October 10, 2018

Mr. James Kwon
U.S. Environmental Protection Agency (EPA)
Office of Air and Radiation
Washington, D.C. 20460

Re: ENERGY STAR® Consumer Electronics Program, Displays Version 8, Draft 2

The Information Technology Industry Council (ITI) appreciates the opportunity to provide comments for U.S. EPA's Draft 2 Version 8 ENERGY STAR Displays specification.

Computer Monitors Energy Requirements

Industry appreciates that EPA has revised the coefficient and intercept values for the Maximum TEC equation, but since the dataset only contains ENERGY STAR qualified products, it does not represent an overall pass rate of 28% for ac-powered models on the market. We recommend the EPA issue a data request for non-ENERGY STAR qualified devices.

Enhanced Performance Displays (EPDs)

Using Version 7 as a baseline, for a 4K resolution display at 27" size, our analysis of power reduction for v8 Draft 2's EEP at 32.9% is 40%, and for EEP at 38.4% is 84%. Reductions of this level are unrealistic and vastly more than the 20% reduction shown in v8 Draft 2 for ETEC-Max for this same display resolution and size. Fundamentally we see no reason for the percentage reduction of EEP to be no greater than the percentage reduction of ETEC-Max at 20%.

Equation 4 Recommendations

Our original proposal to the EPA was that instead of using only two steps at 32.9% CIE and 38.4% CIE it would be very useful to develop a function that supports color spaces both between these two data points, and color spaces beyond the 38.4% point.

To this goal, looking at Version 7 as a baseline, the current calculation, at least for a 27" panel would yield the following equation:

EEP = (464 x G) - 145 [This represents ES7 for a 27" display, where G represent CIE Color Space Gamut as a percentage, in the unitary range from 0 to 1]

We would support reducing this by the same ratio as the 20% reduction to ETEC-Max. The equation that we would thus support would be:

EEP = (371 x G) – 116 [G representing percentage of CIE color space gamut in the range 0 to 1, and eligibility only starts with color gamuts matching or exceeding 32.9% CIE]

Further, by changing the criteria to even qualify for the allowance from FHD to QHD, the total number of potentially qualified products will be too restrictive.

Justification

Current displays support only about 35% of the human viewable color range. Therefore, most colors visible in reality cannot be displayed on current monitors. With rec.2020/2100 there is now a new industry effort underway to increase the displayable set to 73% of human capacity, delivering corresponding improvements in display realism. Reducing the allowance at this time may deprive users of these significant benefits.

Based on EPA's linear regression analysis of on mode power vs. color gamut there are clearly additional factors that impact power consumption of enhanced performance displays that need further investigation (e.g. HDR capability, multi-zonal backlights, etc). These factors should be analyzed as part of the v9 revision process.

Future Power Savings

Industry believes this proposal is unduly restrictive and will ultimately contradict objectives for net energy savings. HDR can increase performance and save power due to dimming capabilities. However, HDR is also typically combined with wide color gamut, which will enable better performance.

High Dynamic Range (HDR)

We note EPA's intention to evaluate HDR in conjunction with the v9 revision process and encourage such steps. With the ability to split backlighting into segments that can be separately controlled, luminance no longer equates to power nor efficiency.

Equation 8 – Curved Display Energy Allowance

We recommend an allowance of 30% to provide consistency with the California Energy Commission (CEC). CEC regulations include the same adder for curved displays.

Different curvature of TFT and Color Filter layers causes a larger misalignment between the layers due to mechanical stresses; resulting in crosstalk between the sub pixel colors.
Note:

- To prevent cross talk between sub pixels, the design of the TFT needs to be modified but at the expense of lower transmittance efficiency
- For curved displays, panel transmittance efficiency drops ~30%

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 three or more criterion listed below:
(1) Diagonal screen size is greater than 30 inches;
(2) Maximum Reported Luminance is greater than 400 candelas per square meter;
(3) Pixel density is less than or equal to 5,000 pixels per square inch;
(4) Ships without a mounting stand designed to support the display on a desktop; or
(5) Designed to be operated by an external data controller or remote management system.

We recommend increasing pixel density to 7000 pixels/square inch for criteria point 3.
Justification:

- Pixel density will increase as screen resolution is trending higher
- Specifically impacted for 30" < screen size < 65"

Calculation of Maximum TEC (E_{TEC_MAX}) for Monitors <300in^2

E_{TEC_MAX} = (4.20*R) + (0.122*A) + 8.00 Section 3.3.2 Equation 2

- EPA implement a separate and higher area coefficient value for sizes > 300in^2
- All models >300in^2 and resolution >FHD failed
- Incorporate additional energy allowance for mainstream models

We welcome the opportunity to discuss any aspect in greater detail.

Sincerely,

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