

Extreme Office Makeover



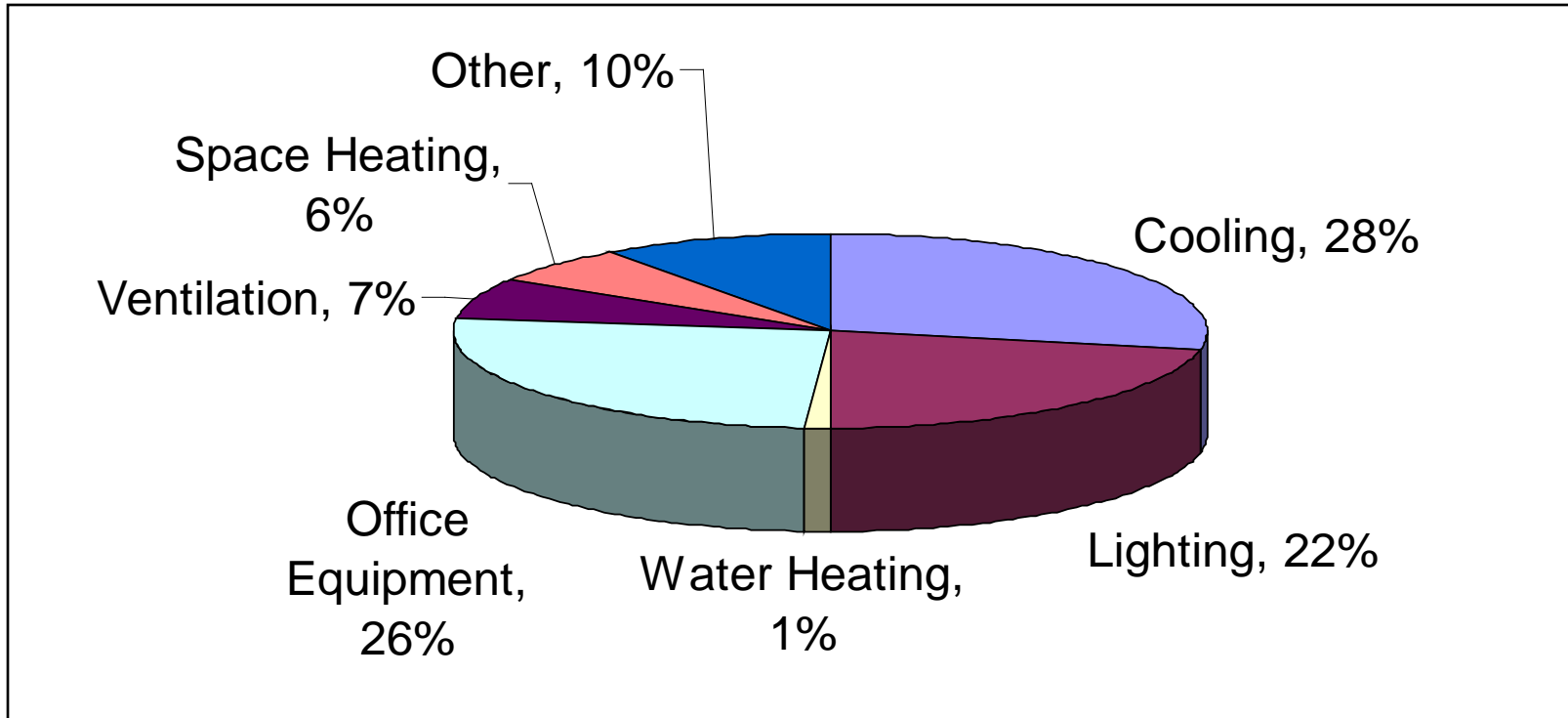
Mira Vowles, Bonneville Power Administration

Colorado Utility Efficiency Exchange Conference

October 22, 2009



Office Energy Use



Based on data from the Department of Energy, Energy Information Administration, Building End-Use Consumption Survey

New York State Energy Research and Development Authority (NYSERDA) Extreme Office Makeover

Plug-load audits for institutional buildings



NYSERDA Extreme Office Makeover

1. Get commitment from the top
2. Audit plug loads
3. Have an IT expert on the team
4. Recommend EE measures and policies



Plug load equipment

Computers and monitors

Small power supplies

Speakers

Printers

Copiers and multi-function
devices (MFD)

Faxes

Scanners and MFDs



Vending machines

Task lighting

Large coffee machines

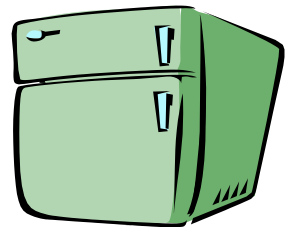
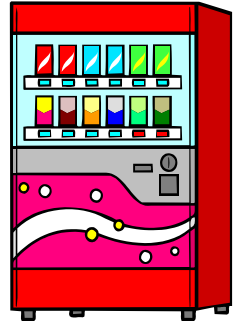
Water coolers

Refrigerators

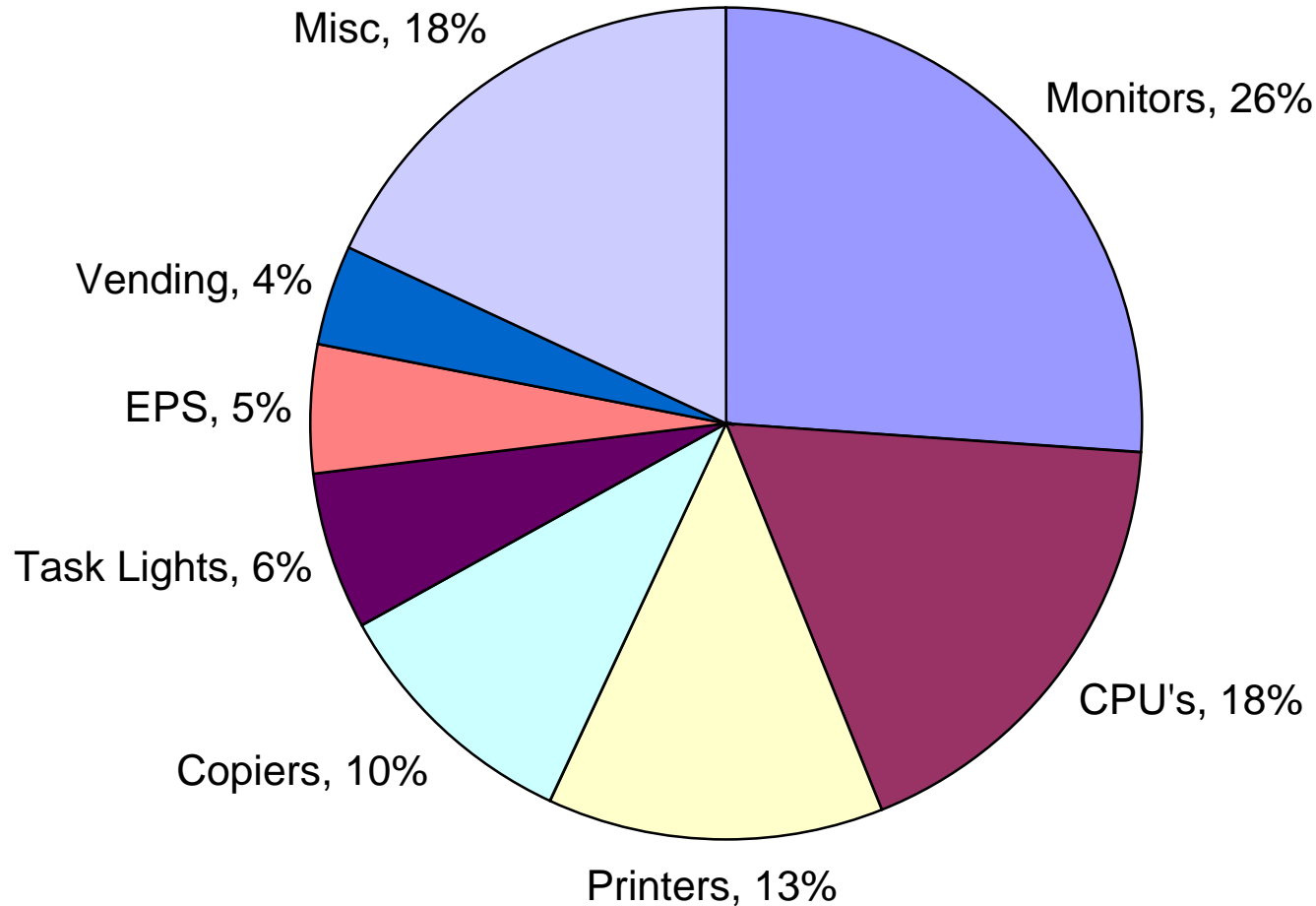
Clothes washers

Space heaters

Other electronics



Sample Plug Load Energy Use

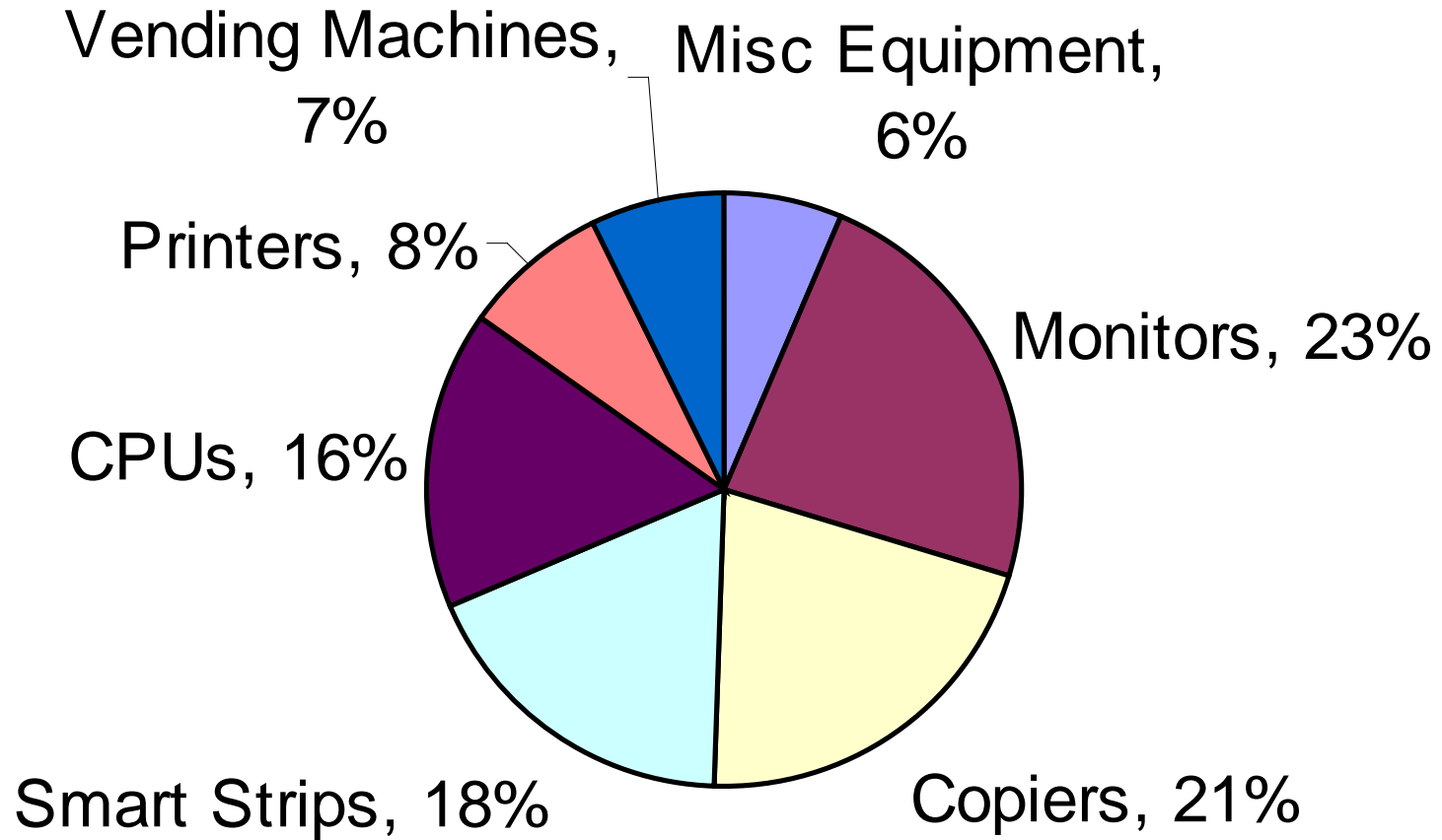


Three “P’s” for Plug-Load Savings

- **P**ower off
- **P**ower management
- **P**olicies



Sample Plug Load Savings



Personal Computer Opportunities

- Use power management (170 kWh)
- Replace desktops with laptops (185 kWh)
- Replace CRTs with LCDs (115 kWh)



Printer Opportunities

- Turn off “after hours”
- Consolidate printers
- Standardize printer models



Detailed Plug-Load Recommendations with LARGE Potential Savings!

Equipment	# of Units	Implement Energy Efficiency Measures	% Saved With Implemented Measures	Total Office Savings @ \$0.10
PC/Monitors	1600	Shut off PCs & Monitor Power Management	59%	\$48,800
Printers	661	Shut off & Power Management	43%	\$11,565
Copiers	66	Shut off & Power Management	67%	\$5,031
Faxes/Scanners/MFDs	119	Shut off & Power Management	41%	\$1,412
Task Lights	68	Replace Incandescents with CFLs	72%	\$167
Water Coolers	33	Turn off Hot Water Tap	36%	\$595
Refrigerators	73	Replace Old Inefficient Units	32%	\$1,964
Coffee Machines (Lg)	40	Turn off at night/use timers	25%	\$1,190
Vending Machines	7	Replace w/ENERGY STAR machines	62%	\$1,178
Total Equipment Users	1600		53%	\$71,901



BPA's Extreme Office Makeover Team

- Lane Community College Energy Management Program staff and student interns
- Eugene Water and Electric Board EE staff
- Building property manager
- NYSERDA delivery contractor
- BPA EE staff



BPA Extreme Office Makeover of two office buildings

- 60,000 SF
- Three story
- All electric
- 30 years old
- Energy efficient lighting, HVAC and controls

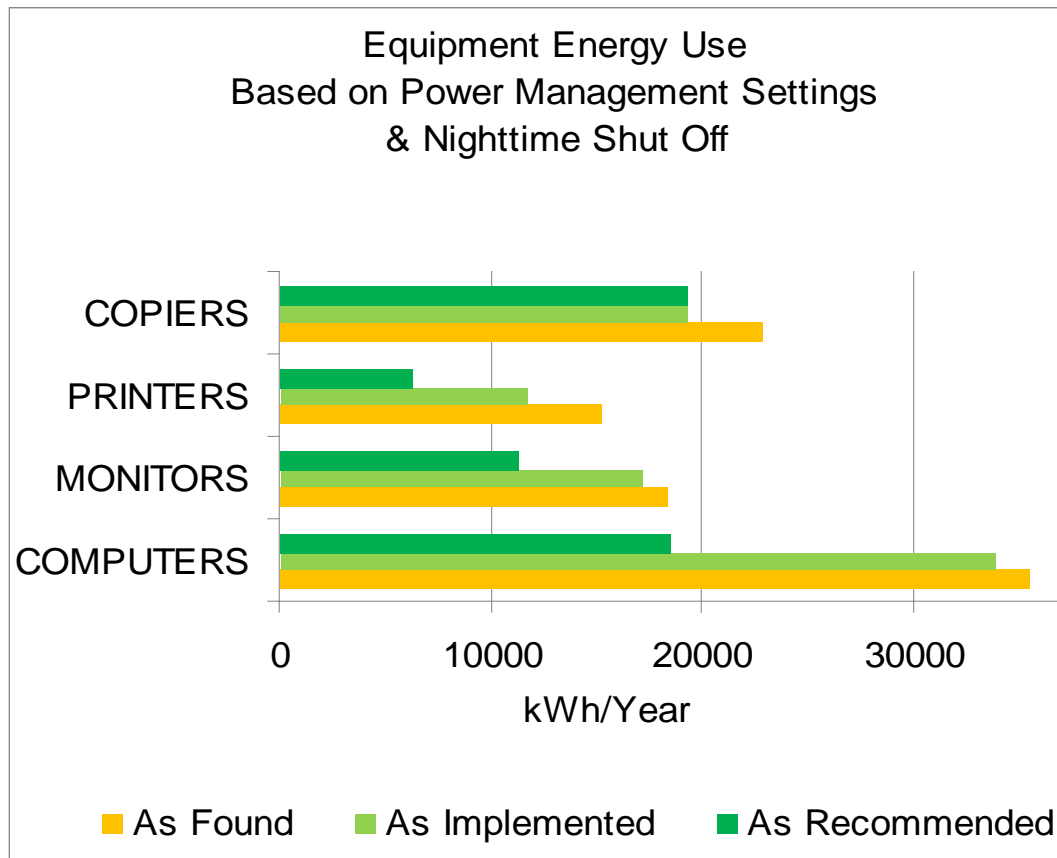


BPA Extreme Office Makeover Pilot

- Analyze lease
- Plug load audits of two office buildings
- Provide sample smart-strip, recommendations, results and incentive information



BPA Extreme Office Makeover tenant plug-load audits



Plug Load References

- Ecos Consulting; “Field Report: Energy Use of Plug Load Device in California Homes”, October 2006
 - http://www.efficientproducts.org/reports/plugload/Plug_Loads_CA_Field_Research_Report_Ecos_2006.pdf
- ESource; “Managing Plug Loads; Laptop and Chargers and Fans, Oh My”, Feb 2009
 - http://www.epa.gov/stateply/documents/events/11feb_plugloads.pdf
- LBL Study; “After-hours Power Status of Office Equipment and Inventory of Miscellaneous Plug-Load Equipment”, Jan 2004
 - <http://enduse.lbl.gov/Info/LBNL-53729.pdf>
- BNXS15: Standby power consumption – domestic appliances Version 1.4
 - <http://www.mtprog.com/spm/download/document/id/590>
- BNXS36: Estimated UK standby electricity consumption in 2006; Version 2.5; updated 24/02/2009.
 - <http://www.mtprog.com/spm/download/document/id/784>
- A review of the Energy Efficiency Commitment 2005-2008; OFGEM, 1 August 2008
 - <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/PrevSchemes/Documents1/Annual%20Report%202008%20Final.pdf>
- Carbon Emission Reduction Target (CERT) carbon reduction matrix
 - <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/InfProjMngrs/Documents1/Carbon%20Reduction%20Matrix.xls>
- Energy saving matrix (2007)
 - <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/Documents1/Energy%20saving%20matrix.xls>



BPA Extreme Office Makeover Lessons Learned

- Owner occupied buildings best application
- Need to know occupants' motivations
- Audits are labor intensive
- Significant savings from no/low cost measures
- Sub-metering can help
- Smart-strips are a good tool



Commercial Smart Strip Incentives

- Office pilot
- Deem minimum savings
- Incent for all smart-strips?
- Direct install?


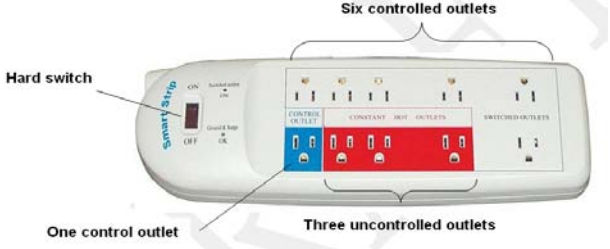



BPA Office Pilot

- 165 smart-strips installed
- 700 kWh per year average savings
- Installed if cubicle plug-load was more than 250 watts
- Smart-strip required if cubicle had an electric heater



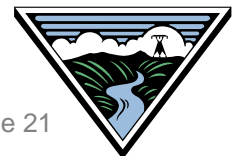
Types of available smart strips

<p>Occupancy Sensor Price: \$80 – \$95</p>	
<p>Load Sensor Price: \$20 – \$160</p>	
<p>Timer Plug Strip Price: \$20 - \$50</p>	



Smart strips: your savings may vary

Smart Strip Type	Savings & Rebates
<p>Occupancy Sensor</p> <p>Barriers:</p> <ul style="list-style-type: none"> • False detection • Blind spots <p>Solution:</p> <ul style="list-style-type: none"> • Adjust sensitivity/sensor position 	<p>Savings:</p> <ul style="list-style-type: none"> • 700 kWh/yr – BPA • 94 - 295 kWh/yr – PG&E • 30%– Florida Solar Energy Ctr <p>Rebates:</p> <ul style="list-style-type: none"> • \$15 – Rocky Mtn Power • \$10 – Idaho Power
<p>Load Sensor</p> <p>Barriers:</p> <ul style="list-style-type: none"> • Fails to trigger • Dependent on PC sleep mode <p>Solution:</p> <ul style="list-style-type: none"> • Adjust threshold 	<p>Savings:</p> <ul style="list-style-type: none"> • 327 kWh/yr – Univ Study • 41 - 119 kWh/yr – PG&E • 30%– Florida Solar Energy Ctr <p>Rebates:</p> <ul style="list-style-type: none"> • \$20 – NYSERDA • \$7 – BC Hydro
<p>Timer Plug Strip</p> <p>Barrier:</p> <ul style="list-style-type: none"> • Savings depend on time setting <p>Solution:</p> <ul style="list-style-type: none"> • Consumer education 	<p>Rebate:</p> <ul style="list-style-type: none"> • \$7 – BC Hydro



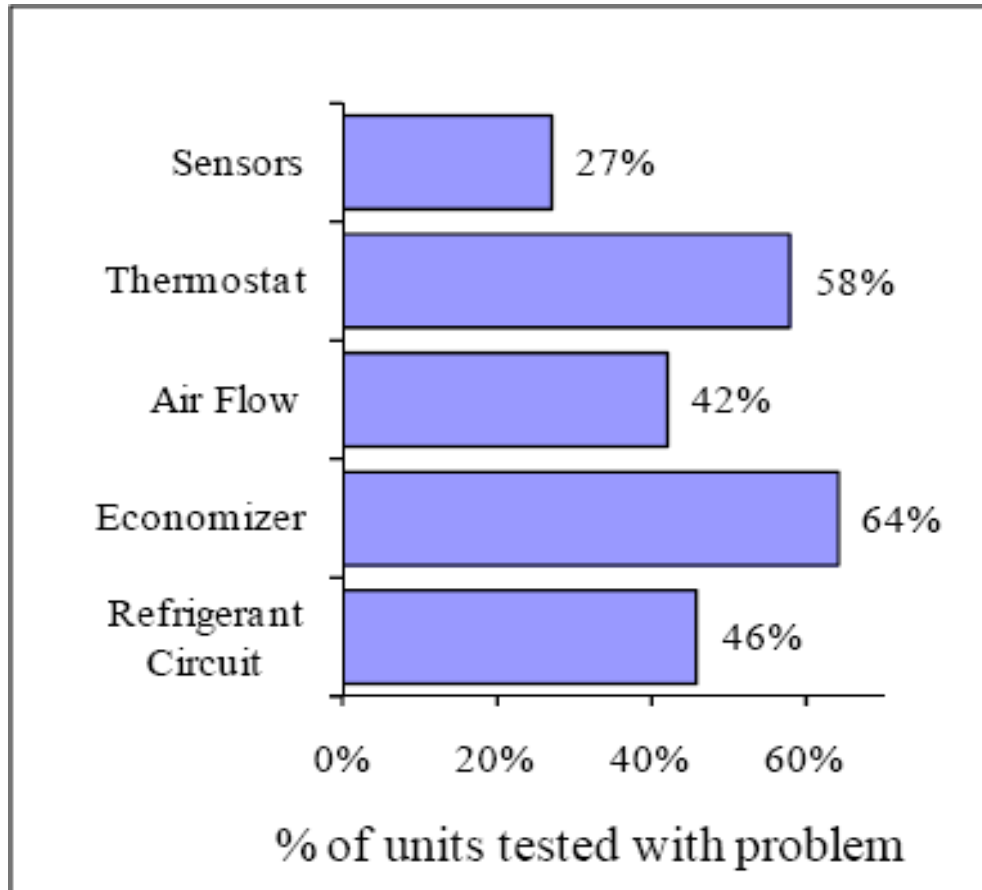
Are you ready for a Colorado Extreme Office Makeover?



Retro-Commissioning Commercial HVAC Rooftop Units



Rooftop unit problems



Cowan, A. 2004. *Review of Recent Commercial Roof Top Unit Field Studies in The Pacific Northwest and California*. October 8, 2004. White Salmon, Wash.: New Buildings Institute.



Performance Tested HVAC Pilot

1. Estimate energy savings
2. Retro-commissioning
3. Verify savings estimates



Performance Tested HVAC

Standardized service protocols:

1. Airflow
2. Refrigerant system
3. Economizer
4. Thermostat

Ensure energy savings:

1. Training
2. Quality control
3. Data-logging



Performance Tested HVAC tools



TrueFlow plate



Service assistant

Performance Tested HVAC M&V

- Install data-logging equipment two weeks prior to service
- Remove data-logging equipment two weeks after service
- Analyze savings



Performance Tested HVAC Rooftop Units

- Operational,
packaged rooftop units
- Must be over three tons
with an economizer
- Operate over 40 hours per week



Performance Tested HVAC Results

- Data for 165 RTUs
- Working group
- Over 300 RTUs



The Future of Performance Tested HVAC

- Data analysis
- Economizer training
- HVAC Trade Allies
- Premium Ventilation
- Deemed savings estimates



Comments? Questions?

