OFFICE OF THE NEW YORK STATE COMPTROLLER

DIVISION OF LOCAL GOVERNMENT
& SCHOOL ACCOUNTABILITY

Computer Power Save

2008-MS-5

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State of New York
Office of the State Comptroller

Division of Local Government
and School Accountability

October 2008

Dear Local Officials:

A top priority of the Office of the State Comptroller is to help local government officials manage government resources efficiently and effectively and, by so doing, provide accountability for tax dollars spent to support government operations. The Comptroller oversees the fiscal affairs of local governments statewide, as well as compliance with relevant statutes and observance of good business practices. This fiscal oversight is accomplished, in part, through our audits, which identify opportunities for improving operations and general municipal governance. Audits also can identify strategies to reduce costs and to strengthen controls intended to safeguard local government assets.

Following is a report of our audit entitled Computer Power Save. This audit was conducted pursuant to Article V, Section 1 of the State Constitution, and the State Comptroller's authority as set forth in Article 3 of the General Municipal Law.

This audit's results and recommendations are resources for local government officials to use in effectively managing operations and in meeting the expectations of their constituents. If you have questions about this report, please feel free to contact the local regional office for your county, as listed at the end of this report.

Respectfully submitted,

Office of the State Comptroller
Division of Local Government
and School Accountability

EXECUTIVE SUMMARY

The electricity used by common computer equipment represents a significant portion of the electricity used in school district and government buildings. Reducing the amount of electricity consumed by computer equipment has important environmental and economic benefits (e.g., cost savings).

Power management reduces energy consumption when personal computers and monitors are not in active use. As of early 1996, the Environmental Protection Agency estimated that upwards of 70 percent of all new PCs and nearly 100 percent of all personal computer monitors sold had power management capability. However, power management can only save energy if it is enabled and working properly. Unfortunately, many computers with power management capability are not saving energy — because the feature was never enabled, because it was actively disabled, or because of interference specific to the computer system or network. Enabling power management settings is both monetarily and environmentally beneficial; less energy usage equates to lower costs and lower greenhouse gas emissions.

Scope and Objective

The objective of our audit was to determine whether school districts and counties have implemented effective computer power management procedures and settings aimed at reducing the electricity used by computer equipment, for the period July 1, 2006 through April 30, 2008. Our audit addressed the following related questions:

- Have school districts and counties enacted computer power management policies and procedures?
- Can school districts and counties realize cost savings and electricity reductions by managing their computer shut-down practices more effectively?
- What is the environmental impact of implementing power management procedures?

Audit Results

We found five of the seven units have not enacted computer power management policies and procedures. By enabling power management settings such as power save modes, changing and/or enabling power management policies and practices, and by establishing directives instructing

computer users to power down computers during periods of inactivity, the seven audited school districts and counties could save as much as $240,000 annually. Further, the seven units can collectively save approximately 1.8 million kilowatt-hours, and reduce carbon dioxide, nitrous oxide and sulfur dioxide emissions by more than 1.5 million pounds annually.

For perspective, there are 736 schools[1] across New York State, which in 2004 had about 840,000[2] computers. The five school districts included in our audit had 15,679 computers. We found that these districts could save about $212,300 annually ($13.54 per computer) by enabling power save settings and/or shutting down during periods of inactivity. If similar conditions exist in school districts statewide, districts could collectively save over $11.3 million annually or reduce annual energy consumption by over 84 million kWh, and reduce greenhouse gas emissions by over 69.7 million pounds, which is the equivalent of removing 5,790 cars from the road.

Comments of Local Officials

The results of our audit and recommendations have been discussed with local officials and their comments have been considered in preparing this report. The County and three school districts that responded agreed with our findings and recommendations and stated they plan to initiate corrective action. Greene County, the Newburgh Enlarged City School District and Schenectady City School District were provided with an opportunity to respond, but they chose not to do so.

[1] This includes 698 school districts and 38 Boards of Cooperative Educational Services.

[2] New York: *The State of Learning. A Report to the Governor and the Legislature on the Educational Status of the State's Schools*. October 2006 Edition.

Introduction

Background

The electricity used by common computer equipment represents a significant portion of the electricity used in municipal and school buildings. Reducing the amount of electricity consumed by computer equipment has important environmental and economic benefits (e.g., cost savings).

In the early 1990s, the U.S. Environmental Protection Agency (EPA) introduced ENERGY STAR®, a voluntary labeling program designed to identify and promote energy-efficient products. Since that time, in partnership with the U.S. Department of Energy (DOE), EPA has introduced programs for more than 20 product types including office equipment. The ENERGY STAR program is the foundation of efforts to address office equipment efficiency; it has transformed the market so that most office equipment sold today has significant energy-saving capabilities.

Power management reduces energy consumption when personal computers and monitors are not in active use. As of early 1996, EPA estimated that upwards of 70 percent of all new personal computers (PCs) and nearly 100 percent of all PC monitors sold had power management capability. However, power management can only save energy if it is enabled and working properly. Unfortunately, many computers with power management capability are not saving energy — because the feature was never enabled, because it was actively disabled, or because of interference specific to the computer system or network.

Generally, when a computer is fully on, both the central processing unit (CPU) and the monitor are plugged in and turned on with various programs running. The amount of energy a system uses varies directly with the number and complexity of programs running on that system. Various power management settings can be enabled on a computer to reduce energy consumption. One such setting is system standby; in this case, both the monitor and CPU enter a reduced power mode where the computer's power usage is reduced to 1-3 watts for each (monitor and CPU) and the entire system wakes up in seconds. Another setting is hibernate mode. In this mode the monitor and computer reduce power consumption to 1-3 watts each, they

wake up in 20-plus seconds and work is saved in the event of power loss. Both power management settings are useful ways to save energy.

Although many people believe that screensavers are a source of energy conservation, screen savers generally do not save energy. In some instances, certain graphic-intensive screen savers can cause the computer to use twice as much energy and can prevent a computer from entering a power save mode. In contrast, the only instance where a computer has zero energy consumption is when both units are unplugged from the power source. If a computer is plugged into a power source, even though it is completely off, (i.e., both the CPU and monitor are powered down), the computer is still using small amounts of energy.

We selected seven units across New York State to determine whether cost savings could be realized by implementing power management procedures aimed at reducing the electricity used by computer equipment. The following table provides background information for each selected school district and municipality:

Municipality /School District	County	Population/ Enrollment	Annual General Fund Budget (in millions)
Broome County	Broome	200,500	$328
Greene County	Greene	48,195	$98
Mount Vernon City School District	Westchester	9,700	$178
Newburgh Enlarged City School District	Orange	13,000	$203
North Syracuse Central School District	Onondaga	9,750	$127
Schenectady City School District	Schenectady	9,730	$140
Williamsville Central School District	Erie	10,600	$145

Objective

The objective of our audit was to determine whether school districts and counties have implemented effective computer power management procedures and settings aimed at reducing the electricity used by computer equipment. Our audit addressed the following related questions:

- Have school districts and counties enacted computer power management policies and procedures?

- Can school districts and counties realize cost savings and electricity reductions by managing their computer shut-down practices more effectively?

- What is the environmental impact of implementing power management procedures?

Scope and Methodology

To assess whether school districts and counties have implemented effective computer power management procedures and settings aimed at reducing the electricity used by computer equipment, we examined the energy efficiency of the computer infrastructure at each of the units for the period July 1, 2006 through April 30, 2008. In addition, we interviewed information technology department staff, examined appropriate policies and procedures relevant to our objectives, analyzed computer inventory records, and reviewed district utility bills, technology plans (if available), Board of Education and Legislative meeting minutes, energy contracts (if available), and other documents with pertinent information maintained by the districts and municipalities that were relevant to our objectives. We judgmentally selected seven units, which consisted of five school districts and two counties. The school districts included North Syracuse Central School District (Onondaga County), Newburgh Enlarged City School District (Orange County), Schenectady City School District (Schenectady County), Williamsville Central School District (Erie County) and Mount Vernon City School District; (Westchester County); the counties included Broome County and Greene County.

Our findings and results are based on calculations of the average kilowatt hours consumed by the most common computer models within the units, the average utility rates of electricity charges based on actual kilowatt hours consumed and charged by the utility company and energy provider, the projected numbers of computers left on in the district or county, estimated cost savings and environmental effects. We used conservative estimates and made objective judgments in determining how to proceed with our analysis of calculated cost savings, which were consistently applied to each of the audited units.

We conducted our audit in accordance with generally accepted government auditing standards (GAGAS). More information on such standards and the methodology used in performing this audit are included in Appendix B of this report.

Comments of Local Officials The results of our audit and recommendations have been discussed with County and District officials and their comments, which appear in Appendix A, have been considered in preparing this report. The County and three school districts that responded agreed with our findings and recommendations and stated they plan to initiate corrective action. Greene County, the Newburgh Enlarged City School District and Schenectady City School District were provided with an opportunity to respond, but they chose not to do so.

Policy Guidance

Policy guidance and control procedures are necessary to ensure that municipalities and districts are utilizing power management features and instructing computer users to follow certain procedures to ensure energy efficiencies.

An effective energy conservation policy governing computer usage should outline the organization's commitment to reducing energy consumption and maximizing energy efficiencies and provide guidance on how to effectively achieve these efficiencies. The policy should address powering down non-essential machines, which would include both monitors and CPUs during non-working hours such as nights and weekends as well as during extended periods of inactivity such as holidays. In addition, the policy should address enabling power management features and settings such as sleep, system standby and hibernate modes that would result in reduced energy consumption during inactive periods during the standard workday.

Policies and Procedures

We found that five of the seven selected units had not developed an energy conservation policy governing computer use. Although North Syracuse and Schenectady had policies, both need improvement. Schenectady's policy instructed staff to shut down computers at the end of the day. North Syracuse's policy instructed users to shut down monitors nightly, but leave computers on during the week and shut them down on Fridays. The common component lacking in both of these policies is that neither addressed enabling power save settings.

Conversely, in Greene County, the Information Services Director rescinded the County's prior practice of requiring users to shut down computers at the end of each day. Users are currently instructed to keep their computers on at all times to facilitate periodic system updates. This practice does not conserve energy during non-working hours, including extended periods of inactivity such as on weekends and holidays.

Policy Enforcement and Monitoring

To minimize energy consumption, counties and districts should develop mechanisms to monitor compliance and promote accountability with established energy conservation policies and procedures.

Today's technology allows municipalities and districts to monitor compliance and enforce practices through automated processes. Monitoring networked computers can occur from a central location using an automated computer application. In addition, reminders to shut down computers can be sent out automatically by email. Further, dedicated information technology department staff could periodically test select machines to ensure that power management settings are enabled and that computers are being powered down as intended on weeknights, weekends, or holidays.

We found that school districts and municipalities are not effectively monitoring and managing computer energy conservation opportunities. None of the school districts or municipalities had established processes to determine if computers were unnecessarily left on during periods of inactivity. In addition, we found that only Schenectady sent out email reminders to turn off computers prior to weekends, holidays and extended periods of inactivity. The other units tested did not remind computer users of the need to shut off computers.

Recommendations

1. School districts and municipalities should develop and update energy conservation policies that address shutting down computers and monitors during extended periods of inactivity such as on weeknights, weekends, and holidays; and enabling power management settings.

2. School districts and municipalities should monitor and periodically test computers to ensure that employees are following energy conservation policies.

3. School districts and municipalities should encourage energy conservation by sending periodic reminders (e.g., emails) to shut-down computers during extended periods of inactivity such as weeknights, weekends and over holiday periods.

Power Management

School districts use computers as one of the primary sources of learning and classroom activity. Most school classrooms have computers for teachers and students. In addition, districts have incorporated technology into their libraries and labs by equipping them with computers. Similarly, municipalities have incorporated technology in managing and operating municipal governments. Computers are used in most departments to conduct day-to-day business. Departments use computers to maintain data required to provide services for the population they serve as well as to maintain financial and accounting records. The following table summarizes the electricity consumption and total electricity cost for each selected school district and county for the 2006-07 school year or 2007 fiscal year, respectively:

ELECTRICITY USAGE AND COSTS[3]

District/County	Electricity Consumption/ Usage (kWh)	Total Electricity Cost	Average cost per kWh
Broome County	20,992,050	$2,392,299	$0.11
Greene County	3,001,388	$322,217	$0.11
Mount Vernon City School District	9,162,852	$1,182,033	$0.13
Newburgh Enlarged City School District	12,973,404	$1,366,868	$0.11
North Syracuse Central School District	11,419,898	$1,559,094	$0.14
Schenectady City School District	6,012,519	$1,007,985	$0.17
Williamsville Central School District	14,160,106	$1,944,700	$0.11
Total	**77,722,217**	**$9,775,196**	**$0.13**

Power Management Settings

Most computers are equipped with power management features that, if enabled, can save electricity and money. County and school districts should enable power management features and direct users to power off the computers during certain daily/ weekly times to minimize the electricity demand and expense to the county or the district.

[3] See Appendix B for further methodology on electricity analysis.

Generally, schools and county computers have the following power management options available:[4]

- Off — this represents a machine with both the monitor and CPU plugged into a power source but completely powered down. This should be the setting during nights and weekends. On average, this setting uses 2.2 watts.

- On — this represents a machine with both the monitor and CPU fully powered on and logged onto the desktop. This should be the setting during the standard weekday. On average, this setting uses 99.4 watts.

- Monitor Sleep — this represents a machine in which the monitor is set to enter a "sleep" mode after a set period of time; however, the CPU remains on. This setting can be used during the day when inactivity occurs. On average, this setting uses 65.1 watts.

- System Standby — this represents a machine in which a feature is enabled in which both the monitor and CPU enter a standby mode after a set period. This setting can be used during the day when inactivity occurs. On average, this setting uses 9.7 watts.

- Hibernate — this represents a machine in which a feature is enabled in which both the monitor and CPU enter a hibernate mode after a set period. This setting can be used during the day when inactivity occurs. On average, this setting uses 3.0 watts.

- System Sleep — this represents a CPU which is set to enter a "sleep" mode after a set period. This setting can be used during the day when inactivity occurs.[5] On average, this setting uses 6.7 watts.

The Environmental Protection Agency (EPA) recommends setting computers to enter into a system standby or hibernate mode after 30 to 60 minutes of inactivity as well as setting computer monitors to enter into a sleep mode after 5 to 20 minutes of inactivity.

[4] At each unit, we used an electricity wattage machine to test the electricity used in each power setting by computer type. The amounts represent the average from our testing.

[5] Only Mount Vernon used this setting.

Overall, we found that school and county computers generally did not have power management settings enabled on the CPUs. We reviewed the power management settings on 350 computers, 50 at each unit, and found that generally power management settings were enabled on the monitors, but not for the CPUs. Officials from each of the units told us department employees do not change the vendor settings upon receipt of the machines; therefore, the current settings are generally the default settings from the manufacturer.

Specifically, we found that most school and county computers had power management settings enabled for their monitors (319 of 350 tested), thus effectively reducing the energy consumption of the monitors when not in use. However, our tests found that the schools and counties did not effectively enable power management settings on CPUs by using either standby or hibernate settings on CPUs. For example, although the Mount Vernon School District and Greene County enabled standby and hibernate modes for some machines, it was not consistently enabled on all computers. In Mount Vernon, for the 50 computers reviewed, the system sleep option was enabled on all 27 machines that had it available, however the remaining 23 machines did not have the system sleep option. Of these 23 machines, only one had the standby option enabled while none had the hibernate feature enabled. Similarly, in Greene County, for the 50 computers reviewed, we found that the hibernate power save setting was not enabled on 42 machines or 84 percent; and the system standby setting was not enabled on 38 machines or 76 percent. This results in computers unnecessarily consuming energy during periods of inactivity.

Periods of Inactivity

By enabling power management features and directing users to power down machines during extended periods of inactivity, school districts and municipalities can save electricity and money. To determine if cost savings could be achieved by minimizing the amount of electricity used by the municipality and district computers, we tested the on/off status of computers during weeknights, on weekends and during extended periods of inactivity such as holidays when applicable. We had staff from the district or municipality send an electronic signal, commonly referred to as a "Ping," to all the computers on the network. A Ping is a basic internet program that allows a user to verify if a computer is operating and has a valid internet protocol (IP) address that can accept requests. Because a Ping can only reach

working IP addresses, we tested only networked computers in the district or municipality.[6]

For analysis purposes, we assumed that school district computers should be on during the standard business day.[7] County operations are less standard than school districts because some departments are fully operational 24 hours a day, 7 days a week: for example, Sheriff Departments, Correctional Facilities and Emergency Medical Services Facilities. To present our findings conservatively, we did not include these departments in our analysis for county operations. We also did not assume holidays for county operations. School and county operations require certain computers to be on at varying times of the day. Our testing excluded computers that officials indicated should be left on at all times such as servers, critical district and county computers, as well as select IT department staff computers. Our analysis is primarily focused on computers that can be shut-down or placed in a lower power setting during periods of inactivity. Our electronic weeknight tests were conducted after the conclusion of the standard workday while weekend and holiday tests were conducted at random times during those respective days.

Greene County Information Technology (IT) Department personnel were unsuccessful in capturing all of the networked computers in the County and therefore were unable to Ping all County computers. County IT officials indicated they have multiple networks set up at the request of several departments and that they do not have the software or capabilities that would allow the network administrator to scan or Ping all the computers on the various networks throughout the County. In addition, the County IT Department did not maintain an updated and complete inventory listing of all computers located throughout the County. Therefore, to determine the number of computers left on after standard office hours, we conducted a physical walk-through to observe the on/off status of computers located throughout the County.

Overall, we found that all units had computers that were on during periods of inactivity. The following table illustrates the percentage of computers left on during these periods of inactivity at each of the audited units.

[6] The difference in the number of networked computers compared to the total number of computers was negligible, thus we only included networked computers.

[7] See Appendix B for further methodology.

PERCENTAGE OF COMPUTERS LEFT ON DURING INACTIVE PERIODS			
Municipality/School District	**Daily**	**Weekend**	**Holiday[8]**
Broome County	42%	37%	Not Applicable
Greene County	75%	75%	Not Applicable
Mount Vernon City School District	13%	16%	10%
Newburgh Enlarged City School District	67%	85%	29%
North Syracuse Central School District	68%	39%	25%
Schenectady City School District	13%	8%	2%
Williamsville Central School District	20%	14%	9%
Average	**43%**	**39%**	**15%**

The following table illustrates the annual kilowatt-hour savings that each unit would annually save had they shut down computers during periods of inactivity on weeknights, weekends and holidays.

TOTAL KILOWATT-HOUR SAVINGS				
Municipality/School District	**Weeknight**	**Weekend**	**Holiday**	**Total**
Broome County	94,076	51,018	NA	**145,094**
Greene County	65,749	41,028	NA	**106,777**
Mount Vernon City School District	46,507	39,809	8,397	**94,713**
Newburgh Enlarged City School District	218,939	189,226	19,037	**427,202**
North Syracuse Central School District	426,889	168,544	37,152	**632,585**
Schenectady City School District	120,313	48,621	2,955	**171,889**
Williamsville Central School District	157,514	77,063	17,033	**251,610**
Total	**1,129,987**	**615,309**	**84,574**	**1,829,870**

[8] We excluded the holiday test for the two counties, because of the lack of extended holiday periods; we included our results for the two counties in the weekend percentage.

Considering the average cost per kWh for our units is $0.13, the reduction of electricity translates into immediate cost savings. The following table illustrates the annual cost savings that each audited unit would experience had they shut down computers during periods of inactivity on weeknights, weekends and holidays.

COST SAVINGS				
Municipality/School District	**Weeknight**	**Weekend**	**Holiday**	**Total**
Broome County	$10,348	$5,612	NA	**$15,960**
Greene County	$7,232	$4,513	NA	**$11,745**
Mount Vernon City School District	$6,046	$5,175	$1,092	**$12,313**
Newburgh Enlarged City School District	$24,083	$20,815	$2,094	**$46,992**
North Syracuse Central School District	$59,765	$23,596	$5,201	**$88,562**
Schenectady City School District	$20,453	$8,266	$502	**$29,221**
Williamsville Central School District	$22,052	$10,789	$2,385	**$35,226**
Total	**$149,979**	**$78,766**	**$11,274**	**$240,019**

Additional cost savings can be realized by properly enabling power save settings to ensure computers enter a power save mode during inactive periods of a standard workday. Significant reductions in energy consumption can be realized immediately when power save options are fully enabled. For example, a teacher and class attending an assembly whose computers are not power save enabled would be utilizing full power for the duration of the event instead of entering a reduced power saving mode. On average, in the seven units tested, a computer with the monitor in power save mode consumes 65 watts of electricity, while a computer in hibernate mode consumes three watts, a savings of over 62 watts. Although we could not quantify the cost savings that could be generated in such instances due to the varying usage patterns of individual operators, additional cost savings could be realized by enabling machines to enter reduced power modes during these occasions of inactivity during the standard workday.

Recommendations

4. School districts and municipalities should review computer settings and enable power management settings such as standby or hibernate on all computers to reduce the electricity consumption and costs.

5. School districts and municipalities should require staff to completely shut down both the monitor and CPU during periods of inactivity such as weeknights, weekends, and holidays.

Environmental Impact

A study released by the National Academy of Sciences[9] confirmed that greenhouse gases accumulating in the Earth's atmosphere because of human activities are contributing to global warming. Carbon dioxide (CO_2) emissions contribute to global warming and nitrous oxides (N_2O) and sulfur dioxides (SO_2) are key pollutants that contribute to smog and acid rain. Information about these gases follows.

- Carbon dioxide is a colorless, odorless gas that allows light from the sun's rays to be transmitted to the Earth's surface but blocks heat radiating from the Earth's surface from escaping into the atmosphere, thus contributing to global climate change or warming due to the "greenhouse" effect.[10]

- Nitrogen oxides are compounds of nitrogen and oxygen that once in the air may undergo a chemical transformation into nitrates and nitric acid, contributing to acid rain and ground-level ozone (photochemical smog).[11]

- Sulfur dioxide is a heavy, colorless gas that once in the air may undergo a chemical transformation into sulfates and sulfuric acid, contributing to acid rain. Electric generation facilities are the largest source of SO_2 emissions. SO_2 emissions are controlled and monitored by Federal and State environmental regulatory programs.[12]

Municipalities must consider the environmental impact of their operations (electricity usage) and pursue methods to operate efficiently in an environmentally sensitive manner.

The districts and counties consumed approximately 77.7 million kWh of electricity during the 2006-2007 school year and/or 2007 fiscal year, according to their respective electricity bills. By implementing our audit recommendations, the

[9] Entitled "Climate Change Science Report," issued 2001
[10] Environmental Disclosure, Consumer Guide, New York State Public Service Commission, 8/03
[11] Ibid
[12] Ibid

districts and counties could save approximately 1.8 million kWh of electricity each year. In addition to lowering their costs, they would also reduce the amount of greenhouse gas emissions by reducing electricity demands. Depending on fuel source, size, and location, the generation of electricity may also cause other public health, environmental and socioeconomic impacts not disclosed above. Generally, each kWh of traditional electricity generated produces harmful emissions or byproducts. The following table illustrates the pollution emission equivalents avoided, in pounds, by enabling computer power saving measures such as shutting down.

POLLUTION EMISSION EQUIVALENTS (POUNDS)[13]					
District/Municipality	**Potential kWh Savings**	**CO_2**	**N_2O**	**SO_2**	**Total**
Broome County	145,094	118,976	144	609	**119,729**
Greene County	106,777	87,556	106	448	**88,110**
Mount Vernon City School District	94,713	77,664	94	397	**78,155**
Newburgh Enlarged City School District	427,202	350,305	425	1,793	**352,523**
North Syracuse Central School District	632,585	518,720	629	2,654	**522,003**
Schenectady City School District	171,889	140,949	171	721	**141,841**
Williamsville Central School District	251,610	206,320	250	1,056	**207,626**
Total	**1,829,870**	**1,500,490**	**1,819**	**7,678**	**1,509,987**

If the districts and counties used power saving measures during periods of inactivity such as on weeknights, weekends and holidays, they would eliminate over 1.5 million pounds of pollutants from the atmosphere each year. This is the equivalent of removing 125 cars from the road. Districts and counties must consider the environmental impact of their operations (electricity usage) and pursue methods to operate efficiently and in an environmentally sensitive manner.

Recommendation

6. School districts and municipalities should further reduce their environmental footprints through efforts that reduce the emission of pollutants.

[13] See Appendix B for further methodology.

APPENDIX A

RESPONSES FROM SCHOOL DISTRICT AND COUNTY OFFICIALS

We provided a draft copy of this global report to each of the seven units we audited and requested responses. The County and three school districts that responded agreed with our findings and recommendations and stated they plan to initiate corrective action. Greene County, the Newburgh Enlarged City School District and Schenectady City School District were provided with an opportunity to respond, but they chose not to do so.

The following comments were excerpted from the four responses we received.

"Broome County agrees with the State's initiative to save tax payers money by means of energy conservation and this is an area we feel we have made some inroads but have room for improvement based on the audit findings."

North Syracuse Central School District: "…be assured that the Board of Education and staff recognize the value of the report's recommendations which will result in a significant savings of at least $80,000 annually, if not more, when fully implemented."

Williamsville Central School District: "…we can assure the Comptroller's Office that we plan to act on the applicable recommendations included in this draft audit report as they apply to our District… In fact, the cost of electricity purchased by the Williamsville Central School District is higher than most of the other municipalities and school districts in this study…"

Mount Vernon City School District: "The district would like to applaud New York State for its efforts to conserve energy for both the financial and environmental impact of conservation." "The district is eager to implement further procedures and policies toward energy use reduction for the computer systems."

APPENDIX B

AUDIT METHODOLOGY AND STANDARDS

Our findings and conclusions are based on calculations of the average kilowatt-hours consumed by the most common computer models within the district or municipality, the average utility rates of electricity charges based on actual kilowatt-hours consumed and charged by the utility company and energy provider, projected numbers of computers left on, estimated cost savings and environmental effects. We used conservative estimates and made objective judgments in determining how to proceed with our analysis of calculated cost savings, which were consistently applied to each of the audited units.

To accomplish our objectives, we interviewed information technology department staff, examined appropriate policies and procedures relevant to our objectives, analyzed computer inventory records, and reviewed utility bills, technology plans when available, board of education and legislative meeting minutes, energy contracts, energy performance reports and other documents maintained by the Districts and Counties that were relevant to our objectives.

For Districts, we used the 2007-08 school calendars to establish the number of working weekdays and weekends as well as to establish holidays. For the Counties we used the standard operations calendar. We concluded that, for both schools and counties, non-essential computers should be shut down for approximately 16 hours on weeknights, 48 hours on weekends and 24 hours during holiday periods.

Average cost per kilowatt-hour — To obtain a fair and reasonable cost per kilowatt-hour, we reviewed district and municipality utility bills to determine the total kilowatts-hour consumed, as well as the total electricity charges during the 2006-07 school year or 2007 fiscal year. We then divided the total electricity cost by the total number of kilowatt-hours consumed to arrive at an average cost per kilowatt-hour. Our calculation of the total cost of electricity included basic service charges, delivery costs, supply costs and demand charges.

Environmental Effect — To estimate the environmental effect, we used the coefficients derived from *The Emissions and Generation Resource Integrated Database for 2006, (eGrid 2006) Support Documentation*, which was developed for the US Environmental Protection Agency. The coefficients for carbon, sulfur, and nitrous emissions per kWh of energy produced were based on New York State generation averages broken down for either Long Island or Upstate New York.

We conducted this performance audit in accordance with generally accepted government auditing standards (GAGAS). Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

APPENDIX C

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