



Tapping into Commercial Office Plug Load Savings:

How Can We Reduce Energy Consumption of Plug Load Devices Through Changes to Hardware, Software & Occupant Behavior?



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2010 Behavior, Energy & Climate Change Conference

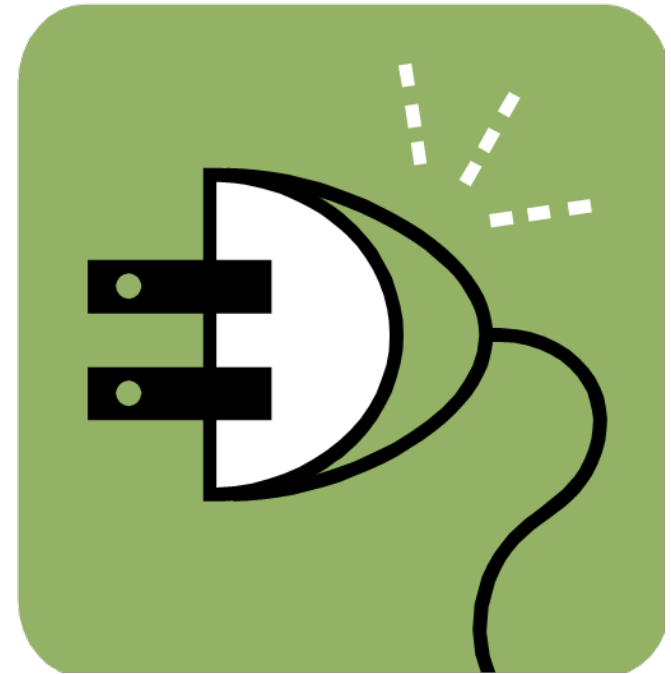
November 15, 2010

Overview

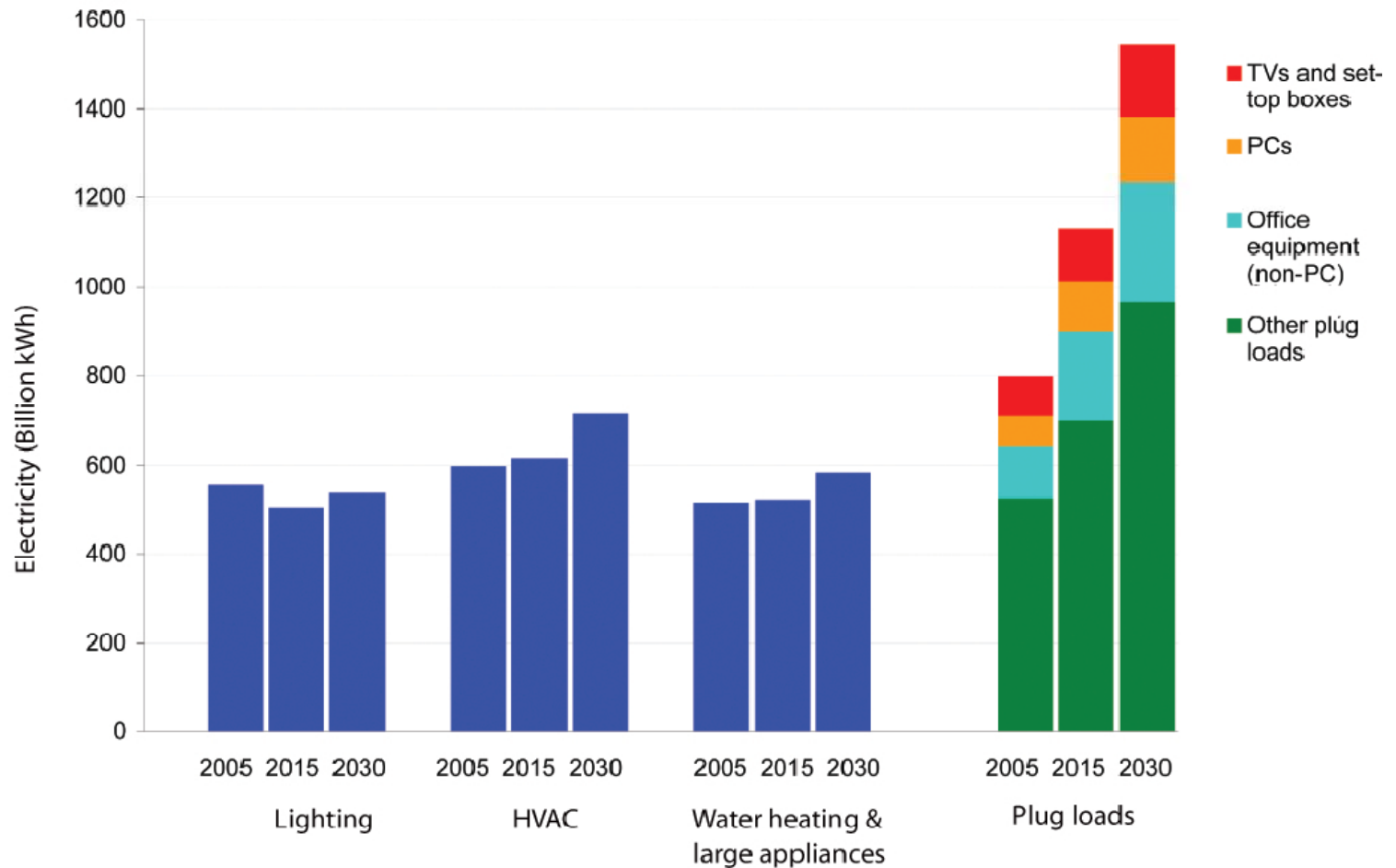
- ▶ What are plug loads and office electronics?
- ▶ Why are we concerned with their energy use?
- ▶ What have we learned from our previous field metering studies?
- ▶ What are we learning from our current field metering study?

What are “Plug Loads?”

- ▶ Plug loads are devices that plug into regular (120 V) electrical outlets (as opposed to being hard-wired)
- ▶ They do not fall into other traditional end-use categories (appliances, lighting, HVAC, etc.)
- ▶ Can be residential (consumer electronics) or commercial (office electronics). Examples:
 - ▷ Computers
 - ▷ Monitors
 - ▷ Printer/ Multifunctional devices
 - ▷ Speakers
 - ▷ Coffee Makers
 - ▷ Cell Phone Chargers



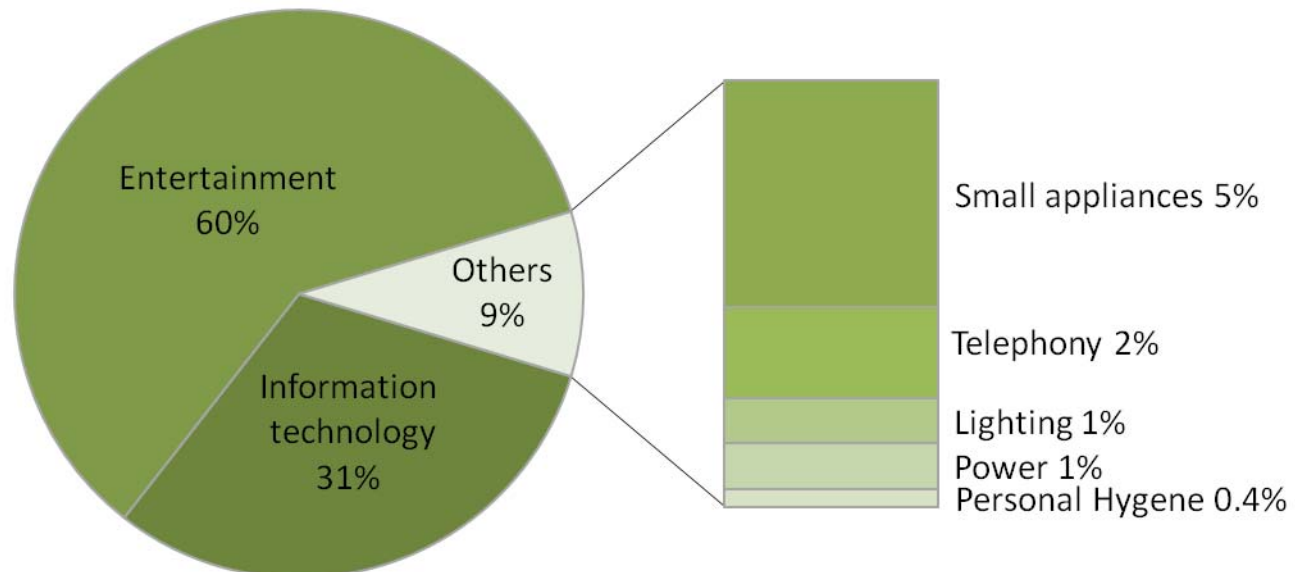
Plug loads are One of the Largest and Fastest Growing End-Uses of the Residential and Commercial Sectors



Source: Graph created by Ecos with data from EIA 2008 Annual Energy Outlook

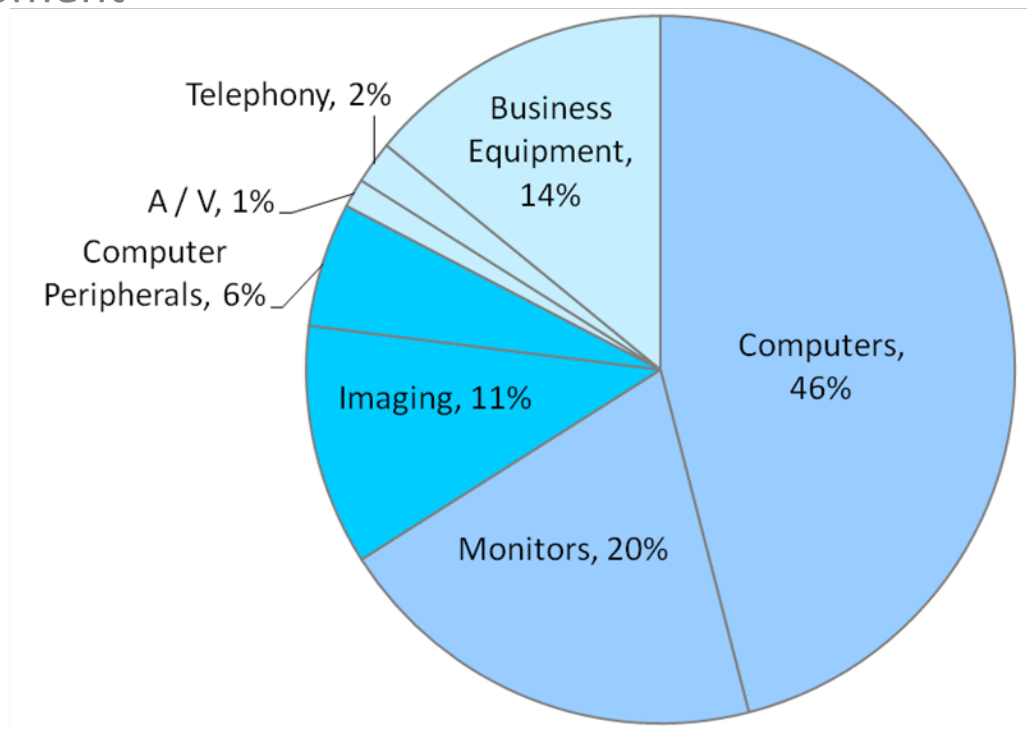
2006 Residential Field Monitoring Study

- ▶ In 2006, Ecos — in cooperation with RLW Analytics and LBNL— conducted the first comprehensive residential plug load field monitoring study in the United States
- ▶ Metered nearly 700 plug loads in 50 homes in California
- ▶ Found that plug load energy use is between 1,069 and 1,207 kWh per year, costing each homeowner approximately \$150 per year to operate
- ▶ This is at least 15% of electricity use in a California household
- ▶ Entertainment electronics, including TVs and set-top boxes, represented over half of the energy use by plug loads in homes



2008 Commercial Field Monitoring Study

- ▶ Research conducted late 2007 / early 2008
- ▶ Visited 48 offices in northern and southern California; inventoried nearly 7,000 plug load devices and monitored 470 of them in 24 offices for two weeks
- ▶ Plug loads may now be as much as 25-30% of California office electricity use
- ▶ Office plug loads are dominated by computers, monitors and imaging equipment



2010 Commercial Plug Load Field Study

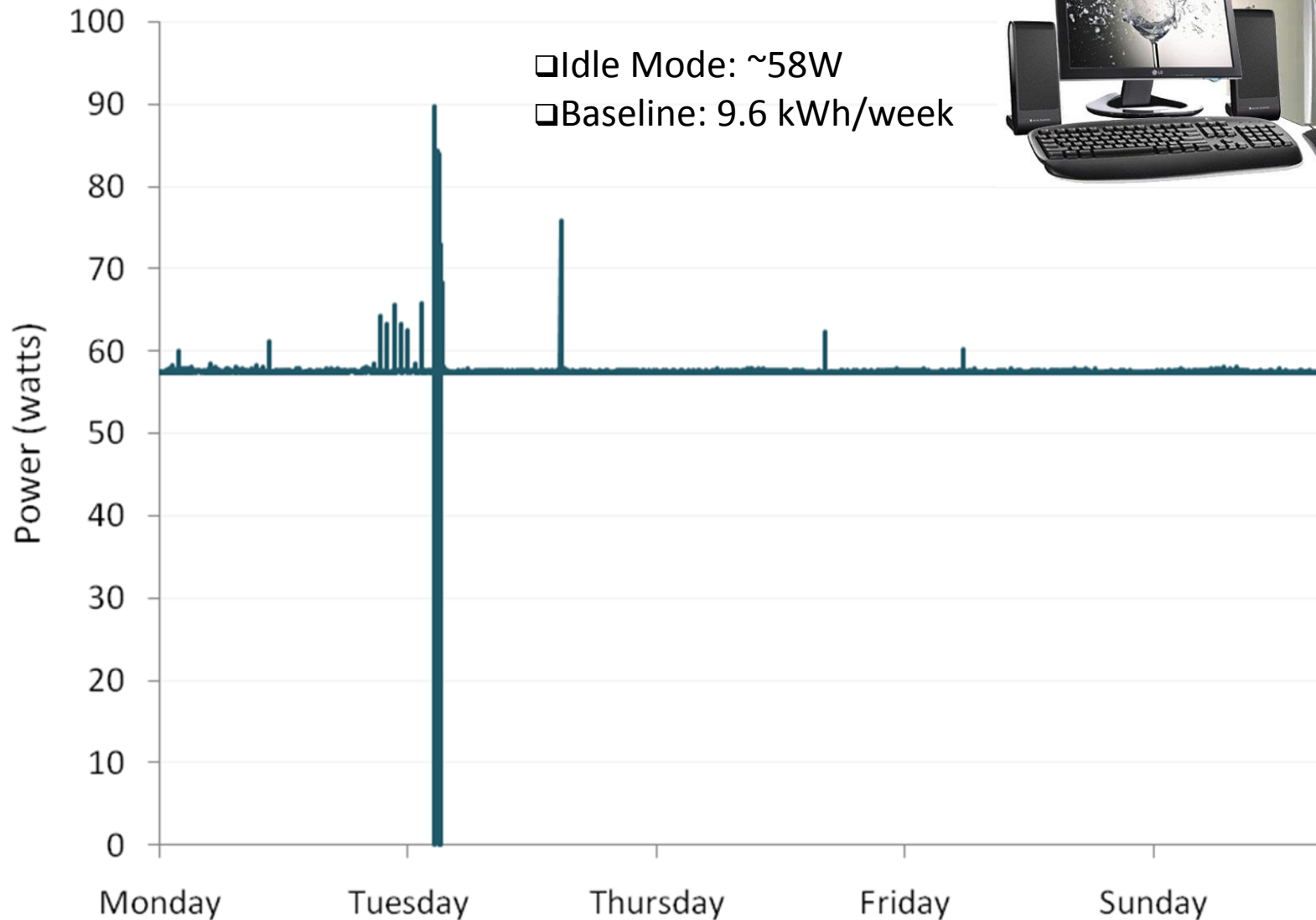
- ▶ Determine the extent to which commercial building occupants can reduce peak demand and energy consumption of their plug load devices through changes to
 - Hardware—highly efficient office equipment, smart plug strips, etc.
 - Software—power management software
 - Occupant behavior—manual power-down of equipment, enable and properly program power management settings, procurement of highly efficient equipment
- ▶ If the above energy reduction strategies are successful, identify actions that utilities and policy makers could take to secure these savings throughout California's commercial buildings.



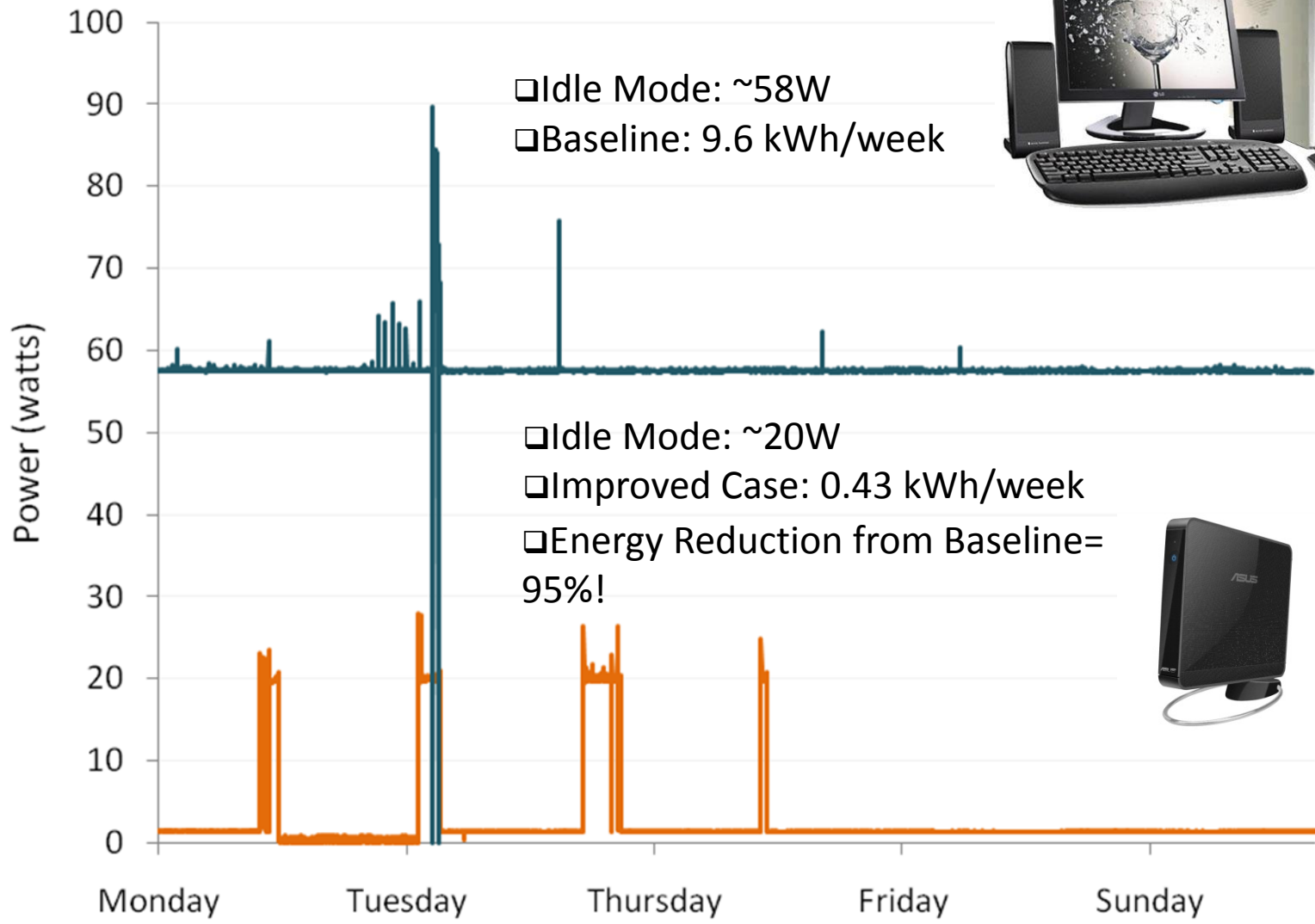
Plug Load Energy Reduction Strategies Evaluated

- ▶ Energy efficiency measures
 - Shift from desktop computers to micro-sized desktops with basic functionality and ultra-low power use when possible
 - Replace inefficient equipment with comparable, high-efficiency TopTen models (<http://www.toptenusa.org/>)
- ▶ Control strategies and occupant behavior measures
 - Enable power management settings for PCs, monitors and imaging equipment
 - Adjust brightness settings of computer monitors
 - Use load-sensor plug strips, remote control plug strips and timers to minimize off-hours energy use
 - Use posters, energy monitoring displays and outlook reminders to encourage office occupants to turn off devices when not in use

Desktop Computers Were Often Left Operating in Idle Mode Overnight and on Weekends

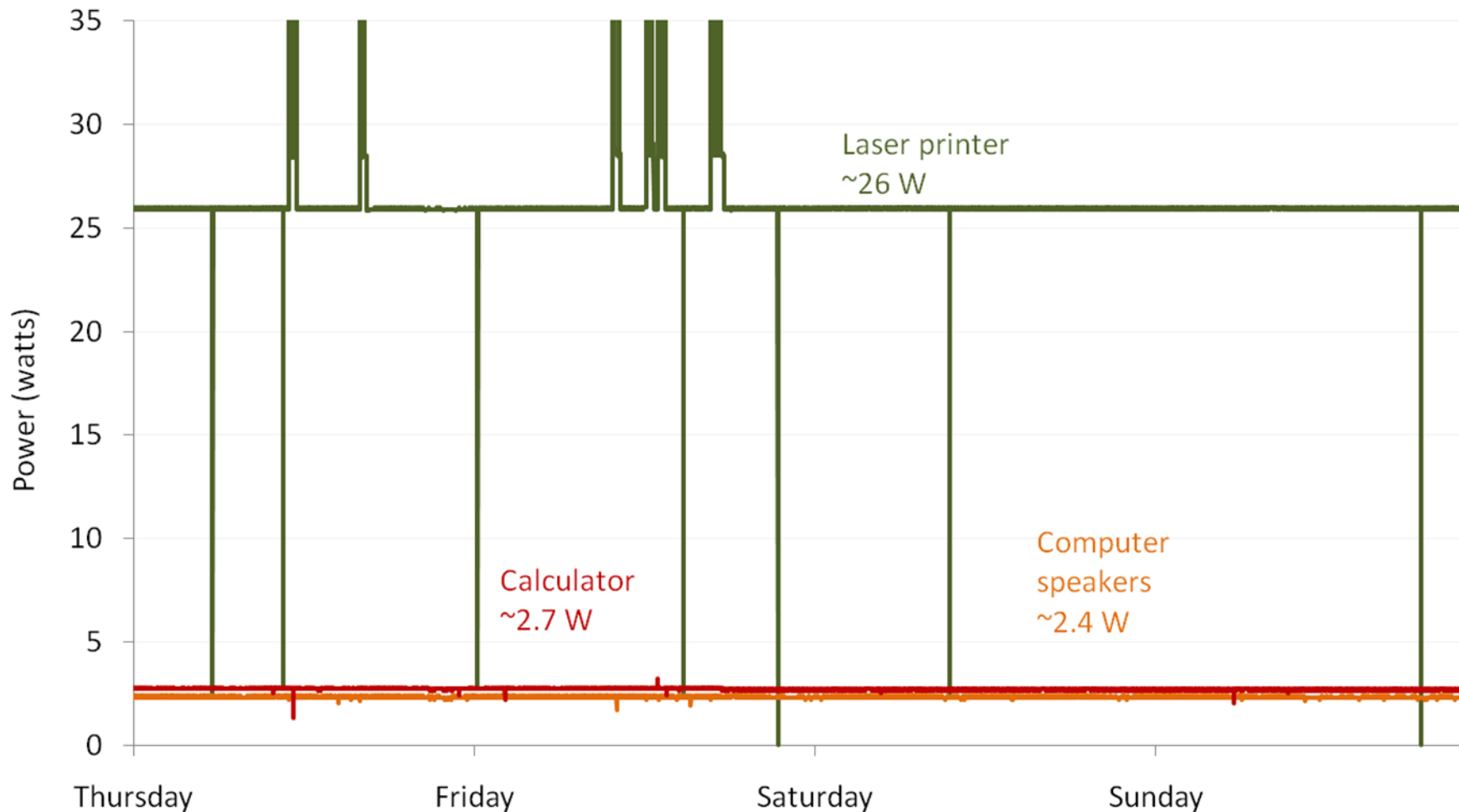


Replaced a Desktop Computer by a Mini-Desktop Computer and Enabled Power Management



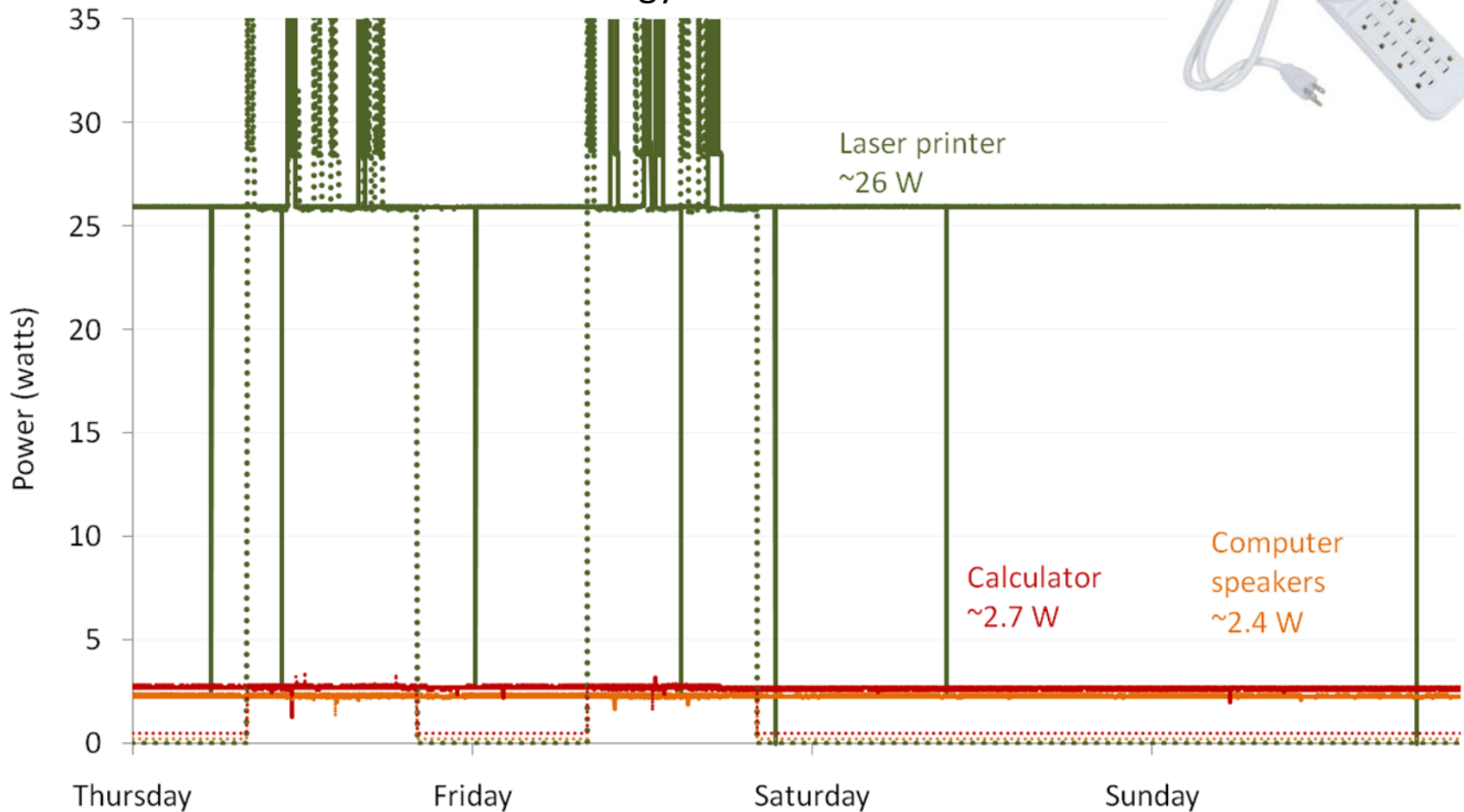
Some Devices Drew Continuous Power Overnight and on Weekends

□ Baseline of printer, calculator and speakers: 5.8 kWh/week



Installed a Timer Plug Strip to Turn Off the Printer, Calculator and Computer Speakers from 9 p.m. to 6 a.m. on Week Days and all Day on Weekends

- Baseline: 5.8 kWh/week
- Improved Case: 3.26 kWh/week
- Energy Reduction from Baseline= 44%!



In Summary

- ▶ The preliminary findings are promising
- ▶ Overall, office occupants were happy with the measures implemented
- ▶ Meters are being removed as we speak
- ▶ Next steps include:
 - Conducting interviews with site contacts
 - Analyzing data from improved case and interviews
 - Developing recommendations for plug load reduction programs and policies
 - Finalizing the project research report

Watch for Further Updates Soon!

- ▶ We aim to finalize the project research report by the end of February and will then work with NBI and PEI to make it public as soon as possible
- ▶ Go to www.efficientproducts.org for our previous plug load field metering research reports
- ▶ Upcoming plug load research with EPRI on behalf of the California Energy Commission's PIER program that will include a deep dive on kiosk computers and high-end (gaming) computers



FACT

So-called "rapid" battery chargers that force high amounts of charge into batteries in a short period of time can consume a lot of energy in this mode.



WHAT IS EFFICIENCY?

Efficiency is a measure of return on investment. Every process - whether lighting a light bulb or running a car - requires some amount of energy "investment" to perform, but only a fraction of that energy actually goes on to do useful work like illuminating your room or moving passengers down a highway. The useful work performed divided by the original total energy investment (usually expressed as a percent) is the energy efficiency.

NEW UPDATES

04/08 - Final California Energy Commission Rulemaking on Battery

Thank You!

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