DOCKETED

Docket Number:	14-AAER-02
Project Title:	Computer, Computer Monitors, and Electronic Displays
TN #:	211230
Document Title:	Aggios Comments: California Energy Commission Draft 2 Workshop on Computers - Technical Demo
Description:	Title 20 Workshop 2016-04-26
Filer:	System
Organization:	Aggios
Submitter Role:	Public
Submission Date:	4/25/2016 10:13:20 AM
Docketed Date:	4/25/2016

Comment Received From: Aggios
Submitted On: 4/25/2016
Docket Number: 14-AAER-02

AGGIOS_Title 20 Workshop_2016_04_26

Additional submitted attachment is included below.

California Energy Commission
Draft 2 Workshop on Computers
- Technical Demo -

04/26/2016

Who we are

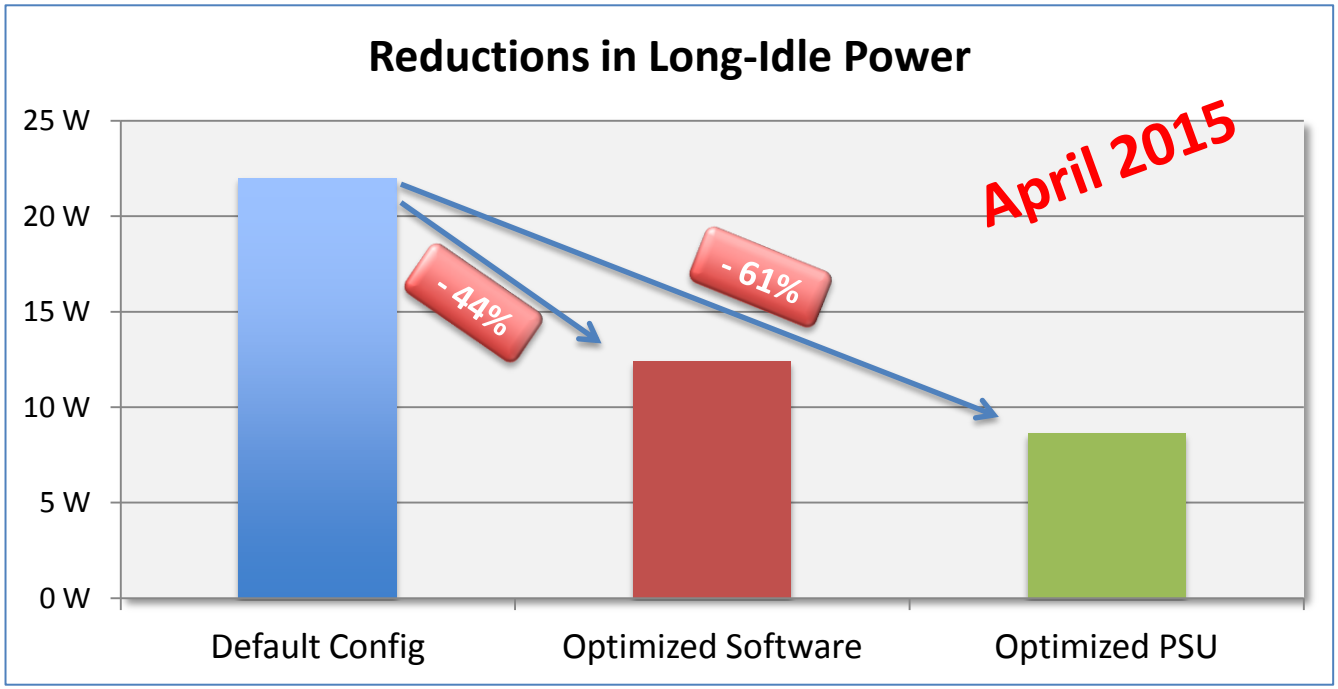
- Irvine, CA based
- Our focus: Software-Defined Power Management
- Why we are here:
  - Support Commission's energy efficiency activities
  - Promote mobile levels of energy efficiency for plug load devices
  - Increase awareness of the new IEEE P2415 technical standard
- Presenters:
  - Davorin Mista, MSEE, VP Eng.
  - Vojin Zivojnovic, Ph.D., CEO

First Workshop: Demo recap

April 2015

Power for assembled computer was reduced from 22W to 8.6W in the Long Idle state (EnergyStar 6.1)

- Main improvements: software optimizations, turning off the HDD and using a niche market power supply (pico-PSU)
- Short Idle power was still high at 18.7W



1 year later …

- We've built a new desktop (denoted here as Desktop A) with higher performance but significantly lower power
  - 10.5W in Long Idle and 11.4W in Short Idle
    - ~40% reduction in Short Idle power without powering off the HDD
    - Long Idle power similar to what we've achieved last year but now without powering off the HDD or using niche market PSU
  - Improvements come from energy efficient off-the-shelf components now widely available:
    - New CPU using less than 2W in short and long idle
    - Improved motherboard
    - DDR4 memory
    - "Green" HDD
  - Brand new PSU reference design: 300W 2-stage PSU with >70% efficiency at 8W, 64% at 6W

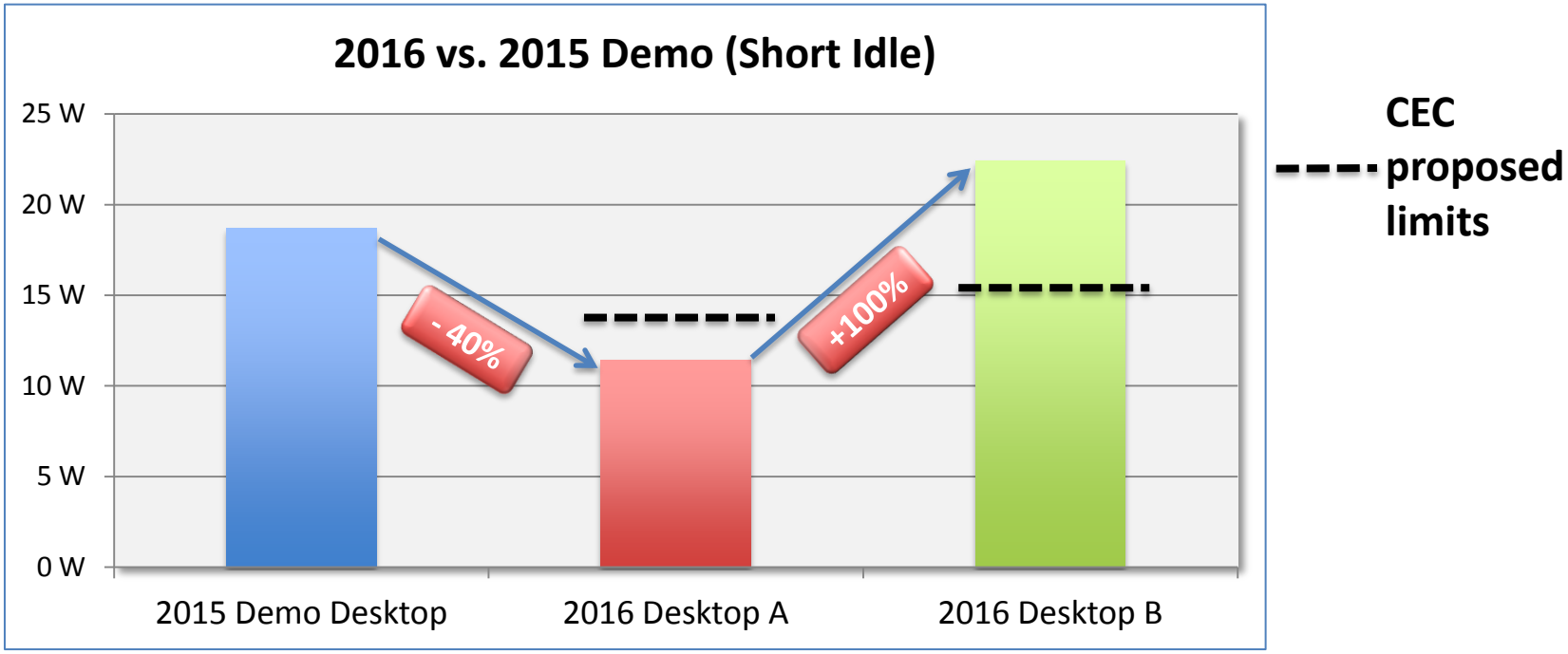
Low power isn’t guaranteed

- Many components on the market are much less efficient than the ones we selected
- It is not obvious which components provide best efficiency
- Example: Desktop B using identical CPU as Desktop A
  - 22W instead of 11W in Short Idle
  - Same processing performance as Desktop A
  - Main sources of additional power consumption are
    - Motherboard design
    - DDR3 instead of DDR4 memory
    - “Blue” HDD
    - Standard 80PLUS power supply

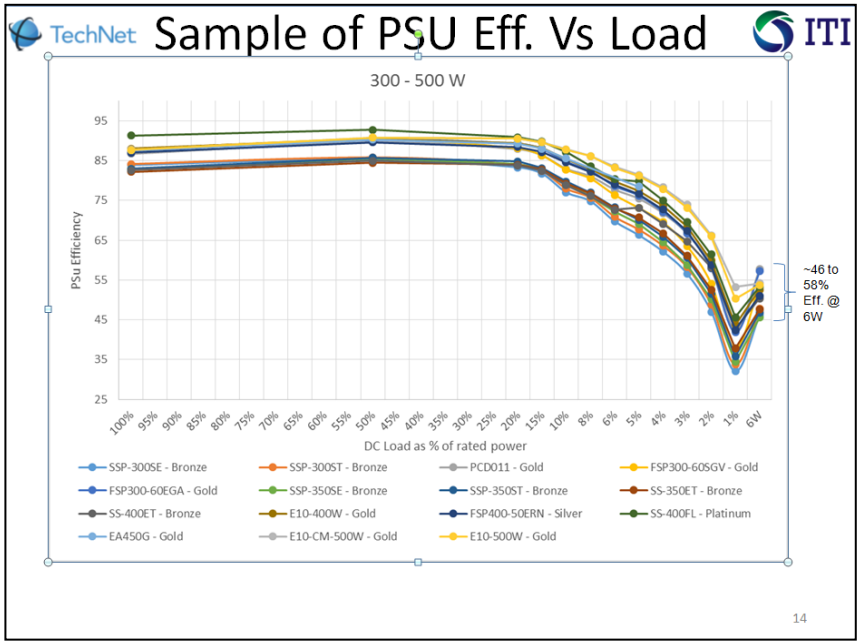
Demo

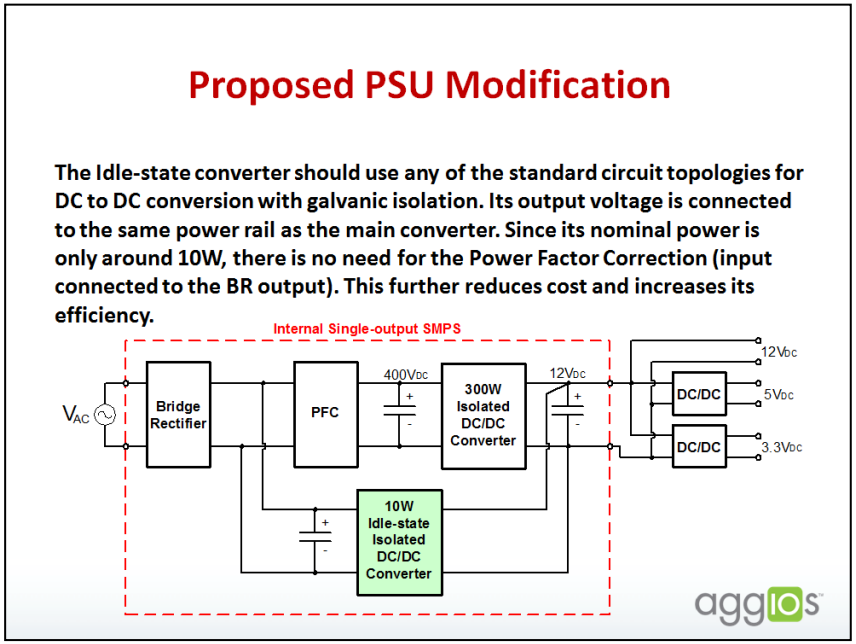
2015-2016 comparison

- Achieving proposed CEC levels is possible using standard components available today
- Many inefficient components are still on the market though



Solving the Low-Load PSU inefficiency





Problem: PSUs are inefficient at low loads (June 2015)

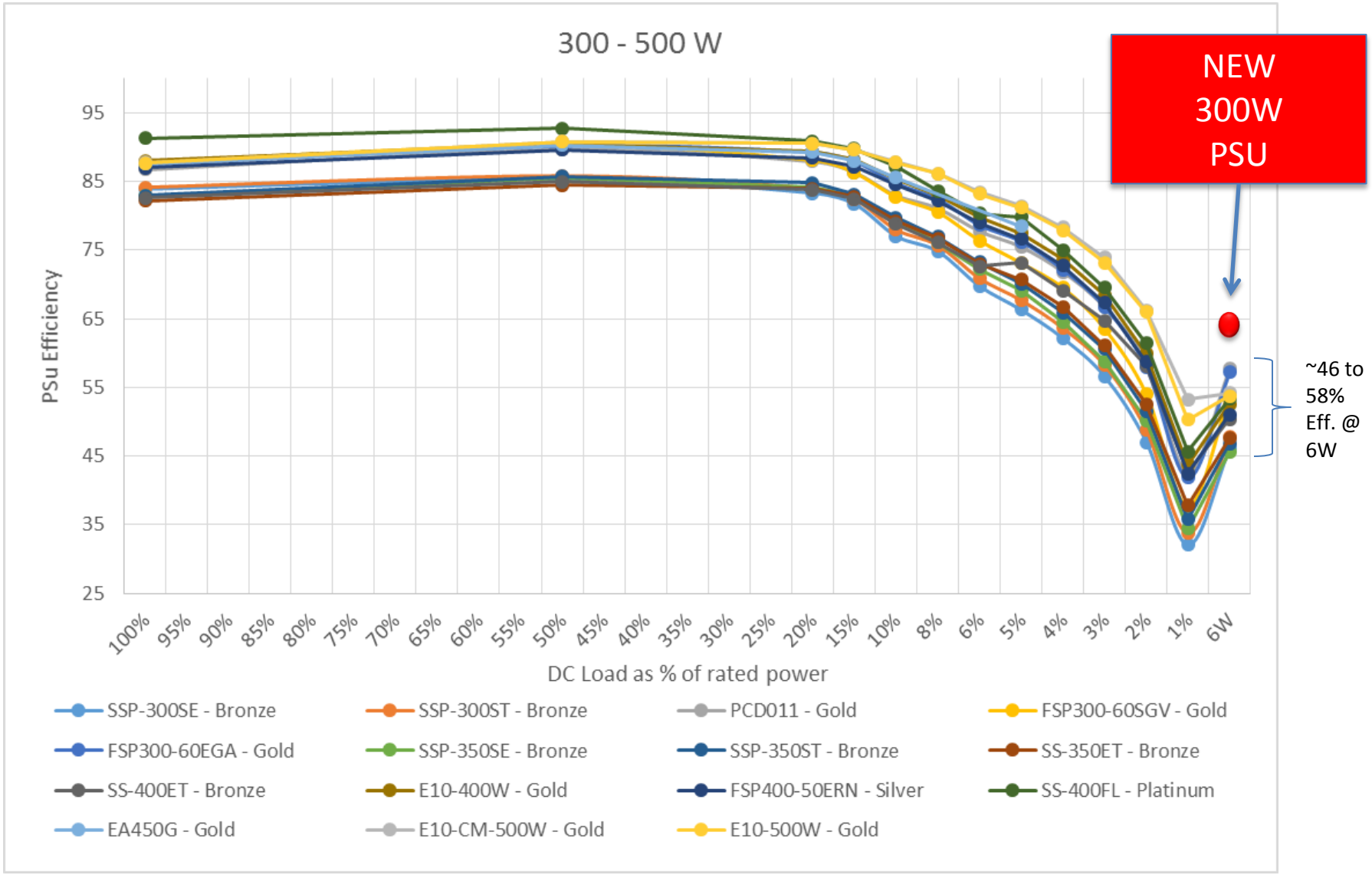
Idea: Two stage PSU (Sep. 2015)

April 2016: Brand New PSU Reference Design

- Collaboration between

- AGGIOS: initial idea, testing, integration, measurements
- Power Integrations: AC-DC stage technical solution and implementation
- Rohm Semi (Powervation): DC-DC stage technical solution and implementation
- Additional costs for PSU components < $1

Sample of PSU Eff. Vs Load (ITI Slide)



Many thanks to power experts at PI and Rohm!

Conclusion

- It is possible to meet and exceed energy consumption levels proposed by the Commission
- The computer industry has made significant technical progress in one year
- Still, computers are not efficient by default
- Plenty of room for additional innovation, especially in power conversion, motherboard design and power management software