DOCKETED

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NRDCâ€™s Presentation for the April 15th workshop on Computer, Computer Monitors, and Electronic Displays

Additional submitted attachment is included below.

CEC COMPUTER EFFICIENCY STANDARDS

APRIL 15, 2015

Computers and displays are responsible for 4-5% of electricity use in California

Computers, monitors, displays energy use in California

CEC Staff Proposal	8,282 GWh/y
EIA - Miscellaneous Electric Loads - 2013[1]	12,125 GWh/y

4-5 power plants

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

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

4-5 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

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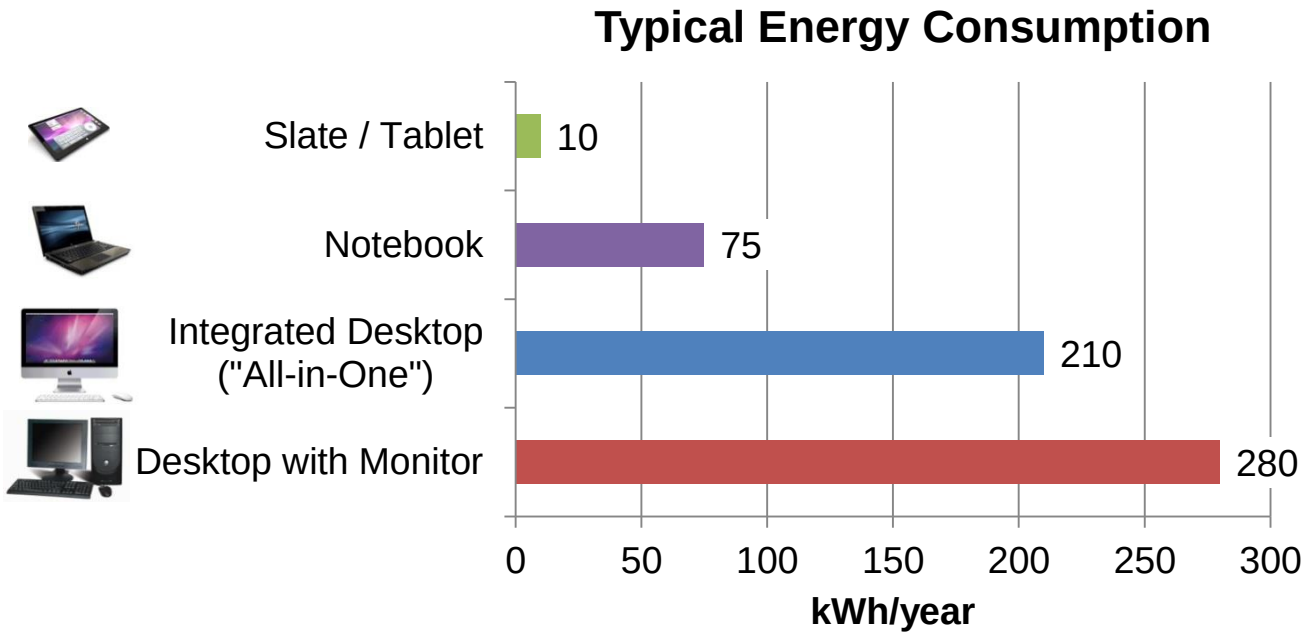
LARGE ENERGY SAVING POTENTIAL WITH EXISTING TECHNOLOGY

Large efficiency gap 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.

Much progress made on low-power technology since previous standards

Recent efficiency technology	ENERGY STAR v6, EU Ecodesign Tier 1 (2010-2012 computers)
• Low-power processor states (C6/C7)	• Not available
• Motherboard switches off inactive components	• Components remain on throughout idle mode
• Peripheral interface PCIe L1.2 sub-state	• Not available
• Graphics switching on desktop (switch to integrated gfx for low-intensity gfx tasks)	• Notebooks only
• Right-sized and efficient power supplies	• Minimum efficiency requirements, but many still oversized
• “Keystroke sleep” (real-time power management)	• 15-min power management

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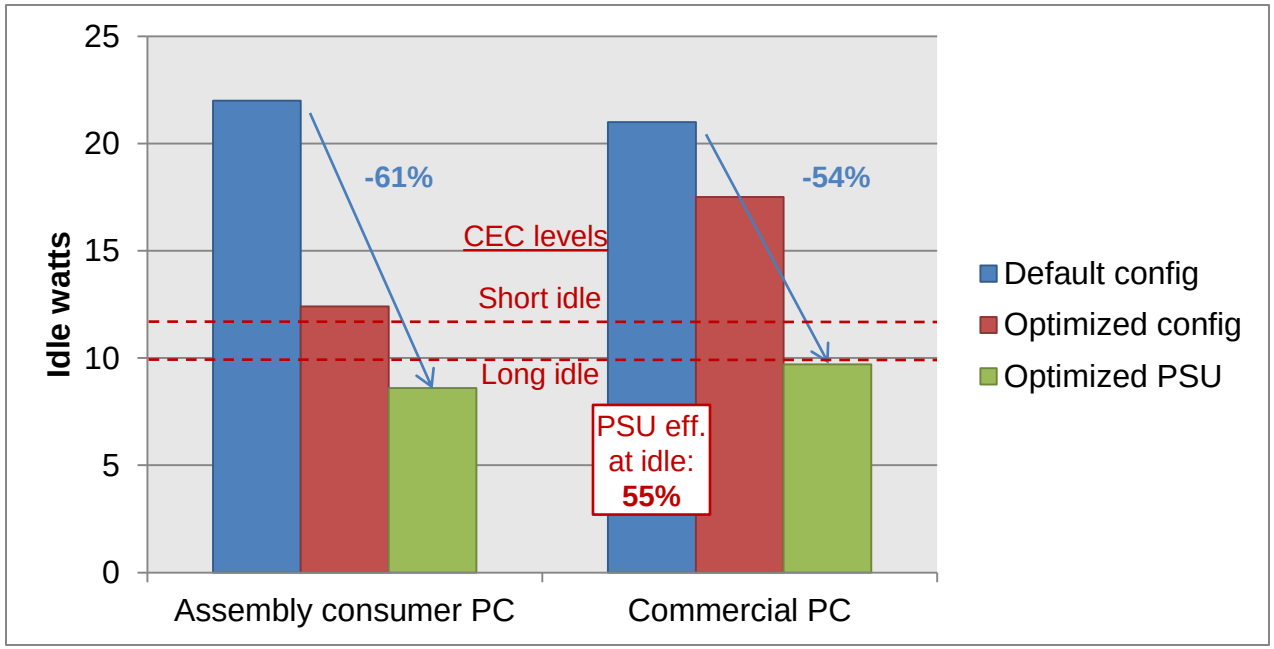
Today's mainstream desktops capable of achieving CEC proposal with minor changes

Aggios demonstration project:



- Reduced power by **54-61%** from out-of-the-box configuration
- Through power management software, BIOS and OS configuration changes, and inexpensive power supply upgrade
- No impact on latency or performance

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Integrated Desktops: significant energy saving potential beyond current CEC proposal

Apple iMac 21.5-inch	HP EliteOne 800 G1 21.5-inch Non-Touch AiO PC	CEC proposed limit[1]	ENERGY STAR limit[1,2]
			
Annual TEC: 73 kWh	Annual TEC: 113 kWh	Annual TEC: 100-125 kWh	Annual TEC: 205-230 kWh

iMac 22% lower than proposed CEC limit,
HP EliteOne 10% lower, without optimizations

(1) HP model has higher adders than the iMac
(2) Both computers in ENERGY STAR I3 performance category, and have same screen size

Notebooks: very large energy saving potential beyond current CEC proposal

Apple MacBook Pro 13-inch with Retina Display	Dell Latitude E6440, 13-inch	ENERGY STAR limit[1,2]	CEC proposed limit[2]
			
Annual TEC: 15.5 kWh	Annual TEC: 42.2 kWh	Annual TEC: 50-65 kWh	Annual TEC: 55-72 kWh

MacBook Pro **78% lower** than proposed CEC limit

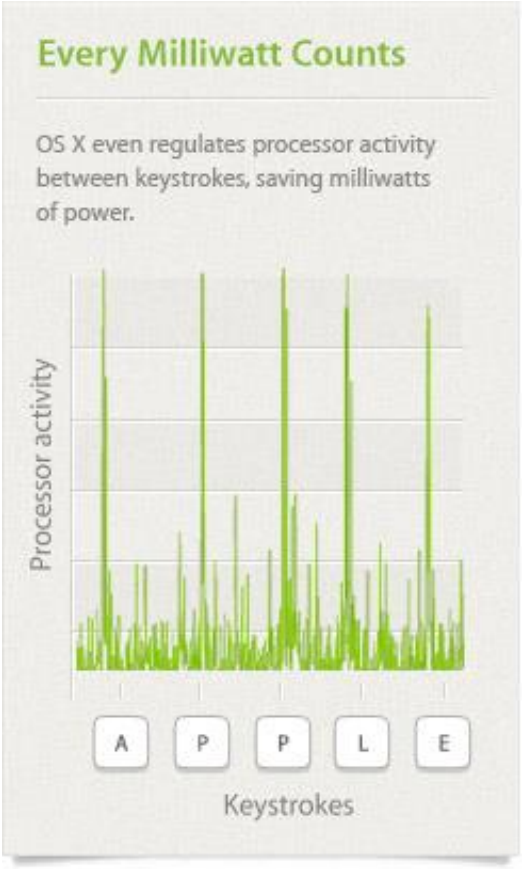
(1) Both laptops in ENERGY STAR I2 performance category, and have same screen size
(2) MacBook Pro has higher adder due to higher resolution screen

Real-time power management: sleep between keystrokes

Smartphone- and tablet-like power management:

- Apple's MacBook Pro manages power at millisecond level
- Goes to low-power "sleep mode" between keystrokes

➢ Demonstrates technical feasibility of much lower levels for notebooks



© Apple computers

CEC's proposal is generally sound, technically feasible, very cost-effective

- ✓ **Large energy saving opportunity**: 1-2 power plants, $430 million, 1-2 million tons CO2 in CA (much more nationally and globally)
- ✓ **Performance-based**: flexibility for industry to achieve levels
- ✓ **Idle mode only**: no impact on new features or performance in active mode

NRDC is committed to working with all stakeholders to make the standards work for all parties.