IT Energy Savings

4 Opportunities for Your Organization

Mike Walker, President
Beacon Consultants Network Inc.
(An ENERGY STAR Technical Support Contractor)

Imagine…

FOOD WASTE DISPOSER

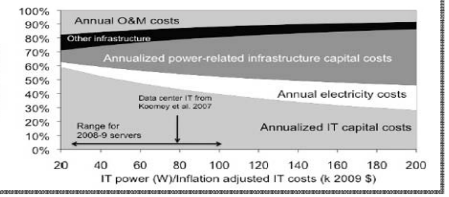
Green IT: Is it all Hype?

THE WALL STREET JOURNAL.
WSJ.com

SEPTEMBER 8, 2009
CONSUMERS
The PC Goes on an Energy Diet
Personal computers suck up enormous amounts of electricity—often when they aren't even being used. Manufacturers are tackling the problem.

Technology Review
PUBLISHED BY MIT
Energy-Aware Internet Routing
Software that tracks electricity prices could slash energy costs for big online businesses.
By Will Knight

AUGUST 20, 2009
White Paper: IT Buyers Need to Look at the Total Cost of Data Centers



CDW
- Energy reduction efforts are yielding significant results. 52% of organizations actively working to reduce energy consumption** have reduced IT energy costs by 1% or more. Still, most are spending millions more on energy than necessary
  - If the average organization surveyed were to take full advantage of energy-saving measures, IT professionals estimate they could save $1.5M annually***

Crain Communications
ENGINEERING NEWS Online
ICT could play key role in greener building

FT.com
FINANCIAL TIMES
It's not easy being green – but it's far from impossible

TechRepublic
Why Isn't Server Virtualization Saving Us More? A Few Small Changes May Dramatically Increase Your Efficiency

FINANCIAL POST
Dialling down data
Energy consumers

The DATACENTER Journal
Where IT, Facilities and Design Meet
Five Ways to Save Real Green in the Data Center
Evolving to a green data center focused on energy efficiency requires implementing data center best practices and taking a holistic

THE GLOBE AND MAIL | TECHNOLOGY
Business seek ways to reduce data centre costs
"Up to 30 per cent of energy costs in a business can come just from the servers," says Bill St. Arnaud, Chief Research Officer at CANARIE (Canada's Advanced Internet Development Organization). "And if that's dirty power – from coal or oil – under Carbon Tax legislation proposed in the U.S. it could be triple the cost it is now."

IT Energy Savings: 4 Opportunities

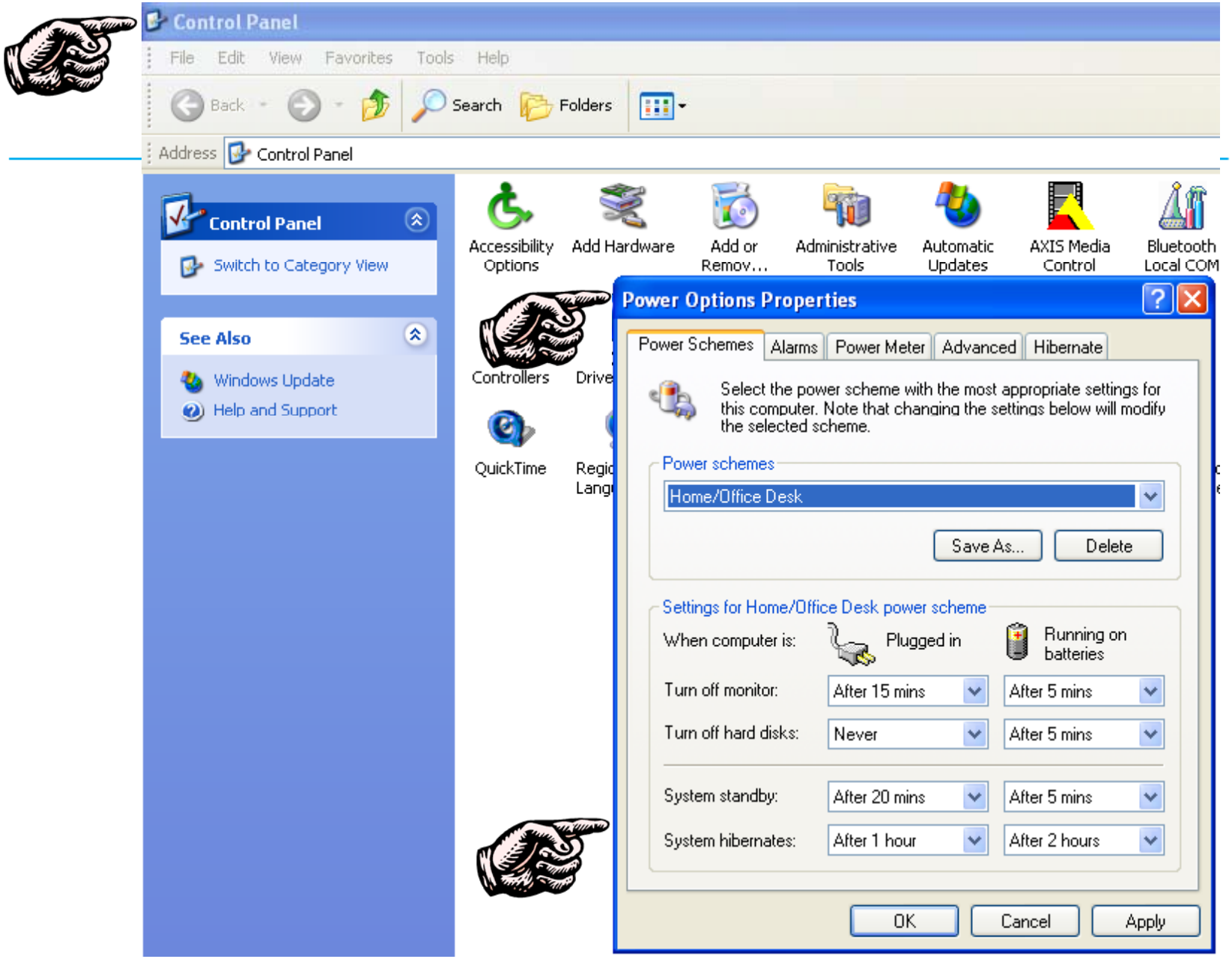
1. ***Power-manage networked computers***
2.
3.
4.

What is “CPM”, and why should I care?

Energy saving features on every computer

- Automatically place inactive *computer* (CPU, hard drive, etc.) & *monitor* into low power mode
- Wakes upon mouse or keyboard input
- Built into Windows, Mac OS X, some Linux OSs
  - Called “standby” and “hibernate” on PC
  - Called “sleep” on Mac

“CPM” settings must be activated!


Control Panel
File Edit View Favorites Tools Help
Back Search Folders
Address Control Panel
Control Panel
Switch to Category View
See Also
Windows Update
Help and Support
Accessibility Options
Add Hardware
Add or Remov...
Administrative Tools
Automatic Updates
AXIS Media Control
Bluetooth Local COM
Controllers
QuickTime
Power Options Properties
Power Schemes
Alarms
Power Meter
Advanced
Hibernate
Select the power scheme with the most appropriate settings for this computer. Note that changing the settings below will modify the selected scheme.
Power schemes
Home/Office Desk
Save As...
Delete
Settings for Home/Office Desk power scheme
When computer is:
Plugged in
Running on batteries
Turn off monitor:
After 15 mins
After 5 mins
Turn off hard disks:
Never
After 5 mins
System standby:
After 20 mins
After 5 mins
System hibernates:
After 1 hour
After 2 hours
OK
Cancel
Apply

Why power management?

- ↓ electricity consumption by $20-100/PC/yr
- ↓ cooling loads (saves additional $3-30/PC/yr)
- ↓ peak load demand charges
- ↓ air pollution
- ↓ carbon footprint
- Executive Order 13423 requires federal agencies to activate “sleep” features

Computer power consumption (hence savings) varies

Use *LESS* Energy	Use *MORE* Energy
Notebook	Desktop
Integrated video/graphics card	High-end video/graphics card
Applications requiring light processor activity	Applications requiring heavy processor activity
LCD monitor	CRT monitor
No screen-saver	Screen-saver
ENERGY STAR qualified	Not ENERGY STAR
Turned off at night	Left on at night

CPM Savings Opportunity:

<100 kWh/yr……vs……>1000 kWh/yr

<$10/yr……vs……>$100/yr

Typical savings for an org. with 1,000 computers

- $40,000* in electricity, or **$160,000** over 4 years
  - Enough electricity to light 240 homes
- Avoid 350 tons of greenhouse gas emissions
  - Equivalent to removing 60 cars from the road
- Online calculator can quickly and easily quantify your savings
  - www.energystar.gov/powermanagement

*Assumes ENERGY STAR qualified computers; night-time turn off rate of 36%; MPM is already activated but CPM is not activated

CPM offers a compelling return on investment

- Labor costs: ~ $5 / seat
  - Identifying appropriate solutions
  - Testing & troubleshooting exceptions
  - Ensuring that sleeping computers do not interfere with administrative software updates
- Software costs: ~ $0-15 / seat
  - Many solutions are free
  - Commercial solutions range from roughly $3-15 per PC
- Vs. energy savings of $120-$160 / seat

Assumptions: 1000 seats; labor costs = 2 weeks of work for one network administrator @ $2,500 per week

Who Offers CPM Rebates?

- Austin Energy
- Avista
- BC Hydro
- Bonneville Power Administration[i]
- Idaho Power
- Los Angeles Department of Water and Power
- Manitoba Hydro
- Northeast Utilities
- Oregon Energy Trust
- Pacific Gas and Electric
- Sacramento Municipal Utility District
- San Diego Gas and Electric
- Seattle City Light
- Silicon Valley Power
- Snohomish PUD
- Southern California Edison

- Utilities w/ Custom Incentives
  - APS
  - Connecticut Light and Power
  - Hawaii Electric Company
  - New York Power Authority
    NSTAR
  - PacifiCorp
  - Puget Sound Energy
  - SRP
  - The United Illuminating Company
  - Xcel Energy

- Regional CPM Incentives
  - Association of Bay Area Governments Energy Watch Program (PG&E)
  - New York State Energy Research & Development Authority (NYSERDA)
  - Oregon Department of Energy
  - San Francisco Energy Watch (PG&E)
  - Wisconsin Focus on Energy

Myth or Reality?

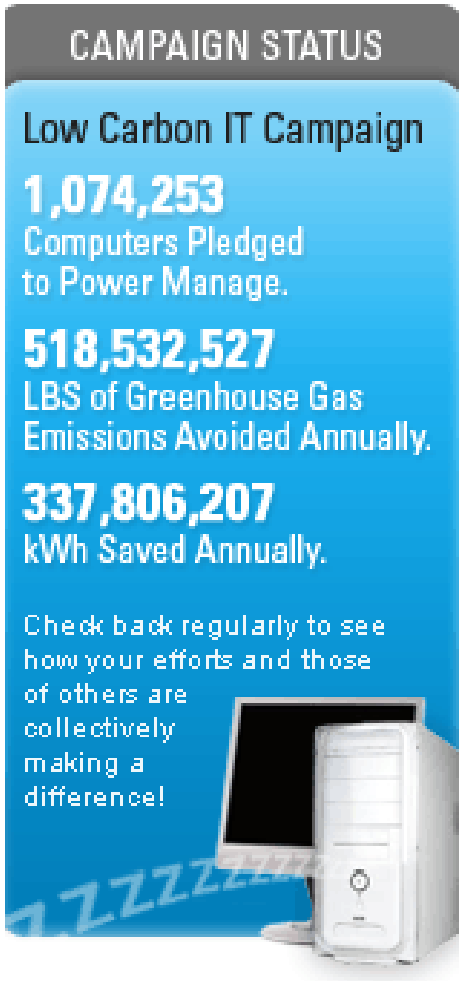
You'd actually save more energy – and a lot of trouble – if you simply required people to turn off their computers each night.

The verdict: Myth!

- While you might save an additional watt or two by turning off a computer vs. placing it in sleep mode, forgetting to shut down your computer just a handful of times will negate an entire year's worth of incremental energy savings.
- Surveys and interviews with IT managers consistently conclude that policies "requiring" users to turn off their PCs at night result in only about 70-90% compliance.

All sorts of leading orgs are embracing CPM

- Anheuser-Busch Companies, Inc.
- Avera Health
- CA Department of Motor Vehicles
- City of Newton, MA
- Coeur d'Alene School District
- FedEx Corporation
- Florida Department of Environmental Protection
- Fox Entertainment Group, Inc.
- HP
- Los Angeles County Department of Public Works
- Raytheon Missile Systems
- Schneider Electric
- Time Warner Cable
- Yale University Health Services



CPM Implementation: Challenges & Solutions

EPA

Learn more at **energystar.gov**

Monitor power management: no-brainer

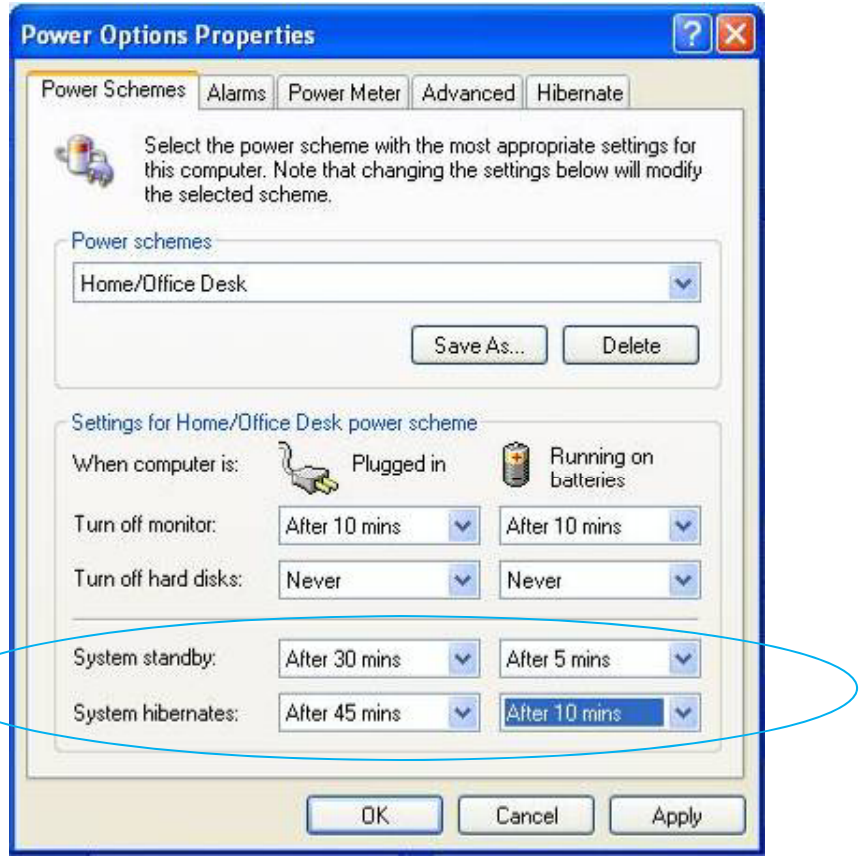
- Easy to activate
- Can't interfere with software patching
- Saves $10-35+ per monitor annually

Most organizations already utilize MPM features – but make sure!

Computer power management: more challenging, more savings

- System Standby (S3)
  - Drops power to 1-3 W
  - Wakes up in a few seconds
  - Saves $10-40 per PC annually

  …or…
- Hibernate (S4)
  - Drops power to 1-3 W
  - Wakes up in 20+ seconds
  - Saves work if power is lost
  - Saves $10-40 per PC annually



For optimal savings & user experience, EPA recommends:

- Setting monitors to enter sleep mode after 5-20* minutes of inactivity
- Setting$_{com}$ puters to enter system standby or hibernate after 30-60* minutes of inactivity
  - *AC* power profile on notebooks
  - Don’t bother with “Turn off hard disks”
- The lower the settings, the more energy you save

Two challenges

1. Activating sleep settings on many computers at once
2. Ensuring that sleep settings do not interfere with the distribution of administrative software updates
   - E.g., Windows security patches, antivirus definitions

Numerous solutions exist, including free software, and software tools that you may already own

Case Study: GlaxoSmithKline

- Situation:
  - 92,000 Win XP PCs
  - Mostly notebooks
  - Already doing MPM

- Solution:
  - Changed settings with a logon script using the command line utility *powercfg.exe* (free!)
  - GSK patches PCs during normal business hours. To minimize disruption, they allow users to defer updates.
- Results:
  - $1 million saved *annually*
  - Roughly 5,300 metric tons of CO2 avoided per year

How To Launch a CPM Initiative

EPA

Learn more at **energystar.gov**

Selling CPM Internally

1. Review current power settings and policies
   - Are sleep features enabled on monitors? Computers?
   - What sleep settings are utilized? (e.g., MPM only? After 1 hr?)
   - Do users leave PCs on at night?
   - Roughly how many computers and monitors are there in total?
2. Estimate savings potential at www.energystar.gov/lowcarbonit
3. Join the *ENERGY STAR Low Carbon IT Campaign*
   - Take pledge
   - Schedule free call to help identify best technical solution
4. Talk to your utility rep
5. Sell the ROI!

5 reasons IT may not initially share your enthusiasm

1. Energy savings aren't rewarded in IT's budget
2. Even a free solution will involve IT staff time to implement
3. CPM could initially complicate how PCs receive security patches and anti virus updates
4. Urgent new security threats emerge regularly to absorb any "free time"
5. Already spending nights and weekends on systems upgrades and other IT initiatives

5 Ways to Get Everyone on Board

1. Estimate your potential $ savings
2. Share the savings opportunity with your management and any "friends" in IT
3. *Counter technical objections with "you might be right: let's ask an expert"*
4. *Make one modest request: join a 30-60 min. call with CPM tech expert*
5. Share the glory

Why join the ENERGY STAR Low Carbon IT Campaign?

1. Free technical expertise and assistance
2. Download free *EZ GPO* software tool
3. An estimate of your customer's energy & carbon savings
4. An official certificate of recognition from EPA
5. Template materials to publicize your efforts
6. Possible national recognition from EPA

IT Energy Savings: 4 Opportunities

1. Power-manage networked computers
2. ***Specify ENERGY STAR for all office equipment purchases***
3.
4.

Why Specify ENERGY STAR?

1. Reduce your energy costs
2. Boost your green credentials
3. Get an edge in competitive bids

Talk up ENERGY STAR & energy efficiency: your competitors might not

ENERGY STAR PC vs. typical four-year-old PC

Usage Scenario	**Lifetime** savings (4 yrs) at…	
	$ 0.11 / kWh (Nat'l avg commercial rate)	$ 0.18 / kWh (Avg residential rate in NE)
CPM not utilized, PCs left on at night	$ 126.72	$207.36
CPM not utilized, but PCs turned off every night	$53.24	$87.12
New PC uses CPM, old doesn't, left on at night	$282.48	$462.24

Sources: DOE/EIA-0226 (2009/09); Office_090204rev.xls; Dell.com (new Business-Class OptiPlex™ PCs start at $432 as of 9/17/09.)

ENERGY STAR-qualified Office Equipment

Coming soon: small network equipment, data center storage, uninterruptible power supplies, products using battery charging systems

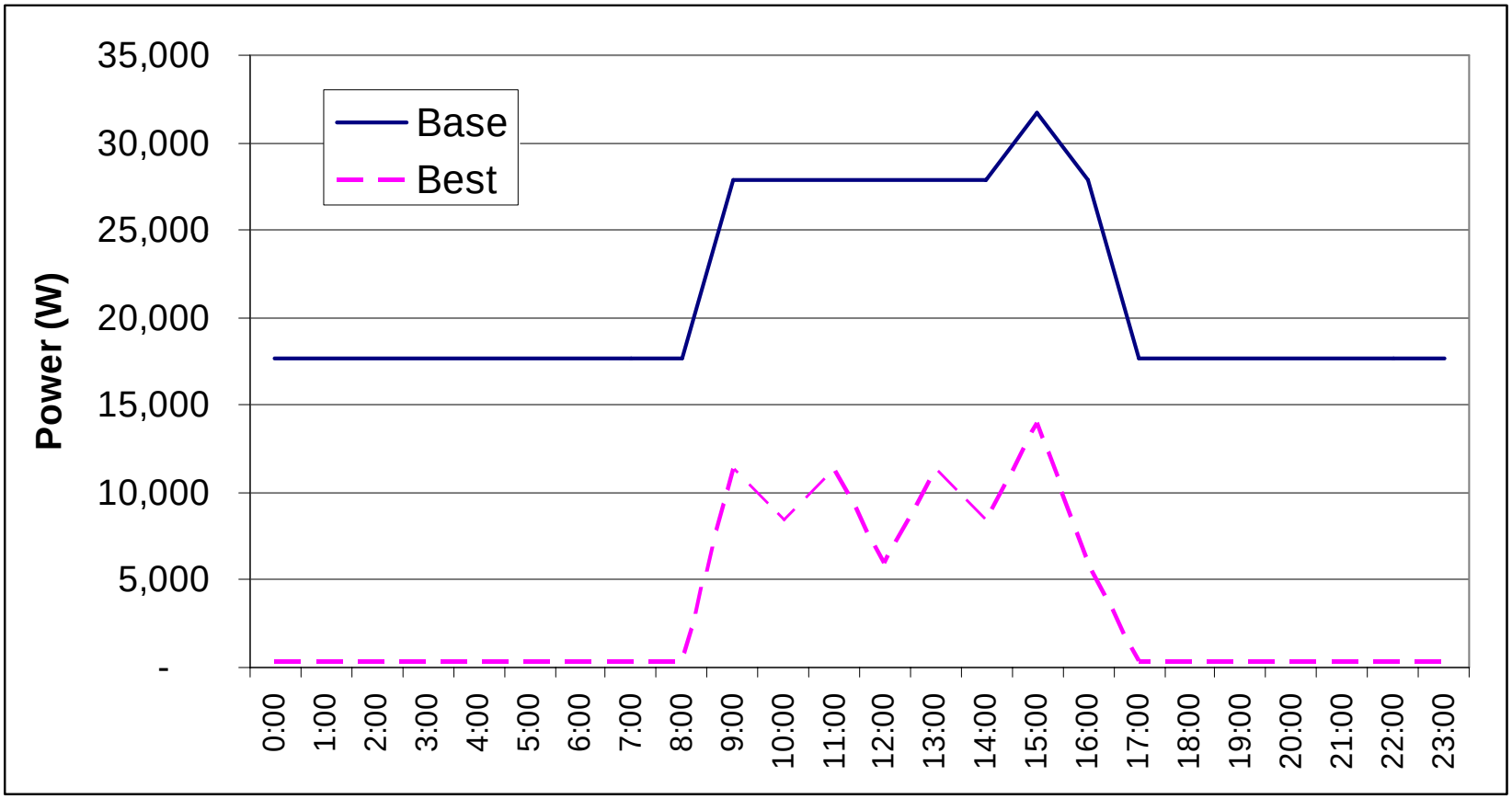
Putting it All Together: a Hypothetical Office

- 100 Staff
- 20,000 sq. ft.
- 40 hour work week

- 125 monitors
- 75 desktops
- 25 laptops
- 2 copiers
- 5 printers
- break room kitchen
- 3 vending machines

Source: The Cadmus Group, Inc. (Quantec)

Save 160,000+ kWh/yr & Lower Peak Demand



Source: The Cadmus Group, Inc.

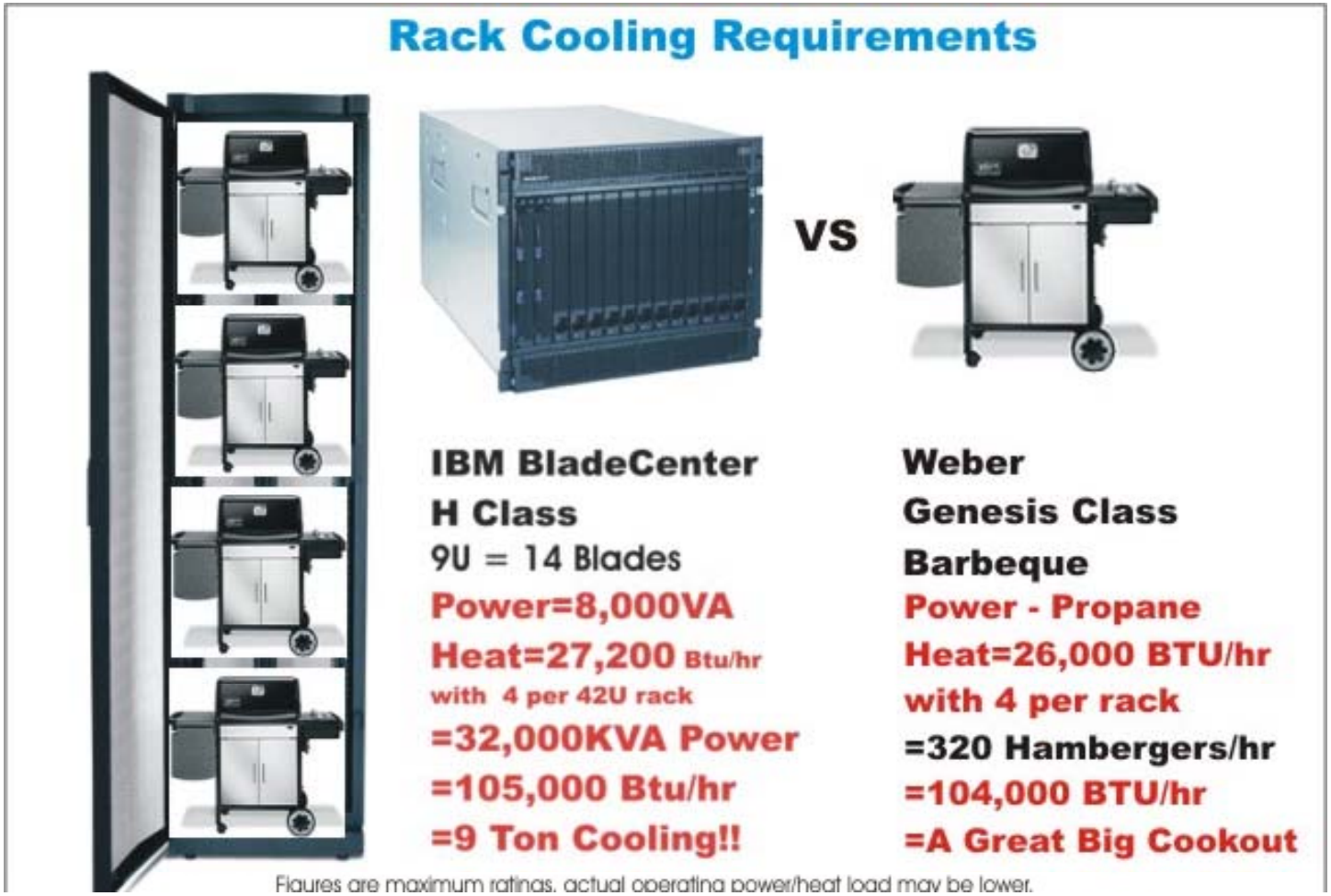
IT Energy Savings: 4 Opportunities

1. Power-manage networked computers
2. Specify ENERGY STAR for all office equipment purchases
3. ***Data centers***
4.

Data Centers

- Account for 1.5 % of total U.S. electricity consumption ($4.5 billion annually)
- Use expected to double over the next five years.
- 10% improvement in efficiency would save 6 billion kWh annually in U.S., enough to:
  - Power more than 350,000 homes
  - Save more than $450 million annually
- Significant savings possible

Server Rack vs. Barbecue



Source: NAAT

Data Centers: Opportunities to Save Energy with IT Equipment

- Server virtualization
- Decommissioning of unused servers
- Consolidation of lightly utilized servers
- Better management of data storage
- Purchasing more energy-efficient equipment

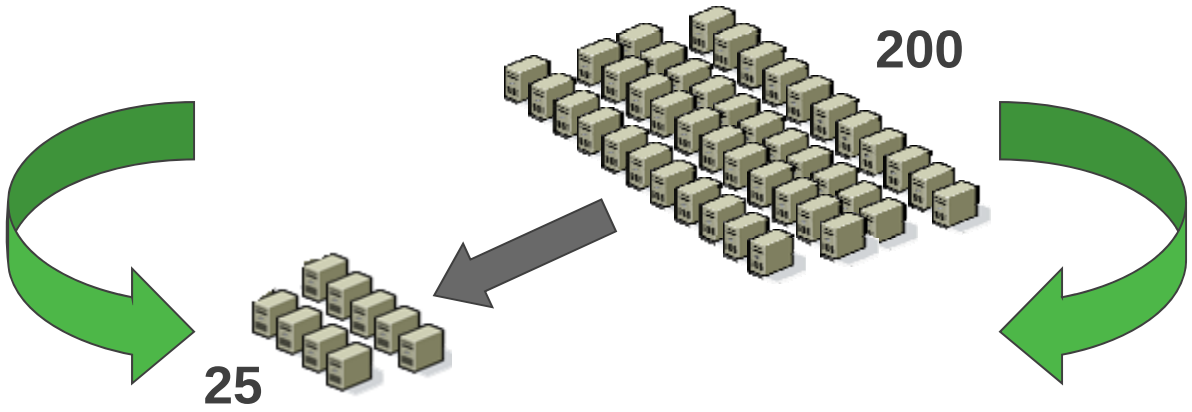
What the h… is a “Virtual machine?”

- A software implementation of a computer that executes programs like a real computer

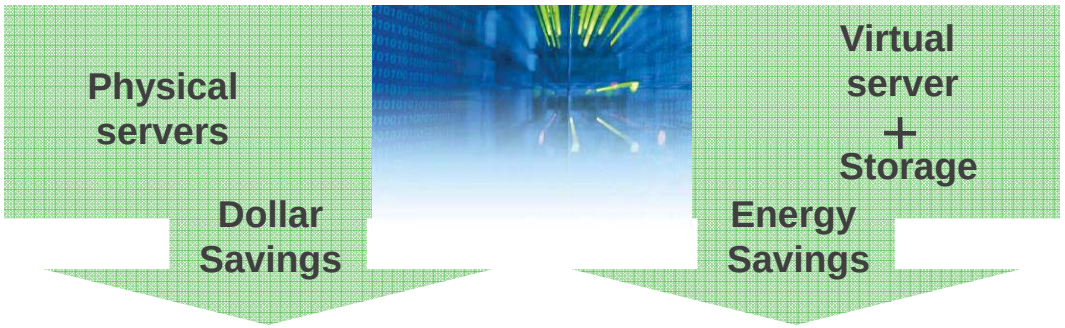
Source: VMWare.com

Virtualization Can Cut Energy *and* Capital Costs

Example



Server Virtualization



Source: BC Hydro

$49,000/yr

980,000 kWh/yr

New ENERGY STAR Servers can Consume 54% Less Power

- Replacing an older server with a new ENERGY STAR-qualified model will save energy *and* deliver more processing power in the bargain

FIGURE 3: BASELINE WORKLOAD -- POWER COMPARISON AT LOAD LEVEL

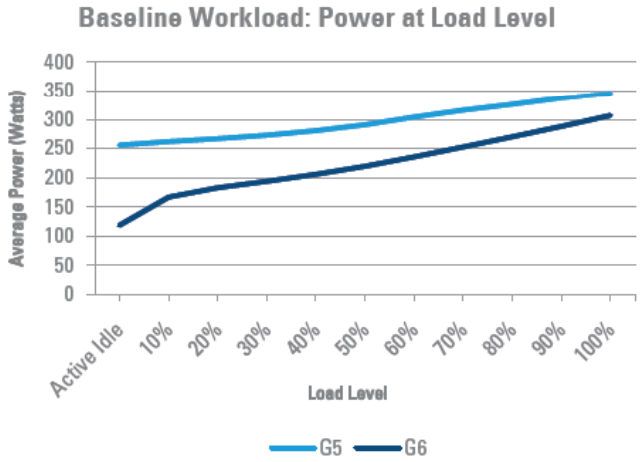
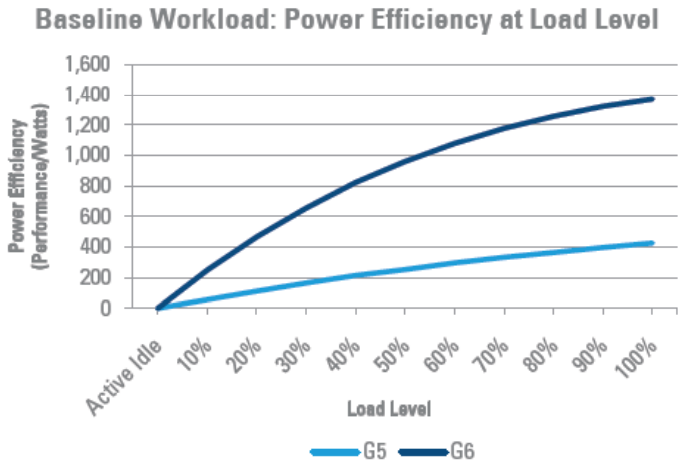
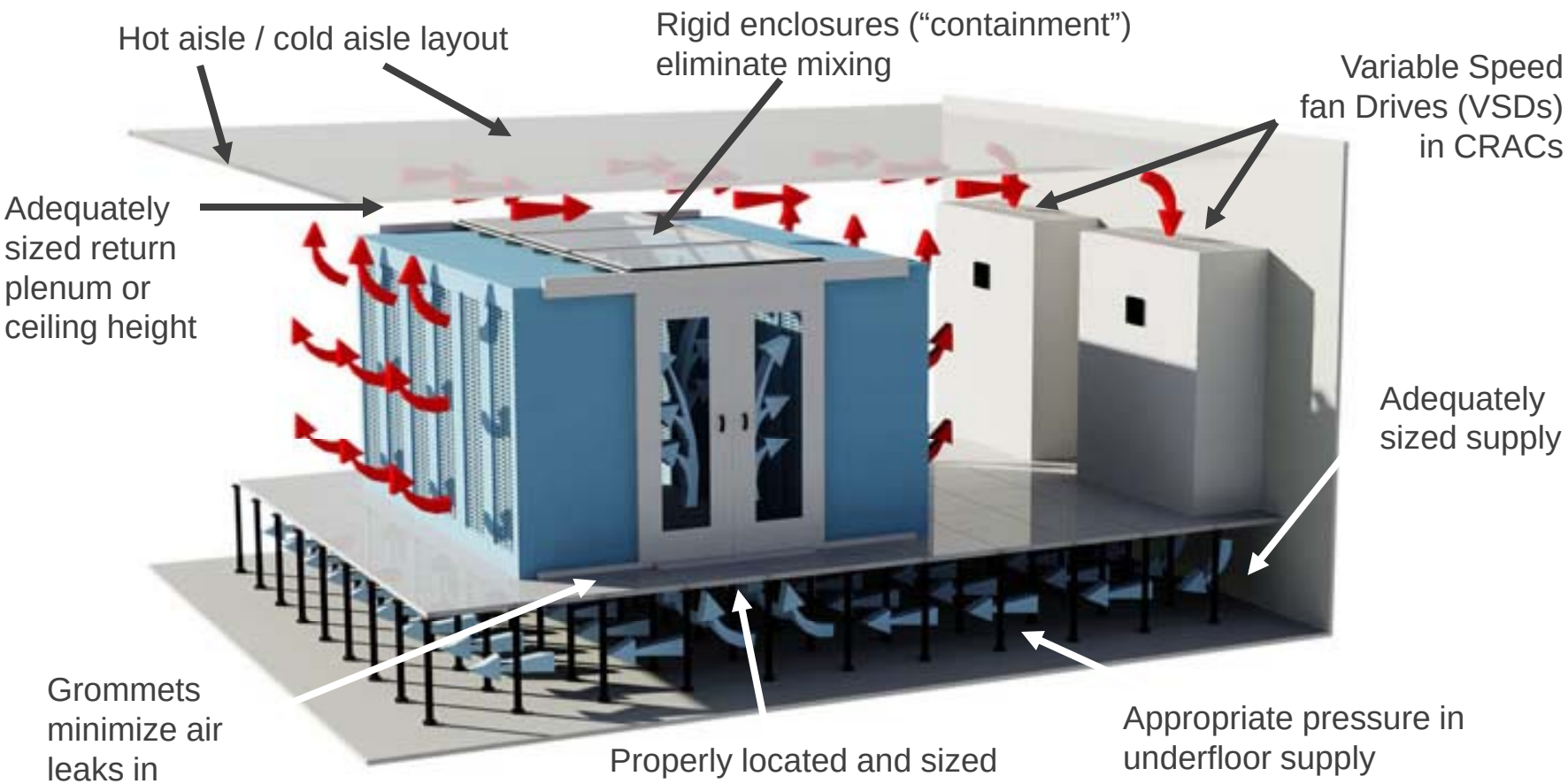


FIGURE 6: BASELINE WORKLOAD -- POWER EFFICIENCY COMPARISON AT LOAD LEVEL



Data Centers: Airflow Management Strategies



Sources: LBNL, Keyzone Computer Products, Ltd.

Data Centers: HVAC Adjustments

- Server inlet temperature and humidity adjustments
- Air-side economizers
- Water-side economizers

Airside Economizers

Exhaust Air
85°F

Outside Air
65°F

In milder climates, cooling with 100% outside air can be used for most of the year (San Francisco: 8,500 out of 8,760 hours annually)

Coming Soon to energystar.gov/lowcarbonit

- Non-technical descriptions of common opportunities for energy savings in data centers
- Impartial information about costs, savings, and implementation considerations

Top 12

1. Virtualization of Servers
2. Decommissioning of Unused Servers
3. Consolidation of Lightly Utilized Servers
4. Data Storage Opportunities
5. Efficient Equipment Purchase
6. Hot Aisle/Cold Aisle Arrangement
7. Containment/Enclosures
8. Variable Speed Drives
9. Housekeeping: Blanking Panels, Cabling and Gaps
10. Server Inlet Temperature and Humidity Adjustments
11. Air Side Economizer
12. Water Side Economizer

New: ENERGY STAR Rating for Data Centers

- For stand-alone data centers and buildings that house large data centers
- Data centers must be in the top 25 percent of their peers in energy efficiency
- Uses a commonly accepted measure for energy efficiency: Power Usage Effectiveness (PUE)
  - PUE = Total Facility Source Energy/ IT Source Energy (output of UPS)
- More info at www.energystar.gov/datacenters

First Data Center to Earn ENERGY STAR Label: NetApp

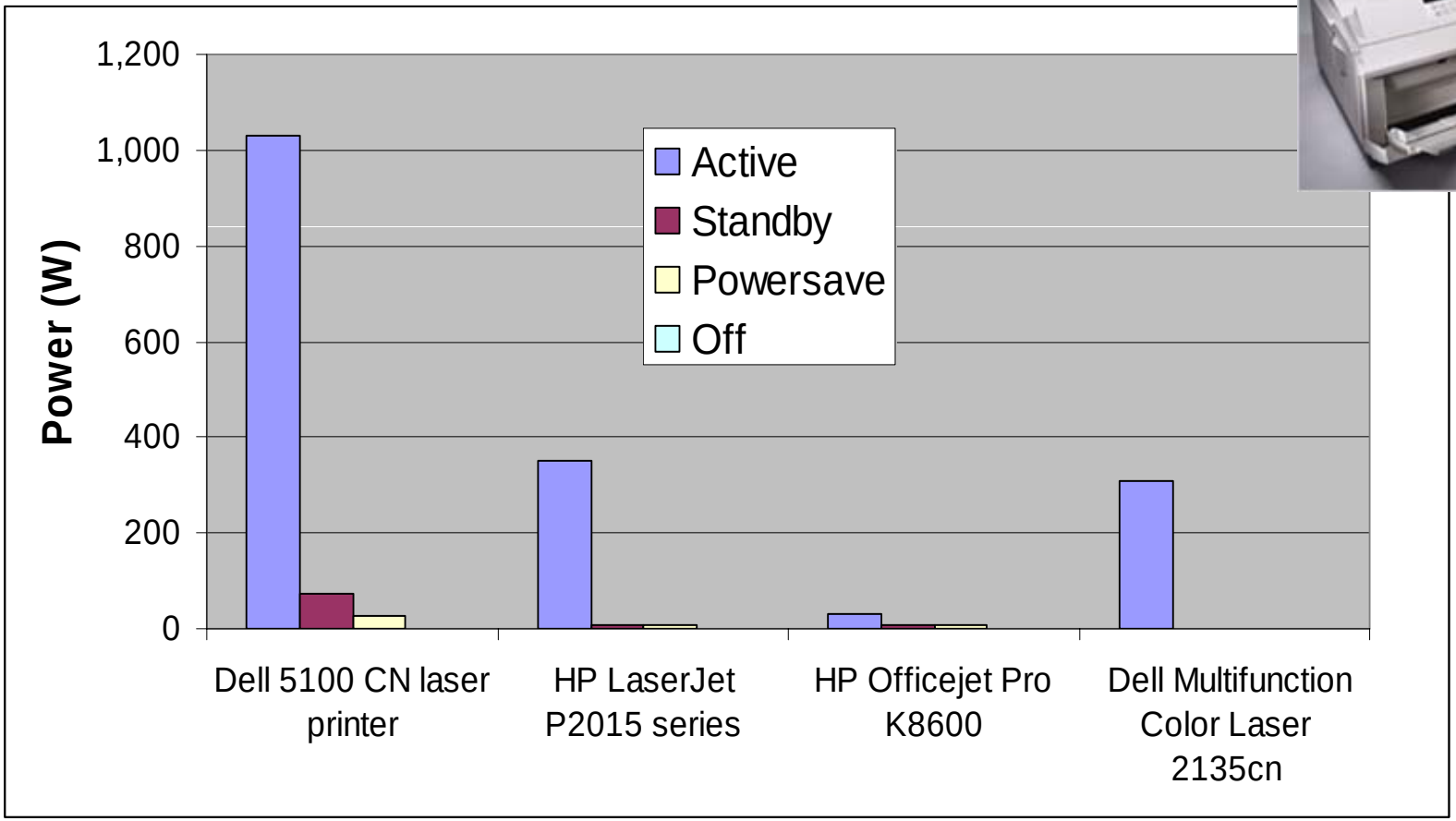
IT Energy Savings: 4 Opportunities

1. Power-manage networked computers
2. Specify ENERGY STAR for all office equipment purchases
3. Data centers
4. ***Computer peripherals***

Consolidate Printers

- Reduce the number of devices in your printer fleet
- Ensure that remaining devices are more cost effective to own & operate:
  - Eliminate inkjet or other high-cost printers
  - Share “workgroup” printers
  - Use multi-function devices
- Benefits:
  - Cut hardware costs
  - Cut paper, ink, and toner costs
  - Reduce electricity use
  - Reduce maintenance expenses
- Representative savings run between 30 and 40 percent and can range as high as 60 percent

Make Sure Standby Modes are Activated



“Smart” Power Strips can Save $10-100+ per Year

Computer, phone charger

Lighting, printer/scanner, PC speakers, backup drives, space heaters, etc.

Monitor

Some utilities offer rebates

Summary

1. Power manage networked computers
2. Specify ENERGY STAR for all office equipment purchases
3. Identify opportunities in your data centers
4. Manage computer peripheral energy consumption

Contact information

- Additional information at:
  www.energystar.gov/lowcarbonit
- Contacts:
  - Mike Walker, Beacon Consultants Network Inc. (EPA Technical Support Contractor): 617-921-8445, mwalker@beaconconsultants.com
  - Dave Korn, The Cadmus Group (EPA Technical Support Contractor): 617-673-7116, dkorn@cadmusgroup.com
  - Steve Ryan, US EPA ENERGY STAR Program Manager: 202-343-9123, Ryan.Steven@epamail.epa.gov

Questions & Answers