ecova™ total energy and sustainability management

MEASURING AND CONTROLLING PLUG LOADS

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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

Credentials: An Extension of More Businesses

•$18B in expenditures •450,000 sites

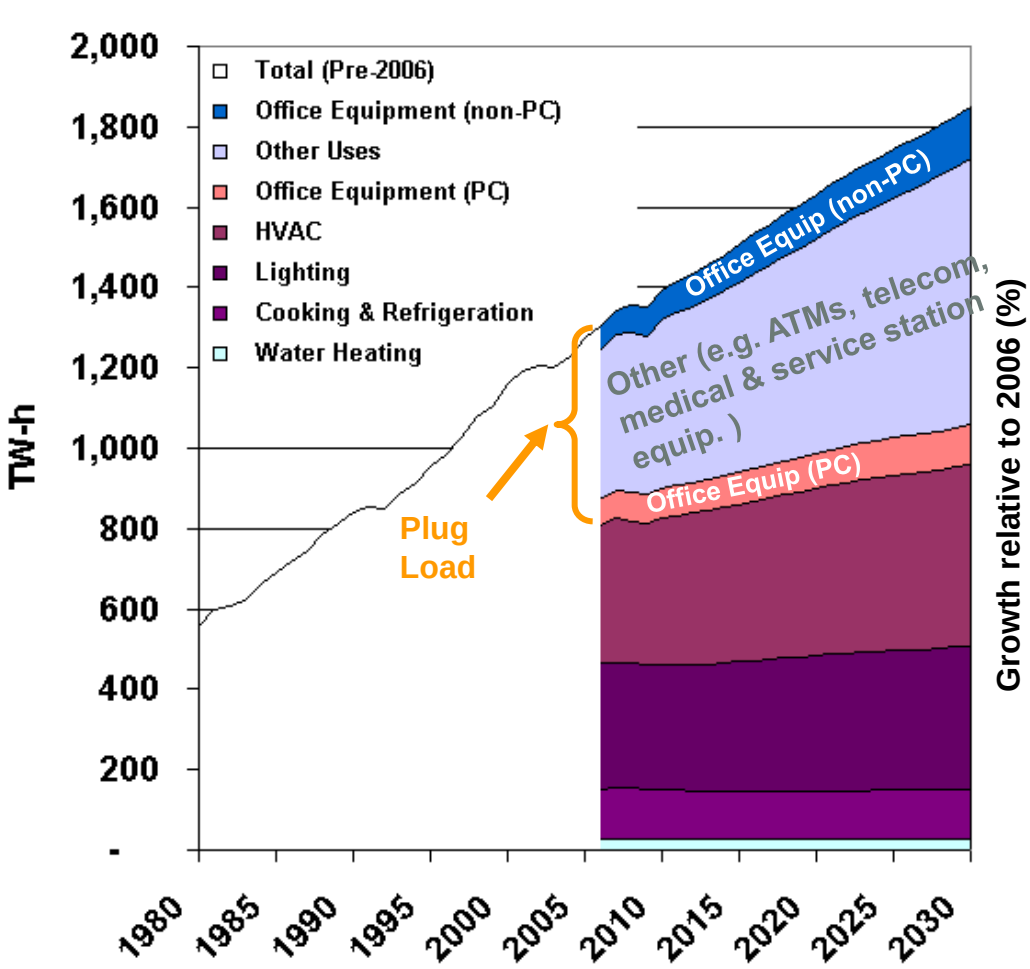
AGENDA

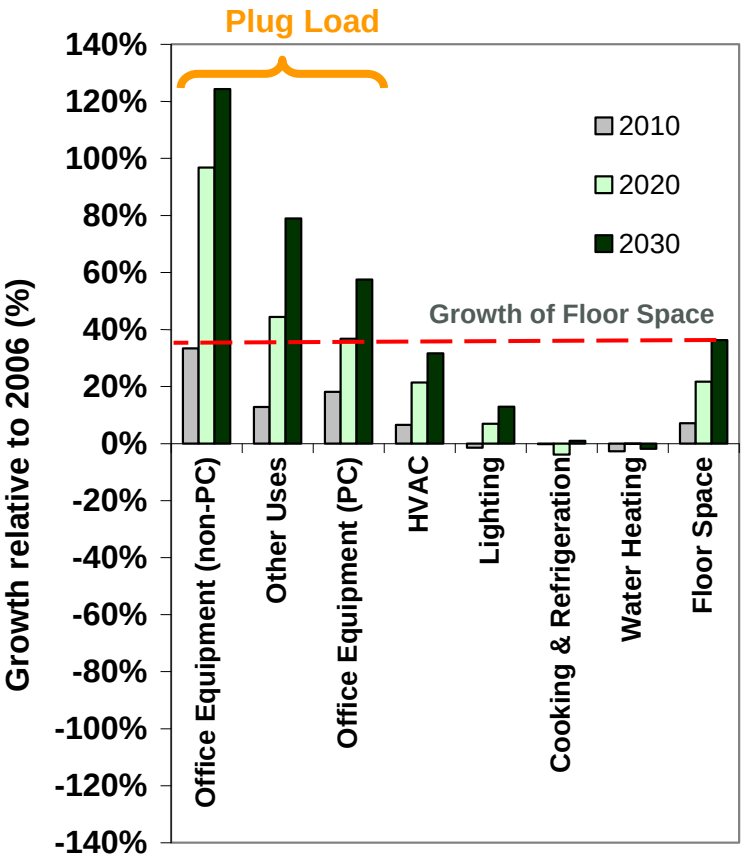
- What are Plug Loads and why should we care?
- California Plug Load Study
- Key Savings Strategies

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 ft^2)
  - 48 employees, open 52 hours per week
  - Includes private offices and a public area; both areas were monitored

- LEED Platinum small office building (14,000ft^2)
  - 20 employees
  - Typically occupied 60 hours per week

STUDY METHODOLOGY AND SCOPE

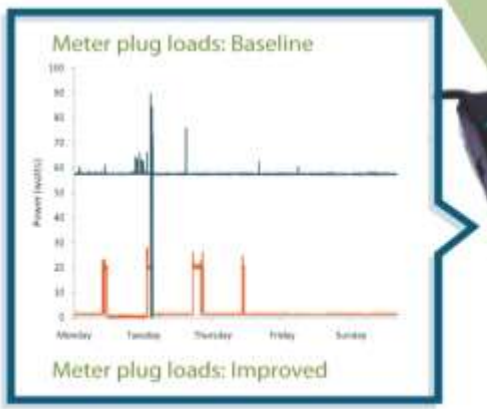
All plug loads
Plug loads include devices powered by an AC wall outlet, except large appliances

Inventoried all plug loads in two offices (N=924)
Inventoried all plug loads, except servers and their air conditioning units

Studied plug loads (N=726)
Analyzed subset

Metered plug loads:
Baseline (N=100)
Chose 100

Metered plug loads
(N=39)



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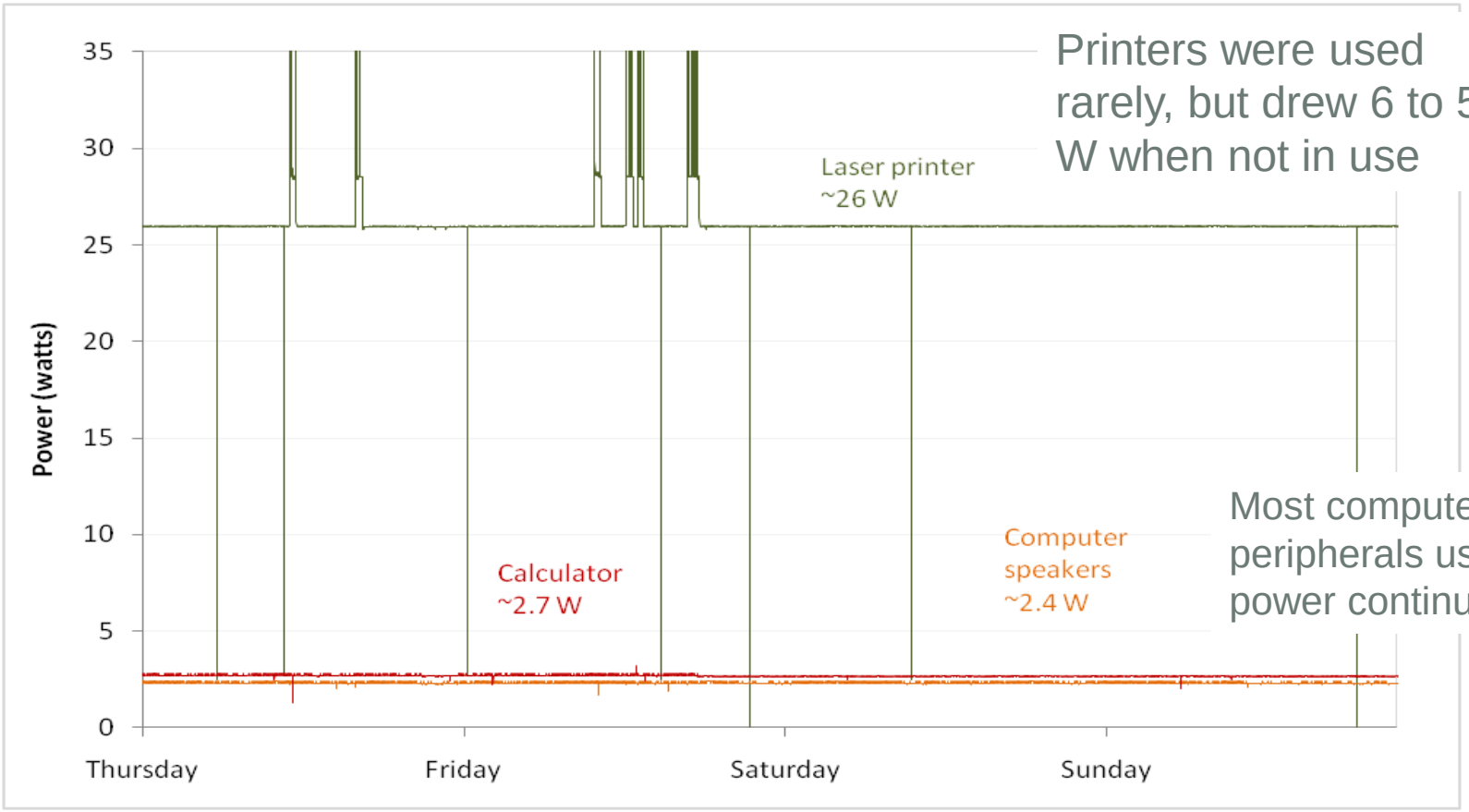
PLUG LOAD METERING

- 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

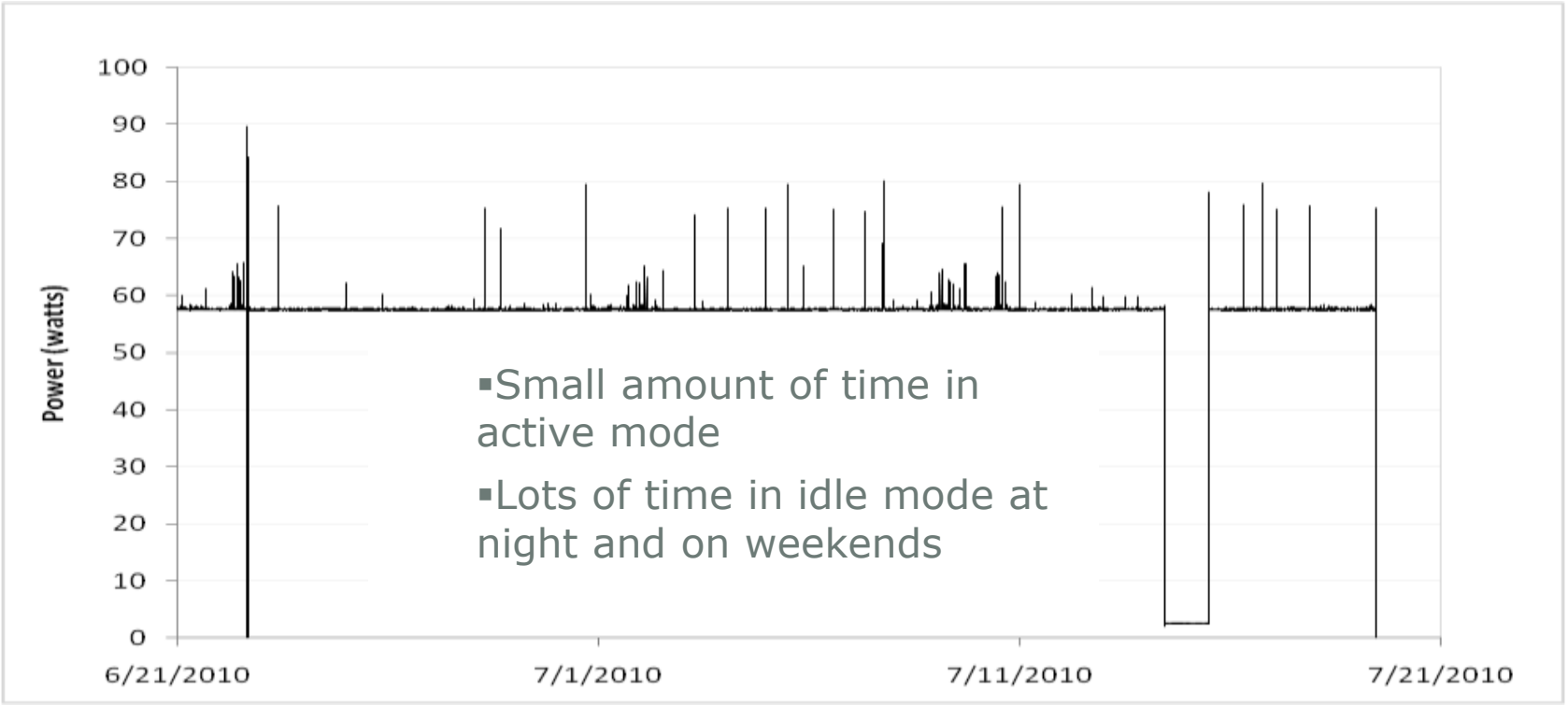
DRAWING POWER WHEN INACTIVE

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



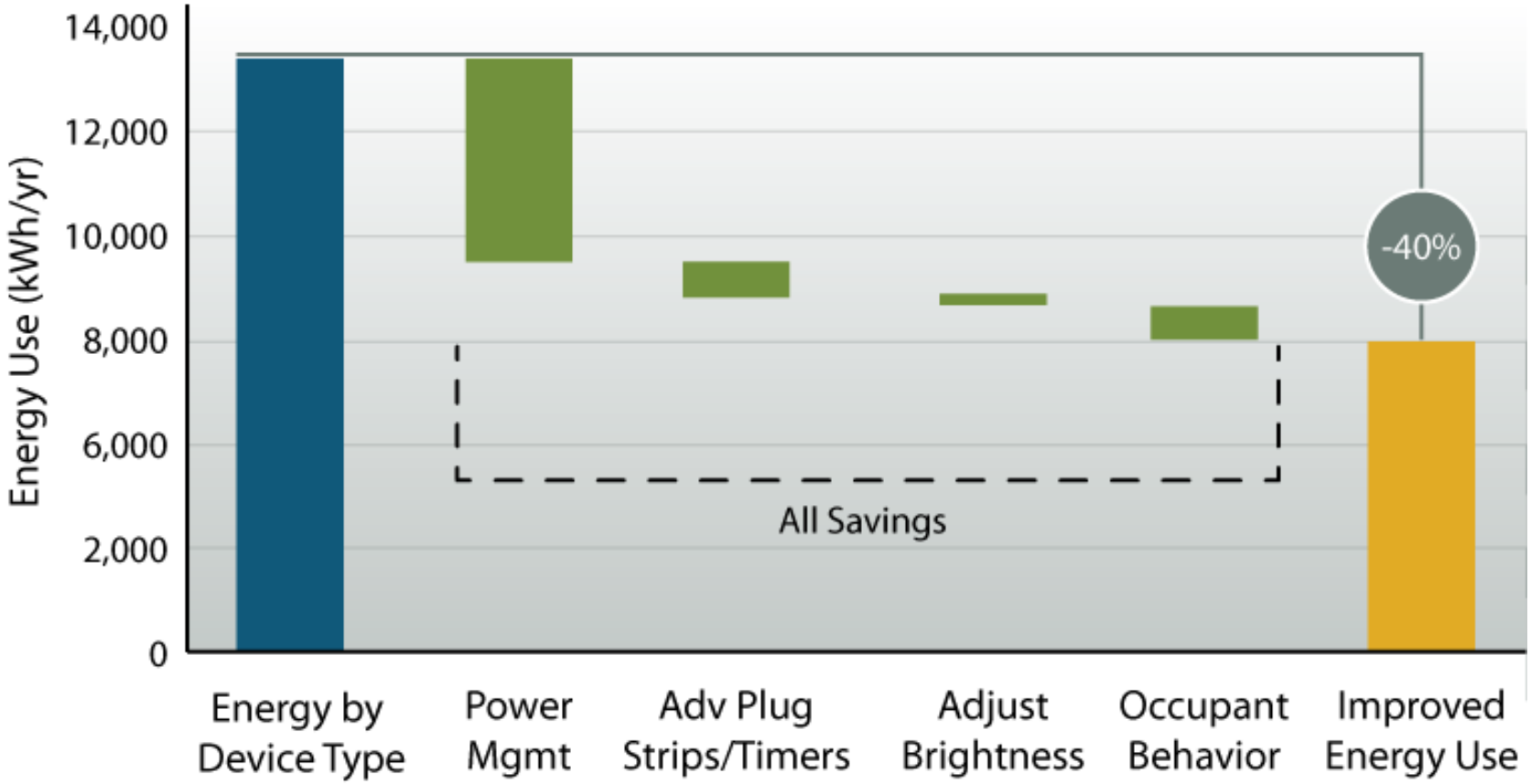
62% of desktop computers at the small office and 40% of staff (non-public) computers at the library were often left operating in active or idle mode overnight and on weekends.

KEY SAVINGS STRATEGIES

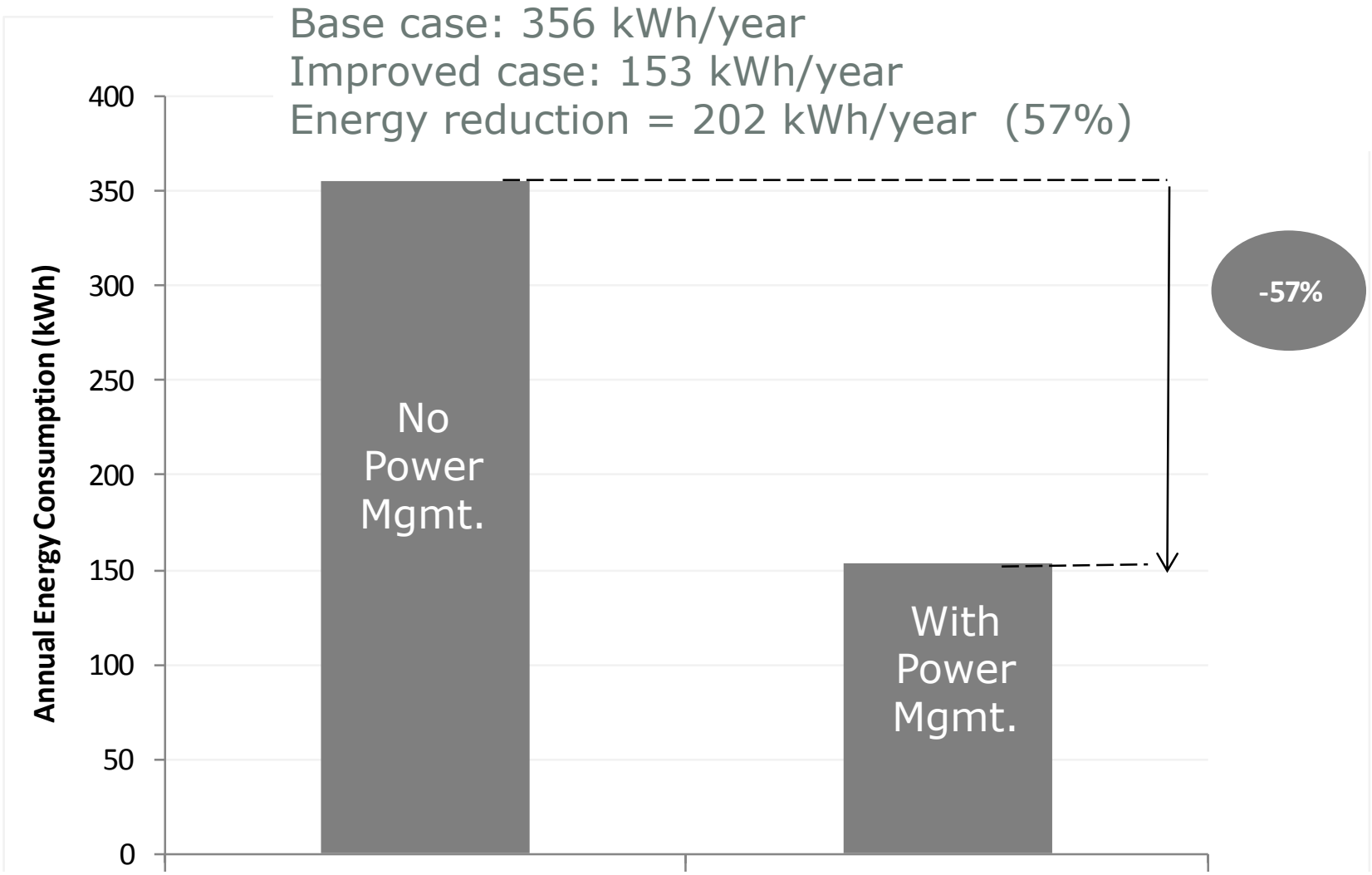
- Enable aggressive power management settings
  - PCs and imaging equipment
  - Largest opportunity
- Use load-sensor plug strips and timers to turn off equipment not in use
- Occupant behavior measures
  - Energy monitoring feedback devices
  - Email & task reminders to encourage office occupants to 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

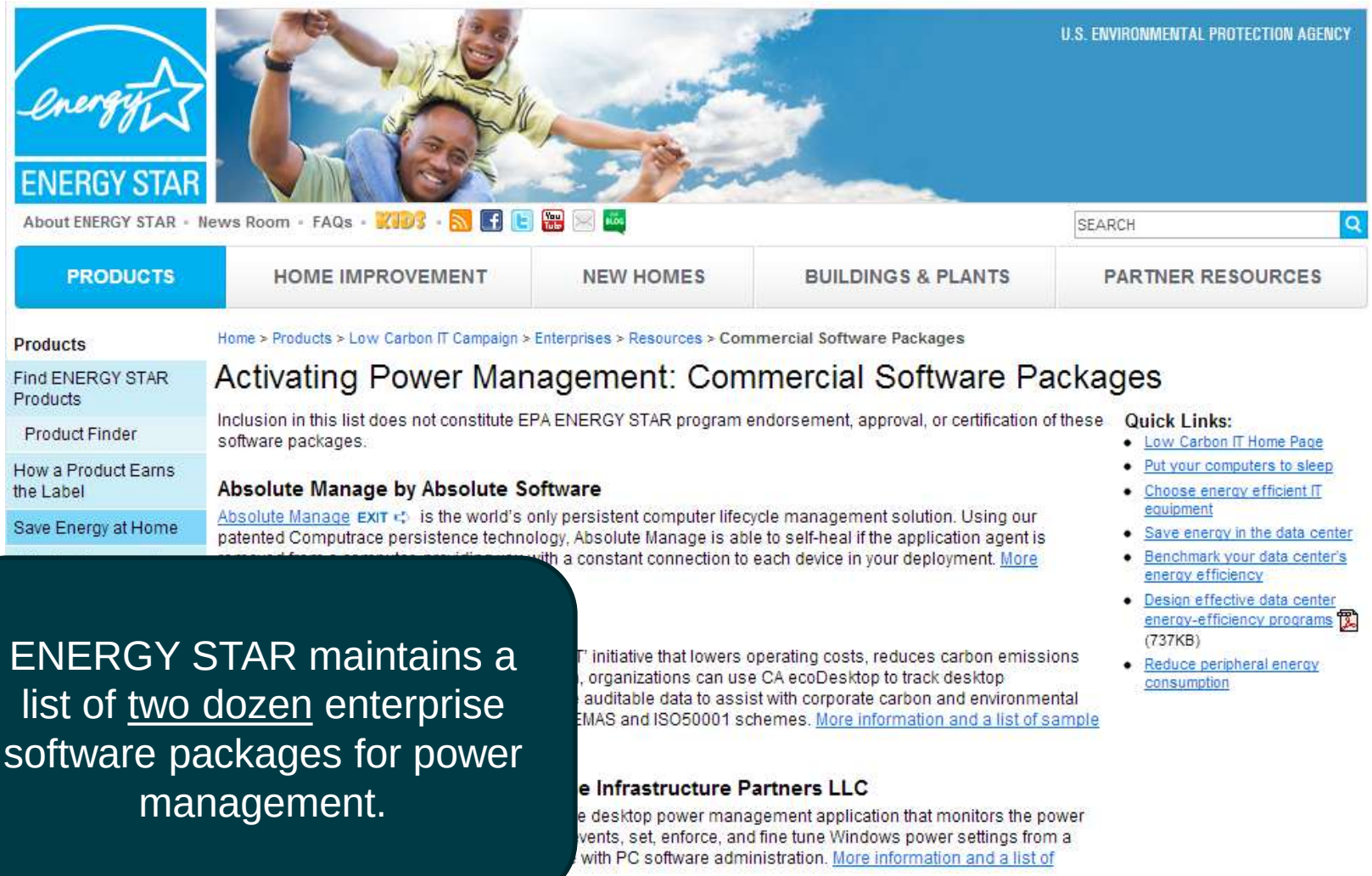
Low- cost strategies could save 40% of studied plug load energy use



POWER MANAGEMENT: DESKTOP COMPUTER



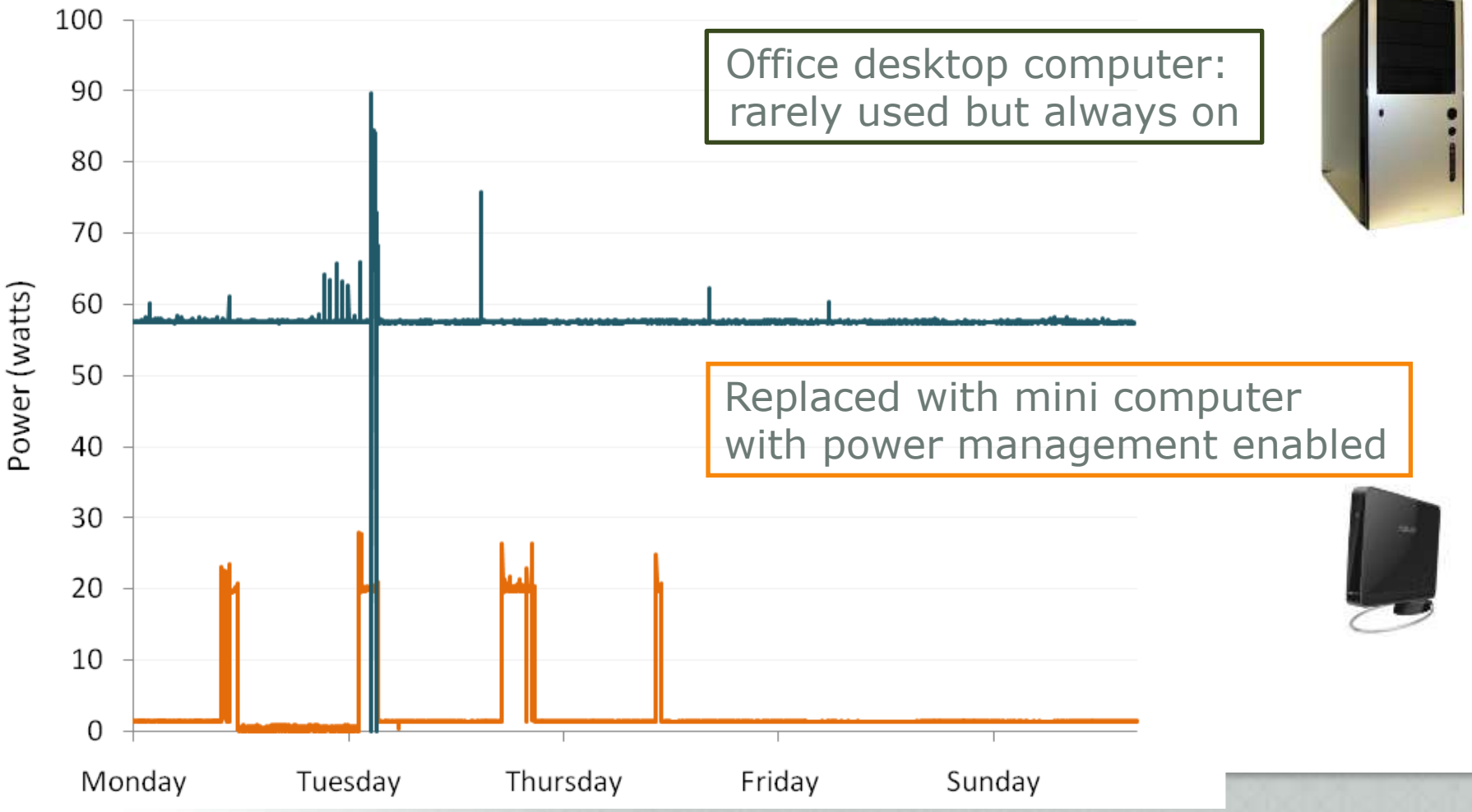
ENTERPRISE POWER MANAGEMENT SOLUTIONS



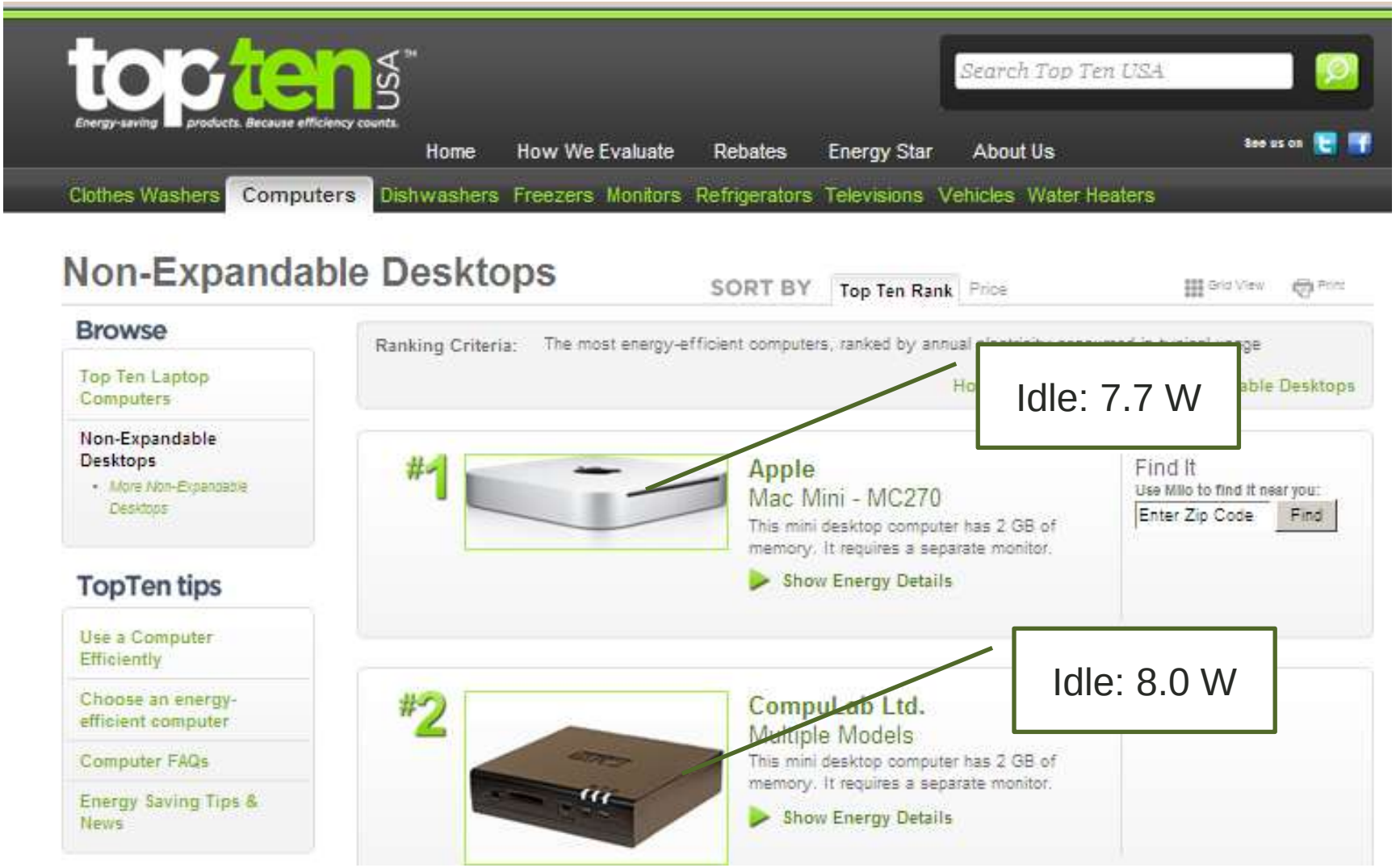
ENERGY STAR maintains a list of <u>two dozen</u> enterprise software packages for power management.

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

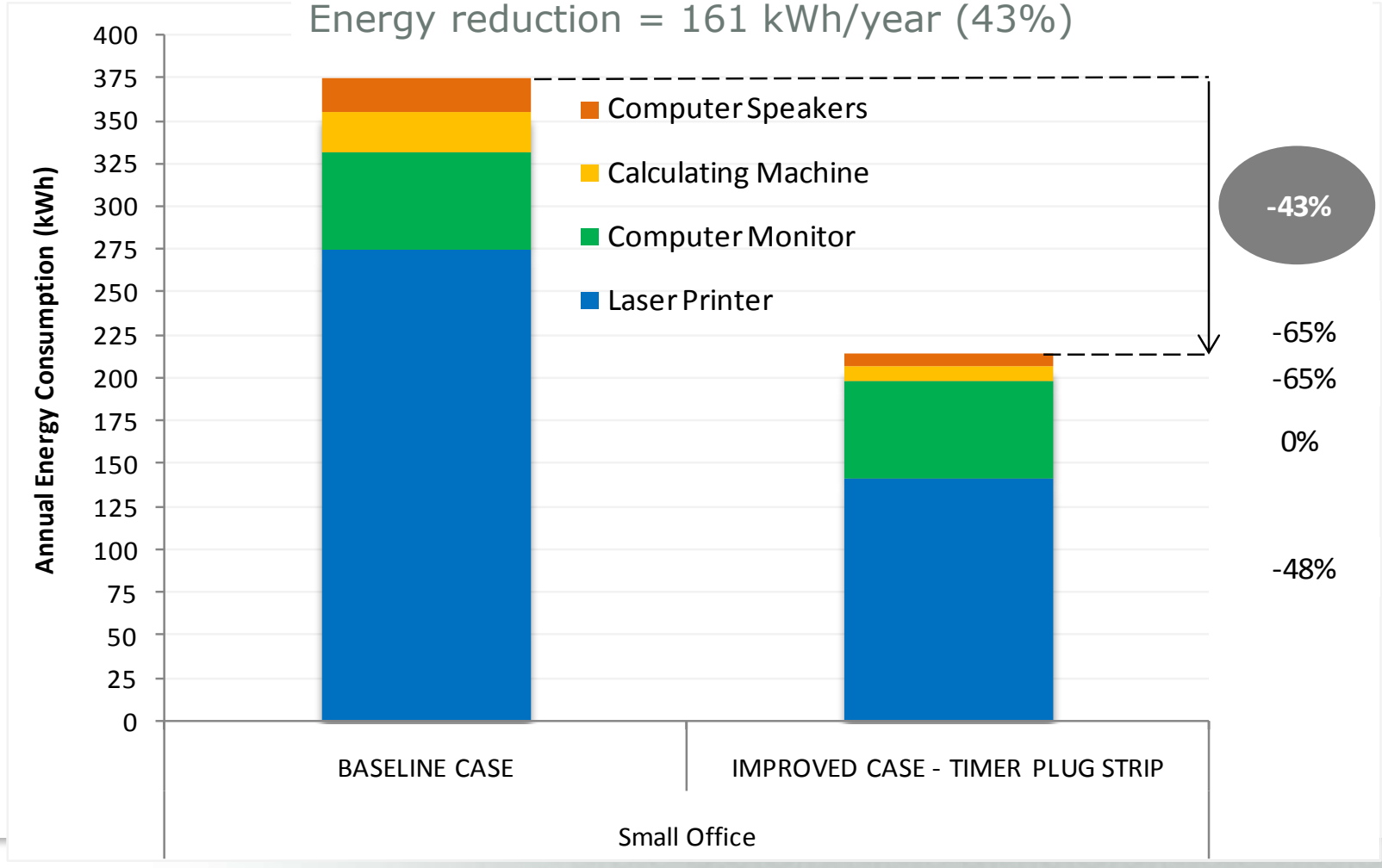


ADVANCED PLUG STRIPS

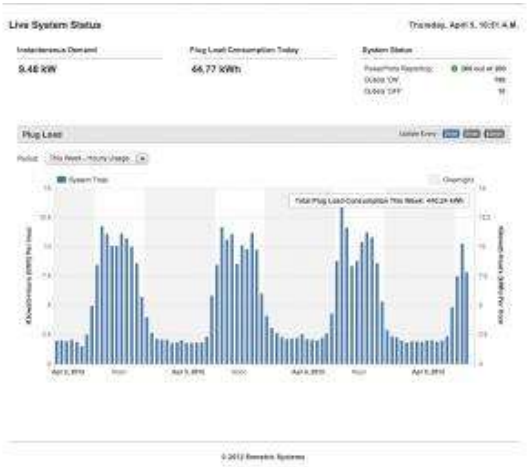
- Installing **hardware control strategies** to turn off devices when they are not in use
  - Can reduce energy consumption significantly
  - Standby power : < 1 W
- **Timers and timer plug strips**
  - Unnoticed by participants
  - Good options to control devices with regular schedules
- **Load-sensor 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

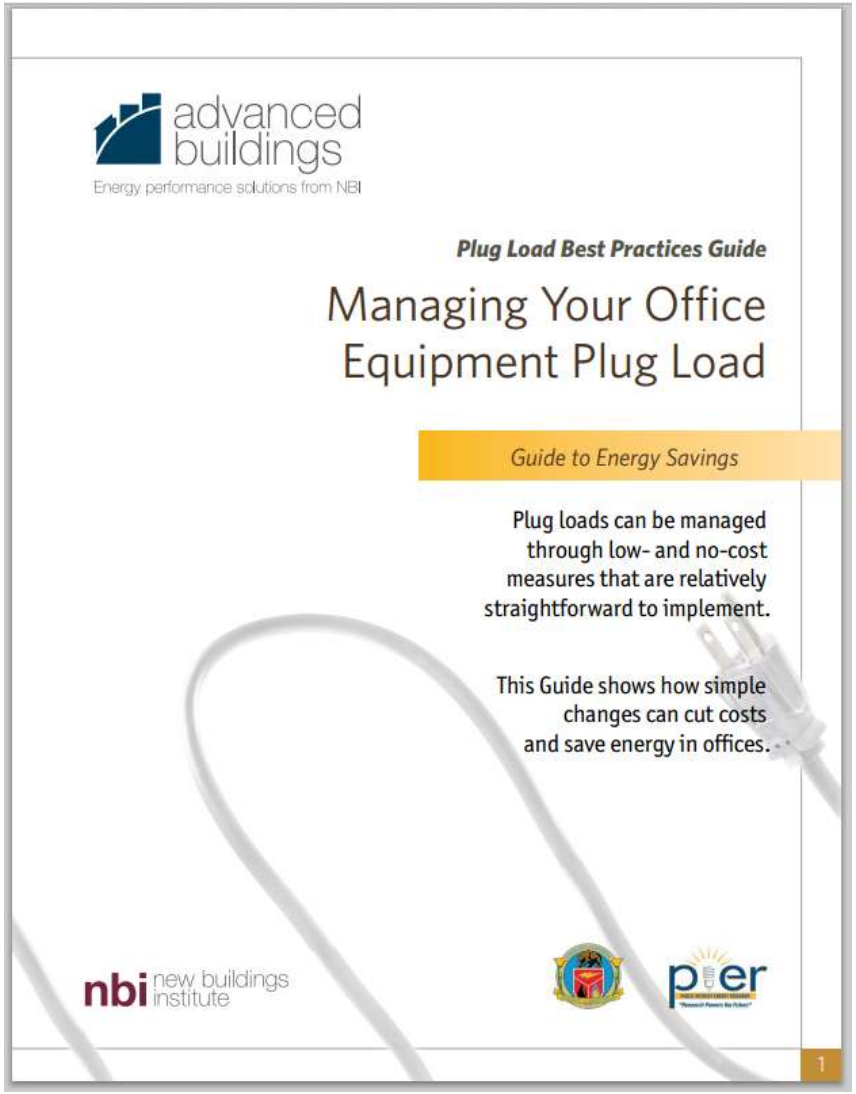


- Wirelessly networked
- Centrally managed
- Dashboards
- BEMS integration

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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