# Proposal for Standards – Consumer Electronics (Docket #12-AAER-2A) – Displays

## *Appliance Efficiency Standards and Measures*

**for California Energy Commission's Invitation to Submit Proposals**

**Authors**

The Information Technology Industry Council ("ITI"; http://www.itic.org/) and the Technology Network ("TechNet"; http://www.technet.org/).

The contacts for our organizations are: Christopher Hankin, 202-626-5753, chankin@itic.org and James Hawley, 916-447-4099, jhawley@deweysquare.com

# 1 Executive summary

The Information Technology Industry Council and TechNet appreciate the opportunity to submit the enclosed proposal for standards for displays. For decades, California has been a leader in achieving significant improvements in energy efficiency, often made possible by technologies the state's Information and Communication Technologies (ICT) industry has pioneered. In recent decades, the ICT industry has achieved unrivaled improvements in energy efficiency, significantly reducing the power consumption of computer systems while concurrently increasing performance. According to the American Council for an Energy Efficient Economy (ACEEE), ICT has "revolutionized the relationship between economic production and energy consumption".

The tremendous efficiency gains have resulted not from mandatory government requirements but as a result of market and consumer demand, vigorous innovation and competition and voluntary initiatives such as Energy Star, and these gains will continue in the future. New, more efficient products are displacing old technologies at a rapid rate. The realization of the State's energy goals pursuant to the Warren-Alquist State Energy Resources Conservation and Development Act and other laws, and the health of the state's economy, depend upon continuing a vibrant, innovative ICT sector and the state's continuing technology leadership.

The industry's approach to continued improvements in energy efficiency is through three areas:

1. Energy efficiency gains while continuing to drive innovation. Industry factors:
   - Market segment/consumer demand
   - Competition
   - Caring for the planet – product energy footprint reduction through technology innovation
2. Support for voluntary programs, to incentivize product energy efficiency in specific product categories. These programs continue to show strong record of success in driving down overall product energy (TEC) footprint. Not only on the targeted products but products which reuse similar components.
3. Global regulatory convergence, with industry driving global convergence of product energy efficiency regulations and standards, with applicability for both voluntary and mandatory programs. This will enable energy-efficient ICT products to be cost-effectively deployed to both save energy and promote economic growth.

**Industry's proposal should CEC decide to adopt a mandatory regulation for Displays:**

Scope: Focus only on high volume and mainstream products used by consumers and businesses. Provide exemptions/exclusion for high performance, highly specialized low volume products used in science, engineering, medical, graphics design, geology, digital signage that require higher level of display performance. These exemptions would promote innovation and avoid disruption to key California industries.

Target/limits setting: Alignment with established ENERGY STAR v5.1 targets; these targets are aligned with display energy regulations existing in AUS/NZ and Korea, and consistent with Industry's recommendations in other countries/regions.

Test Methodology: Alignment with established ENERGY STAR v5.1 test methodology to ensure consistency.

Labeling: No labeling requirements as it creates confusion to customers and adds unnecessary overhead to manufacturers. Most efficient displays are ENERGY STAR qualified that already includes labeling of the product and retail packaging with the ENERGY STAR mark.

Certification: Manufacturer self-certification or testing performed at accredited labs should be accepted as means of declaring compliance and provide an online registration process (if registration is needed)

# 2 Product Description and Proposal Scope

## 2.1 Technical Description

[Provide technical description of the product, its components, software, power supplies, controls, or any other components that control device functionality and consume energy or water.]

Technical description of display technology is discussed in detail in ICT's submission to CEC's ITP process.

Refer to Information Technology Industry Council Comment Letter 2013-05-09 TN-70709.pdf.

## 2.2 Technologies and Best Practices for Energy/Water Efficiency

[Discuss the best design practices for energy/water efficiency, energy/water reducing features in products available today and in the near future, and technology improvements that will improve efficiency. If possible, contrast these improvements with generic or lower efficiency design approaches and technologies.]

Refer to Information Technology Industry Council Comment Letter 2013-05-09 TN-70709.pdf

Power management in Displays is highly dependent on the host device. Displays are slave devices and respond to the host (PCs). Displays are designed to enter low power modes when not in use.

Improvements in Display technologies are described below (similar to previous submission information), these technology shifts provide improvement in Active/On mode energy efficiencies.

- Display panel developments – moving from CRTs → LCD
    - LCD Technology

    a. Twisted Nematic (TN) –narrow viewing angles, poor color gamut, low brightness
    b. Vertical alignment (VA) – wide viewing angles, wider color gamut, deep contrast, higher brightness
    c. In plane switching (IPS) – wide viewing angles, wider color gamut, deep contrast, higher brightness
    d. Plane line switching (PLS) – wide viewing angles, wider color gamut, deep contrast, higher brightness

- Backlight technologies
  - CCFL – 1 backlight and generates heat (always on),
    - Uses a diffuser for even brightness
    - longer warm up times
  - LED backlight
    - energy efficient and less heat
    - not perfect blacks
    - more expensive
    - slimmer designs
    - shorter warm up times

## 2.3 Design Life

[How long will the product be in use after it is purchased? This information can be presented as a single estimate, or a distribution of estimates to show a range of product lifetimes.]

Manufacturer's design products based on warranty, typical warranty periods for:

Commercial/Enterprise products – 3-5 years

Consumer products – warranty of 1-3 years or 3-5years

Uses of data from recycling or product take back programs to estimate actual customer usage is also not accurate due to the fact that consumers may not recycle or dispose of their old displays. Some LCA's study use a 7 year estimate for recycling.

## 2.4 Manufacturing Cycle

[How often are new models of a product introduced into the market? How long do individual product models typically remain on store shelves? How frequently are modest design modifications made within a model? For electronic devices, how frequently are software updates sent to units in operation? How often are product packages changed, printed, or updated?]

For consumer markets: Products are introduced in the holiday seasons, back to school periods, shows or trade events. For Enterprise markets, they are dependent on fiscal budgeting cycles (enterprise/Government). New technologies could also see product introduced.

Manufacturer's design products for world-wide sales and compliance, manufacturer's do not revisit designs or make changes unless they are absolutely necessary. E.g. part obsolescence, large field failure rates, new technology/performance, etc.

Software updates and product redesigns are minimized as much as possible.

For products like Displays, advances in technology (such as size of display panels, backlight technology (I.e. LEDs discussed above), and customer needs/preferences drive product designs/re-designs. Customer needs and preferences drive purchasing behavior including timing of and frequency of purchases.

The same principle (minimizing design changes) applies to packaging designs as well and is less affected by consumer preferences or technology advancements.

Making design modifications after a product release is a significant cost burden to a manufacturer. It involves the entire supply chain and operations, inventory management etc.

## 2.5 Product Classes

[Provide information and details of product classes intended to be covered by the proposals as well as those that should be excluded (be specific). Generally, products are classified based on features, functionality, or other unique market characteristics.]

**IN Scope product class:**
Mainstream Computer monitors: Should CEC find that regulating displays is necessary and cost effective, only "mainstream" (high unit shipment volume) displays should be considered in scope. Definition of Displays that would be in scope of this regulation should be defined as follows: A commercially-available product with a display screen and associated electronics, often encased in a single housing, that as its primary function displays visual information from a computer, workstation or server via one or more inputs, such as VGA, DVI, HDMI, or IEEE 1394, or through a wireless connection.

Common computer monitor technologies include liquid crystal display (LCD), light emitting diode (LED), cathode-ray tube (CRT), and plasma display panel (PDP).

CEC Appliance Energy Efficiency Regulations should exclude (provide an exemption) for high performance/specialized displays (typically low shipment volume):

**Proposed Product class Exclusion** (taken from ITP 12-AAER TN#70709)

i) High performance displays – These displays lead in productivity and efficiency gains for users. These displays are often used in the CAD/Cam, photography, stocks and securities analysis and trading industries where a higher performance is required for productivity. These panels provide a higher pixel density and wider viewing angles compared to normal TN displays. These displays require more backlighting which means more power to achieve the same luminance as a similar TN display. This is a tradeoff between higher performances requiring more power. They are sold in smaller volumes and not targeting the mainstream consumer market.

ii) Specialized Electronic Displays/Signage Displays – These displays are not sold to the general public and are highly specialize. There are no established standards or benchmarks for these specialized displays.

iii) Public Displays – These displays are for public viewing (more than one user at a time), they are highly customizable, they require special installation. They are not mainstream displays. There are no established standards or benchmarks for these public displays.

It would be problematic on several fronts if CA CEC attempts to regulate specialized, high performance displays. The energy savings / cost effectiveness resulting from appliance regulations targeting these specialized / high performance products would not be justified when compared with shipment volumes for mainstream display products.

If we were to look at the California installed base volumes (taken from CA IOUs ITP Response Docket: 12-AAER-2A), 18"-24" displays represents 87% of the market. The market trend data also shows that majority of the display sizes would be in the 21"-24" (diagonal) sized displays.

Estimations indicate that enhanced performance displays represent <3% of the total market regardless of display size. Within the 21"-24" size display market, enhanced performance displays represent only 1.7% of the market. This estimation is based off the Energy Star qualified product list. Install base information taken from CA IOUs ITP (Docket: 12-AAER-2A), which is about 16.5M units for both Consumer and Business segments in CA.

Figure 1 below shows the carbon footprint comparison of enhanced performance displays compared to standard displays in the 21"-24" displays segment. Enhanced performance displays and non-enhanced performance displays data is based on Energy Star's Qualified Product Listing (QPL). Results show that enhanced performance displays contribute to about 2% of the carbon footprint impact of the installed base in 2015. The impact contribution would be even less significant if we included the total displays install base in 2015 (15"-30" displays). Due to the lack of a duty cycle, Industry used the conventional weightings of Desktops in ENERGY STAR v5.2 for Computers to estimate the carbon footprint potential. While the "use profile" in the ENERGY STAR v5.2 for Computers has not been established as appropriate for use in regulating displays, it does provide a means to compare the relative impact.

It is also worth noting that other countries' requirements like Europe's Ecodesign 642/2009 (ErP Lot 5 draft) and Australia's MEPS programs have excluded high performance displays, and the reasons for these exclusions are the same as those described here.

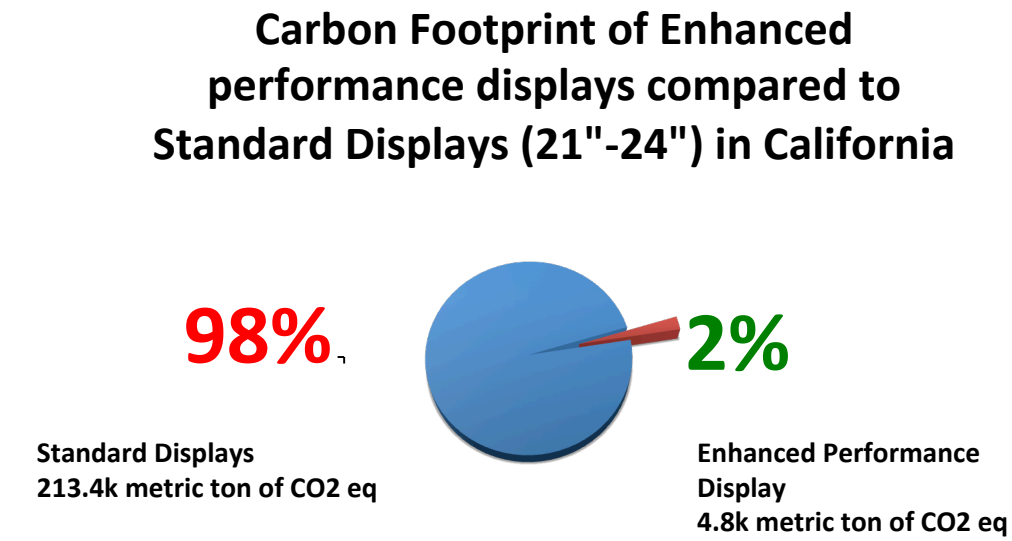


Figure 1: Environmental Impact assessment of Enhanced Performance Displays vs Standard Displays

**Table 7.2 Installed Base in California by Size Bin in 2015 – Computer Monitors**

| Size Bin | Installed Base (000) | Percentage |
|---|---|---|
| <=15-inch | 146 | <1% |
| 16.x-17.x-inch | 1,811 | 5% |
| 18.x-19.x-inch | 7,566 | 23% |
| 20.x-inch | 5,059 | 15% |
| 21.x-22.x-inch | 8,367 | 25% |
| 23.x-24.x-inch | 8,129 | 24% |
| 25.x-27.x-inch | 2,124 | 6% |
| 28.x-30.x-inch | 134 | <1% |
| Total | 33,336 | |

Source: IHS iSuppli 2012

Table 1: California Install base in 2015 taken from CA IOU's ITP

Additionally, it would be very difficult to set appropriate energy efficiency limits (and allowances for performance) for specialized/high performance displays, without impacting

customers' need for performance. Regulators in other countries and regions who have decided to regulate PC displays, have recognized the need to exclude specialized / high performance displays in their energy efficiency regulations.

Given that Display Manufacturers design products for sale world-wide, we anticipate that users of specialized / high performance displays in CA would likely be unable to continue purchasing these products, should CA CEC decide to regulate these specialized products alone without considering the additional capabilities that these displays provide.

It is unlikely that display manufacturers would attempt to design high performance displays solely for the CA market. The unit shipment volumes (as shown above) for these types of products would not justify the cost, and it may not be technically possible given the enhanced performance requirements users of these specialized displays require. User segments that would be impacted by CA CEC regulating specialized / high performance displays would include: Science, Engineering, medicine, graphics, architecture and film arts, and banking.

## 3 Unit Energy/Water Usage

[Provide as much detail as possible about unit energy/water usage by product class, efficiency level, capacity or any other characteristic that drives energy/water use.]

Display energy efficiency data (such as power consumption in On, Sleep, and Off Mode) is readily available through the ENERGY STAR program and additional data for models that do not qualify for ENERGY STAR can be provided. Power consumption varies according to the size of the display and backlight technology used. Generally smaller displays consume less power than larger displays, and displays with more efficient backlights consume less than older technology displays such as CRT technology displays.

## 3.1 Duty Cycle

[Describe the different states, modes, or uses of a product that impact its energy or water consumption (e.g., on, off, and standby modes). Estimate the number of hours the product is used in its various states. Please include an annual estimate of hours of use if the usage is described in some other way. If the product includes automated controls that may alter the duty cycle, please discuss the usage changes caused by these controls.]

**There are basically 3 modes of operation (same as ICT's ITP response):**

1) On Mode: The operational mode of a display that (1) is connected to a power source, (2) has all mechanical (hard) power switches turned on, and (3) is producing an image.

2) Sleep Mode: The operational mode of a display that (1) is connected to a power source, (2) has all mechanical (hard) power switches turned on, and (3) is in a reduced-power state after receiving a signal from a connected device (e.g., computer, game console, set-top box) or by cause of an internal function (e.g., sleep timer, occupancy sensor). Sleep Mode is considered a "soft" low- power condition, in that the product may exit Sleep Mode upon receiving a signal from a connected device or by cause of an internal function.

3) Off Mode: The operational mode of a display that (1) is connected to a power source, (2) has one or more manual power switches turned off, and (3) is not providing any function. The product may only exit Off Mode by cause of direct user actuation of a manual power switch.

**Duty cycle (number of hours):**

Unfortunately, there is no industry established duty cycle standard available for reference. The usage models for consumers would be different from businesses. It also varies on the applications in use. As mentioned previously in the ITP, if a standard use profile is ever determined for Displays, it will need involvement of display manufacturers.

The duty cycle is also dependent on (controlled by) the host device, desktop or notebooks.

## 3.2 Efficiency Levels

[Provide at least two levels of efficiency—a minimum baseline case and an improved case—for each state/mode/use. Provide the average power, energy, and/or water consumption for each level.]

Industry believes that power management is still the lowest hanging fruit that will yield the greatest energy savings without adding additional cost for customers and withholding performance. California regulators and utility providers should evaluate the results of the UC CA Irvine study to identify opportunities for improving use of power management capabilities already being provided by IT product manufacturers, and work closely with ENERGY STAR Low Carbon IT Campaign that provides support for consumer and corporate customers to enable power management on existing stock of both PC's and Displays. Additional information is available:

http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_users
http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_low_carbon_join
http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_manage_reps

While there is a lack of established duty cycles, Industry estimates that Displays are in low power modes the majority of the time. Industry recommends adopting the Energy Star v5.1 limits and if CA CEC would like to take it further, an alternative is to adopt a more restrictive OFF mode, which is aligned to EU Standby/Off requirement. This is described in Section 9: Savings Potential.

For Active/On modes, Industry recommends adopting ENERGY STAR v5.1 for displays, which takes into account both resolution and screen size. Active/On modes are complex and dependent on panel technology, back light, resolution, screen size etc.

### 3.3 Energy and/or Water Consumption

[Provide estimated energy/water consumed based on the above information on duty cycle (3.1) efficiency levels (3.2). The energy/water consumption of a state is equal to the average rate of consumption in the state multiplied by the average hours per year a product is in that state. The unit energy/water consumption of a product is the sum of the energy/water consumption in all of its states. ]

Without an established duty cycle or base line, it would be inaccurate to estimate energy consumption. For relative comparisons, Industry has used the conventional weightings of Desktops in ENERGY STAR v5.2 for Computers. Note that these are not established or recognized duty cycles for displays and are only used for comparisons.

Note: The EPA's ENERGY STAR Ver. 5.1. display qualification data provides actual power consumption data for mainstream displays and could be requested from EPA if needed for this analysis.

## 4 Market Saturation and Sales

### 4.1 California Stock and Sales

[Provide an estimate of existing and projected stock and sales of the product in California. Provide a projected California Annual Growth Rate (CAGR) and any other pertinent information that will affect stock or sales over time.]

As in our ITP response, we recommend that CEC to refer to 3rd party analyst data (IDC, Gartner, DisplaySearch etc.).

### 4.2 Efficiency Options: Current Market and Future Market Adoption

[Provide an estimate of the number of models, and the number of units or market share per model or class, with high efficiency features integrated in them that are currently sold in the market. Describe the high efficiency options and their impact on the operation of the device. Provide detailed information on high efficiency products' market share, and whether any voluntary measures are in place to accelerate market transformation. What are the impacts of voluntary measures currently in effect on the market penetration of high efficiency options? How many products in the market already incorporate the concepts expressed in the proposal?]

To estimate the number of models, industry recommends CEC look at the Energy Star v5.1 qualified product list. As for market share information, industry recommends CEC obtain 3rd party analyst data (such as IDC, Gartner, or DisplaySearch ) and then apply some type of factor such as population scaling to obtain estimates that better approximate market conditions in California.

For install base and recycling estimates over the years, industry recommends CEC to coordinate with CalRecycle to review the annual SB20/50 results.

The annual reports are broken out into the following categories:

- TV (CRT)
- Monitors (CRT)
- Flat Panel (LCD) Monitors
- Laptop Computers (LCD)
- Flat Panel (LCD) Televisions
- Flat Panel (Plasma) Televisions
- Portable DVD Player (with LCD screen)

http://www.calrecycle.ca.gov/electronics/act2003/
Contact: EWaste@calrecycle.ca.gov (916) 341-6269

## 5 Statewide Energy Usage

[Provide an estimate of current statewide energy/water usage of products within the proposal's scope by multiplying unit energy/water consumption by market saturation and sales figures from Section 4. Describe how this energy usage is expected to change in the future without implementing the proposal.]

Without an established duty cycle or market data, it would not be possible to estimate the Energy consumption at this point of time. As noted above, actual modal power consumption data for "mainstream displays" is available in the US EPA's ENERGY STAR Ver. 5.1 display qualification data.

# 6 Proposal

## 6.1 Summary of proposal

[Describe the framework of the proposal, its goals, and the expected market transformation. Also discuss alternate approaches to achieving energy/water savings, and why the proposed approach is superior.]
Should California find it necessary to regulate the power consumption of Displays, the scope of the regulation should include mainstream (high unit shipment volume) Displays, and the regulation should exempt specialized/enhanced performance (low unit volume) Displays.

The regulatory framework (test methods, product classification, performance tolerances, etc.) should be harmonized with existing standards (such as ENERGY STAR ver. 5.1 Program Requirements). This is summarized in Table 2 below.

These are well-established targets and approaches to energy conservation. They are aligned with display energy regulations existing in AUS/NZ and Korea, and consistent with Industry's recommendations in other countries/regions.

Aus/NZ MEPS- http://www.energyrating.gov.au/products-themes/office-equipment/computers-peripherals/documents-and-publications/?viewPublicationID=2641

Korea eStandby- http://www.kemco.or.kr/new_eng/pg02/pg02100300_2.asp

| Framework | Scope | Excludes | Off (W) | Sleep (W) | Active/On (W) | Power Management |
|---|---|---|---|---|---|---|
| ENERGY STAR v5.1 | Standard mainstream displays | High performance/specialized (low volume displays) | 1W | 2W | Metric based on resolution and screen size | APD to sleep |

Table 2: Summary of Display's proposal

Compliance dates should be based on the date of unit manufacture, and exempt products manufactured prior to the regulation compliance date, that are provided to customers as part of manufacturer's warranty, and support programs. I.e. Whole Unit Replacements manufactured prior to the regulations compliance date, should be exempt even when provided to customers after the compliance date (as a result of warranty or customer support programs).

## 6.2 Implementation Plan

[What entities would be responsible for what actions and when? Describe how the proposal would be implemented.]

It is too early to develop an implementation plan for the regulation development process (if needed).
Related to manufacturers implementing new efficiency regulations, the following recommendations are made:

- Manufacturer self-certification or testing (at accredited labs) should be accepted as means of declaring compliance.

- Registration of products by brand holders or their suppliers. Registration process should be available online and should accommodate registration by brand holders' suppliers (one time authorization from brand holder accepted)

- Implementation: 2 years from final publication. (this will allow manufacturer's sufficient time to manage any redesign efforts required to meet with the regulation, communicate requirements, and prepare for full implementation by the compliance date)

### 6.3 Proposed Test Procedure(s)

[If the proposal includes the measurement of product performance or market transformation, describe how these would be measured. Describe why the methodology is the best available, necessary, and the least-cost approach that produces the necessary information.]

Industry recommends test procedures as per Energy Star for Displays v5.1 Test Method. This will be aligned and harmonized with the other mandatory programs around the world (Aus/NZ and Korea).

### 6.4 Proposed Regulatory Language

[Please include draft proposed language if the proposal would require a new regulation, memorandum of understanding, or legislation. To enhance the clarity of such a proposal, define both the scope of what products or entities would be covered and provide definitions for any terms that differ from the dictionary definition or are critical to the proposal. For proposed appliance efficiency standards, also include which types of data the Commission should require for certification.]

Industry will provide comments in the next phase of the process.

## 7 Technological Feasibility

[Discuss the feasibility of improving products that are currently not as efficient as those that would result from the proposed measures. Which technologies are available for manufacturers to improve existing products? Which technologies are proprietary and which are not? How would the improvements impact other aspects of product quality and performance? How long would it take manufacturers to implement these improvements across their affected product line?]

Backlight technologies have improved significantly through the years. Industry has transitioned to energy efficient LED lamps, approximately 35% energy savings compared to CCFL lamps. This was a technology breakthrough that provided good performance and a positive environmental impact. The cost adder to use LED lamps per product has decreased due to large adoption of LEDs in the market, making it more affordable to consumers compared to 4 years ago.

Improvement in Power supplies could help improve energy efficiency but these improvements are not significant and are cost sensitive. Industry calculated that to increase the efficiency by 3% (e.g. moving from 80plus Bronze to Silver) would cost $2.50, while the energy savings does not justify this cost.

Organic LED (OLED) technology could potentially provide significant energy savings as it does not utilize a backlight, but this technology is still not widely adopted in displays due to cost factors. Some mobile phones (smaller form factors) are using OLED technology. Industry recommends that this technology be exempt from regulation until a full study is conducted and that the technology is better established.

Ultra high definition (UHD), models that have a screen resolution of 3840x2140 pixels is emerging in the TV markets this has not picked up in the Computer Displays market as yet. Market penetration of such displays is low due to cost. These displays consume 50% or more additional power than equivalent LED models. Industry also recommends excluding these displays due to its low volume until a proper study is conducted and these technologies become more affordable to the mainstream market.

# 8 Economic Analysis

[Provide the lifecycle cost and cost-to-benefit ratio of the proposed recommendation as it relates to the consumer. If possible, please also include wider societal lifecycle cost and benefit. In addition, discuss whether the proposed change is likely to impact the California economy, tax revenue, and jobs.]

Industry will provide comments in the next phase of the process.

## 8.1 Incremental First Costs

[Please provide the estimated incremental cost to improve the product's efficiency to meet the proposal. Explain in detail how that incremental cost figure was developed and which specific products or product baselines were used to compare cost. Please disaggregate incremental costs associated with non-efficiency improvements. Incremental first costs should be focused on the price to the final purchaser (e.g., the change in retail price for the product).]

Industry will provide comments in the next phase of the process.

## 8.2 Incremental Operating Costs and Savings

[Please provide the estimated incremental operating costs or savings of products with improved efficiency. Incremental operating costs or savings should be focused on the costs or savings to the consumer. These costs or savings may include costs or savings associated with maintenance (if maintenance will change due to the proposed standard), or costs or savings from reduced or increased energy/water consumption. Include any costs or savings from reduced or improved product efficacy resulting from the proposal. Please disaggregate incremental costs associated with non-efficiency improvements.]

Industry will provide comments in the next phase of the process.

## 8.3 Infrastructure Costs and Savings

[Please provide the estimated incremental infrastructure savings or costs of market transformation that are necessary for or will result from implementing the proposal. This refers to the incremental savings or costs caused by a change in the installed base towards higher efficiency products. A broad array of costs should be considered, from power plants and energy infrastructure to network and plumbing infrastructure. Please also include any impact on housing costs.]

Industry does not expect any infrastructure level changes at this point, subject to changes based on the proposed CEC rulemaking on appliance energy efficiency

## 8.4 State or Local Government Costs and Savings

[Estimate the resources necessary for the Energy Commission or any other named state or local agency to implement the proposal as described in 6.2. These costs could include contracts, staff, and necessary expenditures/purchases. Estimate the costs and savings to state and local governments if these entities purchase products with improved efficiencies as a result of the proposal.]

Industry will provide comments in the next phase of the process. Any proposed incentives to motivate users to enable power management (if that turns out to be a gap) will need to be assessed. This will have to wait until the survey results have been reviewed.

## 8.5 Business Impacts

[Estimate how the proposal would: create or eliminate jobs in the state, create or eliminate businesses in the state, provide competitive advantages or cause competitive disadvantages for businesses currently doing business in the state, increase or decrease investments in the state, and/or provide incentives for innovation in products, materials, or processes.]

No significant business impact based on Industry proposal. Industry will need to evaluate business impact based on the proposed CEC rulemaking. Any removal of high performance products from the market would result in disadvantage to California businesses, research & development, academic institutions and consumers.

## 8.6 Lifecycle Cost and Net Benefit

[Provide an estimate of lifecycle cost for both the products that the market will be transformed towards as well as transformed away from as discussed in 6.1. Lifecycle cost is the sum of operating costs and first costs over the useful lifespan of the product. This cost must be calculated from the perspective of the consumer. A second societal or broader lifecycle cost is also welcome.]

Industry will provide comments in the next phase of the process.

# 9 Savings Potential

[Restate the estimated per unit energy/water lifecycle savings to the consumer. Estimate the California energy/water savings and peak demand reduction that would result by implementing the proposal. Please be clear on the time-period methodology (e.g., savings for first-year sales, after entire stock turnover, savings in 2014, etc.)]

Should CEC decide to regulate further than ENERGY STAR v5.2 for Displays with a more stringent Off mode, the estimated TEC improvement is 42%. For comparison purposes, Industry used the Duty cycle from ENERGY STAR v5.2 for Computers, desktop conventional weightings.

| | Mode | | Duty Cycle- From Energy Star v5.2 for Computers: Desktops Conventional weightings | | TEC Actual (kWh/year) |
|---|---|---|---|---|---|
| **Proposal** | **Off (W)** | **Sleep (W)** | **Off %** | **Sleep %** | **(kWh/year)** |
| Energy Star v5.1 | 1.00 | 2 | 55% | 5% | 5.694 |
| Alternate (Off mode aligned with EU Standby/Off requirement) | 0.5 | 2 | 55% | 5% | 3.285 |
| | | | | Improvement | 42% |

Table 3: Savings Potential of an alternate Off mode

# 10 Acceptance Issues

[Provide information related to consumer acceptance of high efficiency products in the market or products that would result from the proposal. Provide solutions to issues and problems identified. Discuss issues that were raised in the Energy Commission's workshops or comments, and how the proposal would address these issues.]

It should be noted that Government, Enterprises and some consumers often decide their monitor purchases based on ENERGY STAR, this is evidenced by the success and adoption of the ENERGY STAR programs throughout the world. i.e. US, Australia, Canada, European union, Japan, New Zealand, Switzerland, Taiwan.

http://www.energystar.gov/index.cfm?c=partners.intl_implementation

## 11 Environmental and Societal Impacts

[Describe any potential beneficial or adverse environmental impacts from implementing the proposal? Does the proposal impact indoor-outdoor air quality or otherwise affect indoor-outdoor environmental quality? Does the proposal affect atmospheric emissions (including greenhouse gas emissions and ozone-depleting gases), and if so, by how much (million metric tons of $CO_2$ equivalents)? Are there environmental impacts associated with material extraction, manufacturing, packaging, shipping to the point-of-sale, or other activities associated with implementing the measure? What are the impacts to the health and welfare of California residents, worker safety, and the state's environment?

Industry has no inputs at this moment.

## 12 Federal Preemption or Other Regulatory or Legislative Considerations

[Does the proposal duplicate or conflict with federal regulations contained in the Code of Federal Regulations that address the same products or issues as the proposal? If so, why is the proposal justified? Are there any existing federal or state test procedures or standards in effect? Please discuss any potential duplication or conflict with those procedures or standards, and why the proposal is necessary in light of those issues. In addition, please discuss how the proposal affects or complements existing federal, state, or local statutes, ordinances, or regulations.]

- NA

## 13 Methodology for Calculating Cost and Savings

[Describe the methodology and approach used in the development of the proposed measures. Typically, this section will contain the assumptions used for the analysis of the proposal, a description of the base case (current Standards or current practice) and the proposed measure. The proposal should also exhibit the methodology used to calculate the savings and incremental cost of efficiency improvement.]

Base case is based on current ENERGY STAR v5.1 for Displays. Lack of established duty cycle, Industry used the ENERGY STAR v5.2 for Computers duty cycles for conventional desktops for comparison purposes.

## 14 Bibliography and Other Research

[List the research and analysis, studies, reports, experts, industry standards, and personal communications that were consulted to develop the proposal. Include research that is underway that is related to an aspect of the proposal. Indicate if data or information will be produced in time to be used in an update of the standards.]
Information Technology Industry Council Comment Letter 2013-05-09 TN-70709.pdf

California IOUs Response to the Invitation to Participate for Displays.pdf

http://www.energy.ca.gov/appliances/2013rulemaking/documents/responses/Consumer_Electronics_12-AAER-2A/

EU Ecodesign requirements ErP Lot 5

http://www.eceee.org/ecodesign/products/televisions

Aus/NZ MEPS

http://www.energyrating.gov.au/products-themes/office-equipment/computers-peripherals/documents-and-publications/?viewPublicationID=2641

Korea eStandby

http://www.kemco.or.kr/new_eng/pg02/pg02100300_2.asp

**Independent Market Research and Intelligence Companies**

IDC -- http://www.idc.com
Gartner -- http://www.gartner.com/technology/home.jsp

DisplaySearch --
http://www.displaysearch.com/cps/rde/xchg/displaysearch/hs.xsl/index.asp