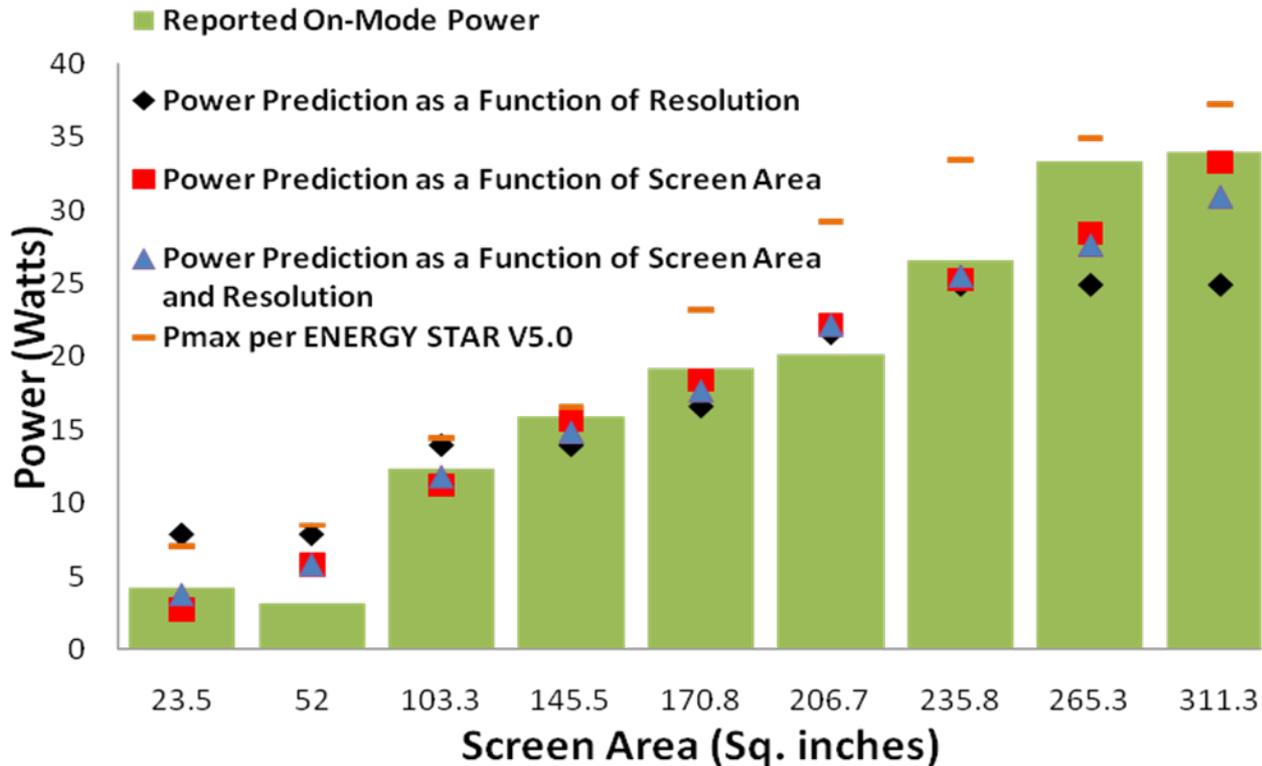
×	1.044MP	■	1.049MP	▲	1.260MP	×	1.296MP	■	1.311MP
●	1.440MP	-	1.764MP	■	2.074MP	●	2.304MP	●	2.359MP
■	3.686MP	—	Pmax for 1.044 and 1.049	—	Pmax for 1.1MP	—	Pmax for 1.260MP	—	Pmax for 1.296MP
—	Pmax for 1.311MP	—	Pmax for 1.44MP	—	Pmax for 1.764MP	—	Pmax for 2.074MP	—	Pmax for 2.304MP
—	Pmax for 2.359MP	—	Pmax for 3.686MP						

# Power Prediction for Displays Less than 30"





# Resolution and Screen Area



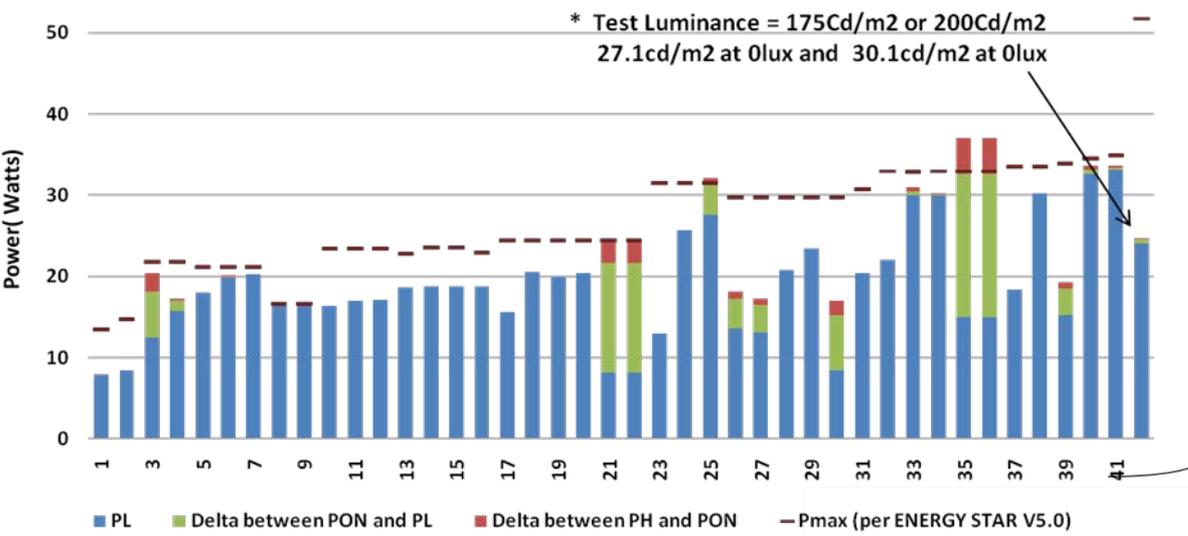
If the calculation for maximum On Mode power consumption were based solely on screen area, the majority of existing qualified models would continue to meet Version 5.1 requirements.

# Resolution and Screen Area



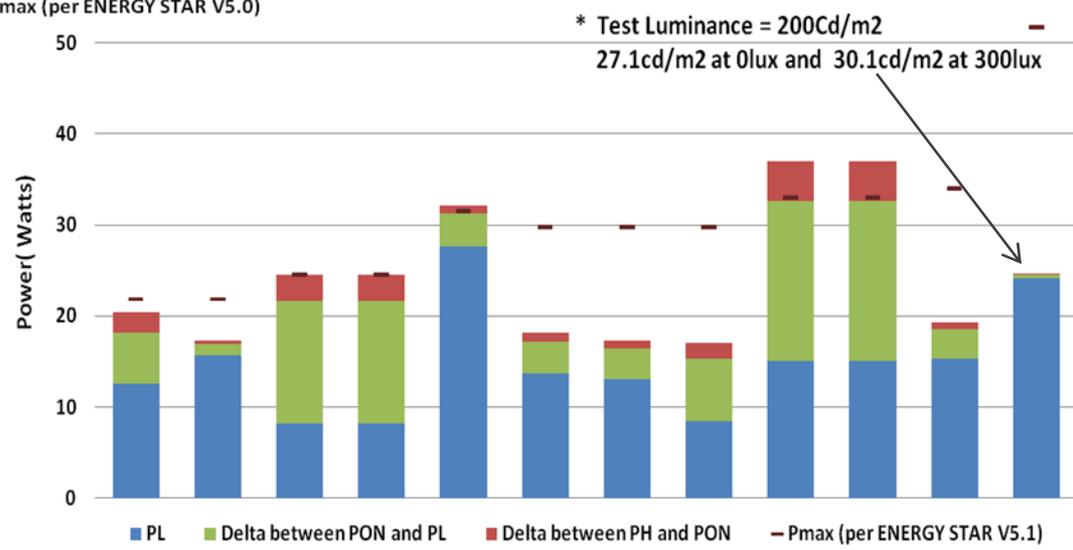
- Some stakeholders feel that removing resolution from the formulation is not reasonable – some products may no longer qualify for ENERGY STAR
- Other stakeholders stated that the power consumption for displays is mainly associated with screen area and backlight intensity, not the number of pixels
- Some other stakeholders stated that displays with reflected light have very low power consumption levels – levels should not be based on display technology

# Automatic Brightness Control



42 displays qualified with ABC enabled by default

Only 12 displays took advantage of the ABC allowance



# Automatic Brightness Control



- There is significant variability in ABC implementations
  - More data is needed to support this observation
- Stakeholders noted that variability in ABC implementations makes performance evaluation difficult
  - What are the difficulties with performance evaluation when a display has ABC is enabled by default?
- What are some alternative approaches to evaluating the real energy savings from the ABC features?

EPA is interested in obtaining stakeholder feedback regarding ways to standardize implementation of ABC in display testing.

# Automatic Brightness Control



- Other stakeholders commented that the variation might be associated with the test method and not the ABC feature
  - How can EPA modify the test method to eliminate the variation in results?
- Test conditions must be revised to ensure reliable and repeatable results
  - Should the ambient light conditions (0 and 300 lux) be re-visited?
  - Should a default test luminance be explored?
- What is the variation of testing at different laboratories?

How can EPA create a more thorough approach to testing the ABC functionality?

# Default Test Luminance (Professional Displays)

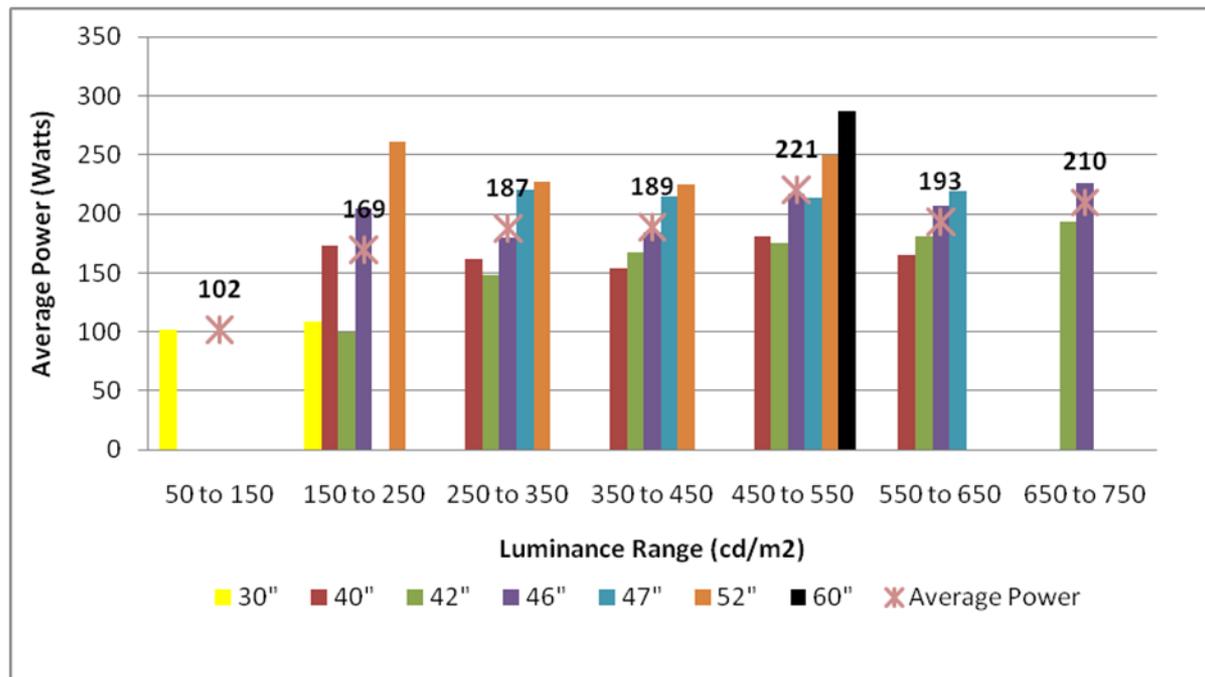


- There is a direct and increasing relationship between default test luminance and On Mode Power
- Setting a default test luminance would allow for fair comparisons between products
- The inclusion of a test luminance level will further harmonize the ENERGY STAR Displays and Televisions test methods

# Default Test Luminance (Professional Displays)



## Average Power Consumption as a Function of Default Luminance and Screen Size



Both, Luminance and Screen Area, have a positive correlation with power consumption

# Default Test Luminance (Professional Displays)



- Stakeholders proposed setting thresholds for default test luminance as a percentage of the maximum display luminance
  - As per ENERGY STAR and EC TV approaches
  - Avoid artificially low power consumption test results based on very low default luminance
- Some stakeholders believe that a default test luminance requirement would:
  - No longer be an incentive for manufacturers to employ a forced menu approach
  - Products would ship at maximum brightness, and users would not be likely to reduce brightness, so products would consume more energy



# Test Method Updates

- Last revised August, 2010 for use by third-party laboratories
- Evaluate new edition (2.0) of IEC-62301 for measurement of Sleep Mode and Off Mode power consumption
- Evaluate testing of features such as touch screens, USB power sources, or presence sensors that are either becoming more prevalent in the market or offer opportunity for greater efficiency.
- Opportunity for further revisions & clarifications during this specification revision process

EPA welcomes stakeholder feedback on the current ENERGY STAR Displays Test Method & possible additions

# Additional Topics for V6



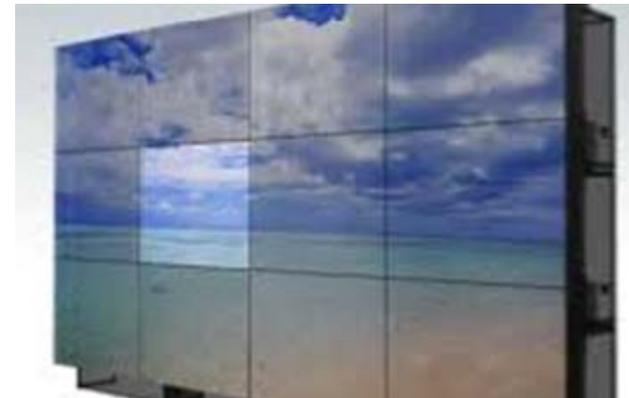
- Implement 1.0 W Sleep Mode power limit, as previously specified in Version 5.1 Tier 2
- Evaluate requirements for testing and reporting of Power Factor
- Evaluate requirements for high-efficiency user settings (e.g., a “dim display” option to turn off backlight after 10 minutes of idle)
- What constitutes ‘high performance displays’?
  - Should requirements be established for these Displays?
  - How does viewing angle relate to power consumption?

EPA welcomes stakeholder feedback on these or other topics



# Scope: Modular Displays

- How are modular displays typically installed and operated?
- Are modular displays typically self contained or are multiple enclosures and power-consuming devices required for operation?
- What are the most important considerations for testing?

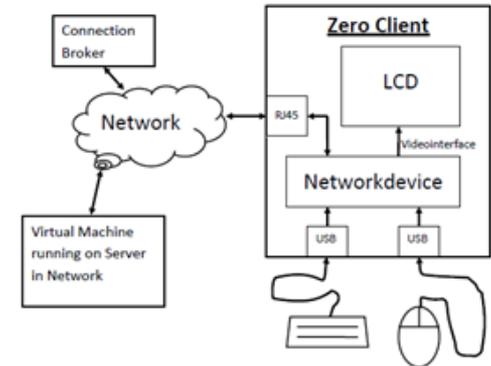


EPA welcomes stakeholder comments on the inclusion and testing of modular displays



# Scope: KVM & Zero-client

- KVM devices (Keyboard/Video/Mouse)
  - Control multiple computers with a single keyboard, monitor, and mouse
- Zero Client
  - Power Over Ethernet (PoE)
  - No CPU



EPA welcomes stakeholder comments on the inclusion and testing of KVM and Zero Client devices:

- What additional hardware is required for device operation?
- To what extent does the additional hardware increase power consumption?

# GHG Emissions



- EPA is evaluating opportunities to provide incentives to manufacturers that engage in GHG reporting and reduction activities
  - EPA is considering how to respond to consumer interest in other environmental benefits beyond just use phase
  - guard against unintended consequences where non use phase GHG impacts are similar to or exceed use phase impact
- Interested in identifying activities manufacturers are engaged in to reduce global warming gas emissions
  - Especially NF<sub>3</sub>, SF<sub>6</sub> and CF<sub>4</sub>
  - Examining emissions associated with the supply chain

# GHG Emissions



- Interested in getting input on existing or draft international efforts to
  - Existing requirements to certify 90% emission control or destruction of GHG emissions associated with fluorinated compounds
  - WRI protocols and ISO standards in development
  - Reporting emissions using the IPCC methodology

What can EPA do to assist manufacturers with  
Highlighting activities relating to GHG emissions?

# What's Next?



- EPA is interested in working with stakeholders to assemble data on non-qualified products, to address the following:
  - Effectiveness of Automatic Brightness Control
  - Default test luminance requirements for displays greater than 30”
  - Test procedures for advanced features & functionality
  - Inclusion of new product types
- Continue to assess new performance criteria
- Establish location and time for future face-to-face stakeholder meeting in Spring/Summer 2011

# Open Comment

---



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

# References and Resources



- ENERGY STAR Displays specification revision:  
[https://www.energystar.gov/index.cfm?c=revisions.display\\_spec](https://www.energystar.gov/index.cfm?c=revisions.display_spec)
- Version 5.1 ENERGY STAR Displays specification:  
[https://www.energystar.gov/ia/partners/product\\_specs/program\\_reqs/Displays\\_Program\\_Requirements.pdf](https://www.energystar.gov/ia/partners/product_specs/program_reqs/Displays_Program_Requirements.pdf)

# Thank You!



Christopher Kent

EPA, ENERGY STAR

(202) 343-9046

[Kent.Christopher@epa.gov](mailto:Kent.Christopher@epa.gov)

Verena Radulovic

EPA, ENERGY STAR

(202) 343-9845

[Radulovic.Verena@epa.gov](mailto:Radulovic.Verena@epa.gov)

Nina Ruiz

ICF International

(914) 997-0587

[nruiz@icfi.com](mailto:nruiz@icfi.com)

Bizhan Zhumagali

ICF International

(202) 572-9448

[bzhumagali@icfi.com](mailto:bzhumagali@icfi.com)