

Creating Energy Smart College Campuses

Susan Andrews, New York State Energy Research and Development Authority

Elliot Easton, SUNY Electricity Buying Authority

Katherine Johnson, KJ Consulting

Carol Sabo, PA Government Services, Inc.

Walter Simpson, SUNY at Buffalo

ABSTRACT

School supplies these days include computers, monitors, printers, and a host of other plug-in electronics that can quickly short-circuit the typical college dorm. In New York State, colleges and universities are also facing rising energy costs. To help these organizations curb energy usage and educate future generations, the New York State Research and Development Authority (NYSERDA) has included a power management program in its New York Energy SmartSM program. This New York Energy SmartSM Offices initiative specifically targets plug-loads in college campuses, government offices, and school districts.

This paper summarizes the findings, recommendations, and strategies based on an analysis of the data from 14 New York State colleges that have participated in this program. Activities include estimating the current and projected electric savings based on on-site equipment surveys and interviews of key staff of these college campuses. These equipment surveys gather data to analyze the specific plug-load usage by key college areas, such as staff, faculty, dormitories and computer labs and libraries. This paper also features examples of student energy conservation campaigns that have resulted from this project, including the University at Buffalo's (UB's) successful "*Do It In the Dark Campaign.*"

NYSERDA's Energy SmartSM Offices uses a comprehensive approach to address the growing use of plug-load equipment on campus through low-cost/no-cost measures. The program team provides education and awareness, computer and monitor power management tools and technical support, policy and procurement language for purchasing energy efficient washing machines, vending machines, and water coolers, and examples of successful campus programs. Conservatively, this NYSERDA project has identified more than \$1.6 million in energy savings at these college campuses, including two of the largest in the state system—University at Buffalo and SUNY-Albany.

Introduction

A typical college student needs more than just books and a desk to succeed. Nowadays, school supplies include a computer, a monitor, CD player, X-Boxes, and a variety of other plug-in electronics that can quickly short-circuit the typical dorm room. In New York State, colleges and universities are also facing rising energy costs. To help these organizations curb energy usage and educate future generations, the New York State Research and Development Authority (NYSERDA) has included a power management program in its New York Energy SmartSM program. To emphasize the focus on office equipment, this initiative was officially called the New York Energy SmartSM Offices Project.

This initiative is designed to lower electricity costs by encouraging energy-efficiency in the state by targeting buildings with significant plug-loads including college campuses. The goal of the project is to assess and help implement energy-savings potential from low-cost/no-cost measures targeting business and non-business plug-load equipment. Through the Energy Smart Program, NYSERDA funds the data collection and analysis, technical support, and outreach and education at no cost to project participants.

All New York Energy SmartSM programs are funded by a System Benefits Charge (SBC) paid by electric distribution customers of Central Hudson, Con Edison, NYSEG, National Grid, Orange and Rockland, and Rochester Gas and Electric. NYSERDA, a public benefit corporation established by law in 1975, administers SBC funds and programs under an agreement with the Public Service Commission. New York Energy SmartSM programs are designed to lower electricity costs by encouraging energy efficiency as the State's electric utilities move to competition.

The New York Energy SmartSM Offices Project was launched in 2002 to promote: the purchase or lease of ENERGY STAR® office equipment, proper enabling of energy saving features, and equipment shutdown in local government offices. It was expanded in 2003 to include additional low-cost/no-cost energy-efficiency measures that reduce energy use of all types of plug-load equipment typically found in offices. Beginning in 2004, more emphasis was placed on state universities and community colleges due to the large potential savings opportunities for plug-load efficiency. The 2006 project will develop benchmarking protocols using data from current and previous projects.

Roughly 100 million office computers and monitors use more than 1 percent of the nation's electricity. However, more than one-half of this electricity used to power the PC is wasted. According to studies conducted by the Environmental Protection Agency (EPA), 60 percent of monitors are left on at night, and 30 percent to 45 percent are not enabled for Monitor Power Management (MPM).¹

This initiative helps participating organizations activate the "power management" capabilities in ENERGY STAR® equipment to enter low-power or "sleep" mode when not in use. ENERGY STAR® office equipment is often available at little or no additional cost thus providing instant "payback." ENERGY STAR® is comparable to "standard" equipment in terms of operating features and may require less maintenance.

A major component is to identify opportunities and help facilitate MPM, and computer power management (CPM). MPM places active **monitors** into a low power sleep mode after a period of inactivity. This reduces the power draw from as much as 90 Watts down to 2 Watts.

Computer power management places the **computer** itself (CPU, hard drive, etc.) into a low power sleep mode. This reduces the power draw, which can range from 40 to 90 Watts, down to 2 to 3 Watts.

The monitor power management functionality already exists in PC-based computers with the Windows 95, 98, 2000 and XP operating systems. Too often, Information Technology (IT) staff believes that these power management capabilities will interfere with their ability to "push" software onto the network, and therefore disable these power management functions. However, this is misinformation that often needs to be corrected as part of this program's educational activities.

¹ Based on information at the EPA Million Monitor Website
http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_management

Summary of College and University Participants

NYSERDA funded the project team's analytical and technical support to implement 14 projects at campus sites that agree to voluntarily adopt the recommended energy efficient policies and energy savings goals. The types of services the project team provided to these participating sites included:

- **Data Collection**—equipment surveys, power management audits, selective metering, staff interviews
- **Analytical Support**— computing current plug-load usage and potential cost savings estimates
- **Technical Support**—power management tools and software; other low-cost/no-cost measures
- **Outreach**—group information sessions, case study write-ups, staff education, press releases, and special recognition

The project team held regional information sessions to introduce this initiative to potential participants from local governments, community colleges, and state universities. Additional outreach was provided by NYSERDA's Energy Smart Community representatives that work regionally to educate customer's on the portfolio of available NYSERDA programs, encouraging participation.

The colleges and universities chose to participate in the NYSERDA New York Energy SmartSM program for a variety of reasons. One of the chief motivations for participating in this program was to identify ways to reduce rising energy costs. Many of these colleges and universities are facing significant cost increases due to rising electric costs. For example, in a six-month period, Dutchess Community College (DCC)'s average cost per kWh rose from 5 to 10 cents. This forced the small community college to aggressively seek out every opportunity to achieve energy savings.

Another major reason for the interest in power management strategies among these educational facilities has been the exponential growth of plug-load demand in these college campuses. This is especially evident in the dormitories, where an estimated 92 percent of all students have at least one computer along with a host of other electronic equipment. This generation of college students is accustomed to plugging in all kinds of electronic gadgets from computers to game cubes, to printers, speakers, and cell phones. In fact, the electric plug-load has increased so significantly that several colleges participating in this initiative indicated that they were in the process of rewiring dormitories to accommodate the growing plug-load demand by college students.

Table 1 lists the participating organizations from New York colleges and universities. Most of these projects were conducted in 2005 and most focused on State University of New York (SUNY) institutions, which include both large state colleges as well as smaller, community colleges. As Table 1 shows, this initiative focused on higher educational institutions with at least 1,000 PCs. Overall, this program targeted more than 54,000 personal computers and related equipment throughout New York State.

Table 1. Summary of College and University Participants

Project Year	NYSERDA Energy Smart Offices Project Sites	Student Enrollment	Students in Dorms	Staff and Faculty	Est. # Participant PCs
2005	SUNY Oneonta	5,800	3,300	1,200	5,000
2005	SUNY Cobleskill	2,500	1,600	320	1,675
2005	Alfred State College	3,300	2,300	1,000	2,700
2005	SUNY Binghamton	13,860	6,000	2,000	6,500
2005	Buffalo State College	11,000	1,850	1,200	4,000
2005	SUNY Fredonia	5,400	2,500	1,100	4,000
2005	SUNY Albany	17,200	6,000	4,400	8,000
2005	Ithaca College	6,000	4,300	1,425	3,600
2004	University at Buffalo	23,000	7,000	7,000	14,350
2005	Total Colleges and Universities	82,260	31,550	18,445	49,825
2005	Dutchess County Community College	8,000	0	440	940
2005	Tompkins Cortland Community College	3,000	400	340	900
2005	Genesee Community College	4,400	0	500	1,000
2005	Finger Lakes Community College	4,900		250	750
2005	Jefferson Community College	1,400			750
	Total Community Colleges	21,700	400	1,530	4,340
	Total	103,960	31,950	19,975	54,165

Source: NYSERDA New York Energy Smart Offices Projects: Colleges and Universities Plug-Load Efficiency Savings (Preliminary Estimates), Prepared by: Carol Sabo, PA Government Services, Inc. on March 3, 2006

Estimating Energy Savings

The data collection process consisted of several steps:

1. Review current policies to identify barriers to and strategies for program implementation.
2. Interview staff from IT networks, student affairs, Residence Life, facilities or energy management, faculty, procurement, and other key functional areas.
3. Encourage IT staff to run EZ-SAVE or other software network polling to identify current monitor power management settings.
4. Conduct an on-site equipment survey of a representative sample of buildings and equipment to estimate quantities of plug-load equipment by type and to determine equipment characteristics including current power management settings for copiers, printers, and other equipment.
5. Conduct an after hours survey of the primary administrative buildings to assess equipment quantities, equipment shutdown, and power management.
6. Make multiple inspections of all major computer labs to determine levels of student traffic/utilization and power management and shutdown

Current Policies Review

This review process also examines current policies to determine if:

1. Power management strategies and policies for staff and student computers and monitors are in place;
2. The colleges and universities are specifying the most efficient ENERGY STAR® office equipment and they are shipped with proper power management settings;
3. There are opportunities to upgrade current cold beverage vending machines to equipment meeting ENERGY STAR® Tier 1 or Tier 2 specifications; and
4. There are opportunities to replace current laundry equipment in residence halls with ENERGY STAR® washers.

This review process also allowed the IT staff to explain their current policies regarding computer configurations for student, faculty, administration, and computer lab machines. Often these various user groups have varying equipment needs and, therefore, require different settings.

None of the participants had any formal power management policies in place. The new computers often were shipped with monitor power management features enabled but the settings were not always optimal, did not remain enabled in all cases, and did not include computer power management. A few college campuses had tried unsuccessfully to implement a computer shut-down policy previously but they typically had little control over faculty behavior. In most cases, computer power management, and sometimes monitor power management, had not yet been considered by either the IT staff or campus administration due to misconceptions and prior experience with older computers. In addition, the IT staff felt they needed to leave computers on most of the time to run software updates and anti-virus solutions. The IT expert on our team was able to overcome most of the barriers posed by the IT directors.

Several college campuses were in the process of renegotiating their vending machine contracts, which presented an opportunity to replace the current vending machines with those meeting Tier 1 specifications. A few college campuses used this project as an opportunity to test out other energy savings strategies, such as installing Vending Misers in selected equipment.

Plug-Load Building Audits

The project team conducted equipment surveys at more than 100 buildings on college campuses. These surveys focused on the buildings that would have the highest concentrations of computers and equipment, so it included buildings that contained faculty offices, administration offices, and classroom buildings with computer labs, libraries, and residence halls.

The building audits provided a unique opportunity to observe, first-hand, computer usage in these educational settings. College campuses are energy-intensive environments, with some buildings, such as residence halls and libraries, operating more than 16 hours per day.

College campuses also include a variety of buildings with diverse energy needs. For example, SUNY-Alfred State and SUNY-Cobleskill offer a variety of vocational courses, so computers are located in agricultural labs, automotive shops, culinary classrooms, and building trade's classrooms. These locations were in addition to the more traditional computer labs and classrooms.

The project team conducted after-hours audits of the main administrative buildings that house the majority of staff working the traditional daytime shift. These plug-load building audits are scheduled at the best time to capture a good snapshot of “actual” usage. However, these audits are “unannounced” to the general staff, faculty, and students, so they will not significantly change their behavior which could alter the audit findings. The project team also conducted daytime audits of the major computer labs, classrooms and lecture halls. The purpose of these energy audits was to determine the power management status of the computers, printers, and related equipment in each location.

Overall, the project has identified that the participating colleges and universities may save as much as \$1.4 million annually by implementing the program measures. The four participating community colleges could save another \$180,000 annually for a total annual savings of more than \$1.6 million. These energy audits revealed a significant opportunity for energy savings. [Note: these savings can be achieved at no additional cost to the participants.]

The biggest savings opportunities are at the largest universities, but as Table 2 shows, even smaller community colleges can save at least \$21,000 annually by participating in this initiative.

Table 2. Summary of Estimated Annual kWh Savings Potential

NYSERDA Energy Smart Offices Project Sites	Est. # Participant PCs	Average Cost Per kWh	Total Identified Annual kWh Savings Potential	Total Identified Annual Electric Bill Savings
SUNY Oneonta	5,000	\$0.100	1,175,000	\$117,000
SUNY Cobleskill	1,675	\$0.134	507,200	\$68,000
Alfred State College	2,700	\$0.101	1,190,000	\$120,000
SUNY Binghamton	6,500	\$0.100	1,878,500	\$188,000
Buffalo State College	4,000	\$0.075	1,467,000	\$110,000
SUNY Fredonia	4,000	\$0.087	860,000	\$75,000
SUNY Albany	8,000	\$0.090	3,210,000	\$290,000
Ithaca College	3,600	\$0.108	1,394,400	\$150,000
University at Buffalo	14,350	0.100	4,438,300	\$310,675
Total Colleges and Universities	49,825	\$0.089	16,120,400	\$1,428,675
Dutchess County Community College	940	\$0.113	539,000	\$61,000
Tompkins Cortland Community College	900	\$0.102	206,000	\$21,000
Genesee Community College	1,000	\$0.087	469,000	\$41,000
Finger Lakes Community College	750	\$0.075	455,250	\$34,000
Jefferson Community College	750	\$0.089	258,000	\$23,000
Total Community Colleges	4,340	\$0.466	1,927,250	\$180,000
Grand Total for Colleges and Universities	54,165	\$0.555	18,047,650	\$1,608,675
Average Savings per Participant			333	\$30

Source: NYSERDA New York Energy Smart Offices Projects: Colleges and Universities Plug-Load Efficiency Savings (Preliminary Estimates), Prepared by: Carol Sabo, PA Government Services, Inc. on March 3, 2006

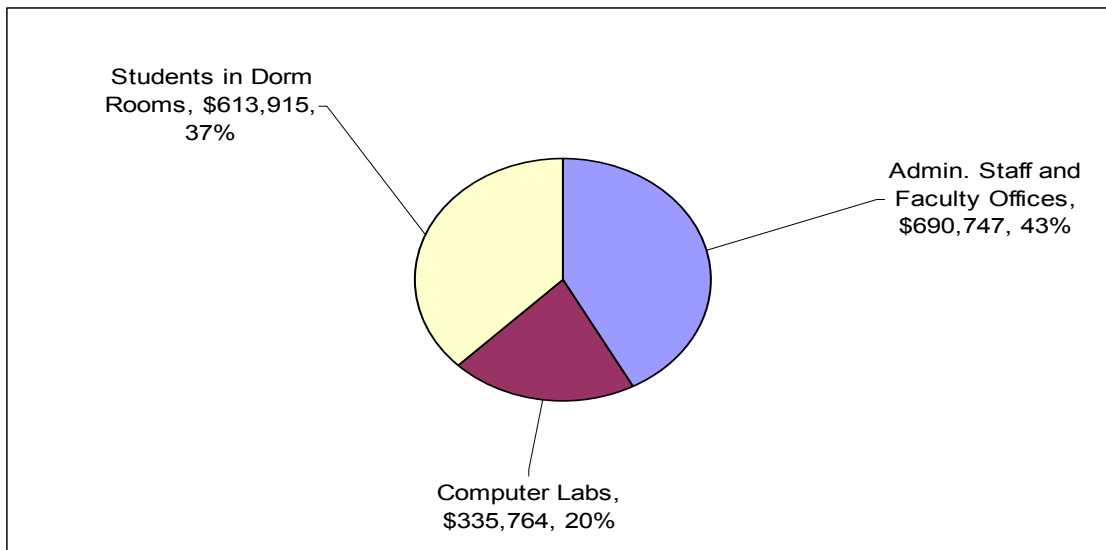
Savings Estimates by Building Type

The energy audits conducted in 2005 identified energy savings from plug-load savings by building type. As Table 3 shows, the majority of savings will be achieved by implementing power management strategies among the staff and faculty offices, and enlisting support from the students in residence halls. The colleges and universities can also achieve significant energy savings by implementing power management in computer labs.

In reality, it was easiest for the colleges and universities to achieve energy savings in the computer labs, since these machines were often controlled directly by the IT staff. Achieving savings among faculty and staff was a little more difficult, but possible. However, biggest challenge involved convincing college students to voluntarily shut off computers and related equipment at nights and weekends. The IT Staffs were especially supportive of recommendations that encouraged computer shut downs, since it assisted their efforts to ensure computer security and combat viruses.

Figure 1 illustrates these savings in terms of potential dollar savings by building type.

Figure 1. Estimated Dollar Savings by Computer Location



Source: NYSERDA New York Energy Smart Offices Projects: Colleges and Universities Plug-Load Efficiency Savings (Preliminary Estimates), Prepared by: Carol Sabo, PA Government Services, Inc. on March 3, 2006

Strategies to Achieve Energy Savings

Perhaps the most unique part of this NYSERDA program was that the project teams did not simply identify opportunities, but also worked closely with the participating organizations to develop workable strategies to actually *achieve these energy savings*.

The project team spent considerable time working with the faculty, staff, and student representatives on ways to implement a holistic power management campaign at a college campus. Often these campaigns involved gaining support from critical campus groups including the facilities and engineering staff and representatives from various committees working with students in the residence halls.

The participating campuses created their own approaches to encourage power management within their organization. Several campuses developed student-led campaigns to promote energy power management. Perhaps the most successful was the student campaign developed by SUNY at Buffalo called “*Do It In The Dark.*” This campaign encouraged students to log on to a central location and install the software that would automatically set the monitor into low management mode. This process would also automatically enter a student into a weekly prize drawing, and become eligible to win the grand prize- a new computer system. This campaign included posters, pins, and other materials (that lit up in the dark) to encourage monitor power management.

Ithaca College, long-known for its environmental activism, incorporated its energy power management campaign into other student-led activities. For example, power management strategies were featured during its environmental awareness week, and this program was incorporated as part of the campus-wide environmental plan. Students from the Energy and Environmental Club were actively involved in promoting computer and monitor power management in the residence halls.

These college campuses also tried to incorporate longer-term strategies into these power management strategies. For example, SUNY Cobleskill has plans to include the monitor and

computer power management software on the orientation CD that all incoming students receive. That way, all new computers arriving on campus will automatically be set for low power mode.

Several colleges and universities also examined ways to instill power saving strategies into faculty and staff employment contracts. For example, as a condition of employment, all new hires at DCC have to agree to abide by the campus' power management policies and shut off unneeded equipment at night.

Changing out Equipment

Several participating colleges and universities also aggressively sought energy savings beyond the office equipment and implemented energy savings strategies for vending and laundry equipment.

Vending machines. The project team worked closely with SUNY Buffalo (UB) to provide the technical analysis and support they needed to renegotiate their cold beverage contract. Vending machines provide significant revenues to the UB Campus, but consume an estimated \$50,000 of electricity each year. Reducing the electric use of the vending machines without impacting product purchases would effectively reduce UB's energy bills and make more funding available for academic programs.

The NYSERDA project team assessed the various options for the UB campus including the availability of energy-efficient machines, current experience at similar facilities, incremental costs, and potential energy and financial benefits.

The project team estimated that UB could save between 92,000 and 290,000 kWh per year by replacing 126 vending machines with ENERGY STAR models. They recommended that UB specify ENERGY STAR®-qualified beverage vending machines in upcoming contracts and test the impact of turning off vending machine lights in some buildings for periods when they are typically unoccupied (such as during breaks and summer sessions).

By October 2004, UB had replaced 77 beverage machines with energy-efficient ENERGY STAR®-machines. These machines will save an estimated 133,000 kWh per year, and reduce electric costs by about \$9,000 annually. UB is also exploring the possibility of retrofitting a number of non-ENERGY STAR® machines with vending misers to achieve additional savings.

The project team has also assisted both Ithaca College and DCC in making decisions to install Vending Misers. This interim strategy appeals to those colleges and universities that are not yet able to renegotiate their vending contracts, but provides them an opportunity to achieve energy savings in the meantime.

Laundry equipment: The project team also worked closely with the officials at SUNY Binghamton and Buffalo State College to encourage the replacement of their current washers with the more efficient ENERGY STAR models. SUNY Binghamton can expect to save more than \$26,000 in both gas and water costs, while Buffalo State would save \$3,200. According to an analysis using the ENERGY STAR® Calculator, the estimated water and energy savings per year for replacing current top loading models with more efficient clothes washers is approximately \$4.00 per student. The cost per load is about \$0.23 with a conventional machine compared to \$0.12 for the ENERGY STAR equipment. NYSERDA offers incentives for

efficient commercial washing machines and is also piloting an effort to award incentives to route operators leasing equipment to customers.

Table 3 summarizes those colleges and universities that were able to capitalize on these additional savings opportunities during the past two years.

Table 3. Additional Savings Opportunities

School Location	kWh Savings		Estimated Dollar Savings
	Vending Machines	Res Halls Laundry	
SUNY Binghamton	94,000		\$9,408
Buffalo State College	0	43,000	\$3,224
SUNY Fredonia	70,000		\$6,105
Ithaca College	75,500	0	\$8,122
University at Buffalo	133,200	0	\$9,324
Tompkins Cortland Community College	14,000	0	\$1,427
Total	386,700	43,000	\$37,609

Source: NYSERDA New York Energy Smart Offices Projects: Colleges and Universities Plug-Load Efficiency Savings (Preliminary Estimates), Prepared by: Carol Sabo, PA Government Services, Inc. on March 3, 2006

Key Findings

The NYSERDA New York Energy SmartSM Offices initiative will help the 14 participating colleges and universities in New York State save more than 18 million kWh annually. This translates into an annual dollar savings of more than \$1.6 million by just implementing simple “no-cost,” or “low-cost” energy savings strategies. The biggest energy savings come from monitor and computer power management. However, there are also significant savings that can be achieved if these colleges and universities switch to ENERGY STAR® vending machines and clothes washers, and office equipment.

Key Lessons Learned

The project team learned three major lessons from implementing these plug-load energy management programs on college campuses throughout New York State.

The first is that *flexibility is key*. College campuses are diverse environments that require developing specific policies for each of the key target groups: students, faculty, staff, and computer labs. Large colleges (of 10,000 students or more) tend to be more disaggregated and slower to change in terms of their decision-making on plug-load equipment policies, while smaller colleges are quicker to take action.

Therefore, the project team developed a set of recommendations for each specific audience considering the decision-making framework for each college. For example, the project team developed several general recommendations regarding procurement strategies designed that could be implemented campus-wide. The team also developed several audience-specific recommendations, as a way to help these organizations achieve their energy savings goals.

General Recommendations:

- Develop consistent policies for administrative staff and faculty (if possible) for monitor power management and powering off equipment when not in use. Get buy in early.
- Establish procurement policies to ensure the most efficient ENERGY STAR® equipment are always purchased and delivered with power saving features enabled for optimal savings.
- Analyze the student use of computer labs during various times of the year and consider shutting down blocks of computers or labs during periods of underutilization.
- Encourage shut down and unplug all equipment at holiday breaks.
- Establish screen saver policies for administrative staff. For example, three dimensional screen savers can double the power output of some computers and white and bright colors can use up to 20 percent more power than black or dark colors. Using black screen savers can reduce the power used by screen savers.
- Set the default time for going into “sleep mode” or “power save” mode to 15 minutes.
- Look for opportunities to purchase LCDs instead of CRTs, particularly in student labs, where monitors may be left on and the mass of computer monitors add to the air conditioning load.

Student-Specific Recommendations:

- Promote monitor power management to students when processing their computers to get on the network.
- Work with Residence Life to design a program for students living in residence halls that would include dorm competitions with prizes for reducing overall energy use.

These projects also required *developing creative approaches* to implementing power management strategies. Each campus developed its own approach. For example, Ithaca College used this opportunity to involve students in a research project on plug-load. The student participant was involved in conducting both energy audits, analyzing energy usage, and presenting the results in the final project meeting. This is a recommendation that the project team is encouraging other colleges and universities to adapt, since it integrates student learning with energy efficiency.

These projects also require *a long-term commitment*. The project team has learned that its involvement with these projects does not end once the final results have been presented. Indeed, the project team routinely receives request for information and technical assistance, as well as updates, from participants, dating back to 2004. This means that colleges and universities, once convinced of the benefits of these techniques, will continue to explore new avenues for energy savings. But, it also means they will continue to need the technical support and resources provided by NYSERDA. In particular, the project team found that universities and colleges, such as UB and Ithaca College, already have an established Green Office or a sustainability committee in place that is well-positioned to take the project recommendations and move quickly to implementation.

The New York Energy SmartSM Offices project illustrates that significant energy savings are possible within the energy-intensive college campus environments by simply targeting the most ubiquitous equipment—computers. Moreover, in bringing the energy efficiency message

to college campuses, NYSERDA is also providing yet another way to educate future leaders about the importance of energy savings and environmental stewardship.