



total energy and sustainability management



MEASURING AND CONTROLLING PLUG LOADS

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September 18, 2013



SEE MORE



SAVE MORE



SUSTAIN MORE

Value: Growing Results on Saving Resources

Total Energy & Sustainability Management

See More



Gain broad visibility
and precise insight
into inefficiencies

Save More



Lower expenses &
increase return on
capital investments

Sustain More



Build lasting
advantages for the
bottom line and the
environment

Data-driven + Fully managed + Technology-optimized

AGENDA

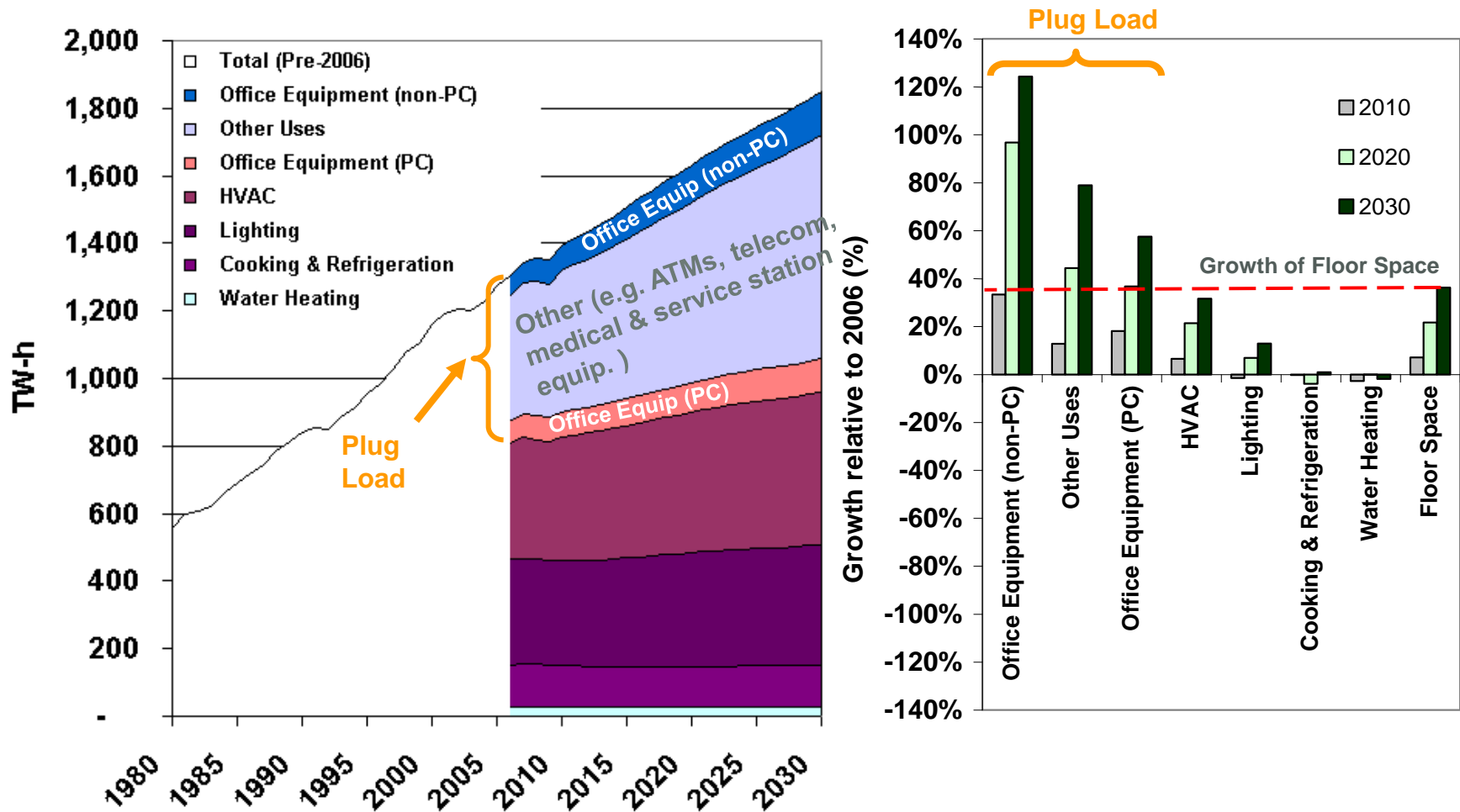
- What are Plug Loads and why should we care?
- California Plug Load Study
- Key Savings Strategies



WHAT ARE PLUG LOADS?

- Other or Miscellaneous electrical uses that are not hard wired lighting or HVAC
- Often are not “process” loads – but can be
- Most have “plugs” but can be hard-wired
- Examples
 - Computers, monitors, speakers, projectors
 - Printers and copy machines
 - Vending machines, refrigerators, kitchen appliances
 - Task Lighting – not hard wired
 - IT equipment – servers, routers, etc
 - Other – leg warmers, battery chargers, water coolers

COMMERCIAL ELECTRICITY CONSUMPTION



Source: U.S. Department of Energy: Energy Information Administration, Annual Energy Outlook

NEW ENERGY CODE ASHRAE 90.1-2010

Section 8.4.2 stipulates automatic control of 50% of receptacles installed in private offices, open offices and computer classrooms, including receptacles installed in modular partitions

What is an automatic control device?

1. Scheduled or timer operated
2. Occupancy sensor turns plugs off after 30 minutes absence
3. Receives signal from another device → centrally managed

Section 9.2.2.3 exempts certain task lighting from consideration in LPA calculations if it is automatically controlled



CA OFFICE PLUG LOAD STUDY

CEC-PIER funded
New Buildings Institute
and Ecova

TWO NORTHERN CALIFORNIA SITES SELECTED

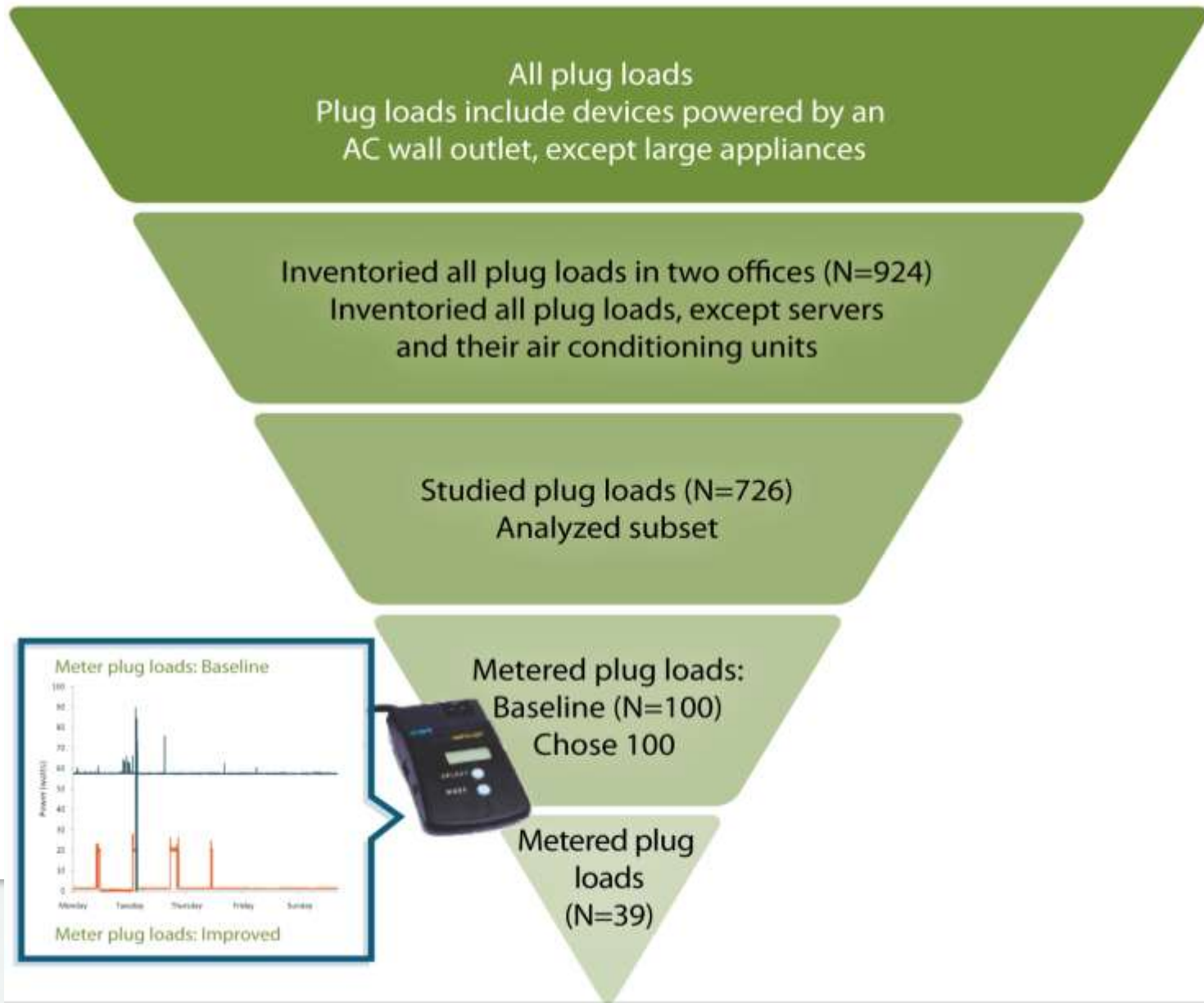
- LEED Gold public library (95,000 ft²)
 - 48 employees, open 52 hours per week
 - Includes private offices and a public area; both areas were monitored



- LEED Platinum small office building (14,000ft²)
 - 20 employees
 - Typically occupied 60 hours per week



STUDY METHODOLOGY AND SCOPE



PLUG LOAD METERING

- True power meter, network data feed (WattsUp? .net)
- Data logged one month, one-minute intervals (true power, PF, etc.)
- Results scaled up to total device inventory



Device energy
use

=

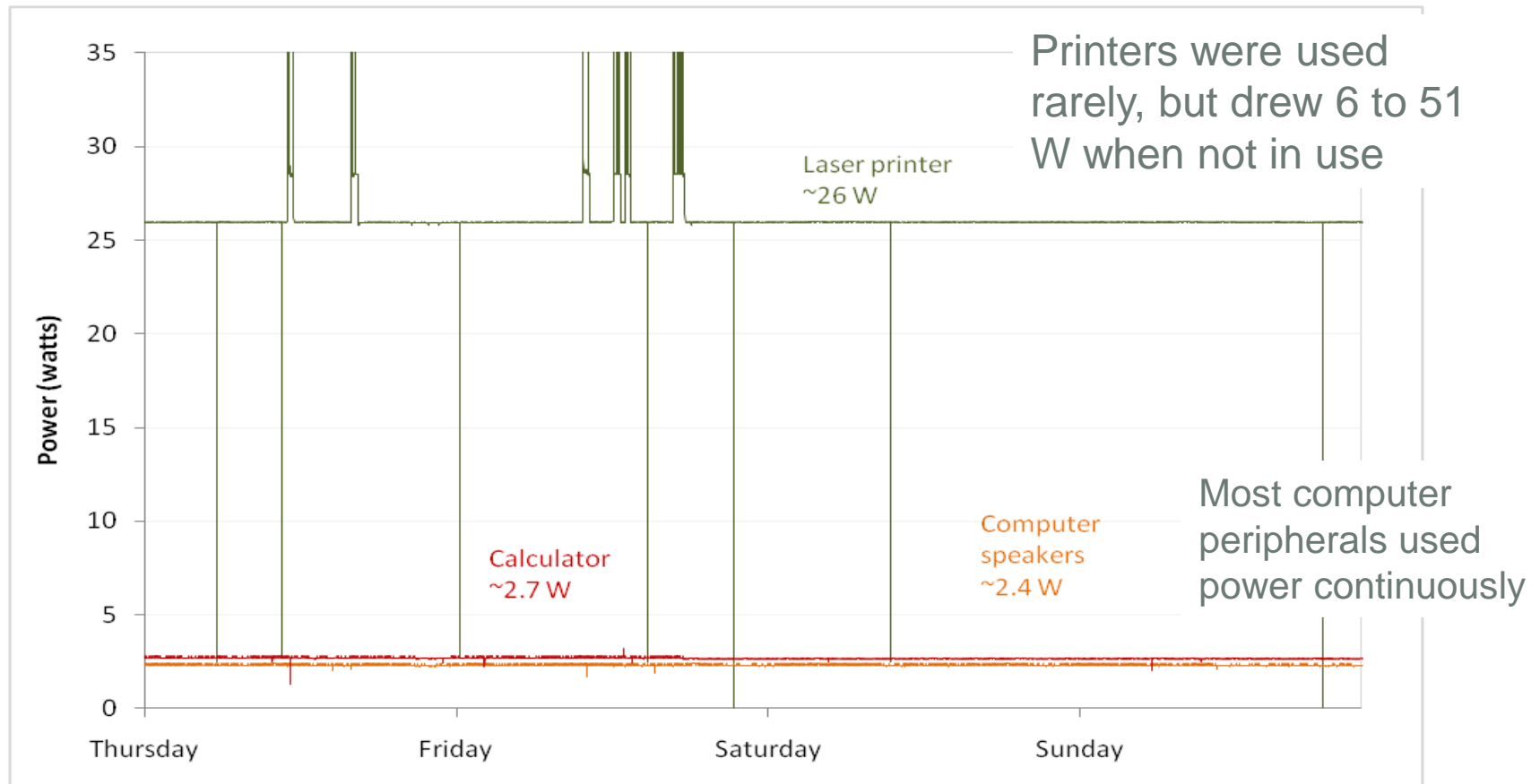
Avg. device
energy use from
metering

X

Total # of devices
inventoried

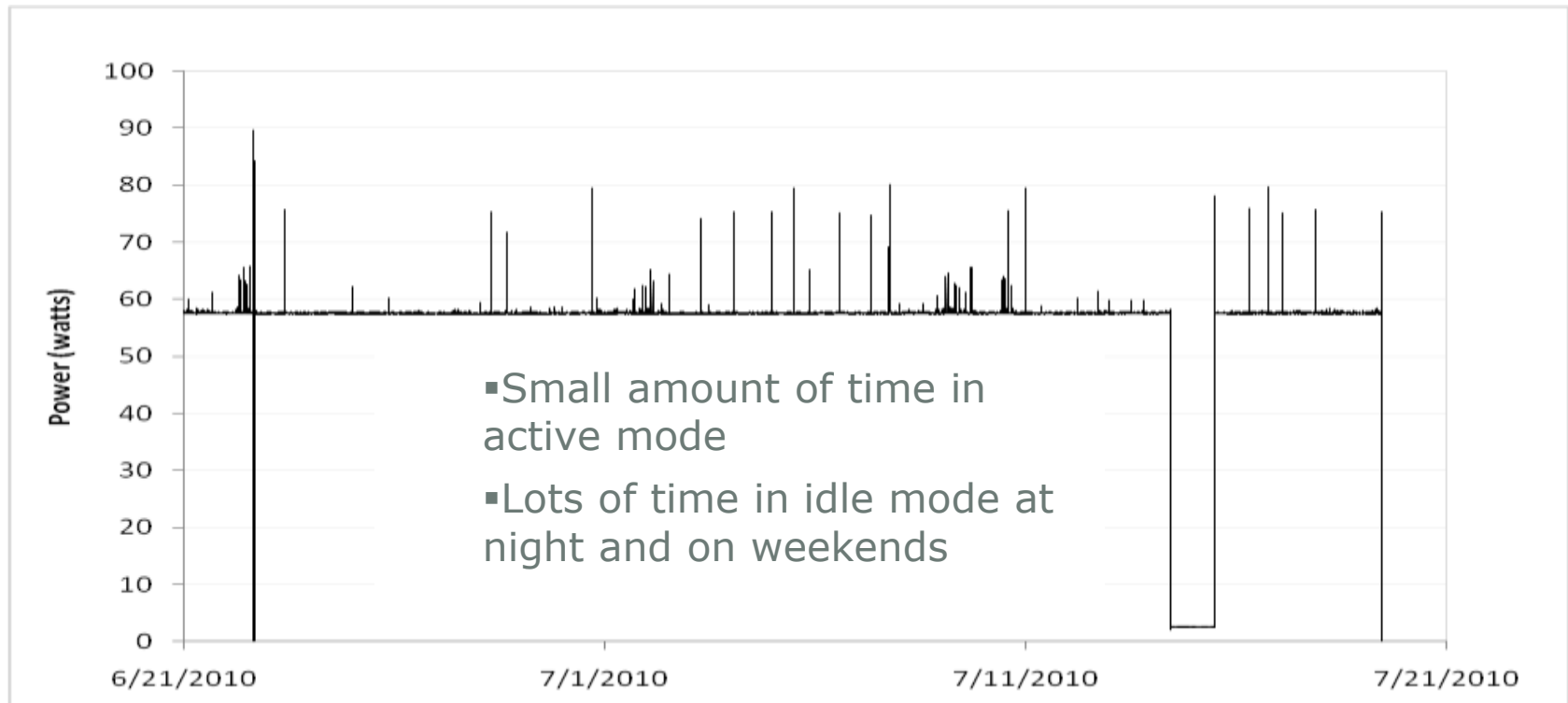
DRAWING POWER WHEN INACTIVE

Power meter data of a printer, calculator and computer speakers at the small office



COMPUTERS LEFT ON OVERNIGHT & WEEKEND

Power meter data of a desktop computer at the small office



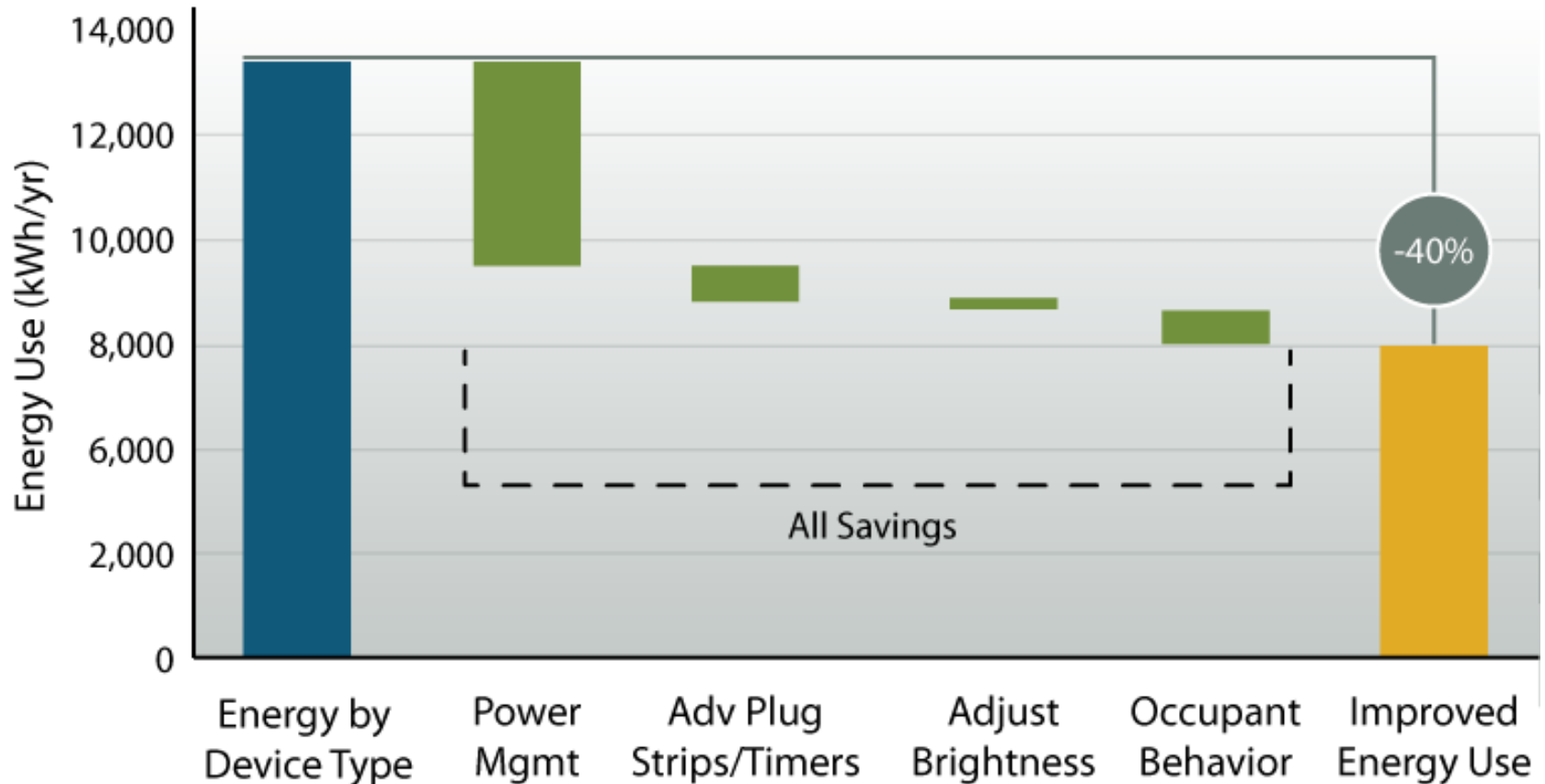
62% of desktop computers at the small office and 40% of staff (non-public) computers at the library were often left operating in active or idle mode overnight and on weekends.

KEY SAVINGS STRATEGIES

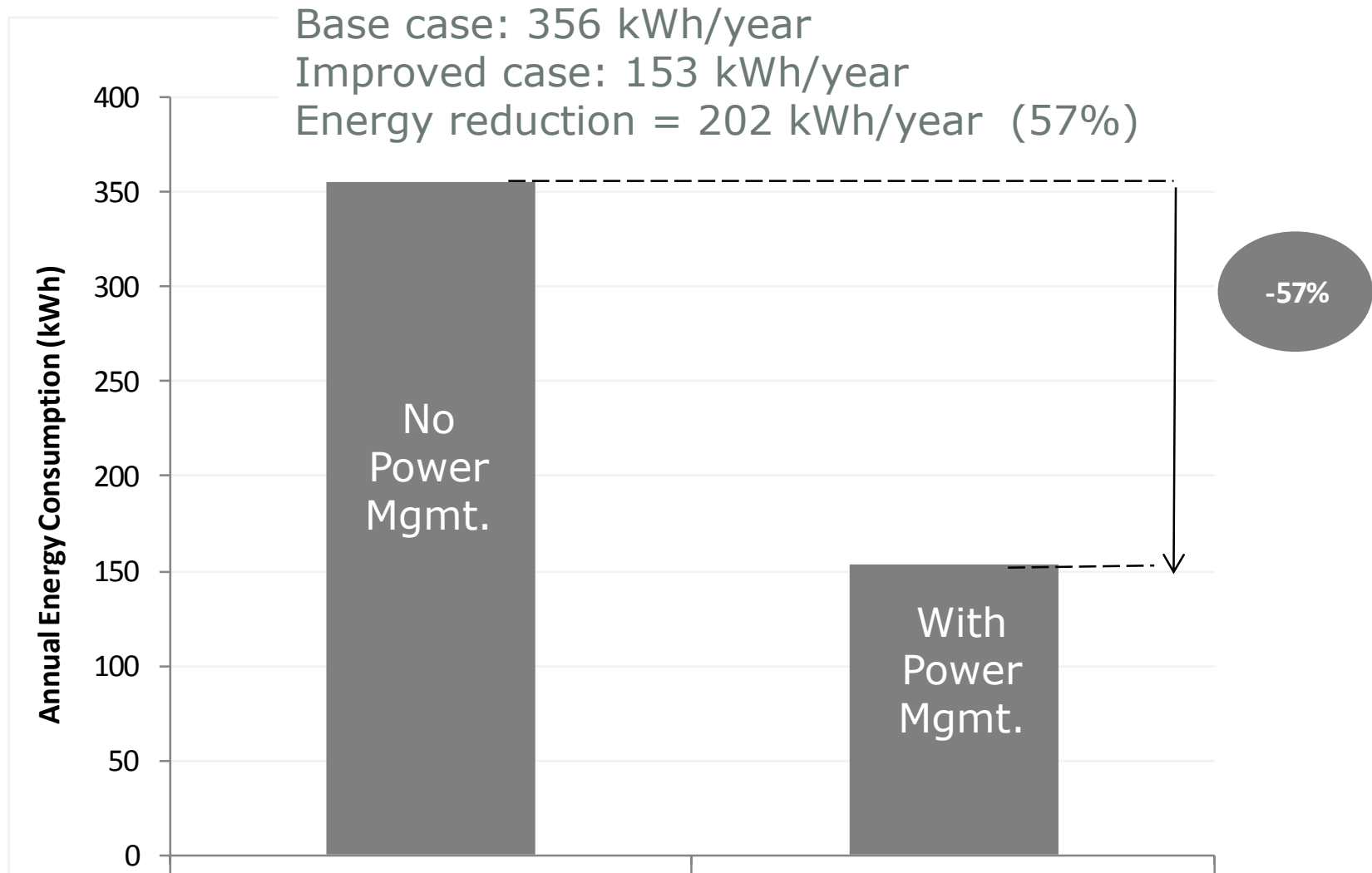
- Enable aggressive power management settings
 - PCs and imaging equipment
 - Largest opportunity
- Use load-sensor plug strips and timers to turn off equipment not in use
- Occupant behavior measures
 - Energy monitoring feedback devices
 - Email & task reminders to encourage office occupants to turn off devices
- Efficient equipment
 - Shift from desktop computers to lap tops or micro-sized desktops with ultra-low power use when possible
 - Consolidate Printers
 - Replace any CRT (Cathode Ray Tube) monitors with LCD
 - Base Procurement on lowest Life Cycle Cost rather than purchase price

AT THE SMALL OFFICE

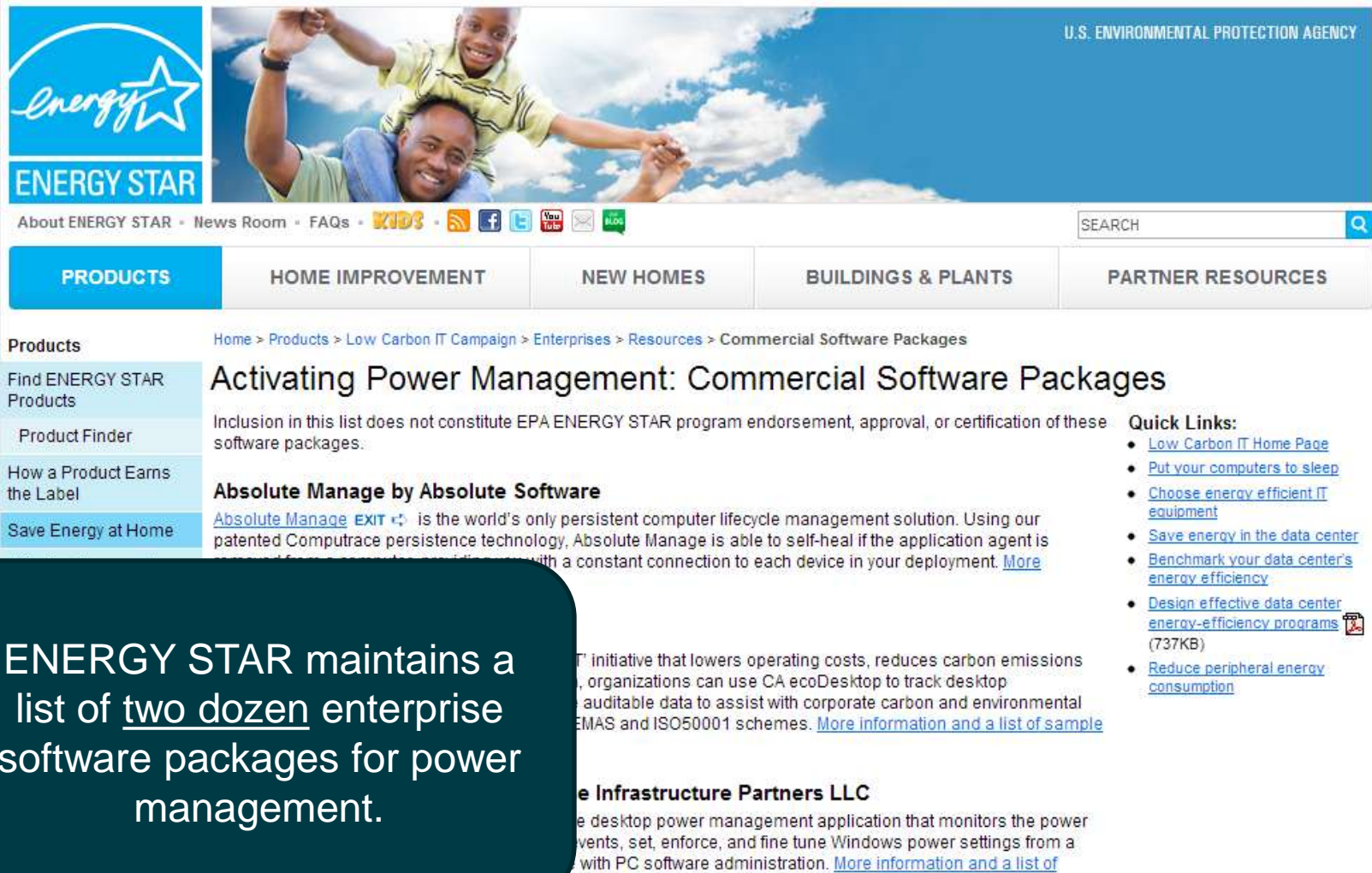
Low-cost strategies could save 40% of studied plug load energy use



POWER MANAGEMENT: DESKTOP COMPUTER



ENTERPRISE POWER MANAGEMENT SOLUTIONS



The screenshot shows the ENERGY STAR website's navigation and content. At the top, there is the ENERGY STAR logo and a banner image of a man carrying a child on his shoulders. The U.S. Environmental Protection Agency logo is in the top right. Below the banner is a navigation bar with categories: PRODUCTS, HOME IMPROVEMENT, NEW HOMES, BUILDINGS & PLANTS, and PARTNER RESOURCES. The main content area is titled "Activating Power Management: Commercial Software Packages" and lists several software solutions. A sidebar on the left contains links like "Product Finder" and "How a Product Earns the Label". A "Quick Links" section on the right provides additional resources. A dark blue callout box is overlaid on the left side of the page.

ENERGY STAR maintains a list of two dozen enterprise software packages for power management.

U.S. ENVIRONMENTAL PROTECTION AGENCY

About ENERGY STAR • News Room • FAQs • **KIDS** • RSS • Facebook • Twitter • YouTube • Email • LinkedIn

SEARCH

PRODUCTS HOME IMPROVEMENT NEW HOMES BUILDINGS & PLANTS PARTNER RESOURCES

Products [Home](#) > [Products](#) > [Low Carbon IT Campaign](#) > [Enterprises](#) > [Resources](#) > [Commercial Software Packages](#)

Find ENERGY STAR Products

Product Finder

How a Product Earns the Label

Save Energy at Home

Activating Power Management: Commercial Software Packages

Inclusion in this list does not constitute EPA ENERGY STAR program endorsement, approval, or certification of these software packages.

Absolute Manage by Absolute Software

[Absolute Manage](#) EXIT ↕ is the world's only persistent computer lifecycle management solution. Using our patented Computrace persistence technology, Absolute Manage is able to self-heal if the application agent is removed from a device. It maintains a constant connection to each device in your deployment. [More](#)

CA ecoDesktop by CA Infrastructure Partners LLC

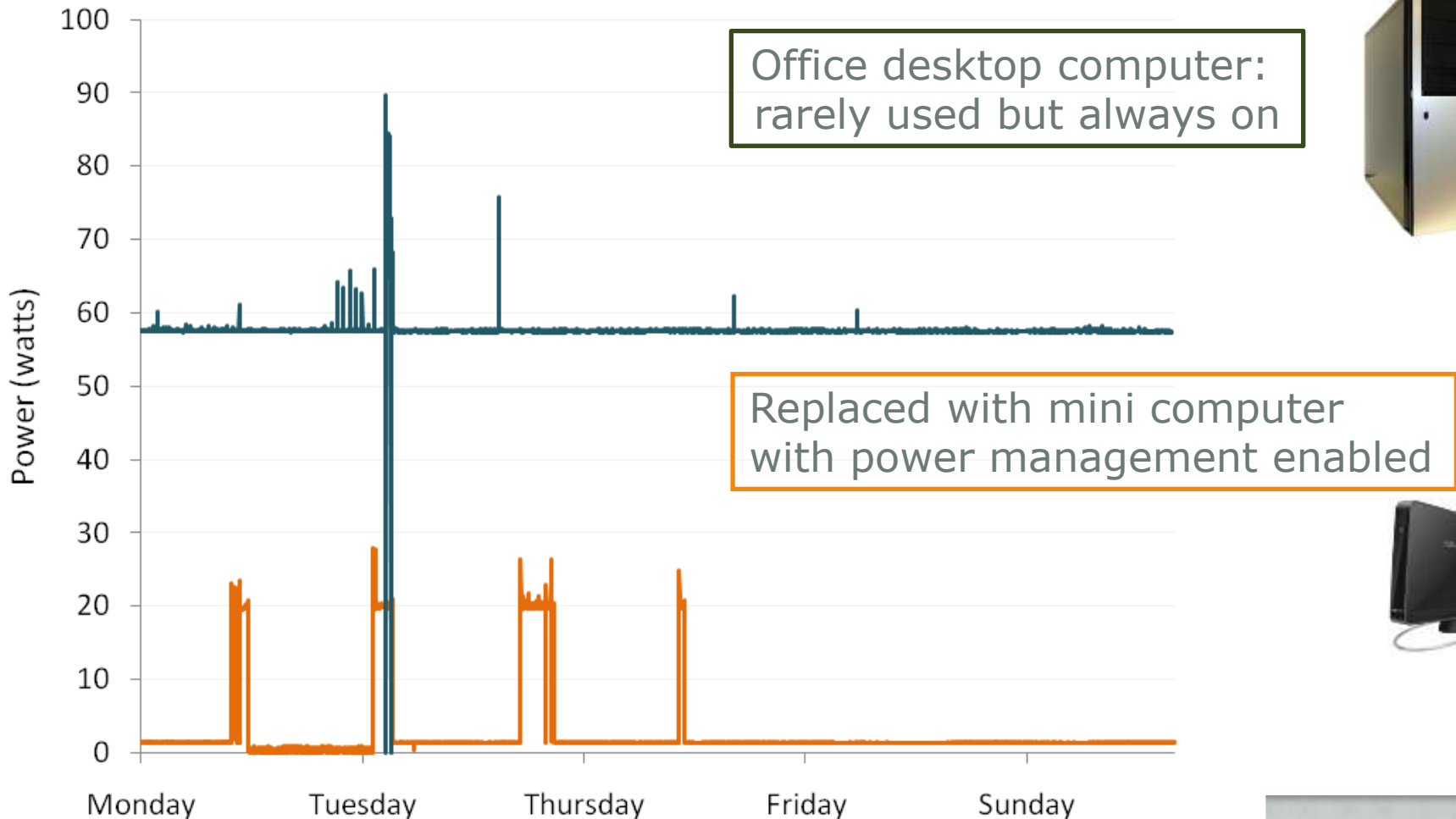
CA ecoDesktop is a desktop power management application that monitors the power events, set, enforce, and fine tune Windows power settings from a central console. It integrates with PC software administration. [More information and a list of sample](#)

Quick Links:

- [Low Carbon IT Home Page](#)
- [Put your computers to sleep](#)
- [Choose energy efficient IT equipment](#)
- [Save energy in the data center](#)
- [Benchmark your data center's energy efficiency](#)
- [Design effective data center energy-efficiency programs](#) (737KB)
- [Reduce peripheral energy consumption](#)

MINI COMPUTER + POWER MANAGEMENT = 95% SAVINGS

Other benefits: less desk or floor space, quieter, and create less waste heat



MINI COMPUTERS WITH BASIC FUNCTIONALITY AND ULTRA-LOW POWER USE

top ten USA
Energy-saving products. Because efficiency counts.

Search Top Ten USA

Home How We Evaluate Rebates Energy Star About Us

Clothes Washers Computers Dishwashers Freezers Monitors Refrigerators Televisions Vehicles Water Heaters

Non-Expandable Desktops

SORT BY Top Ten Rank Price

Grid View Print

Ranking Criteria: The most energy-efficient computers, ranked by annual energy consumption in kilowatt-hours.

Idle: 7.7 W

#1



Apple Mac Mini - MC270

This mini desktop computer has 2 GB of memory. It requires a separate monitor.

Show Energy Details

Find it

Use M110 to find it near you:

Enter Zip Code Find

#2



Computab Ltd. Multiple Models

This mini desktop computer has 2 GB of memory. It requires a separate monitor.

Show Energy Details

Idle: 8.0 W

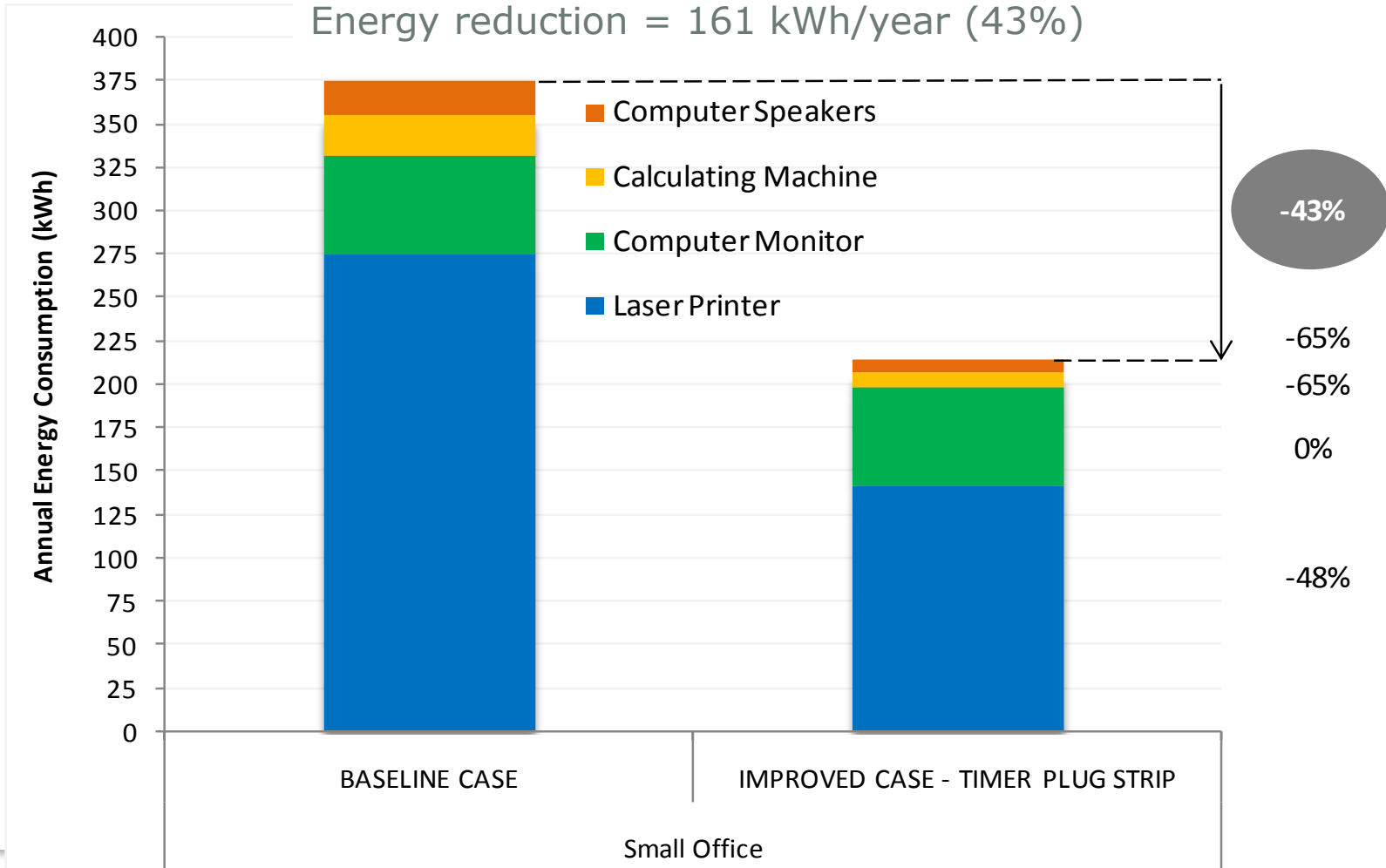
ADVANCED PLUG STRIPS

- Installing **hardware control strategies** to turn off devices when they are not in use
 - Can reduce energy consumption significantly
 - Standby power : < 1 W
- **Timers and timer plug strips**
 - Unnoticed by participants
 - Good options to control devices with regular schedules
- **Load-sensor plug strips**, automatically turn off power to devices when the current draw drops below a certain threshold
 - Savings ranged widely and depended on user's behavior
 - Low-cost measure to eliminate the energy use of often-forgotten computer peripherals at some workstations

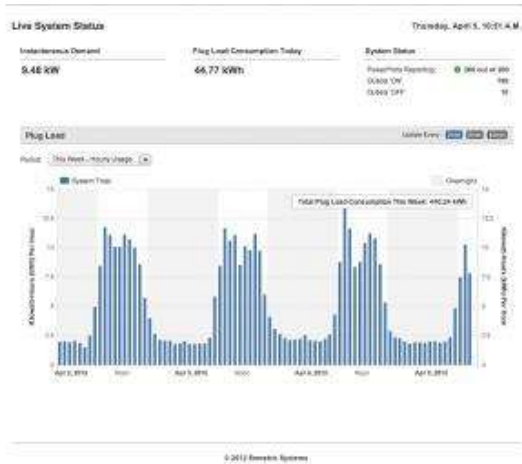
TIMER PLUG STRIP: WORKSTATION AT THE SMALL OFFICE



Base case: 375 kWh/year
Improved case: 214 kWh/year
Energy reduction = 161 kWh/year (43%)



SMART PLUG STRIPS 2.0

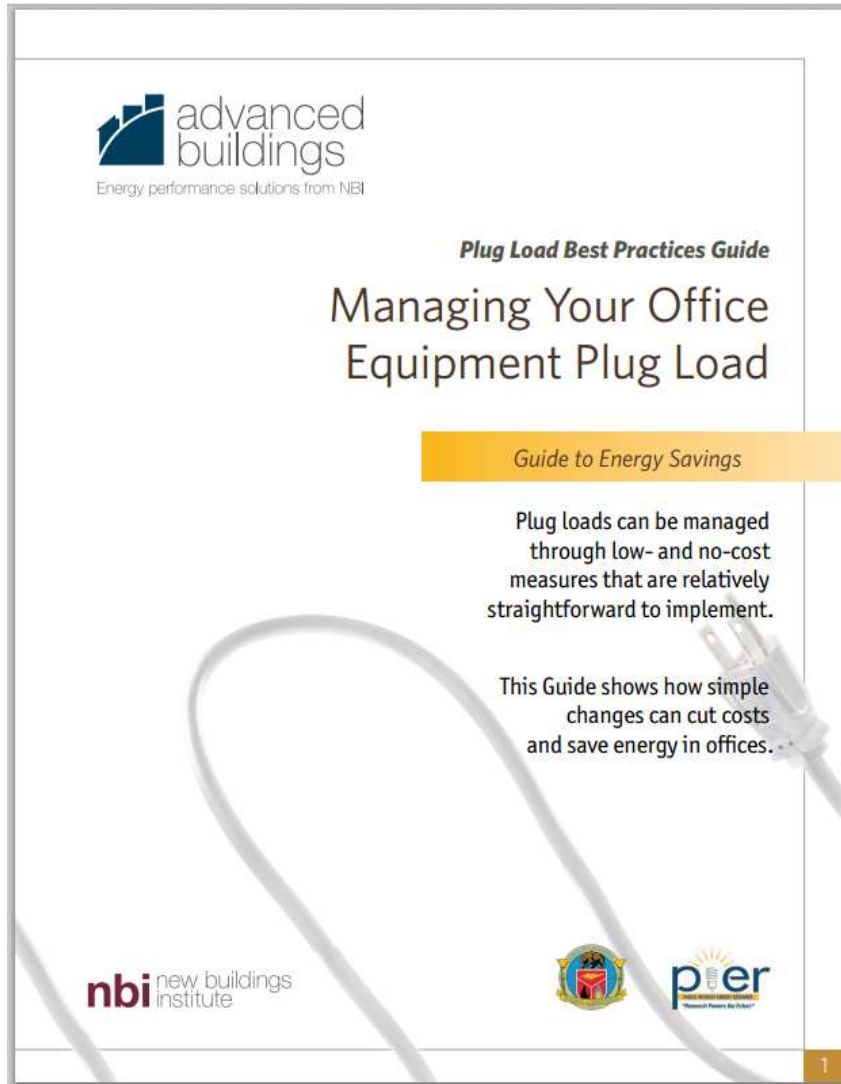


- Wirelessly networked
- Centrally managed
- Dashboards
- BEMS integration

BUT...

- Pricey
- What's the right form factor?
- Is this overkill?

OUTCOME: PLUG LOAD MANAGEMENT GUIDE



Available at New Buildings Institute website:

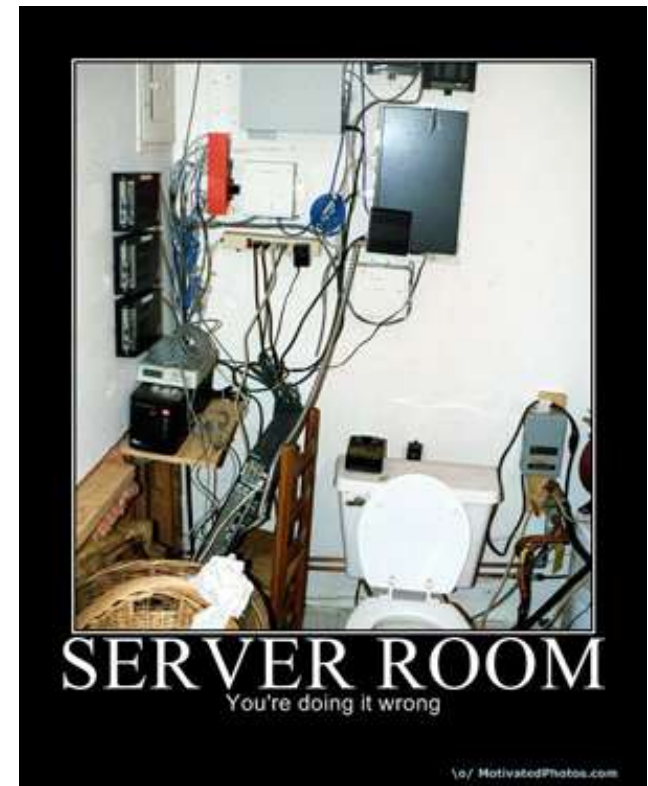
- <http://newbuildings.org/sites/default/files/PlugLoadBestPracticesGuide.pdf>

OVERVIEW

- Plug Load Energy Use Is Expected To Increase
- Plug Load Use Is Driven By Facility Occupants
- Five Steps For Managing Plug Load Energy Use:
 1. Review – Inventory Equipment & Identify User Needs
 2. Remove – Eliminate Or Unplug Unnecessary Devices
 3. Replace – Buy Energy Efficient Devices When Replacing Equipment
 4. Reduce – Turn Off When Not In Use
 5. Retrain – Engage Staff – Make Sure IT & Occupants Understand Why, When And How To Power Down
- Data Centers & Server Closets Are Also Energy Savings Opportunity But Require Special Attention

ENERGY SAVINGS OPPORTUNITIES: SERVER ROOMS

- Excluded from previous plug load field metering studies
- Can use more kWh than all other office plug loads combined
- Look for Energy Efficient Data Center Information
- Large savings potential
- Partner with IT



EXAMPLE OFFICE BUILDING

- ▶ 21 Story Office Building
 - ▷ 350,000 square feet total area
 - ▷ Typical mix of open & private office
- ▶ Study evaluated IT Data Center
 - ▷ Rooms housed internal e-mail and websites
 - ▷ Internal business finances – not a bank
 - ▷ Banks & financial Institutions have higher IT equipment power use

	Central Data Center	Commercial Office Building Total	Data Center as Percent of Building Total
Area	3,000 sq ft	350,000 sq ft	0.8%
Average Monthly Real Demand	189 kW	1,889 kW	10%
Average Monthly Consumption	140,000 kWh	701,300 kWh	20%

THANK YOU!



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