Strategies for Energy-Efficient Use of Computers and Other Plug-Load Equipment

Presented to: State Electronics Challenge Partners

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Topics

- Introductions
- The Growth of Computers and Other Electronics
- NYSERDA's Energy $mart Offices Program
- Power Management and Other Efficiency Measures
- Potential Savings in Offices and Other Facilities
- Project Implementation Strategies
- Sources of Information

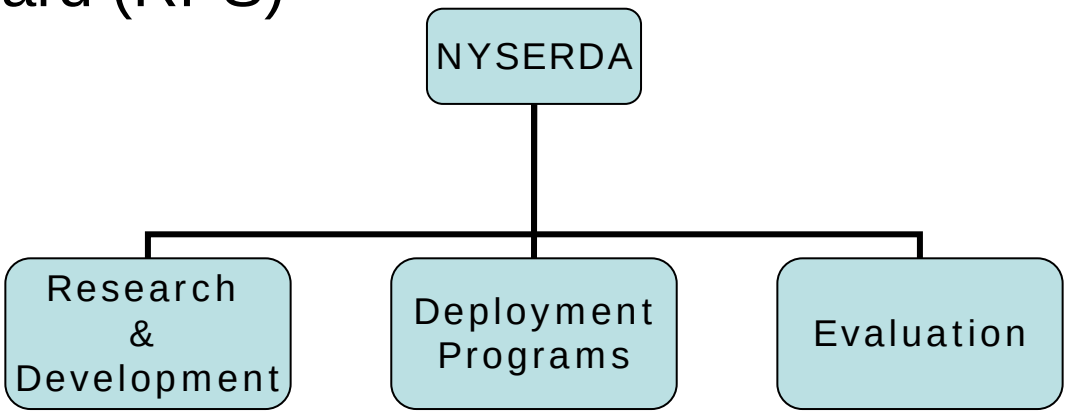
The Growth of Computers and Other Electronics

NYSERDA Energy $mart Offices Program

Susan Andrews

Who Is NYSERDA?

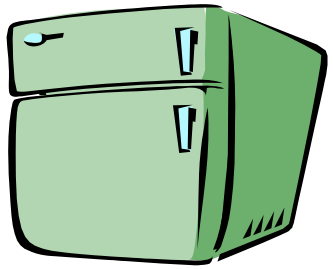
- Founded in 1975
- Statewide offices (headquarters in Albany)
- Primary funding is through the Systems Benefit Charge (SBC)
- Responsible for oversight of the Renewable Portfolio Standard (RPS)



Plug-Load Equipment Typically Accounts for At Least 20 Percent of the Electric Use in Office Buildings

- Computers & monitors
- Small power supplies
- Speakers
- Printers
- Copiers and MFDs
- Faxes
- Scanners and multi-function devices (MFDs)

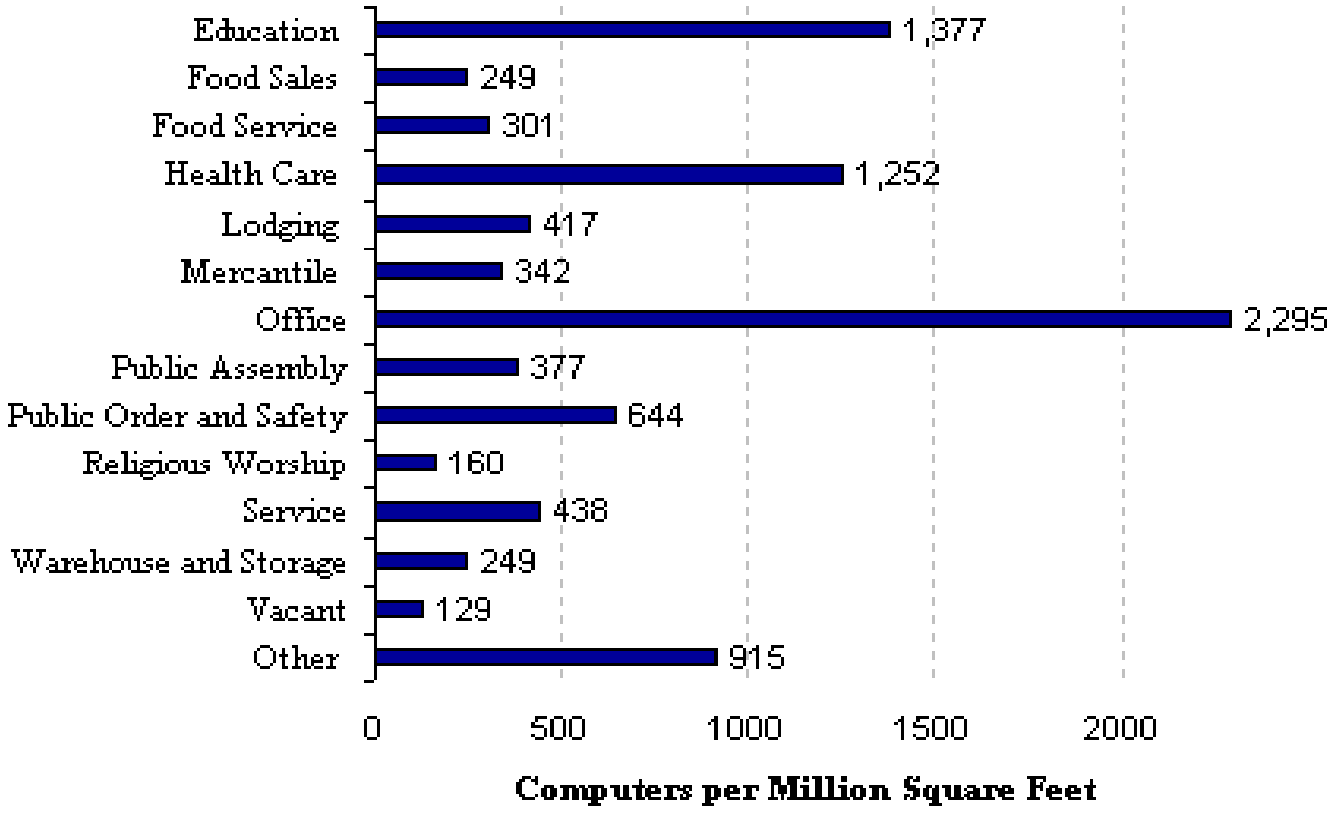
- Vending machines
- Task lighting
- Large coffee machines
- Water coolers
- Refrigerators
- Clothes washers
- Space heaters
- Other Electronics



Plug-Load Usage Is Growing Rapidly

- PCs and non-PC office equipment are estimated to be the fastest growing energy uses for the commercial sector through 2030 according to the Energy Information Administration—Annual Energy Outlook 2006 Report
  - Energy consumption for PCs is estimated to grow 3 percent annually
  - Energy consumption for other office equipment is estimated to grow 4.1 percent annually
  - In comparison, energy consumption for other end-uses such as space heating is estimated to grow about 1 percent

Offices are the most computer-intensive followed by Educational Facilities.



Source: Energy Information Administration, 1999 Commercial Buildings Energy Consumption Survey.

NYSERDA Energy $mart Offices

- Funded through NYSERDA's **New York Energy $mart[SM]** program designed to lower electricity costs by encouraging energy-efficiency in New York State
- The goal of the project is to identify and help implement energy-savings from low-cost/no-cost measures
  - targeting business and non-business plug-load equipment
  - in commercial and government offices, school districts, and college campuses
- NYSERDA funds the data collection and analysis, technical support, and outreach and education
- See http://www.nyserda.org/programs/offices/

NYSERDA Energy $mart Offices

- Plug-load equipment data have been collected and analyzed at about 55 project sites:
  - **20 offices** including local governments, state government, large commercial buildings, and small organizations
  - **5 municipal school districts** in New York State
  - **21 universities (SUNY and private) and 7 community colleges** for NYSERDA Energy $mart Offices projects since 2004 representing 113,760 computers using electricity on campus with identified estimated potential plug-load savings of $3.5 million annually

Power Management and Other Efficiency Measures

Potential Savings in Offices and Other Facilities

Carol Sabo

Three “P’s” of Plug-Load Efficiency

- **Power management:** ensure that all applicable ENERGY STAR® office equipment such as PC monitors (and computers where applicable), printers, and copiers are enabled to go into “low power” or “sleep mode” when not in use.

- **Power off:** educate staff to turn off plug-load business equipment (PCs, monitors, printers, copiers, speakers, task lights) after hours and when not being used for several hours. Use timers to control the operating hours of other inefficient equipment such as large coffee makers that heat water 24 hours a day, water coolers that have hot and cold water taps, and other plug load equipment.

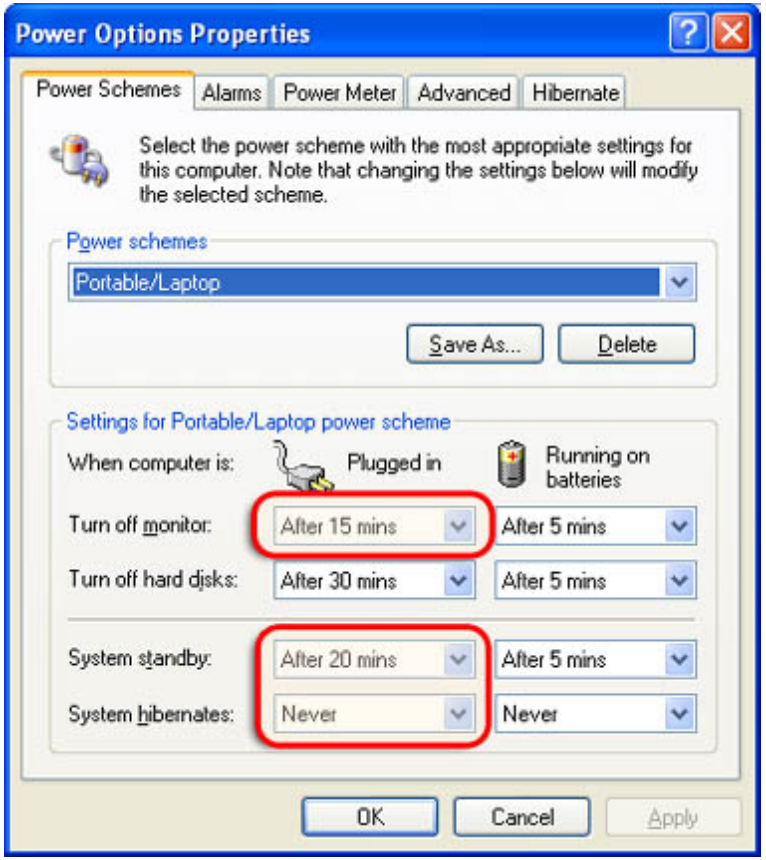
- **Procure the “best” ENERGY STAR equipment**: develop and enforce purchasing/leasing standards that specify the most efficient ENERGY STAR office equipment including copiers, printers, task lighting, vending machines, water coolers, clothes washers, and other plug-load equipment.

Why Power Management?

- Monitor power management (MPM) places active monitors into a low power sleep mode after sitting idle for a specified period
  - Reduces power draw from 30–90 watts to 2–3 watts
- Computer power management (CPM) places the computer itself (CPU, hard drive, etc.) into a low power sleep mode
  - Reduces power draw from 40–90 watts to 2-3 watts
- Visit www.energystar.gov/powermanagement for more information

Power Management is Easy

- Power Management capability already exists in most computers — it just needs to be activated
- There are a variety of network software tools available (if needed) to:
  - assess the current status of power management
  - quickly enable large groups of computers and monitors
- Many IT networks already have software tools in place that can be used to enable power management settings on groups of computers



Procurement of ENERGY STAR Computers

- On July 20, 2007, ENERGY STAR's new specifications for computers went into effect.
- Qualified products must now meet energy use guidelines in three distinct operating modes: standby, sleep mode, and while computers are being used.
- Newly qualified computers must also include a more efficient internal power supply.

But We Purchase ENERGY STAR Computers Already

- Most new computers are ENERGY STAR and they are usually shipped with power management enabled
- IT staff often disable the settings because of prior bad experiences or other reasons
- Individual staff, if they have administrative privilege, sometimes disable the power management settings
- A significant percentage still do not power off their computers when not in use for several hours
- Savings potential has averaged 300 kWh annually for every computer in the office

NYSERDA $mart Offices Case Study (Equipment Survey Conducted 2004)

Building: Buffalo City Hall

Building Size: 566,313 total square feet

Number of Floors: 26 floors

Number of PC Using Employees: 1,000

Use of Building: City Administration

Total Annual kWh: 3,991,680

Total Annual Electric Bill: $486,836

Average Electric Cost Per kWh: 12 cents

Plug-Load Equip. Use: 960 kWh/employee

Buffalo City Hall Est. Savings of $71,400 for 1,000 Employees at 12 cents/kWh

Equipment	# of Units	Low-cost/No-cost Energy Efficiency Measures	% Saved With Extreme Office Makeover	Total Electric Bill Savings @ $0.12
PC/Monitors	1000	Shut off & Power Mgmt	69%	$55,857
Printers	330	Shut off & Power Mgmt	31%	$4,138
Copiers/Doc. Centers	75	Shut off & Power Mgmt	67%	$6,815
Faxes/Scanners/MFDs	25	Shut off & Power Mgmt	37%	$289
Task Lights	38	Repl w/ENERGY STAR CFLs	72%	$117
Water Coolers	43	Turn off Hot Water Taps	48%	$1,522
Refrigerators	22	Replace with ENERGY STAR	54%	$1,718
Coffee Machines (Lg)	17	Turn off at night/timers	25%	$597
Vending Machines	2	Replace w/ENERGY STAR	62%	$354
Total Equipment Users	1000		62%	$71,407

NYSERDA Energy $mart^{SM} Offices Savings Identified in School Districts

Use of Facility (Grade Levels)	# Students or Staff	Total Annual Projected Savings	Savings per Student or Staff	Cost per kWh	# Computers	Savings per Computer	Students per Computer
A. Grades 6-12 (2005)	260	$5,100	$19.62	$0.10	83	$61.45	3.1
B. Small School Dist.	2,682	$45,000	$16.78	$0.10	1,232	$36.53	2.2
C. Large School Dist.	39,867	$688,500	$17.27	$0.12	14,000	$49.18	2.8
D. 2 High Schools 9-12	2,700	$21,000	$7.78	$0.12	504	$41.67	5.4
E. Board of Ed. Bldg.	486	$17,857	$36.74	$0.07	486	$36.74	
Total	45,995	$777,457	$16.90		16,305	$47.68	

Campus Case Study: 3,300 Students Enrolled with 1,750 Living on Campus—Annual Savings

Equipment (2007 Study)	Staff/Gen.	Labs	Res. Halls
Computers	$13,000	$36,000	$35,000
Copiers/Printers	$6,500		
Vending (48)	$9,000		
Clothes Washers			$1,300
Refrigerators	$1,500		$19,000
Task Lights	$500		$15,000
Total Est. Annual Savings	**$30,500**	**$36,000**	**$70,300**

Purchase Laptops Instead of Desktops for Appropriate Users to Save Electricity

- Using laptops instead of desktop computers can cut computer electric use by 50 percent or more
- Est. savings for a laptop replacing a desktop with CRT monitor is $25
- When appropriate, use power strips with laptops to shut off power supplies (printers & other individual equipment at the desk)

Replace Old CRT Monitors On Desktops

- Purchase LCD monitors when replacing monitors
  - Average annual savings per monitor (based on 40 watts reduction) is $35 if the monitor is not turned off after hours and drops to $10 savings if the monitor is always turned off after hours
  - There are other benefits such as reduced heat from the monitor and less flicker that help justify the incremental cost, which has dropped considerably in the last few years

Screen Savers Do Not Save Energy

- Limit the use of 3-dimensional screen savers that can double the power use of some PCs
- Use dark colors—white and bright colors can increase power use of a screen saver by 20 percent or more

Copiers/Document Centers/MFDs

- Develop specifications to purchase/lease the **most** efficient ENERGY STAR model
- Centralize procurement of similar models to save on supplies and maintenance
- Power off all copiers after hours using “auto off” feature or manual shutdown
- Reduce the wait time before “powering down”
- Estimated annual electric cost savings: $30-$70

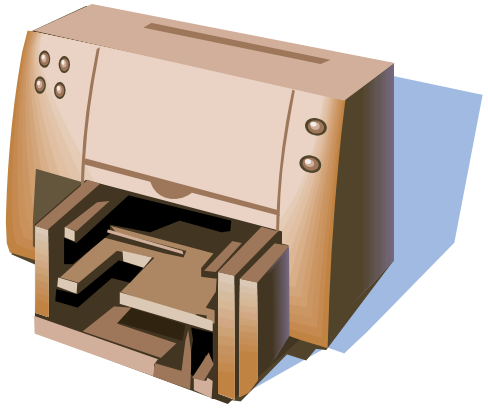
Examples: Copier Model Differences

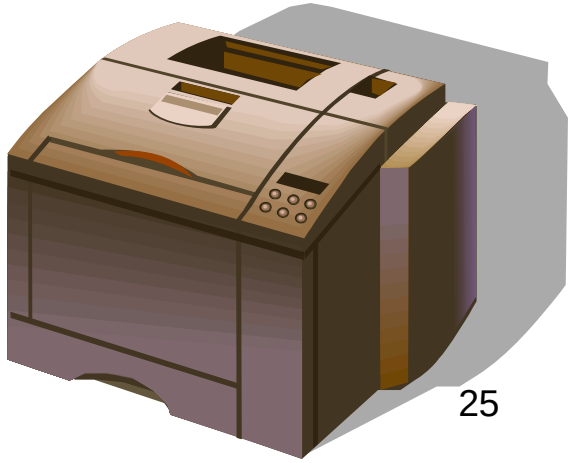
Power Consumption	WorkCentre Pro 55	WorkCentre Pro 255
Running	<1247 watts	≤1230 watts
Standby	<284 watts	≤290 watts
Low Power Mode	<223 watts	≤125 watts
Auto Off/Sleep Mode	<75 watts (sleep)	≤9 watts
Warm up to Copy	105 seconds (max.)	≤28 seconds
Ready to Print		≤130 seconds
Low Power Recovery	30 seconds (max.)	≤20 seconds

The specifications have changed. For the most current information, go to http://www.energystar.gov/ia/products/prod_lists/image_equip_prod_list.xls

Printers: Savings Opportunities

- Ensure that all printers are turned off “after hours”
- Set the default time for medium/large laser printers going into “sleep mode” or “power save” mode to 15 minutes instead of 30 minutes
- Look to consolidate small inkjet printers by replacing with network printers to reduce operating costs (could be $100 per year per printer)
- Centralize procurement and standardize on printer models to save on printer cartridges and maintenance





Servers: Saving Opportunities

- The Green Grid estimates that the energy consumption of an individual server with 5 percent utilization is about 1800 kWh annually. EPA estimates that they can save at least 20 percent of the energy use of data centers with low-cost improved operation measures that include consolidation of and elimination of unused servers, power management, and improved airflow management.
- There are a number of low-cost IT software and hardware solutions that are relatively easy to adopt including, but not limited to:
  - Consolidation of existing servers and elimination of unused servers
  - Virtualization of remaining servers
  - Procurement of energy efficient servers with improved power supplies when replacing or adding servers
  - Power off and power management of servers when not needed
  - Storage power management and centralization of server

- There are also a variety equipment replacement and design improvements to achieve energy efficiency in the electrical and cooling systems.

Lessons Learned

- Ensure that **IT staff are directly involved** in any plug-load efficiency project to achieve the largest savings opportunities for computers and monitors
- Inspect a sample of computers and other equipment to **obtain actual power management settings**
- Estimate **plug-load equipment use and savings opportunities** by end-user segments (admin./students)
- Recognize that per-unit savings **estimates incorporate some existing level of power management** and efficiency so estimates will vary
- Take a **comprehensive approach** to plug-load efficiency analysis—computers are most important but substantial savings opportunities exist for other plug loads (business and non-business equipment)

Implementation Strategies

Jim Pepe

SUNY Fredonia Case Study

- **Recent Estimated Enrollment:**
  - 5,400 students
  - 2,600 living on campus
- **PC's on Campus by Function:**
  - 700 Administrative Staff
  - 400 Academic/Faculty
  - 300 Classrooms & Labs
  - 2,675 Residence Halls
- Estimated Total Number of Computers: 4,000
- Gross Square Feet: 2,024,950

Maytum Hall

Key Findings for SUNY Fredonia

- An estimated $75,000 can be saved annually at SUNY Fredonia by implementing various plug-load energy efficiency measures for administrative staff, faculty, student labs and classrooms, and residence halls
- Electric use for computers and monitors on campus was over 14 percent of the total 2004 electric use for the campus
- Estimated plug-load electric use per student in residence halls is 1,300 kWh or $113 each annually—close to half is likely from computers

Potential Est. Savings SUNY Fredonia

Equipment	# of Units	Implement Key Energy Efficiency Measures for Plug-Loads	Total Savings @ $.087
PC/Monitors	2,600	Shut off PCs & Implement Monitor Power Management & CPM	$68,350
Copiers	10	Replace with “best” ENERGY STAR, optimize “sleep” wait time, power off after hours	$400
Med-Large r Printers	80	Shut off & Power Management	$900
Small Inkjet Printers		Power off after hours	
Computer Speakers		Turn off after hours	
Vending Machines (Soda)	54	Replace w/Tier I ENERGY STAR machine	$6,000
Total Equipment Users		*% Saved Depends on Amount of Active Use	$75,650

The Voluntary Approach

- SUNY Fredonia's Associate Vice President of IT sent a public announcement via ListServ to "Celebrate Our Earth on Earth Day April 22nd by Implementing Computer Power Savings Tips" that included:
  - Instructions on how to implement monitor power management on individual PCs and Macs.
  - Use a black screen saver since studies indicate white and bright colors can use up to 20% more power than black or dark colors.
  - Discontinue use of 3-dimentional screen savers since they double the power output of some computers.
  - Turn off printers after hours or when not in use.

Use the “Carrot” Instead of the “Stick”

The following was a collaborative effort of Facilities Management, RESNET, and Residence Life using the Web:

Qualify to win an iPod Nano!

*Just participate in the **"I'm Only Sleeping"** program. It is easy. If you agree to use the Monitor power management settings available in Windows or run the "EZ Wizard" tool, which will take you through a step by step process to put your monitor to sleep when your computer is on but not in use.*

To qualify: Complete and print the certificate (pdf format) with your name, residence hall name, room number and Fredonia I.D. number. Take the completed certificate to your RD to be entered in the drawing.

Entries must be received by February 14, 2006. Drawing will be held on March 1, 2006

This offer is for current SUNY Fredonia residents only.

You Will Need to Reinforce Behavior

- The initial introduction of the “I’m Only Sleeping” program was 05/06 school year with an estimated 83% participation by student’s in residence halls.
- The 06/07 school year saw an increase in the estimated number of res. hall computers as University Commons was opened. Student participation for this school year was 89%.
- The 07/08 school year saw a drop in the percentage of students using their sleep functions. The reason for the decrease may be due to the campus’ lack of continuously informing the student’s about using their sleep functions.

Don’t Be a Slug! Unplug!

- There is an increase in student’s use of electronic games. Thirty percent of the student resident rooms had some variation of a gaming device (ps3,wii, xbox) These devices are powered off, when not in use but they continue to draw power.
- Campaign will be launched in the fall of ’08 to encourage students to unplug their electronic equipment from the outlet when not in use or to use a power strip and turn the power strip off.
- A marketing classes contest resulted in a slogan to encourage students to…..”don’t be a slug! Unplug. ….complemented with a caricature of a green snail, who’s tail is a plug and its body is a plug strip…..

Take a Holistic Approach to Efficiency

- Established a sustainability committee
- Residence Hall staff, custodians, and other staff monitor and turn off unnecessary equipment
- All staff who contribute to energy-efficiency are recognized by name for their efforts in staff meetings
- Facilities management staff update the campus activities schedule on a regular basis and use that information in conjunction with their energy management system to reduce energy use
- Developed a “GoGreen” section on the web-site with “Conservation 101” tips that includes plug-load efficiency ideas

More Information

- Susan Andrews, NYSERDA Project Manager
  sta@nyserda.org 1-866-NYSERDA
- Carol Sabo, Lead Contractor, Project Manager
  carol.sabo@paconsulting.com 703-915-4034
- James Pepe, James Pepe, Physical Plant Director SUNY Fredonia
  James.Pepe@fredonia.edu
- Also see information on the NYSERDA project at http://www.nyserda.org/programs/offices/

Presenter Biographical Sketches

Susan Andrews, NYSERDA
Carol Sabo, PA Consulting Group
Jim Pepe, SUNY Fredonia

Susan Andrews

- Senior Project Manager, Energy Efficiency Services Program at NYSERDA
- Responsibilities include Market Development and Market Transformation Programs
- Specific efforts include Data Centers and Plug Load efforts, Sector-based Program oversight, and Marketing and Outreach for Commercial, Industrial and Institutional Programs.
- Over 25 years of experience in all areas of energy efficiency – 13 years with the NYS Public Service Commission and 12 years at NYSERDA.

Carol Sabo

- Managing Consultant, PA Consulting Group
- Close to 30 years experience in estimating and forecasting electric energy use and savings opportunities for utility system planning, energy-efficiency programs, and end-user customers
- Over 7 years experience in designing, managing, and implementing New York State Energy Research and Development Authority's (NYSERDA) Energy $mart Offices Program
- Government clients: Efficiency Maine, TVA, Cape Light Compact, CPUC, WI Focus on Energy

James Pepe

- Director of Facilities Management at the State University of New York at Fredonia. SUNY Fredonia is a four year comprehensive university in Fredonia, New York with an enrollment of 5400 students.
- Spent the past 34 years working in facilities management. The first 17 years was in private industry and the past 17 years on a college campus.
- Led SUNY Fredonia's participation in NYSERDA's Energy $mart Offices program for plug load analysis in 2005.
- Responsible for a number of initiatives to reduce electric use of computers and other equipment on the campus.