DOCKETED

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NRDC Draft 2 workshop presentation

Additional submitted attachment is included below.

CEC “DRAFT 2” WORKSHOP COMPUTERS

APRIL 26, 2016

Computers and displays are one of the largest unregulated residential and commercial electric loads in California

Computers, monitors, displays energy use in California

CEC Staff Proposal	8,200 GWh/y
EIA - Miscellaneous Electric Loads - 2013[1]	12,100 GWh/y

3-5 power plants in CA

Actual energy use even higher, when adjusted for real-usage[2]

Desktop	+ 15%
Integrated Desktop	+ 25%
Notebook	+ 40%

3-5 MMT CO2/y

$1.5-2 billion/y

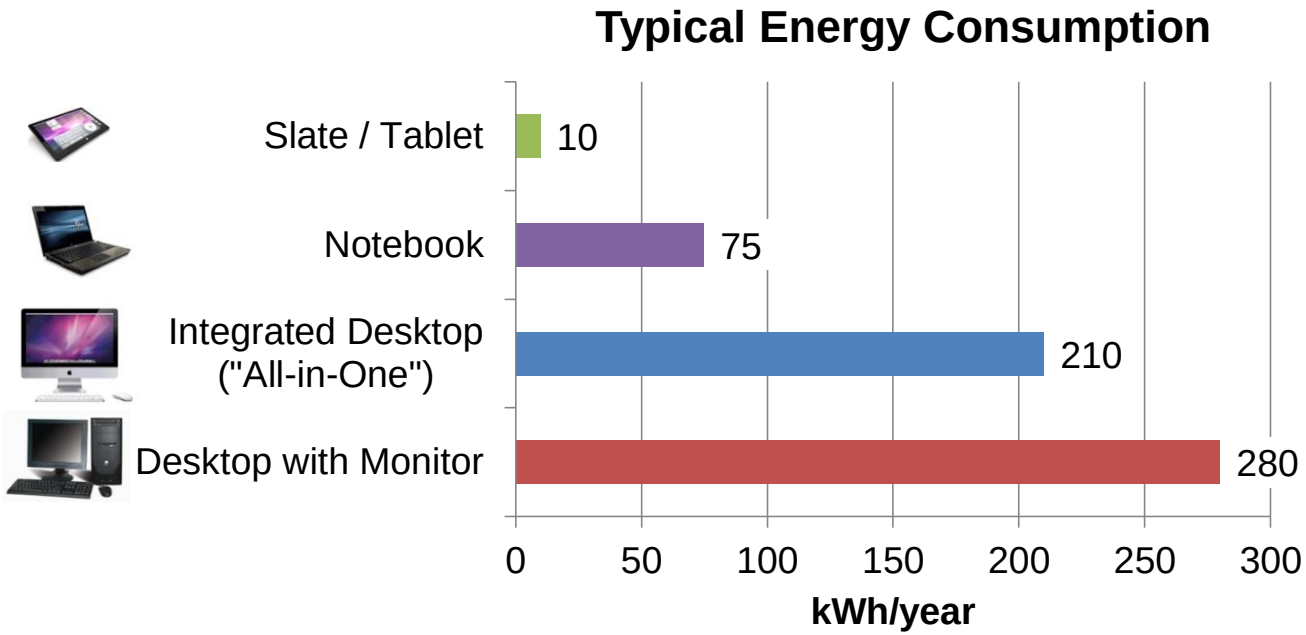
1. http://www.eia.gov/analysis/studies/demand/miscelectric/pdf/miscelectric.pdf
2. CA IOUs, Real World Adjustment Factor, Oct 2014 CASE report addendum, Docket #12-AAER-2A

NRDC

LARGE ENERGY SAVING POTENTIAL WITH EXISTING TECHNOLOGY

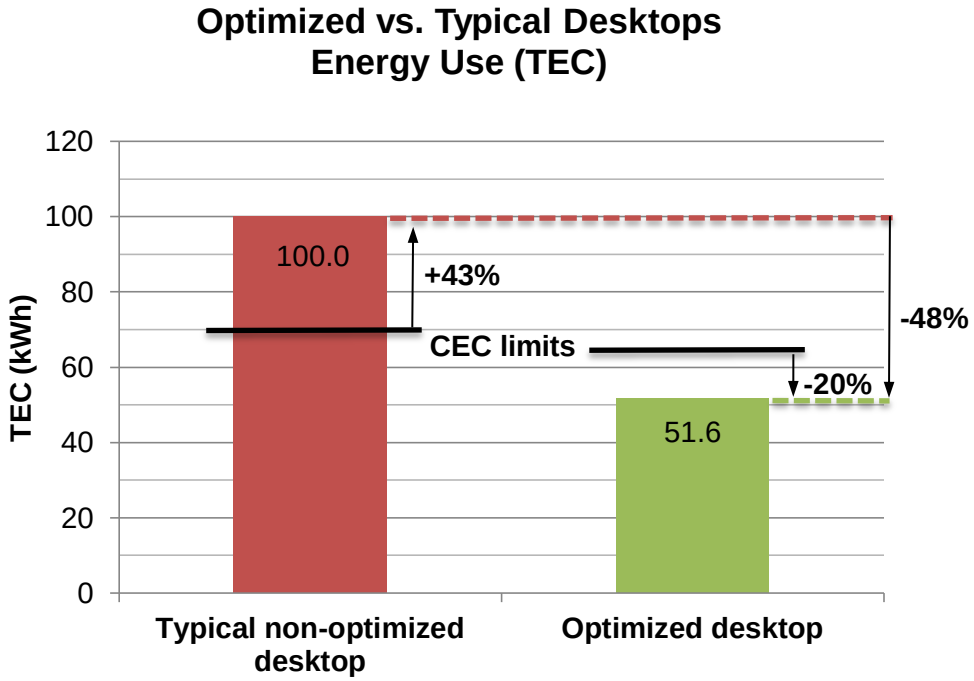
Large differences in energy use between computer form factors

Battery-powered devices of similar capabilities and price have radically lower power use



Source: Fraunhofer 2014, plus real-world adjustment factor.

April 2016 demonstration: Optimized desktop uses half the energy of non-optimized equivalent, and 20% below CEC limit

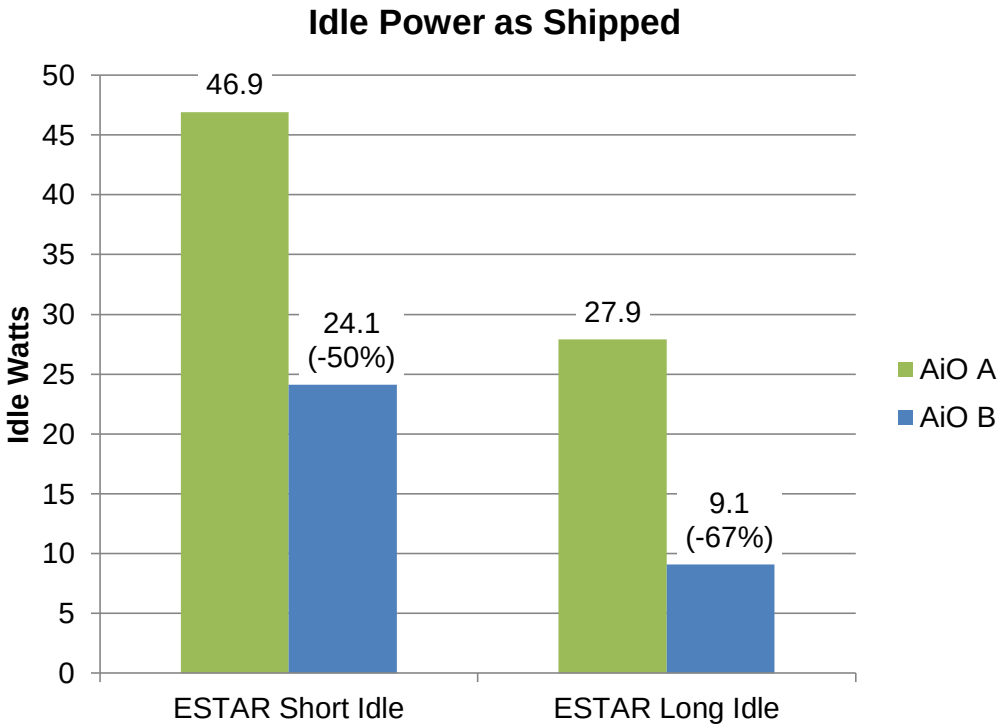


Optimized desktop
High-efficiency motherboard
High-efficiency power supply (prototype), extra cost < $1
High-efficiency HDD (“Green”) and memory (DDR4)
Optimized power management settings

- Two desktops of equivalent specs, fairly high performance
- Optimized desktop use **half** the energy of the typical desktop
- Optimized desktop **20%** lower than CEC limit

Two commercially available all-in-one computers with similar features and performance, but a 2-3x difference in idle power

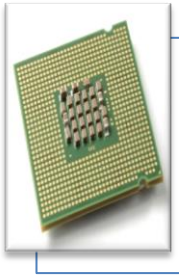
AiO A, 21.5”



AiO B, 21.5”

- Many reasons for difference: power settings, software, hardware
- Most energy efficiency improvements cost nothing (settings) or little more (software)

Key opportunities for energy savings in computers



System power settings

- Low power states (C-states)

User power settings

- Display brightness
- Dimming, screen off, sleep

Power supply

- High-efficiency at low load

Motherboard

- Power off unused ports

Display

- More efficient backlighting and films

Disk

- More efficient HDDs
- Hybrid SSD-HDD architectures

Stringency: CEC's proposed levels are reasonable, far from today's most cost-effective and technically feasible solutions

- Proposed levels can be achieved cost-effectively using just a few of these solutions, as demonstrated
- Many more solutions available to manufacturers
- Performance-based approach => flexibility for manufacturers to implement the most cost-effective solutions and innovate
- Far from the maximum cost-effective energy savings possible

Key improvements opportunities to ensure effective standards

Two tiers to maximize savings

- Tier 1: Less ambitious, earlier savings
- Tier 2: More ambitious, longer timeframe

Expandability adder

- Strongly support concept, but important details to finalize

Some allowances and adders too generous

- Mainstream notebooks
- Display adder
- Disk adder

Definitions

- Several definitions need tightening and some new component definitions needed

Duty cycle

- Network connectivity duty cycle not based on data. Should use conventional only.

Power supply

- Idle limits not sufficient. Need reasonable active efficiency and power factor requirements.

CONCLUSION: CEC's proposed computer standards will benefit CA consumers, businesses and economy

- ✓ **Large energy saving opportunity**
  1 large power plant, $400 million electric bill savings, 3/4 million tons CO2 in CA (much more nationally and globally)

- ✓ **Good for CA consumers and businesses**
  3:1 savings-to-costs for desktops, payback in 1.5 years

- ✓ **Good for CA economy**
  Economic benefits from bill savings: increase in consumer disposable income, cost reduction for CA businesses