FY 2010 Resource Conservation Plan

Montgomery County Public Schools

Rockville, Maryland

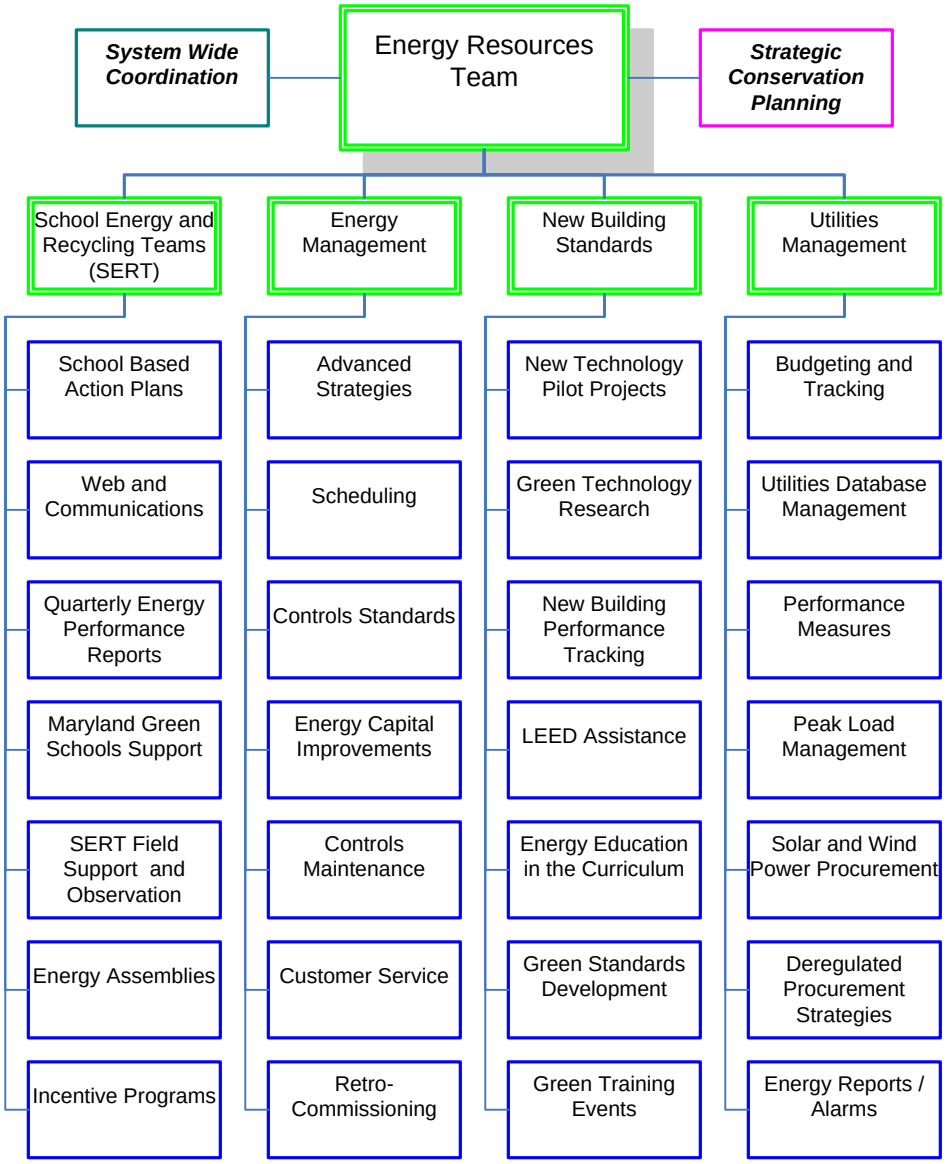
Pictured above: Section of Lakelands Park Middle School Roof
Part of 133 kW Solar Photovoltaic System Installed by Power Purchase Agreement in 2008

Department of Facilities Management
2096 Gaither Road, Suite 200
Rockville, MD 20850
240-314-1090

MONTGOMERY COUNTY PUBLIC SCHOOLS

Introduction

The Montgomery County Public Schools (MCPS) maintains a comprehensive program of resource conservation and management for its facilities. The following chart summarizes the program elements in place:



The MCPS ***Resource Conservation Plan*** follows a standardized reporting format suggested by the Montgomery County Department of Environmental Protection. Energy information is formatted in predefined tables for easy reference and consistent tracking of data from year to year. The categories of information presented are Facility Summary, New Measures, Existing Measures, and Planned Measures. An Innovations section lists significant "firsts" achieved over the past year and an Appendix lists conservation policies and guidelines.

Resource Conservation Plan
FY 2010
Summary

The information on this page reflects the facilities owned or operated by this agency as of the end of **FY 2008 (June 30, 2008)**

Agency	**Montgomery County Public Schools, Maryland**		
Number of Facilities	223	Change in number of facilities	+1
Total square feet	23,315,663	Change in total square feet	291,762
Average operating hrs, year	3,220	Change in avg. operating hrs, year	0
Changes effecting energy consumption	**Expanding Community Use of Schools:** MCPS schools are used for a growing number of outside groups scheduled through the Community Use of Public Facilities (CUPF). Annual operating hours are on the rise. **Increasing Summer Use of Schools:** Schools have been fully air-conditioned and are used over the summer for an increasing number of academic, extended learning opportunities (ELO), recreational, and community activities.		

	Units	Total Consumption (Actual FY 2008)	Percent Change from Actual FY 2007	Total Cost (Actual FY 2008) $	Percent Change from Actual FY 2007
Electricity	kWh	213,641,930	-1.0%	$ 27,663,507	12.5%
Natural Gas (Firm)	therms	6,114,957	-5.0%	$ 9,295,542	-4.4%
Natural Gas (Irate)	therms				
Fuel Oil #2	gallons	82,939	-13.5%	$ 187,847	-11.0%
Propane	gallons	51,514	36.1%	$ 103,848	48.1%
Water/Sewer	kgallons	557,943	7.4%	$ 2,754,357	18.8%
Total				$ 40,005,101	8.4%

Resource Conservation Plan
FY 2010
Summary

Analysis of Annual Cost Savings from Energy Efficiency Programs since FY 1998

One-Time Projects	**Completion Year**	**Implementation Cost**	**Annual Cost Savings**	**Average Simple Payback (Years)**
New Measures	FY 2009	$1,700,000	$490,560	3.5
Existing Measures	FY 1998 To FY 2008	$9,929,175	$4,869,892	2.0
Planned Measures	FY 2010	$1,700,000	$513,040	3.3
Subtotal		**$13,329,175**	**$5,873,492**	**2.3**
Recurring Annual Operations Programs		**Annual Cost**	**Annual Cost Savings**	**Return on Investment**
School Energy and Recycling Teams		$964,266	$2,100,000	218%
Peak Load Management		$120,000	$624,000	520%
Subtotal		**$1,084,266**	**$2,724,000**	**251%**
Grand Total MCPS Annual Savings			**$8,597,492**	

New Measures

The **New Measures** table on the following page lists and describes energy retrofit activities occurring in the current fiscal year. Other new measures in ongoing MCPS processes are described below.

New Construction: New building design guidelines generate substantial energy savings in each MCPS construction project. For example, Spark Matsunaga Elementary School opened in 2001 with the first ground source heat pump system in MCPS. This highly efficient heating and cooling system has now also been installed in Great Seneca Creek and Little Bennett elementary schools and Richard Montgomery High School. Ground source heat pumps exchange heat with the earth through fields of closed-loop wells and reduce annual heating and cooling energy by 30 percent compared to conventional HVAC systems. New construction measures are not listed in this table due to the large number of measures involved and because the cost and benefits of these measures are integrated into the building design.

Beyond energy conservation measures, MCPS seeks to be environmentally responsible in all aspects of facility design and operation. To comply with the Montgomery County Green Buildings Law of 2006 for new buildings, all new MCPS facilities that started design in FY 2008 or later will be certified by the United States Green Building Council under the Leadership in Energy and Environmental Design (LEED) rating system. LEED directs sustainable design in the categories of (1) Site Selection, (2) Efficient use of Water, (3) Energy and Atmosphere, (4) Materials and Resources, (5) Indoor Environmental Quality, and (6) Innovative Design.

Great Seneca Creek Elementary School, which opened in September of 2007, became the first school in Maryland to receive LEED Gold certification. Currently, seven schools in design are registered for LEED certification (Paint Branch High School; Francis Scott Key and Cabin John middle schools; and Cashell, Clarksburg #8, Cresthaven and Carderock Springs elementary schools) and five more are in line to become registered this year (Farmland ES, Garrett Park ES, Cannon Road ES, Seven Locks ES, and Gaithersburg HS).

Utility Procurement: MCPS also controls utility costs through competitive procurement of deregulated energy supplies. Natural gas is procured by locking in one-third increments when market conditions are favorable. Starting in fiscal year 2008, MCPS procures electricity in preplanned blocks of on-peak, off-peak, and around-the-clock products for various times of year, managed through a wholesale account on the PJM Independent System Operator (ISO) electric system. This flexibility and other market advantages of a wholesale electric account have kept electric prices well below the standard offer of the local utility company, and also below one-time annual bid approaches used in the past. To minimize the risk of price increases, the procurement of natural gas is planned and executed for the current year and for portions of future years up to two years into the future. Electric procurement is planned and executed for portions of future years up to five years ahead.

New Measures

This table shows information on resource conservation measures planned to be implemented in **FY 2009 (July 1, 2008 through June 30, 2009)**

Measures - Planned: (For FY 2009)	Projected Completion Date (Mo/Yr)	Projected Initial Cost ($)	Projected Annual Net Impact on Maintenance Cost ($)(-)	Fuel Type(S) Affected and Units	Estimated Units Saved Per Year	Projected Annual Cost Savings ($)
Capital Improvement Projects:						
EMS Upgrades	03/2009	$ 1,500,000	($121,250)	NG Therm	173,750	$260,620
				Elect kWh	303,570	$40,980
Lighting	03/2009	$200,000	($20,000)	Elect kWh	340,000	$45,900
Energy Star 4.0 Computer Refresh Cycle	09/2008	$0	$0	Elect kWh	720,000	$97,200
Solar PV PPAs	06/2009	$0	$0	NA	NA	$45,860
Subtotal		$1,700,000	($141,250)			$490,560
Operations and Maintenance:						
Continue ongoing						
O&M programs						
See Existing Measures						
Subtotal						
Grand Totals		**$1,700,000**	**($141,250)**			**$490,560**

Description of Activities

Energy Management Upgrades: The infrastructure of energy management systems at MCPS has reached an age where many systems need to be replaced or upgraded. Advances in electronics and communications now enable greater savings from energy management systems than previously was possible.

Solar PV PPAs: A power purchase agreement (PPA) allows a government building owner to host the operation of a solar photovoltaic (PV) system on the roof of the building. A solar developer installs, owns and maintains the solar array and sells power directly to the building owner. The building owner benefits from cheaper electricity and reduced demand charges at no upfront cost.

Energy Star 4.0 Computer Refresh Cycle: Computers in MCPS schools receive technology modernization on a four-year cycle. New computers meet the latest Energy Star criteria, version 4.0 B at the present time, including LCD flat panel monitors and high-efficiency power supplies, to reduce energy use over existing equipment. The market has evolved to where there is no longer a price premium for these features.

Operations and Maintenance: As a policy, the Division of Maintenance uses high-efficiency replacement equipment when replacing failed equipment in facilities. The incremental cost for efficiency is small at the point of equipment replacement and not tracked.

Operational Savings by Occupants: The School Energy and Recycling Teams (SERT) program continues to educate and monitor schools on minimizing use of resources. Proven cost reductions from this effort are over $2 million per year and growing. Additional description of the SERT program appears on page 7.

Green Power Procurement: MCPS has procured 10 percent of its electricity as clean or renewable energy through purchase of renewable energy certificates (RECs) in FY 2007 and 2008. MCPS is participating in an interagency procurement of green power RECs, and anticipates increasing its FY 2009 green power purchase to 15 percent.

Solar Power Purchase Agreements: A new method of hosting solar photovoltaic installations on schools has been employed by the Department of Facilities Management (DFM). A power purchase agreement (PPA) allows a government building owner to host the operation of a solar photovoltaic (PV) system on the roof of the building. A solar developer installs, owns, and maintains the solar array and sells power directly to the building owner. Unlike a government building owner, the developer is able to access significant cost offsets to solar projects available under state and federal tax laws and also to sell solar RECs to utilities to meet renewable portfolio standards. The result of these credits can be renewable energy production at below the cost of grid electricity. The building owner benefits from electricity at below market rates, with no upfront cost.

In the initial phase of solar PPA deployment, MCPS has contracted for up to 1.4 MW of solar photovoltaic development with SunEdison. SunEdison was selected by a solicitation of vendors based on lowest net present value per kilowatt-hour over a 20 year period. Between July and October 2008, MCPS initiated projects at four schools, per the following table:

School	Capacity (kW ac)	Number of Panels	Construction Value ($)	Construction Timeline Start date	Construction Timeline End date
Clarksburg HS	260	1,466	$1,504,000	10/17/2008	12/31/2008
Lakelands Park MS	133	770	$790,000	10/26/2008	12/31/2008
College Gardens ES	86	497	$510,000	10/26/2008	12/31/2008
Richard Montgomery HS	135	784	$804,000	1/4/2009	4/25/2009
Totals:	**614 kW**	**3,517**	**$3,608,000**		

These sites were selected based on having large roof sections less than five years old and clear of equipment or shading. Roof age is an important consideration since the PPA contracts call for the solar panels to remain in place and produce power for 20 years. Provided these first four projects succeed as a “proof of concept” additional schools will be designated to fill the 1.4 megawatts (MW) capacity goal.

It is the hope of DFM to eventually extend this procurement model for solar power to all new schools and modernizations. For existing buildings, the solar PPA model will be integrated into replacement roofing projects where feasible.

Existing Measures

MCPS has made significant investments in energy conservation going back to 1980. The **Existing Measures Summary** table on the following page includes projects back to FY 1998. Subsequent detailed tables document the specific types of projects, investment, and savings by year.

Conservation Culture: In addition to capital improvements, MCPS has long maintained a program of behavioral education to reduce energy use by facility users. The School Energy and Recycling Teams (SERT) program continually promotes and rewards a culture of conservation in the school system. SERT communicates with the schools through group training and professional development events, newsletters, curriculum modules, informational flyers, e-mail, Web sites, a telephone hot line, and, most importantly, regular site visits. As rewards for participation, the programs offer quarterly financial awards and annual competition events. This program produces millions of dollars a year in utility savings for the school system and helps to instill environmental responsibility in future generations.

In FY 2005 and 2006, SERT program staff was increased to provide frequent on-site monitoring of behavior and assistance to schools in saving energy by trained energy facilitators. The energy-saving results have been broad-based and significant across the system. In FY 2008, 120 schools achieved the initial goal of a 5 percent reduction in electric use over the baseline year. Of those 120 schools, 86 significantly exceeded the goal, scoring in the range of a 10 to 30 percent reduction in electric consumption.

In FY 2008, cost avoidance for this program was $ 2.1 million. At this rate, the program is returning more than twice its annual cost in new savings.

Peak Load Management: Recent estimates of the growth in electric use in Maryland and the Washington metropolitan area indicate possible shortfalls in the ability of the electric grid to bring in power to the region, starting as soon as the year 2011. Faced with potential shortfalls in transmission capacity, the PJM ISO has increased the annual charge for transmission use several fold. Starting in 2007, PJM ramped up the for Peak Load Contribution (PLC) rate to potentially add 15 percent to annual electric bills for MCPS.

To defray part of these additional charges, DFM has developed a program to reduce peak electrical demands at facilities during the critical, summer afternoon hours when the charges are most likely to be set. The program uses energy management systems to drop air-conditioning to many facilities during the critical hour each weekday, while SERT “energy sweepers” simultaneously sweep the facility to turn off unnecessary lights and plug loads. During the summer of 2008, the program successfully reduced PLC charges by 20 percent, avoiding $624,000 in the following year’s utility costs.

Existing Measures Summary

This table summaries information on resource conservation measures implemented from **FY 1998 through FY2008**

Existing Measures	Completion Year	Implementation Cost	Annual Cost Savings	Average Simple Payback (Years)
Project Types				
All Types	FY 2008	$2,420,000	$984,510	2.5
All types	FY 2007	$2,769,000	$1,921,940	1.4
All types	FY 2004 to FY 2006	$1,185,000	$845,000	1.4
All types	FY 1998 To FY 2003	$3,555,175	$1,118,442	3.2
Existing Measures Grand Totals		$9,929,175	$4,869,892	2.0

Please see the following **Existing Measures Details** tables for project descriptions and financial details on the above line items. Energy savings through operations and behavior change are accomplished through the **SERT** program and reported separately on page 7.

Existing Measures Details

This table shows information on resource conservation measures planned to be implemented in **FY 2008 (July 1, 2007 through June 30, 2008)**

Measures - Planned: (For FY 2008)	Projected Completion Date (Mo/Yr)	Projected Initial Cost ($)	Projected Annual Net Impact on Maintenance Cost ($)(-)	Fuel Type(S) Affected and Units	Estimated Units Saved Per Year	Projected Annual Cost Savings ($)
Capital Improvement Projects:						
Energy Management Upgrades	03/2008	$ 1,200,000	($97,000)	NG Therm	139,000	$208,500
				Elect kWh	242,857	$31,570
Lighting Retrofits	03/2008	$ 500,000	($50,000)	Elect kWh	850,000	$125,000
Energy Star 4.0 Computer Refresh	09/2007	$120,000	$0	Elect kWh	720,000	$97,440
Subtotal		$1,700,000	($147,000)			$426,510
Operations and Maintenance:						
Group Relamp with 25 Watt T8 – Phase 2	6/2008	$600,000	($31,000)	Elect kWh	4,020,000	$522,000
Subtotal		$720,000	($31,000)			$522,000
FY 2008 Page Total		**$2,420,000**	**($178,000)**			**$984,510**

Description of Activities

Energy Management Upgrades: The infrastructure of energy management systems at MCPS has reached an age where many systems need to be replaced or upgraded. Advances in electronics and communications now enable greater savings from energy management than previously was possible.

MCPS Comprehensive Lighting Retrofits: This program improves building light fixtures. Fluorescent fixtures receive T8 lamps and electronic ballasts, 400-watt mercury vapor fixtures are replaced with 250-watt metal halide fixtures (with improved light output), incandescent fixtures are changed to compact fluorescent, and incandescent exit signs are changed to light emitting diode (LED) type. LED exit signs consume only 5 watts and have an extremely long life cycle, thus also improving the safety of the facilities.

Group Relamp with 25 watt T8: Group relamping with new higher-efficiency and longer-life T8 lamps allow a 25 percent reduction in energy use in existing fixtures without loss of light. MCPS plans to change all existing lamps to take advantage of this new technology system wide. Pilot installation started in FY 2006. Financing was provided by the Maryland Energy Administration for full implementation in FY 2007 and FY 2008.

Energy Star 4.0 Computer Refresh Cycle: Computers in MCPS schools receive technology modernization on a four year cycle. New computers meet the latest Energy Star criteria, version 4.0 B at the present time, including LCD flat panel monitors and high-efficiency power supplies, to reduce energy use over existing equipment.

Replace Pin Timers with Digital: Until now, unreliable electro-mechanical time clocks, using thumbscrew pins to set ON/OFF times, have operated all exterior lighting for schools. These clocks become unreliable as pins become loose, power failures cause loss of time, and the clocks do not compensate for monthly changes in sunrise/sunset times. As a result, lights are frequently on when not needed, resulting in a waste of hundreds of thousands of dollars each year. Throughout the system MCPS is installing modern technology digital clocks designed for exterior lighting. These electronic clocks, the Paragon EL (Exterior Lighting) 72, have digital accuracy, daily sunrise/sunset adjustments, seven-day capacitor backup for power outages, and can download programming from a notebook PC.

Existing Measures Details

This table shows information on resource conservation measures implemented in **FY 2007 (July 1, 2006 through June 30, 2007)**

Measures Existing	Projected Completion Date (Mo/Yr)	Projected Initial Cost ($)	Projected Annual Net Impact On Maintenance Cost ($)(-)	Fuel Type(S) Affected And Units	Estimated Units Saved Per Year	Projected Annual Cost Savings ($)
Capital Improvement Projects:						
Energy Management Upgrades	03/2007	$ 1,200,000	($97,000)	NG Therm	139,000	$208,00
				Elect kWh	242,857	$31,000
Lighting Retrofits	03/2007	$ 500,000	($50,000)	Elect kWh	850,000	$125,000
Energy Star 4.0 Computer Refresh	09/2007	$120,000	$0	Elect kWh	720,000	$97,440
Subtotal		$1,820,000	($147,000)			$461,940
Operations and Maintenance:						
Group Relamp with 25 Watt T8 – Phase 1	6/2007	$804,000	($31,000)	Elect kWh	5,360,000	$680,000
Replace pin timers for exterior lighting with digital	6/2007	$145,000	($15,000)	Elect kWh	6,030,000	$780,000
Subtotal		$949,000	($46,000)			$1,460,000
FY 2007 Page Total		**$2,769,000**	**($193,000)**			**$1,921,940**

Description of Activities

Energy Management Upgrades: The infrastructure of energy management systems (EMS) at MCPS has reached an age where many systems need to be replaced or upgraded. Advances in electronics and communications now enable greater savings from EMS than previously was possible.

MCPS Comprehensive Lighting Retrofits: This program improves building light fixtures. Fluorescent fixtures receive T8 lamps and electronic ballasts, 400-watt mercury vapor fixtures are replaced with 250-watt metal halide fixtures (with improved light output), incandescent fixtures are changed to compact fluorescent, and incandescent exit signs are changed to light emitting diode (LED) type. LED exit signs consume only 5 watts and have an extremely long life cycle, thus also improving the safety of the facilities.

Group Relamp with 25 watt T8: Group relamping with new higher efficiency and longer life T8 lamps allow a 25 percent reduction in energy use in existing fixtures without loss of light. MCPS plans to change all existing lamps to take advantage of this new technology system wide. Pilot installation started in FY 2006. Financing was provided by the Maryland Energy Administration, via a low-interest loan, for full implementation starting in FY 2007.

Replace Pin Timers with Digital: Until now unreliable electro-mechanical time clocks, using thumbscrew pins to set ON/OFF times, have operated all exterior lighting for schools. These clocks become unreliable as pins become loose, power failures cause loss of time, and the clocks do not compensate for monthly changes in sunrise/sunset times. As a result, lights are frequently on when not needed, resulting in a waste of hundreds of thousands of dollars each year. MCPS is installing modern technology digital clocks designed for exterior lighting as retrofits throughout the system. These electronic clocks, the Paragon EL (Exterior Lighting) 72, have digital accuracy, daily sunrise/sunset adjustments, 7-day capacitor backup for power outages, and can download programming from a notebook PC.

Existing Measures Details

This table shows information on resource conservation measures implemented in **FY 2004 through FY 2006**

Measures - Existing	Date Implemented (Mo/Yr)	Initial Cost ($)	Annual Net Impact on Maintenance Cost ($)(-)	Fuel Type(S) Affected And Units	Units Saved Per Year	Annual Cost Savings ($)
Capital Improvement Projects:						
Energy Management Upgrades	1/2006	$500,000	($50,000)	Elect kWh	354,000	$45,000
Lighting Retrofit at Clopper Mill Elementary School	12/2004	$ 70,000	($ 3,500)	Elect kWh	330,000	$ 28,000
Internet Control of Portable Classrooms	8/2004	$350,000		Elect kWh	5,000,000	$450,000
Waterless Urinals at Martin Luther King Middle School	10/2004	$ 10,000	($ 500)	Water Gal	560,000	$ 4,000
Retro-Commissioning Wheaton / Edison High School	09/2004	$255,000	($ 8,000)	Elect kWh	420,000	$ 43,000
Subtotal		$1,185,000	($62,000)			$570,000
Operations and Maintenance:						
Shutdown of Network Computers	7/2004	0	0	Elect kWh	3,060,000	$275,000
Subtotal		0	0			$275,000
FY 2004 – FY 2006 Page Totals		**$1,185,000**	**($62,000)**			**$845,000**

Description of Activities

The "Internet Control of Portable Classrooms": A first-of-its-kind application to portable classrooms of Carrier's "Broadcast Energy Savings" (BES) technology. MCPS and Carrier jointly developed the approach in which an Internet interface allows MCPS to synchronize the HVAC schedules and thermostat set points at all portables. The savings for this project is large because portables originally contained only manual thermostats and ran essentially uncontrolled. The use of conventional seven-day programmable (but non-communicating) thermostats is impractical in this application because of the inability to verify programs at more than 500 locations and the inability of seven-day programmable thermostats to schedule holidays, breaks, and summer closings. The BES interface supports a 24-hour override to a setback temperature, or "snow day" command, allowing MCPS to shut down portables and save energy opportunistically. The newly developed system now makes it feasible to efficiently control large numbers of small, relocatable buildings, with a payback of under a year.

Shutdown of Network Computers: In FY 2005 MCPS instituted the system-wide shutdown of all 40,000 computers at the end of the evening via network controls. The network also sets Energy Star settings on each computer to deactivate the monitor after 30 minutes of idle time. Research is continuing to optimize these settings.

Existing Measures Details

This table shows information on resource conservation measures implemented in **FY 1998 through FY 2003**

Measures - Existing:	Date Implemented (Mo/Yr)	Initial Cost ($)	Annual Net Impact on Maintenance Cost ($)(-)	Fuel Type(S) Affected and Units	Units Saved Per Year	Annual Cost Savings ($)
Capital Improvement Projects:						
Lighting Retrofits	01/1998	$ 644,633	($25,325)	Elect kWh	2,992,939	$209,506
Lighting Retrofits	01/1999	$ 467,748	($18,376)	Elect kWh	2,171,687	$152,018
Lighting Retrofits	01/2000	$ 241,693	($ 9,495)	Elect kWh	1,122,147	$ 78,550
Lighting Retrofits	01/2001	$ 193,471	($ 7,601)	Elect kWh	898,259	$ 62,878
Lighting Retrofits	01/2002	$1,544,630	($60,682)	Elect kWh	7,171,498	$502,005
Lighting Retrofits	01/2003	$ 237,000	($ 9,377)	Elect kWh	635,496	$ 54,485
Energy Management Upgrades	01/2003	$ 161,000	0	Elect kWh	442,000	$ 31,800
		0	0	NG Therm	18,500	$ 15,200
Cooling Tower Water Monitors	01/2003	$ 65,000	($15,000)	Water Gallons	2,800,000	$ 12,000
Subtotal		$3,555,175	($145,856)			$1,118,442
Operations and Maintenance:						
Subtotal						
FY 1998 – FY 2003 Page Totals		**$3,555,175**	**($145,856)**			**$1,118,442**

Description of Activities

MCPS Comprehensive Lighting Retrofits: This program improves building light fixtures. Fluorescent fixtures receive T8 lamps and electronic ballasts, 400-watt mercury vapor fixtures are replaced with 250-watt metal halide fixtures (with improved light output), incandescent fixtures are changed to compact fluorescent, and incandescent exit signs are changed to light emitting diode (LED) type. LED exit signs consume only 5 watts and have an extremely long life cycle, thus improving the safety of the facilities.

Cooling Tower Water Monitors: Monitors are installed and detect excess water flow through cooling towers caused by malfunctioning controls and alerts maintenance staff. The monitors send a pager signal to the responsible person, including the type of alarm and the facility number. Monitors were installed on 92 cooling towers owned by MCPS, averting water losses of hundreds of thousands of gallons per year.

Operations and Maintenance: As a policy, the Division of Maintenance uses high-efficiency replacement equipment when replacing failed equipment in facilities. The incremental cost for efficiency is small at the point of equipment replacement and not tracked.

Planned Measures

Energy Capital Improvement Program (CIP): A significant backlog of profitable energy projects exists in MCPS for energy management, lighting, and water conservation. The Planned Measures table on the following page reflects the target areas for the coming fiscal year.

Solar Power Purchase Agreements: As described under "New Measures" above, a new method of hosting solar photovoltaic installations on schools has been employed by DFM. A power purchase agreement (PPA) allows a government building owner to host the operation of a solar photovoltaic (PV) system on the roof of the building. In FY 2010 deployment of PPAs by MCPS will continue through the initial phase of 1.4 MW of installed solar PV capacity. It is the hope of DFM to eventually extend this procurement model for solar power to all new schools and modernizations. For existing buildings, the solar PPA model will be integrated into replacement roofing projects where feasible.

Planned Measures

This table shows information on resource conservation measures planned to be implemented in **FY 2010 (July 1, 2009 through June 30, 2010)**

Measures - Planned:	Projected Completion Date (mo/yr)	Projected Initial Cost ($)	Projected Annual Net Impact on Maintenance Cost ($)(-)	Fuel Type(s) Affected And Units	Estimated Units Saved Per Year	Projected Annual Cost Savings ($)
Capital Improvement Projects:						
Energy Management Upgrades	03/2010	$ 1,500,000	($121,250)	NG Therm	173,750	$260,620
				Elect kWh	303,570	$40,980
Lighting Retrofits	03/2010	$200,000	($20,000)	Elect kWh	340,000	$45,900
Energy Star 4.0 Computer Refresh	09/2008	$0	$0	Elect kWh	720,000	$104,400
Solar PV PPAs	06/2010	$0	$0	NA	NA	$61,140
Subtotal		$1,700,000	($141,250)			$408,640
Operations and Maintenance:						
Continue ongoing						
O&M programs						
See Existing Measures						
Subtotal						$104,400
FY 2010 Page Totals		**$1,700,000**	**($141,250)**			**$513,040**

Description of Activities

Energy Management Upgrades: The infrastructure of energy management systems (EMS) at MCPS has reached an age where many systems need to be upgraded or replaced. Advances in electronics and communications now enable greater savings from EMS than previously was possible.

Lighting Retrofits: This program improves building light fixtures while introducing new technologies to reduce energy use.

Solar PV PPAs: A power purchase agreement (PPA) allows a government building owner to host the operation of a solar photovoltaic (PV) system on the roof of the building. A solar developer installs, owns and maintains the solar array and sells power directly to the building owner. The building owner benefits from cheaper electricity and reduced demand charges at no upfront cost.

Energy Star 4.0 Computer Refresh Cycle: Computers in MCPS schools receive technology modernization on a four year cycle. New computers meet the latest Energy Star criteria, version 4.0 B at the present time, including LCD flat panel monitors and high-efficiency power supplies to reduce energy use over existing equipment. The market has evolved to where there is no longer a price premium for these features.

Operations and Maintenance: As a policy, the Division of Maintenance uses high-efficiency replacement equipment when replacing failed equipment in facilities. The incremental cost for efficiency is small at the point of equipment replacement and not tracked.

Operational Savings by Occupants: The School Energy and Recycling Teams (SERT) program continues to educate and monitor schools on minimizing use of resources. Proven cost reductions from this effort are over $2 million per year and growing. Additional description of the SERT program appears on page 7.

Significant Technology and Program Advances in Resource Conservation

1) First use of **Internet-communicating thermostats** in a U.S. school system to control HVAC in portables.

2) **First public school system in Maryland** to register a new building design for LEED Certification, and first to achieve a LEED Gold certification (Great Seneca Creek Elementary School was LEED Gold certified in 2007).

3) Started deployment of a **Web interface in MCPS** to view real-time building information.

   a. Seventy schools are now "online" to anyone on the MCPS-wide area network to view building environmental conditions through a Web browser.

4) Started use of a **Web-based system to monitor daily electric profiles** in buildings and detect abnormal use patterns, control, and scheduling problems.

   a. Seventy sites are installed under the Potomac Electric Power Company (PEPCO) "CEO Online" subscription program.

5) Started MCPS use of the **automated scheduling database** operated by the ICB/Community Use of Public Facilities program to receive HVAC scheduling requests from three school clusters in place of paper calendars manually filled out by school staff.

   a. This system was extended to all elementary and middle schools in FY 2005.

6) Started **network control** of power-saving settings on all MCPS computers.

7) Started systematic **retro-commissioning** of MCPS facilities to modernize energy management controls, correct control failures, improve comfort, and reduce energy expenses.

8) First MCPS school opened with a **GeoExchange system** for heating and cooling.

   a. Spark Matsunaga Elementary School and Longview Center, 125,000 square feet.

   b. Four schools now have GeoExchange systems.

9) New staff (**energy facilitators**) and program support designated to **visit schools monthly** and monitor and assist with energy saving plans.

10) Started use of Community Energy Loan Program (CELP) financing from the Maryland Energy Administration for new energy conservation opportunities, including the premium for GeoExchange at the new Richard Montgomery High School and the conversion to 25-watt T8 lamps listed next.

11) Started use of **new technology 25-watt T8 lamps** in a system-wide retrofit to reduced lighting energy use 25 percent, including:

   a. Started use of building service staff to implement a system-wide energy retrofit.

   b. Started use of students to assist staff in a system-wide energy retrofit.

12) Started use of **electronic time clocks to control exterior lighting**, including:

   a. Use of automatic compensation for time of sunrise and sunset.

   b. Use of capacitor back-up to hold time and program over power outages.

   c. Use of automatic changeover for daylight saving time.

13) Started use of **Energy Star 4.0** standard in computer technology renewal cycle, including;

   a. **Flat panel displays.**

   b. **"80+" efficiency** power supplies in CPUs.

14) FY 2008 started use of **wholesale electric procurement** buying blocks of power to stabilize rates over time below standard offer service.

15) FY 2009 started use of **solar photovoltaic power purchase agreements** to install production scale solar power arrays on schools at no upfront cost to MCPS. Initial phase includes 1.4 MW ac of installed capacity.

Appendix – Montgomery County Public Schools

Resource Conservation Policy and Guidelines

- Board of Education Policy On Energy Conservation
- Electricity Guidelines
- Heating Guidelines
- Food Preparation Guidelines
- Water Use Guidelines

POLICY BOARD OF EDUCATION OF MONTGOMERY

Related Entries: ECM, ECM-RA
Responsible Office: Supportive Services

Energy Conservation

A. PURPOSE

To ensure that Montgomery County Public Schools pursues energy conservation efforts and practices that continue to preserve our natural resources while providing a safe and comfortable learning environment for all staff and students

B. ISSUE

The nation is experiencing a depletion of its natural resources which include crude oil, natural gas, and other energy sources. The Montgomery County Public Schools is committed to reducing its consumption of natural resources and still improving the quality of its educational programs. The Montgomery County Board of Education desires to work with other agencies of government and plan school system activities so that the learning environment of essential education programs are not curtailed or compromised.

C. POSITION

1. The superintendent of schools shall continue to establish procedures to ensure the conservation of natural resources by personnel at all levels of the school system, which shall include the following practices:
    a) Generation of a system-wide resource conservation plan that outlines goals and objectives
    b) Development of acceptable energy conservation guidelines as outlined in the resource conservation plan
    c) Continued development and implementation of conservation programs
    d) Performance of energy studies on all new MCPS construction
    e) Monitoring the general operation and maintenance of all heating, ventilation and air-conditioning equipment

f) Procurement and consumption management of fossil fuels and electricity

g) Continuing reminders to staff and students of the need for conservation of all natural resources

2. MCPS will participate in a coordinated effort by government authorities to establish appropriate resource conservation plans and utility price monitoring systems to ensure that public schools have adequate supplies of essential fuels and can obtain these at the best possible prices.

D. DESIRED OUTCOME

Create a healthy and comfortable learning environment while controlling energy consumption more efficiently and diverting the otherwise rising utility costs towards educational programs. Continue development of energy conservation efforts that proportionally reduces energy consumption in new and existing facilities.

E. IMPLEMENTATION STRATEGIES

1. Should natural resources be insufficient to meet normal operating needs, the superintendent will develop further plans for the consideration of the Board of Education to conserve energy.
2. Copies of this policy and the annual resource conservation plan will be sent to appropriate school system and county government officials.

F. REVIEW AND REPORTING

This policy will be reviewed on an on-going basis in accordance with the Board of Education's policy review process.

Policy History: Adopted by Resolution No. 654-73, November 13, 1973; amended by Resolution No. 285-97, May 13, 1997.

Electricity

1. **Temperature Set Point:** The maximum cooling level is 76° F. Set thermostats accordingly. Some temperature variation will occur as equipment cycles on and off. Report cooling problems only if room temperature measured with a thermometer stays three degrees or more above or below set point.

2. **Controls:** Do not attempt to tamper with energy management or HVAC controls on equipment. Any problems with controls or equipment should be dealt with promptly through the work order system. Provide frequent inspection of pneumatic controls, including system filter/dryer, automatic bleed, and compressor run time. Test and calibrate all pneumatic thermostats at the start of each cooling season.

3. **Computers:** Shutting down computers not in use is important. Computers in our schools consume more energy than the lighting. **Teachers and students should shut down the computer at the end of each use, unless a new user is waiting.** Sweeps should be made to shut down all computers immediately after school hours and before weekends, holidays, and breaks. Use of **flat panel monitors** is encouraged whenever procuring new displays. Flat panel monitors use 70 percent less energy than CRT models and help reduce excessive heat build-up in computer labs and closets.

4. **Lights:** Teachers should ensure lights are turned off when leaving the classrooms unoccupied, even for a few minutes. Every effort should be made to avoid accidentally leaving lights on in storerooms, crawl spaces, attics, and other unoccupied spaces. Corridor lighting should be reduced in over-illuminated areas and turned off during unoccupied periods. Gym, auditorium, and stadium lights should be controlled on a tight schedule. Gym lights should be turned off during class periods when the gym is not in use.

5. **Light Levels:** Light levels may be reduced to the acceptable levels for different activities as listed on the attached chart**: Recommended Footcandle Levels.** Your SERT Energy Facilitator will provide you with instruments and instructions to successfully reduce light levels and save energy.

6. **Task Lighting:** Use a desk lamp (with compact fluorescent bulb) instead of overhead lighting as much as possible, especially at teaching stations when students are out. Computer labs should use compact fluorescent uplights (torchiere lamps) to improve visibility of computer screens, and save energy by turning out overhead lights.

7. **Lighting Maintenance:** Maintain automatic lighting controls, occupancy sensors, or daylight sensors where installed. Light fixtures and lenses should be cleaned annually and the date documented.

8. **Daylighting:** Whenever possible, teachers should utilize natural light instead

of artificial light. Window shades should be adjusted to make best use of daylighting. Most classroom lights are controlled by two or more switches, so artificial lighting can be reduced when daylight is available.

9. **Exterior Lighting:** All outside lighting should be **off** during daylight hours. Building security lighting should be on from dusk to dawn daily. Parking lot lights should be turned off at the close of the regular school day or evening activities (by 12:00 midnight at the latest) and back on at 6:00 a.m., to dawn (unless sunrise is before 6:00 a.m.) Building service managers should notify the maintenance depot of any irregularities in exterior lighting control.

10. **Cleaning Crews:** All lights are to be turned **off** when students and teachers leave school. Building service workers are to turn on lights only in the areas in which they are currently working.

11. **Holidays and Breaks:** All electrical equipment should be shut down or unplugged per checklists before long weekends and school breaks.

12. **Off-Peak Use:** When possible, electricity use (for kilns, laminators, etc.) should be scheduled prior to 12:00 noon when lower, off-peak rates are in effect.

13. **Infiltration Control:** All windows and outside doors are to be kept closed when cooling systems are in operation. Corridor doors and doors to classrooms should remain closed when HVAC is provided. Doors to gyms and pools are to be kept closed. Report faulty door closers to the maintenance depot.

14. **Vending Machines:** Vending machines are major electric users that often cost more to operate than the school receives in revenues. A typical soft drink machine costs over $500 per year to operate. Measures should be taken to minimize the number of vending machines and the hours of use.

    a. Review your school's vending machine use and have little-used units removed.
    b. Vending machines must be removed from the main entrance or lobby of all schools effective with the 2004-2005 school year.
    c. Unplug vending machine units when "Sold Out" is displayed.
    d. Operation of vending machines must be automatically controlled per the following specifications.

Vending Machine Specification
for Montgomery County Public Schools

Effective Date: August 1st, 2006

Application: This specification applies to all vending machines in Montgomery County Public Schools (MCPS), located inside the buildings or in outside areas surrounding the school buildings. These items include beverages, such as soft drinks, fruit juice and juice beverages, water, sports drinks; and snacks, such as cookies, crackers, chips, ice cream and candy.

References: Maryland Code, Education, Section 7-423, Division II, title 7 subtitle 4, "Health and Safety of Students"

MCPS Policy JPG: *Wellness: physical and Nutritional Health;* MCPS Regulation JPG-RA: *Wellness: physical and Nutritional Health;* MCPS Policy ECA: *Energy Conservation*

Timing Controls: Vending machines in MCPS schools must have an integrated timing device to automatically shut off operation of the machine in accordance with nutrition policies established by the Board of Education and energy conservation policy.

Automatic shut off is to include the following features:

1. Prohibit access to products
2. Turn off all lighting
3. Turn off refrigeration

Hours of Operation

Machines containing approved items-

- Non-perishable—7:00 a.m. until midnight, with refrigeration timed to resume one hour before access.
- Perishable—Refrigeration units remain on 24 hours; however access by students is limited too 7:00 a.m. until midnight.
- Machines containing items not approved for sale during the instructional day must be programmed for automatic shutoff from midnight until the end of the instructional day. Refrigeration may be timed to resume one hour before access.
- Vending machines in teachers' lounges must be operational from 5:30 a.m. until midnight. Refrigeration may be timed to resume one hour before access.

Approved Items:

Beverages (container size not to exceed 16 ounces except for unflavored water)

- Flavored, non-carbonated water
- 100% fruit juice
- Fruit juice beverages with a minimum 50% fruit juice
- Low fat or nonfat milk
- Sports drinks (only allowed in the immediate area of the gymnasiums)

Snacks

- Single-serving size packages
- 7 grams or less of fat (except for nuts and seeds)
- 2 grams or less of saturated fat
- 15 grams or less of sugar (except for fruit)

Recommended Footcandle (fc) Levels For Voluntary SERT De-Lamping Projects	
Corridor and Stairways ▪ As low as 10fc – for high reflectivity flooring/walls (white or pastel) ▪ Up to 20 fc for dark-colored flooring	10 -20 fc
Conference Rooms	30 fc at table height
Reception Areas	20 fc (average ambient) 50 fc (on task surface/desk)
Classrooms	30 fc (reading/ writing)
Art class	75 fc (preferably natural lighting)
Computer labs	15 fc
Restrooms	15 fc
Gyms	30 fc
Cafeteria (seating area)	30 fc
Cafeteria (food prep area)	75 fc

Heating

1. **Temperature Setpoint:** The maximum heating level is 70° F. Set thermostats accordingly and recheck monthly. Some temperature variation will occur as equipment cycles on and off. Report heating problems only if room temperature measured with a thermometer stays 3^{o} or more below set point.

2. **Controls:** Building staff or occupants should not attempt to manually control equipment by tampering with energy management or HVAC controls of equipment. Any problems with controls or equipment should be dealt with promptly through the work order system. Provide frequent inspection of pneumatic controls, including system filter/dryer, automatic bleed and compressor run time. Test and calibrate all pneumatic thermostats at the start of each heating season.

3. **Hours:** During non-school hours, heat is furnished only for MCPS activities and user groups with reservations through the ICB/CUPF. Consolidate necessary MCPS evening activities into the minimum number of zones possible. HVAC will not be provided for an individual to use a classroom or office outside of normal hours. HVAC systems will remain off during cleaning, except when ventilation is required for waxing or stripping activities.

4. **Filters:** Replace filters of all equipment at recommended intervals. Maintain documentation per your building maintenance plan.

5. **Boiler Maintenance:** Fuel oil burners should be cleaned and tuned for optimum combustion twice yearly.

6. **Pumps:** Only one main heating pump should be operated, except where additional pumps are provided for separate zones. Do not operate main pump and standby pump at the same time.

7. **Unit Ventilators:** Maintain unit ventilators free of obstruction, such as books, plants, and furnishings, both on the top grill and at the bottom intake, so that air can circulate efficiently throughout the room.

8. **Infiltration Control:** All windows and outside doors are to be kept closed when heating systems are in operation. Corridor doors and doors to classrooms should remain closed when HVAC is provided. Doors to gyms and pools are to be kept closed. Report faulty door closers to the maintenance depot.

9. **Storage Spaces:** Close unused storage rooms and set thermostat controls, where installed, to the lowest possible temperature setting that will prevent freezing.

10. **Personal Electric Space Heaters:** Personal space heaters will not be permitted. Such units, in addition to having high energy costs, are a fire and safety hazard. Only heaters installed by the Division of Maintenance for emergency use will be permitted; others will be confiscated.

Food Preparation

Cooking Equipment

1. Preheat only equipment to be used 15 minutes before using.
2. Reduce temperature or turn equipment off during slack periods.
3. Cook full loads on every cooking cycle when possible.
4. Use the correct size equipment for all operations.
5. Avoid slow loading and unloading of ovens and opening doors unnecessarily.
6. Keep equipment clean for efficient operation.

Hot Food Holding and Transporting

1. Preheat equipment before loading.
2. Always use at full capacity when possible.
3. Clean thoroughly daily.

Refrigeration Equipment

1. Keep doors tightly closed and avoid frequent or prolonged opening.
2. Place food in refrigerator or freezer immediately upon arrival from supplier.
3. Keep evaporator coils free of excessive frost.
4. Keep condenser coils free of dust, lint, or obstructions.
5. Unplug equipment that is not needed.

Ware Washing Equipment

1. Always operate equipment at full capacity when possible.
2. Flush after heavy meal periods—clean thoroughly, daily.

Water Heating

1. Repair leaking faucets as soon as possible.
2. Reduce storage temperature to 120° F where possible.
3. Insulate hot water pipes.

Ventilating System

1. Use only the number of fans necessary at all times to provide adequate ventilation.
2. Turn fans off upon completion of cooking.
3. Operate two-speed fans on the lower speed when possible.
4. Keep filters and extractors clean.

WATER USE

GENERAL

1. **Be alert for water leaks** and water main breaks. Look for continuous water flow through the water meter at any time, ponding of water around the building, and report leaks to maintenance immediately. A broken water main can release tens of thousands of dollars in water a week until it is repaired.
2. **Report and repair leaking faucets** and faulty flush valves promptly. Check and adjust valves for proper timing annually.
3. **Water is an MCPS resource and not to be given away** or used by outsiders. Users scheduled through ICB are allowed to use water related to their activities. Do not provide free water to road maintenance tankers or any other non-MCPS agency.
4. Do not allow local residents to use school hose bibbs or to control irrigation.
5. **Car washes may not** use school water supplies. Off-site arrangements may be made with a local gas station to hold a car wash for fund raising.
6. The utility budget pays for bottled water only in elementary school portable classrooms.

IRRIGATION

These general guidelines are supplied for the education of individuals operating turf irrigation equipment to help with the successful management of healthy turf.

1. **Avoid Excess Watering.** Excessive watering promotes fungal growth and prevents the development of long, deep root systems needed for healthy turf.

    a. **Use a simple rain gauge.** Turf in our climate needs only 1” of water per week for optimum health. Use weather reports or your school’s rain gauge to determine whether irrigation is needed each week.

    b. **With timer systems, check zones for proper saturation levels.** Make sure water saturates the root zone when irrigating but no further. No runoff should occur from the area being watered.

    c. **Make sure irrigation systems are turned off when it rains.** The installation of rain switches on automated irrigation systems is highly recommended.

2. **Irrigate only in early morning or late evening hours**. This timing minimizes evaporation to the air.

3. **Irrigate only two or three times a week**. This interval promotes deeper root growth, which establishes healthier and sturdier turf.