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Additional submitted attachment is included below.

Electronic Displays

Response to Staff Report

Presented to the California Energy Commission

April 26, 2016

PG&E

SOUTHERN CALIFORNIA EDISON
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Why Standards?

- Growth in overall energy consumption due to increased sales of larger screen sizes and higher resolutions in business sector
- Significant energy savings opportunities
- Cost-effective and technically-feasible solutions
- Meet state policy goals

IOUs generally support CEC's proposal and note several areas for improvement

IOU Submissions to the CEC Docket

Date	Report (# *pages*)	Key Points
June 2013	CASE Report (*98*)	• Large variation in efficiency of similar sized and featured **monitors** • Power requirements for **monitors** are cost-effective and technically-feasible • Significant energy savings opportunity with standards
January 2015	Technical Report (*46*)	• Testing details on technical feasibility of proposed standards for **monitors** • Detailed various efficiency improvement measures
May 2015	Response to CEC and Technical Memo (*41*)	• Significant statewide energy consumption of **signage displays** • Update to On Mode requirements for **signage displays** are cost-effective and technically-feasible • Significant energy savings opportunity with updated standards for **signage displays** • Testing details on technical feasibility of updated standards for **signage displays**
August 2015	Response to CEC and Technical Memo (*29*)	• Updated **monitor** market information • Testing details on technical feasibility of proposed standards for **enhanced performance displays**

CEC Proposal: Summary Feedback

Areas of Support

- On Mode levels for 17-inch and larger models
- Sleep and Off Mode levels
- Max resolution allowance

Areas for Improvement

- Include smaller than 17-inch models
- New screen bin at largest level
- Define screen size bins using screen area rather than screen size (similar to ENERGY STAR®)
- Use ENERGY STAR operational mode and product type definitions
- Reduce adders for EPDs and include sunset provision
- Include signage displays

CEC's On Mode Proposal are Cost-Effective and Technically-Feasible

Table 9: Maximum Power Allowances by Modes – Computer Monitors

Diagonal Screen Size in inches (d)	On Mode in Watts (P_{ON_MAX})	Sleep Mode in Watts (P_{SLEEP_MAX})	Off Mode in Watts (P_{OFF_MAX})
Resolution (r) Less Than or Equal to 5.0 MP			
17"≤d<23"	(4.2*r) + (0.02*A) +2.2	0.5	0.3
23"≤d<25"	(4.2*r) + (0.04*A) – 2.4	0.5	0.3
25"≤d	(4.2*r)+(0.07*A)– 10.2	0.5	0.3
Resolution (r) Greater Than 5.0 MP			
17"≤d<23"	21 + (0.02*A) +2.2	0.5	0.3
23"≤d<25"	21 + (0.04*A) – 2.4	0.5	0.3
25"≤d	21 + (0.07*A) – 10.2	0.5	0.3

On Mode Levels are Feasible

169 models across all sizes available today would meet levels

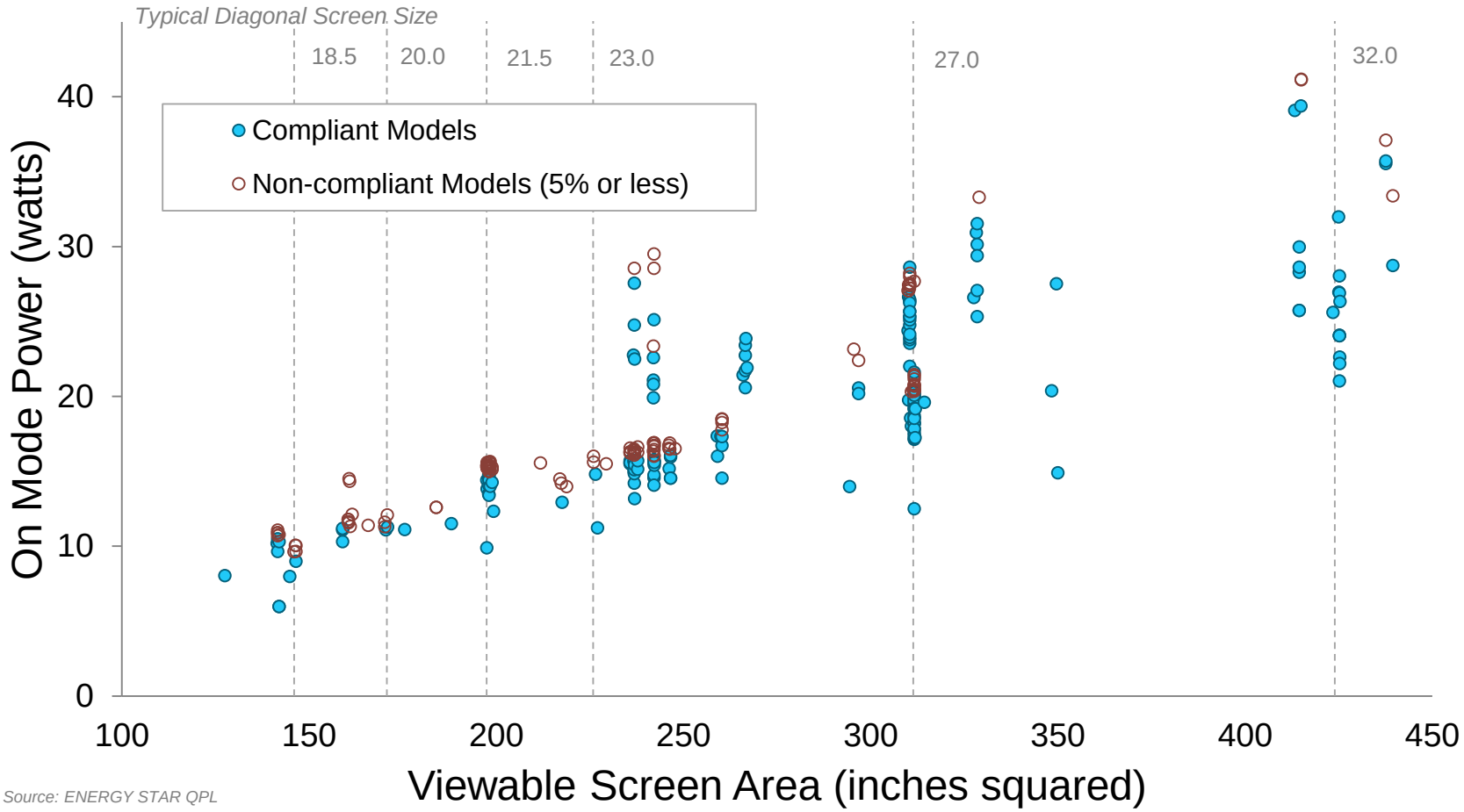
- 20 manufacturers represented
- Various resolutions (1.05 to 8.29 MP) and features
- All panel types: IPS, TN, VA
- Wide range of price points: $130 to $1,300

121 models would need to make improvements of 5% or less to meet proposed standard

- Low to no cost efficiency improvements, e.g., reflective polarizer film, higher efficacy LEDs, improved power supplies

Complying Monitors: 17-inches and Larger

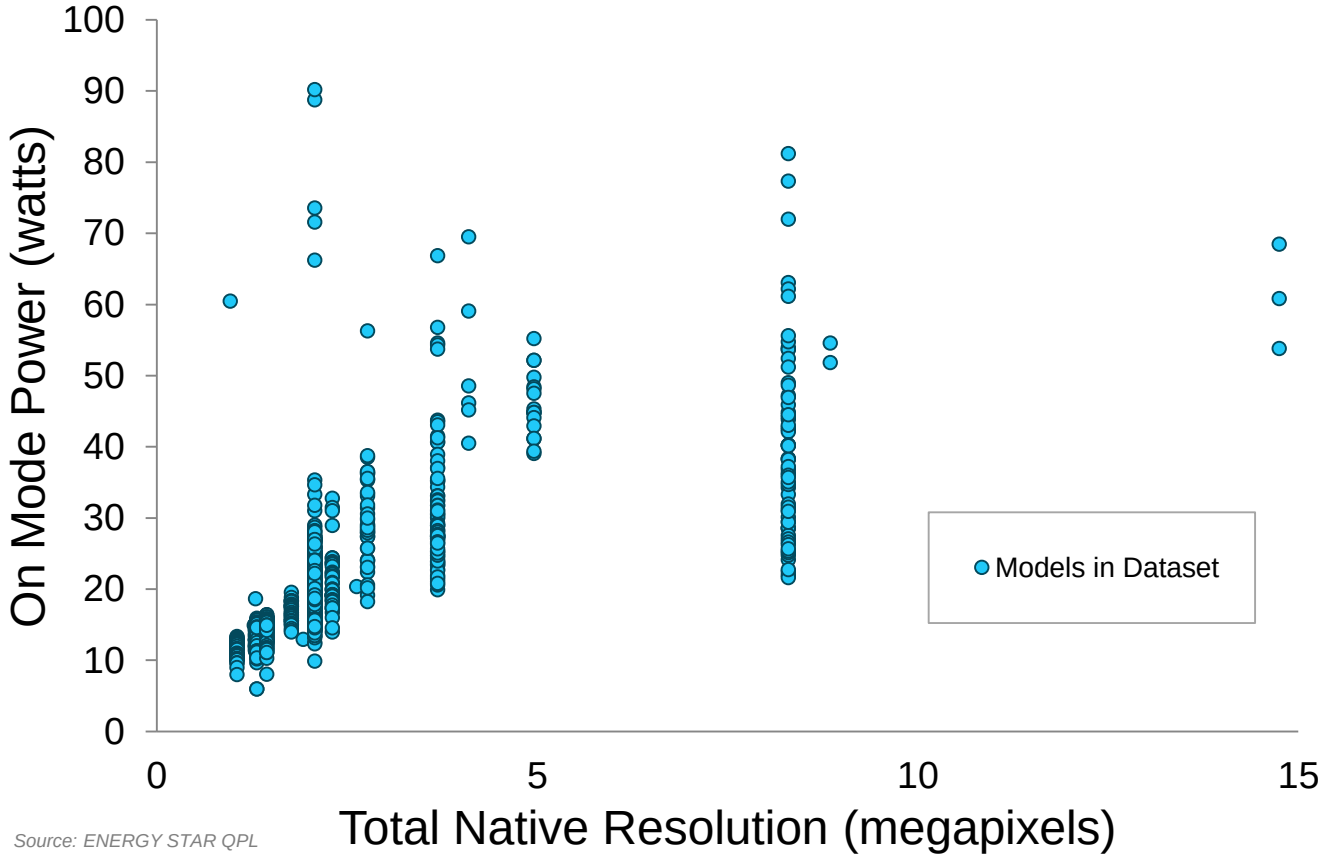
- Comply today: 169 models
- Within 5% of limit: 121 models



Source: ENERGY STAR QPL

IOUs Support Constant Resolution Allowance for > 5 MP

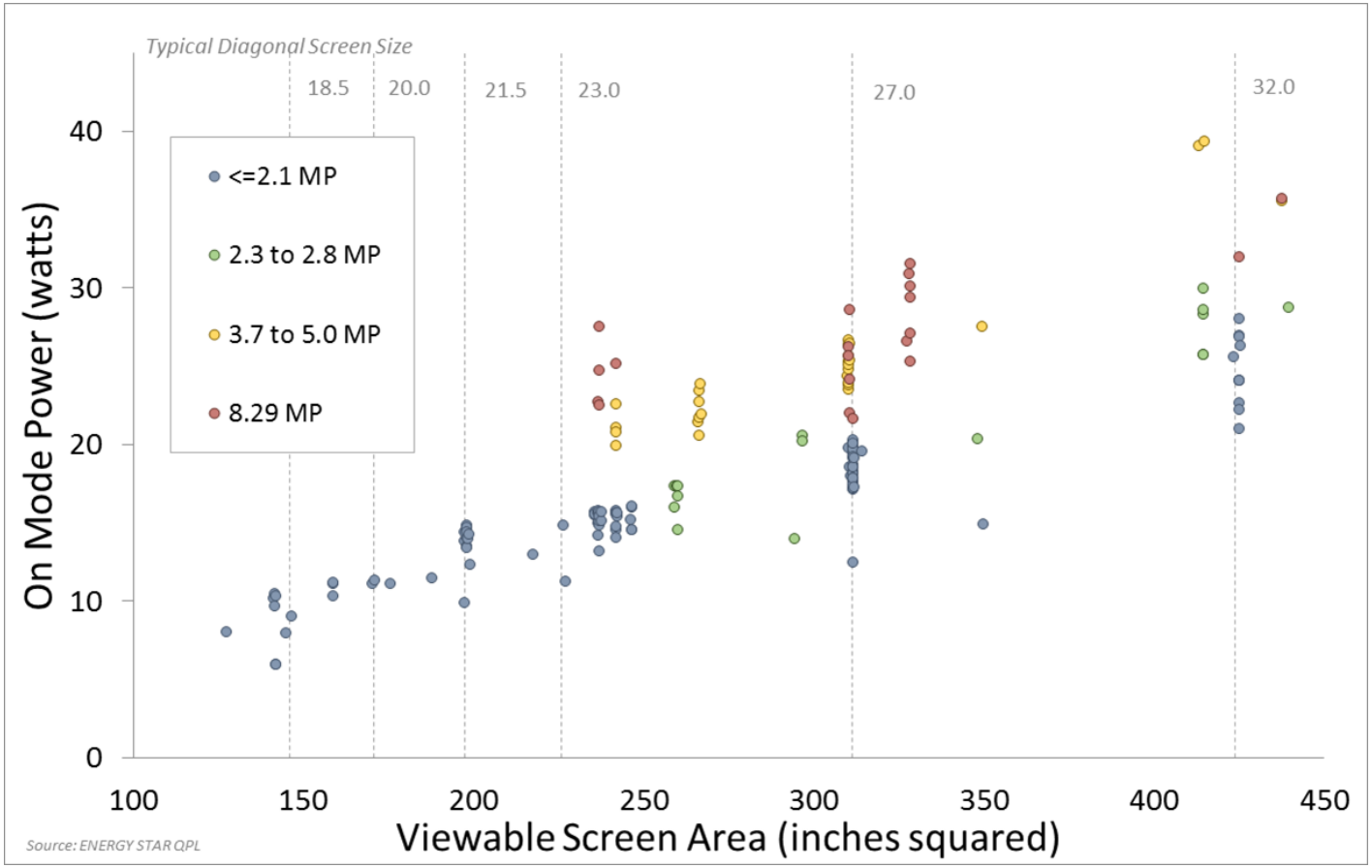
- Incremental power demand decreases with increasing resolution
- Constant allowance prevents lenient level without changing form of equation



Source: ENERGY STAR QPL

IOUs Support Constant Resolution Allowance > 5 MP

- Several examples of high resolution (8.3 MP) models being able to meet CEC's proposal
- Chart shows all models that meet CEC's proposal



Updated Sleep and Off Mode Levels are Feasible

- March 2015 CEC proposal virtually all models complied with Standby and Off Mode levels

- Updated CEC proposal better reflects the power requirements for Sleep and Off Modes
  - A majority of models still meet both Sleep and Off Mode levels

- Our review confirms CEC's finding that majority of models with various networking/data connections are able to meet proposed Sleep and Off Mode levels
  - Large percentage of monitors comply with proposal for every data/connection type except Gigabit Ethernet
  - Gigabit Ethernet connection can meet proposal using EEE
  - Technically feasible and currently available

Test Procedure Brightness Setting

- CA IOUs continue to support testing be conducted in the as-shipped (“default”) configuration rather than calibrated to 200 cd/m^2
  - More representative of actual energy use

- If testing to align with ENERGY STAR at 200 cd/m^2, IOUs would support provision proposed by CEC to limit displays being shipped excessively bright
  - End users can easily increase brightness based on viewing conditions

Areas for Improvement

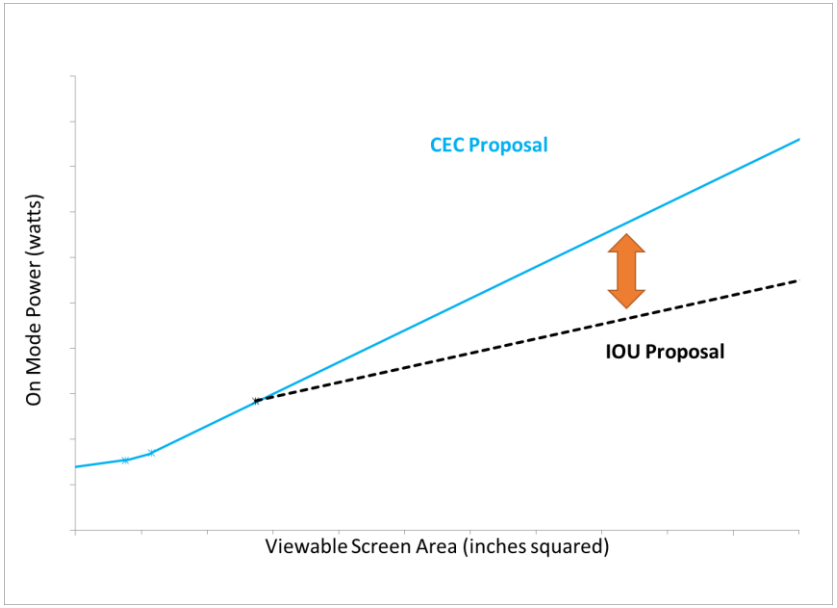
- Models less than 17-inches should be included in regulation
  - Potential loophole if future market shifts to smaller screen sizes
  - No technical justification has been provided to exclude these models
  - ENERGY STAR has been providing power limits for these models for over a decade

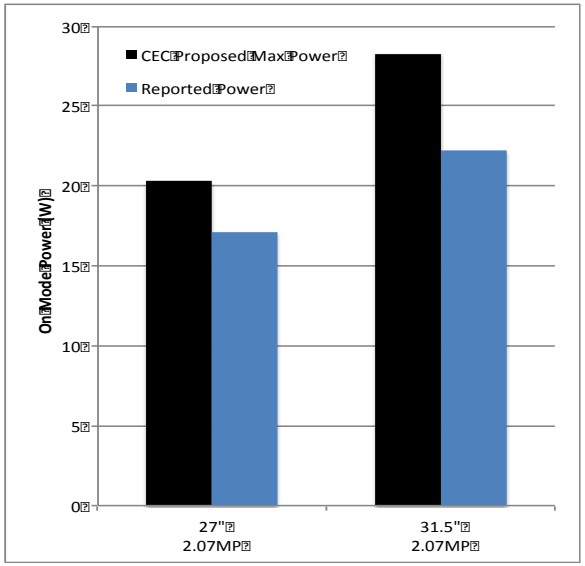
- Align screen bins using screen area rather than diagonal size
  - Several aspect ratios exist, so that given a screen diagonal, multiple screen areas are possible
  - More straightforward, aligns with ENERGY STAR

Screen size (in)	Resolution	Screen Area (in^2)	Bin
24.1	1920x1200	260	23”≤d<25”
25	2560x1080	224	25”≤d

IOU Propose New Size Bin to Limit Power Consumption at Largest Sizes

- As screen sizes get larger, IOUs propose reducing the slope of the On Mode limit for the largest sizes
- CEC's proposal is too generous for displays over 25"
- Larger monitors don't need proportionally larger allowance (the slope of the power vs screen size should decrease with increasing size)





Increased Adders for EPDs are Not Necessary

- EPDs becoming more popular, have high growth potential

- No adder needed for sRGB
  - Becoming a commodity feature, often not marketed unless consumer digs deep into the specs
  - CEC has shown that a large number of sRGB EPDs available today would meet the proposed standard without an adder

- CA IOUs recommend 40% adder for Adobe RGB, with sunset provision of expiring by a specific date
  - Currently available products do not comply with proposed standard without adder
  - CA IOUs have suggested one route to compliance without an adder: Quantum dot film + high efficacy blue LEDs
  - Sunset adder to encourage efficiency improvements in next design cycle

Align with Definitions Developed by ENERGY STAR, Include Signage Displays

- Staff should leverage ENERGY STAR definitions
  - Vetted with industry and advocacy groups through development of multiple versions of specification
  - Recommend use of definitions in Version 7 for product types except EPDs and modes of operation
  - Recommend Version 6 definition of EPDs

- Signage displays On Mode levels should be updated in this rulemaking
  - Similar scope to ENERGY STAR
  - Testing data and analysis provided from IOUs justify cost effective, feasible levels today

Other Questions

- Tuner-Free “TVs” (or displays)
  - A display without a tuner, which is only needed for over-the-air broadcast content, intended to display TV content from cable/satellite TV or streaming
    - Are these TVs or displays? TVs by definition have a tuner
  - Where should these devices be covered?
  - CA IOUs will make a recommendation in written comments

- Automatic Brightness Control (ABC)
  - Test procedure included in ENERGY STAR test method
  - How should CEC use these measurements to calculate power for displays with ABC enabled by default?