

# MARYLAND ENERGY CUP

[Competition for Ultimate Performance]

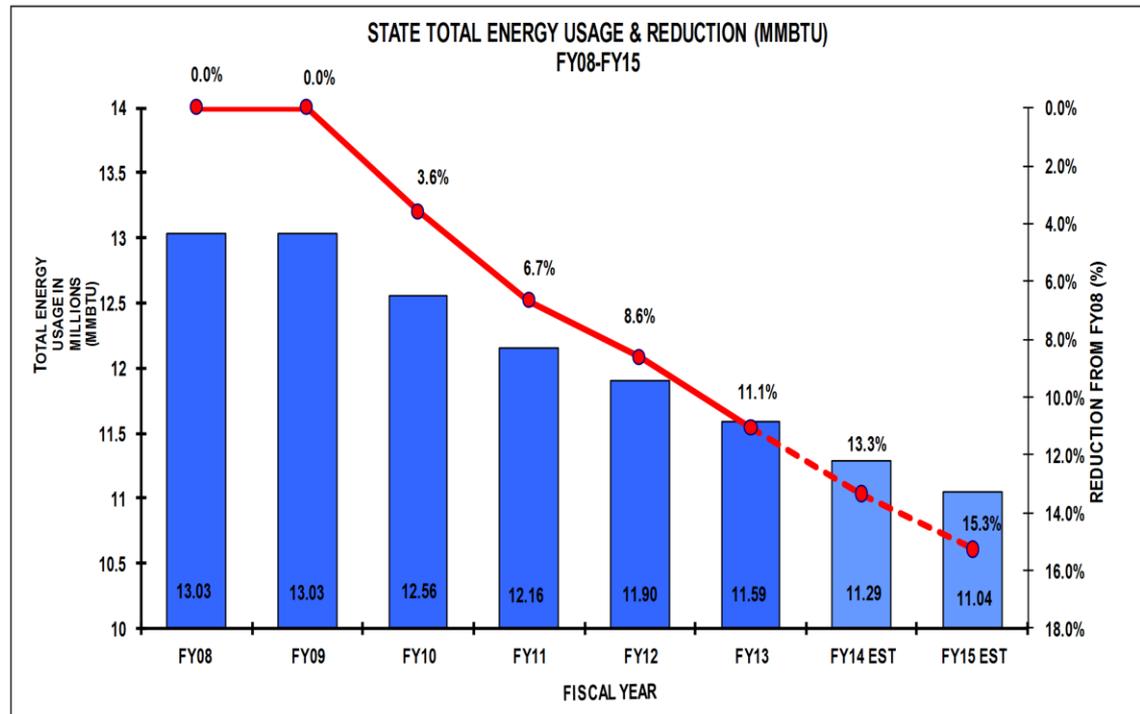


February 6, 2014 | Annapolis, Maryland

*Hosted by DGS Secretary Collins & The Office of Energy Performance & Conservation*



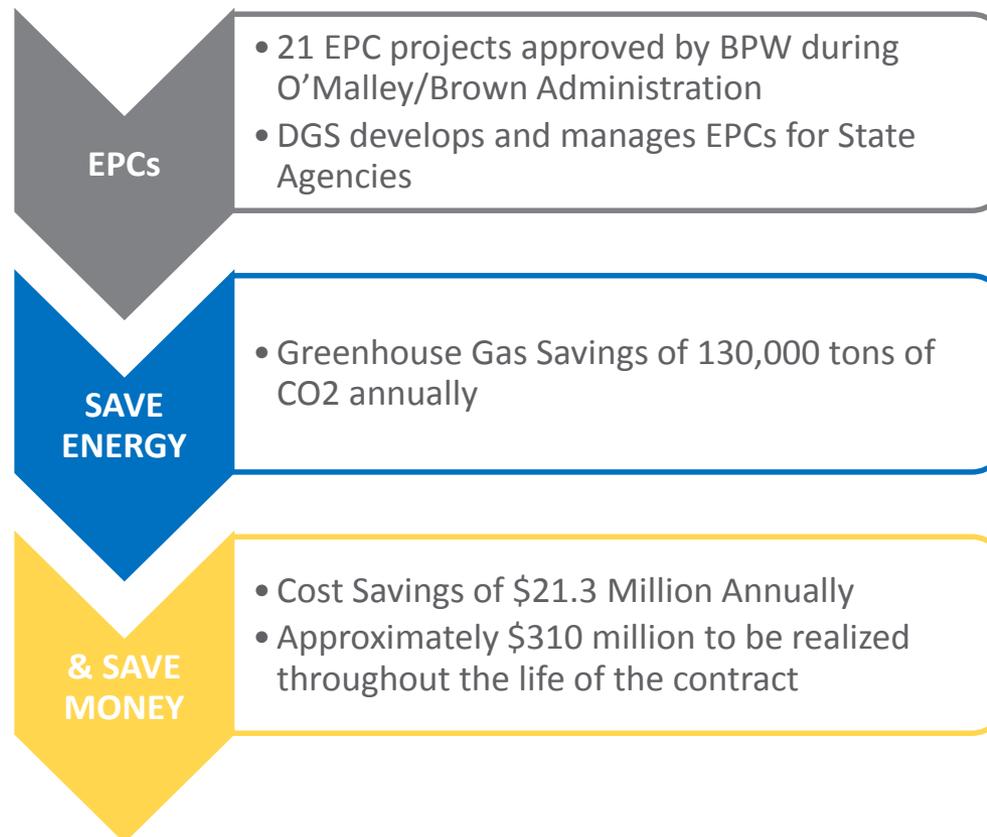
## Maryland State Government Progress Towards EmPOWER Maryland Goal



On Track to Reduce Energy Consumption by 15% by 2015



## Energy Performance Contracts (EPCs)





## State Energy Database

- DGS tracks energy usage and cost for 58 State Agencies
- Electricity, Natural Gas, Oil, Steam, Chilled Water, Water & Sewer
- Over 22,000 Accounts

## Electricity Purchasing

- Purchase deregulated electricity on behalf of all Executive Agencies
- Lock in favorable rates to save State money
- Cost savings \$10.8 Million in FY13





## Renewable Energy

- Solar PV panels on 4 DGS buildings generate 432 kW (520,000 kWh/Year)
- **Generating Clean Horizons** program (DGS and USM) provides electricity via solar & wind contracts
- **Clean Bay Program** (DGS, USM, MEA, MDA, MDE) will generate power for State through chicken litter



## Energy Efficient New Construction

- 2 LEED buildings & 8 more in design or construction
- Maryland Green Building Council

## Other Initiatives:

- Demand Response
- Recycling
- Composting
- Green Purchasing





Replace Aged Chiller and Cooling Tower through the Department of General Services

- When natural gas service is interrupted, this station mixes propane and air to maintain gas service to all equipment.
- An Energy Performance Contract (through DGS) eliminated central steam production and provided boilers in each building throughout the site. Lighting & water conservation measures were also part of this contract.





- Replace inefficient rooftop A/C equipment and controls at all 10 buildings on site. Phase 1 included Cottages 2 & 5. Future phases are in planning stage.
- All project phases are completed through DGS.



**COTTAGE TWO  
POTOMAC CENTER - DHMH**



Salisbury Armory Using Energy Efficient Ground Source Heat Pumps



Salisbury Armory Energy Efficient Ground Source Heat Pump Construction



Olney Readiness Center Using Energy Efficient Ground Source Heat Pumps



## Energy Performance Contract (EPC) at State Police Barracks & Headquarters

EPC Project Cost	\$5,673,603
Anticipated Savings	\$16,175,133



Electricity Conserved	3,535,333 kWh
Natural Gas Conserved	93,830 Therms
Fuel Oil Conserved	5,355 Gallons
Propane Conserved	4,627 Gallons

## Harriet Tubman Underground Railroad State Park



The 15,000 square-foot LEED-certified center will include state-of-the-art green elements, including a green roof, recycled materials, energy efficient lighting and water conservation devices.



## Gunpowder Falls State Park Hammerman Area Services Building



The LEED Silver certified center received points in the categories Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation.



## Albert Powell Fish Hatchery Energy Audit

### RECOMMENDED PROJECTS SUMMARY

**Table 1: Economic Details of Proposed Energy Conservation Measures**

No	Proposed Measure	Estimated Annual Energy Cost Savings	Estimated Cost to the Facility	Estimated Payback in Years
1	Lighting Upgrade	\$464	\$2,993	6.4
2	Lighting Occupancy Controls	\$113	\$748	6.6
3	Install Split System Heatpumps	\$315	\$6,000	19.0
4	Install High Efficiency Motors	\$3,454	\$8,700	2.5
5	VFDs on Blower Fan Motors	\$762	\$4,500	5.9
6	On Demand Hot Water	\$338	\$1,875	5.6
<b>Totals</b>		<b>\$5,446</b>	<b>\$24,816</b>	<b>4.6</b>

Energy audits from the Maryland Energy Administration identify energy conservation projects, costs and payback periods.



## PowerUp Energy Curriculum

### Energy Conservation

#### 5.1.1 Saving Energy – Be an Energy Saver

##### **Activity: Simple Things You Can Do To Save Energy**

Think. Pair. Share. Get together with a friend or classmate to talk about what conservation means. Share your thoughts with the rest of your class and, together, brainstorm a list of 5 to 10 things you all can do to conserve energy.

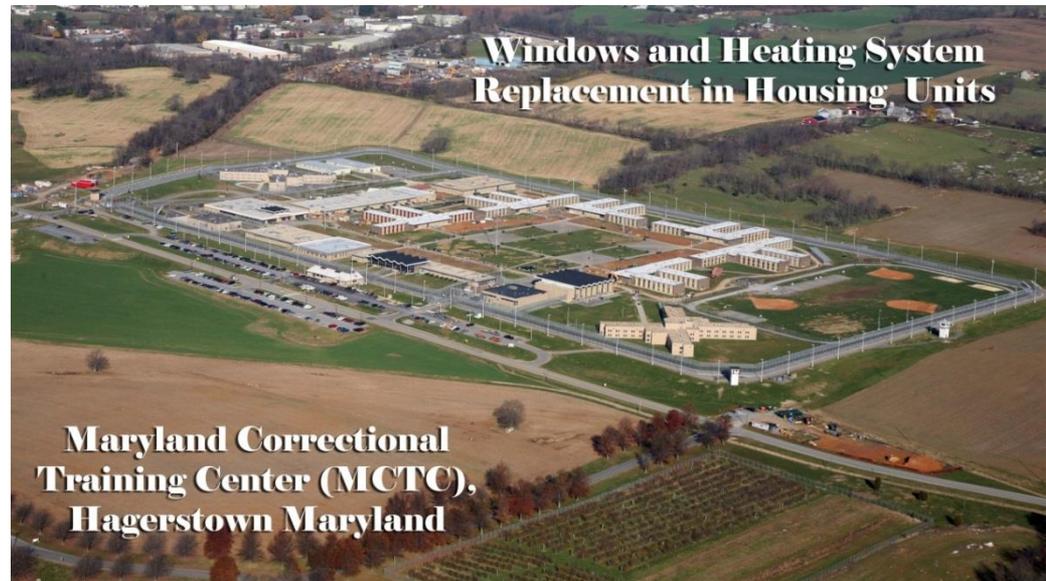
Materials: Poster Board, Markers, Scissors, Glue, Household Energy Icons, Energy Audit Checklist.

Maryland Department of Natural Resources curriculum teaches students about energy production and conservation measures.



## The Challenge

- Energy Conservation is a unique challenge for correctional facilities.
- Residential facilities are operational 24/7 for 365 days all year.
- The Department is dedicated to building LEED certified buildings.
- Future Capital Projects will include projects that provide;
  - ✓ Better Buildings,
  - ✓ Better Systems,
  - ✓ and Energy Performance Contract (EPC) participation.





## Energy Performance Contracts

- Energy Performance contract for all correctional facilities in the Jessup Region
- Instrumental in upgrading the steam system which had many leaks and was very ineffective throughout the years
- Since installation of the new system, the Department has saved over 15% in the use of Natural Gas and over 10% in the consumption of water.
- Energy savings exceeded all contract estimates.

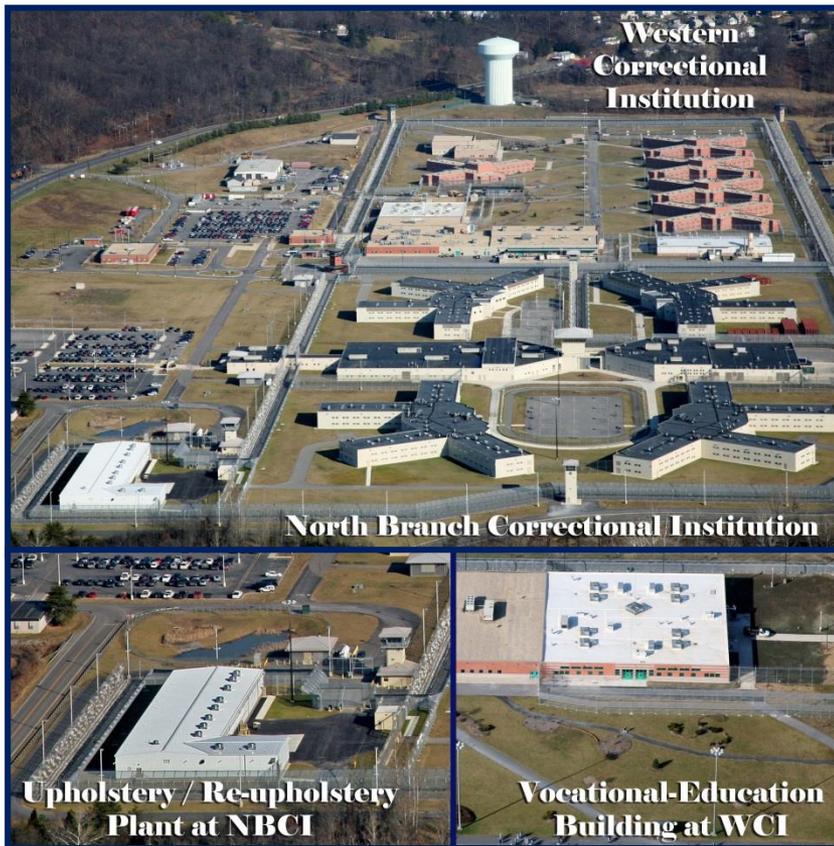


Upgraded steam line loop around Jessup Correctional Institution (JCI), MHC in the background.



New Hot Water and Steam Heating Lines for Housing Units at JCI

## New Energy Efficient Facilities



- In 2008, opened a new facility in the Cumberland region, North Branch Correctional Institution (NBCI)
- The facility houses over 1,000 inmates
- In 2012, a new Vocational-Education Building was added to Western Correctional Institution and an Upholstery / Re-upholstery Plant was opened at NBCI
- The Department is working towards obtaining LEED certification for all future construction projects.

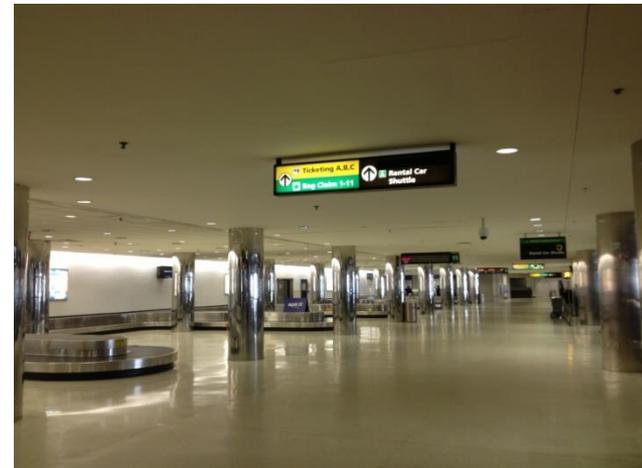


## Energy Performance Contract

- Meeting MAA's specific energy initiatives and State of Maryland energy reduction and efficiency goals
- Incorporation of renewable technologies and achieving Maryland's green goals
- Reductions in energy, water and electrical demand
- Improved lighting efficacy
- Optimal use of financing options, use of Dept. of Energy grant, BGE rebates and Renewable Energy Credits (RECs)
- Energy awareness and education – of MAA Maintenance personnel
- Improved Automation and Control of Building Systems
- Participating in Demand Response Program
- Use of new products and technologies

## BWI Marshall Airport Energy Conservation Measures

- 1) Energy Efficient Lighting
- 2) Domestic Water Conservation
- 3) Energy Management Control System Optimization
- 4) Heating System Optimization
- 5) Chiller Plant Optimization
- 6) Infrared Heating System Installation
- 7) Demand Response Program Participation
- 8) Solar Photovoltaic System
- 9) High Efficiency Summer Boiler installation
- 10) High Efficiency Chiller Replacement
- 11) Escalator Energy Mgmt Control System (EMCS)
- 12) Air handler unit (AHU) Replacement





- The 505 KW Solar Plant at BWI Marshall Airport has generated 1,316,049 KWH of Solar Energy since 2011.
- Solar Energy produced at BWI Marshall is equivalent to CO<sub>2</sub> absorbed by planting 5,194 trees or CO<sub>2</sub> emitted by driving 761,721 miles.



## MDE Implements Composting

A new composting program was implemented in April 2013 at the Department's headquarters located at Montgomery Park.

Approximately 4,440 pounds of organic material has been removed from the waste stream since implementation of this program.





## MDE Reduces Energy Usage



Reduced electricity usage 18% since 2007 by reducing printers, replacing copiers with high efficiency copiers, replacing computers with *Electronic Product Environmental Assessment Tool* (EPEAT) Gold certified computers, using high efficiency lighting, photocell dimming and occupancy sensors.



Reduced paper usage 49% by going to 2-sided printing and implementing a scanning initiative using FORTIS.



Installed low-flow aerators on break room and bathroom sinks to reduce water usage from 2.2 to .5 gallons per minute.

Waterless urinals save an estimated 475,000 gallons of water annually.



Grey water system at headquarters uses reclaimed storm water to flush toilets—saving an estimated 275,000 gallons of water annually.



## MDE Recycles, Reuses, Repurposes

*MDE recycled 51.8 tons or 49.5% of Maryland Recycling Act (MRA) allowable trash in 2012*

MDE used in Headquarters building and office space:

- 225,000 square feet of re-used carpet.
- 12,500 linear ft. of recycled wheat board for cubicle work surfaces.
- 26,000 linear ft. of recycled newsprint (homasote) for cubicle walls.



- 5,900 sq. ft. of recycled concrete for bathroom counters.
- 1,400 sq. ft. of 100% recycled post consumer plastic for bathroom stall partitions and doors.
- 10,200 sq ft of 70% recycled content for the bathroom floor tile.



## Energy Efficiency

- Currently working with Energy Service Company (ESCO), Energy Systems Group (ESG), in response to the State's EmPower Maryland goals.
- Other current and planned activities include the following:
  - Roofing specs requiring COOL ROOFS with an SRI (Solar Roof Index) of 100.
  - Improve efficiency of HVAC to include variable frequency drives on pumps and fans.
  - Install energy management control systems (EMCS's) and Economizers to allow greater use of outside/fresh air.
- Improve efficiency of office equipment to include computers, monitors and servers.
- Prohibit use of 1200/1500 watt personal space heaters to reduce kilowatt consumption /costs. The standard size is 200 watts in approved locations.
- Improve efficiency of lighting: Changed to T-8 and T-5 fluorescent fixtures, ICETRON (inductively coupled electrode-less) lighting systems, and LED'S (light emitting diode).



## Energy Efficiency

- LED traffic-control lighting in use in some toll plazas and bridge operations.
- At the Fort McHenry Tunnel, an LED conversion has an estimated electric savings of \$700,000 per year. It will double the existing light levels, have a 400% longer life, and less maintenance.
- Water saving devices installed on restroom and kitchen devices.
- Converting to tankless hot water heaters where possible.
- Educate employees on conservation practices: Connections newsletter utilized to communicate the energy management program to employees.
- Limit peak energy use: Work with utility companies on peak-load management.



## Renewable Energy

- The MDTA has several solar powered traffic signs and lights at ramps and toll booths.
- The Intercounty Connector's (ICC)/MD 200 Eastern Operations Center has geothermal HVAC.
- At the Francis Scott Key Bridge facility, a solar system generates 22kW of electricity to offset lighting and cooling loads.
- A solar water heating system is installed at the William Preston Lane Jr. Memorial (Bay).
- Exploring WIND ENERGY possibilities at several locations.
- Working with DGS on solar projects for the MDTA.
- Testing solar window film at several Point Breeze offices.

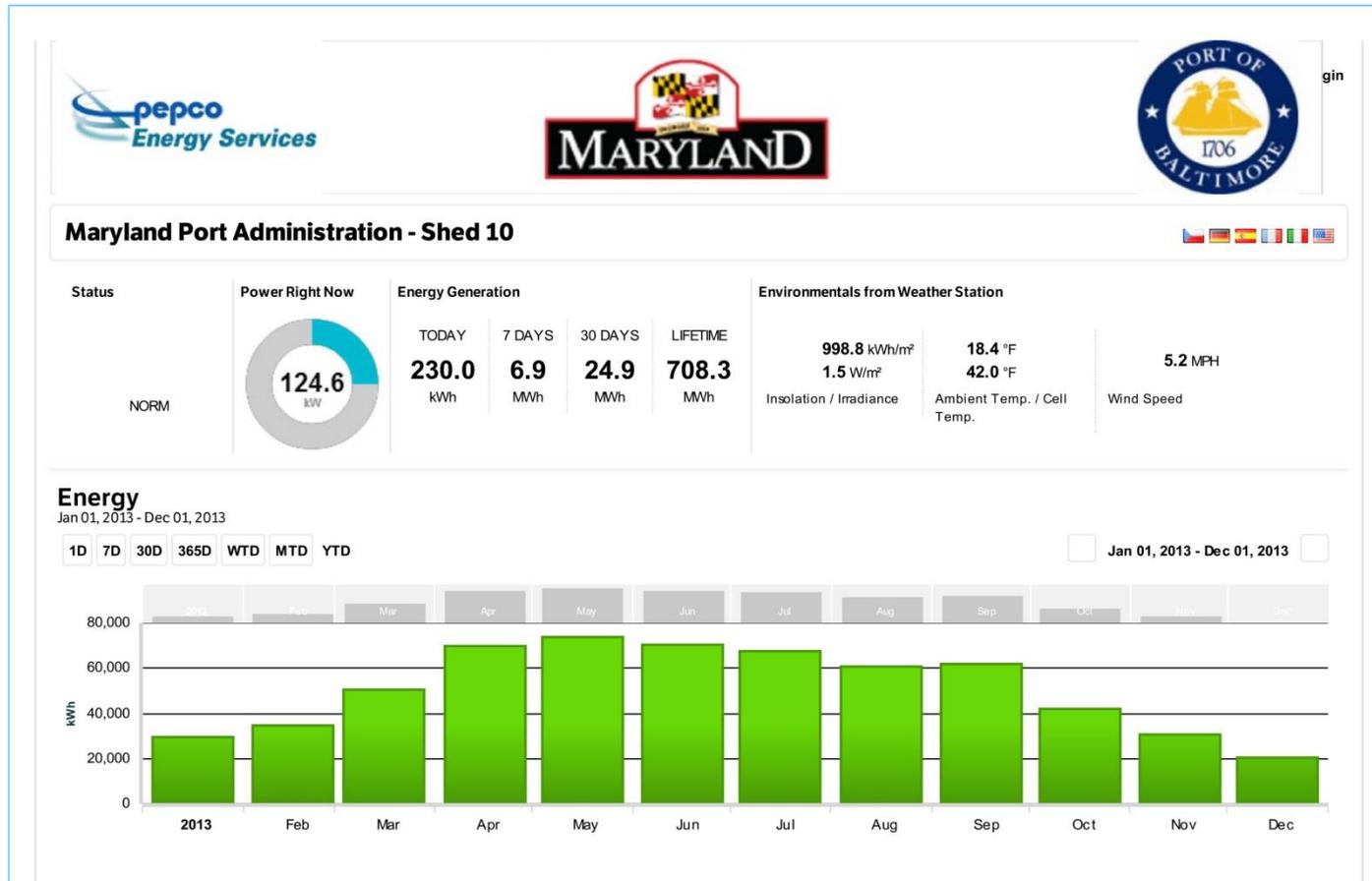


## Maryland Port Administration 250KW Photovoltaic System



Roof top Maryland Cruise Building - Installed 2011

### Maryland Port Administration 500KW Photovoltaic System 2013 Performance





## Maryland Port Administration 500KW Photovoltaic System

1/24/14

Maryland Port Administration - Shed 10

### Environmental Benefits

#### Environmental Equivalents

*Achieved by use of renewable energy*



The energy to operate a TV for **205,115** days



The pollution an *average* passenger car emits over **214.05** years



The energy to power **5,448.54** computers for 1 year

#### Greenhouse Gases

*Greenhouse gases avoided by use of renewable energy*

##### CARBON DIOXIDE

**CO<sub>2</sub>** 2,140,476.20 lb

##### NITROGEN OXIDE

**NO<sub>x</sub>** 387.50 lb

##### SULFUR DIOXIDE

**SO<sub>2</sub>** 762.30 lb

#### Carbon Offset

**970.90** metric tons



You have offset the equivalent of:

**207.00** ac

Typically one acre of pine forest will offset the equivalent of 4.69 metric tons of CO<sub>2</sub>

--, MD --

Install Date: 2012-10-04



M&T Bank Stadium is the FIRST professional outdoor football or baseball stadium in the United States to receive LEED Gold rating for Existing Building: Operations and Maintenance by the United States Green Building Council.



**GOLD**

Certification awarded: **60**  
November 8, 2013

For Existing Building:  
Operations & Maintenance

Sustainable Sites	11
Water Efficiency	8
Energy & Atmosphere	18
Materials & Resources	6
Indoor Environmental Quality	9
Innovation & Design	6
Regional Properties	2

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### Sustainability Highlights

- 43% water usage reduction with the installation of over 400 waterless urinals and water-efficient restroom fixtures
- **27% above the national average in energy efficiency**
- 71% of regularly occupied spaces have access to views of the outdoors
- Offset 123,070 metric tons of greenhouse gas emissions
- Comprehensive Cooling Tower Management Plan
- 38% of stadium staff use of alternative transportation





### PROGRAMS

- Engage the services of Pepco to install energy efficient lighting and VFDs
- Reuse condensate water for pre-heat of domestic water
- Installed LED lighting
- Changed to high efficiency lamps & ballasts
- Added occupancy sensors
- Installed heaters on the Energy Management System
- Rebuilt hot water tanks
- Use of Microlite system to manage lighting

### UPGRADES

- Modernization of the lower concourse to include all concession stands
- Installation of energy star rated equipment
- Installation of energy efficient lighting
- Installation of extensive weatherproof to contain heat

### INITIATIVES

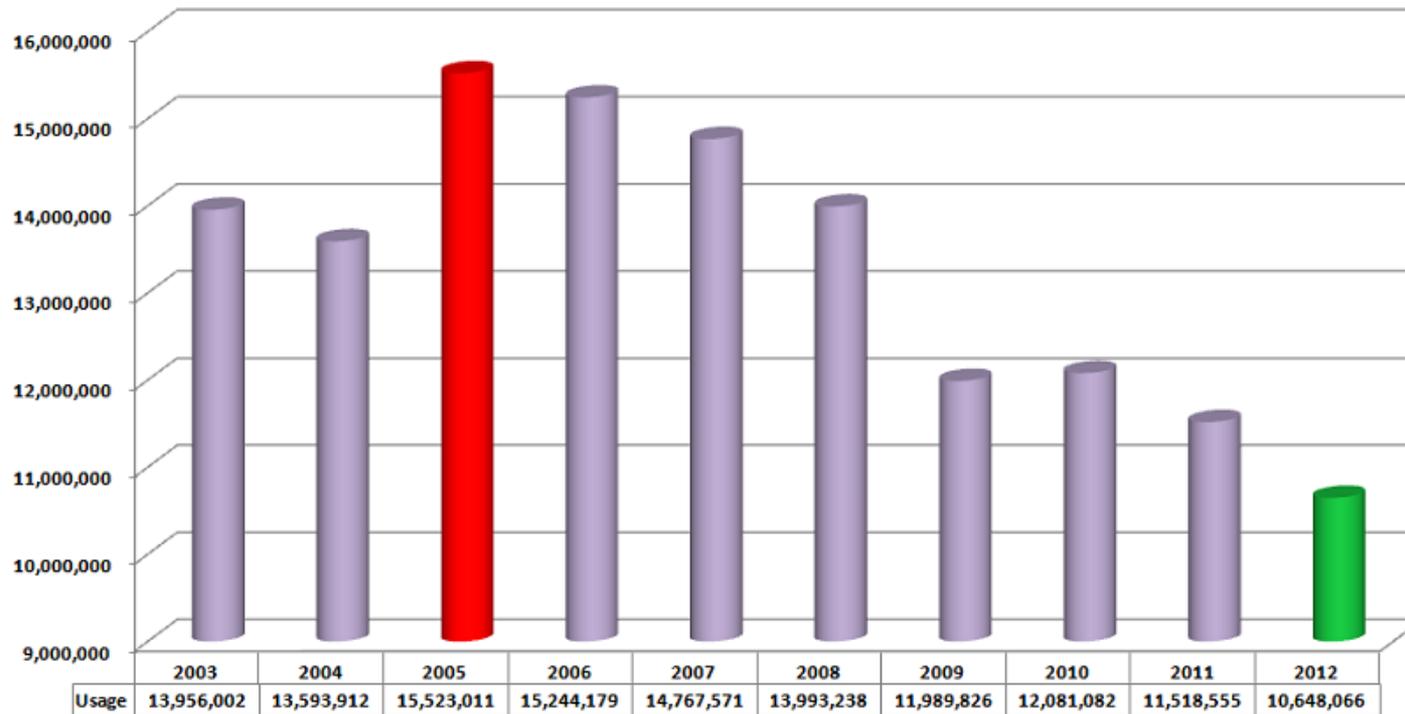
- Annual shut-down process after the football season
- Encourage the culture of turning lights off and not leaving the water running
- Promote recycling not just inside the stadium but to include the parking lots





## Energy Savings

Fiscal Year  
Electricity Usage (kWh) 2003-2012

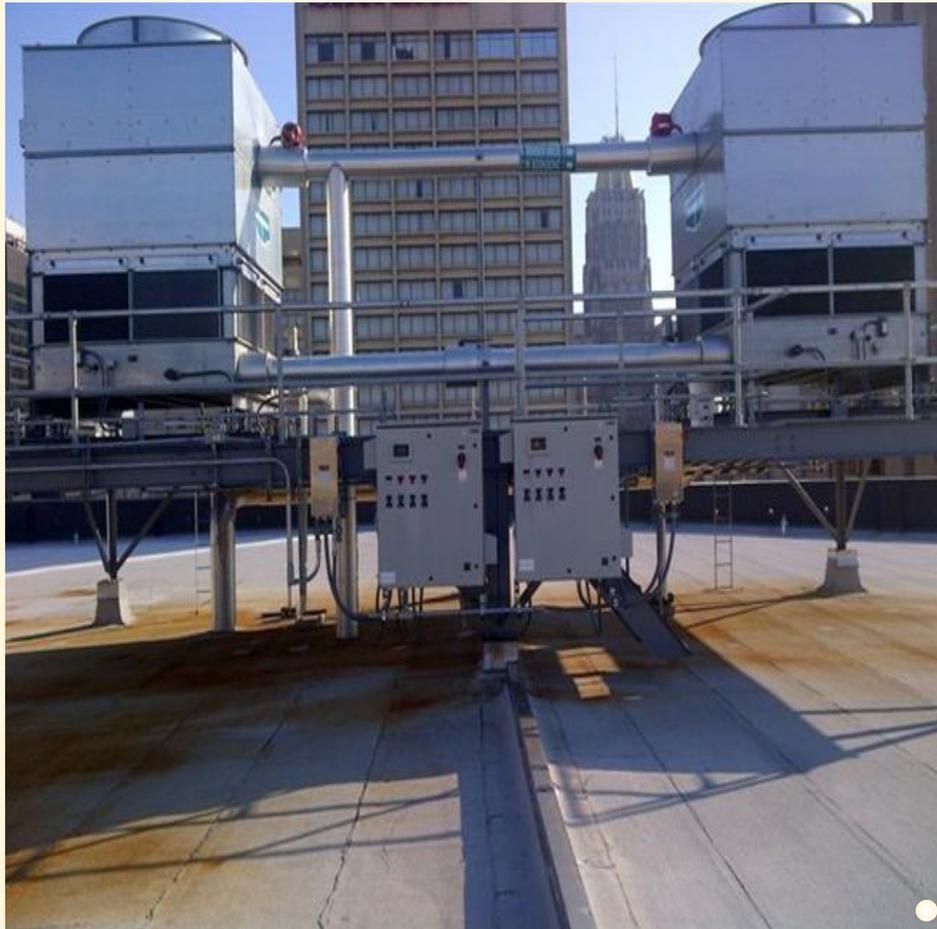




## **Energy Conservation Projects at Nancy S. Grasmick State Education Building:**

- Lighting Upgrade
- Lighting Occupancy Controls (light sensors)
- Water Fixture Retrofit
- Facility Management Control System Upgrade (Metasys Energy Control System)
- Air Balancing
- Insulation Blankets
- Building Envelope Upgrades
- Steam Trap Replacement
- We also adjusted our HVAC operating time.





○ Cooling Tower with VFD's motor controls

○ High Efficiency Water Heater

○ Thermal blankets for steam heat exchanger



○ Installed new low flow 1.0 GPF flush valves

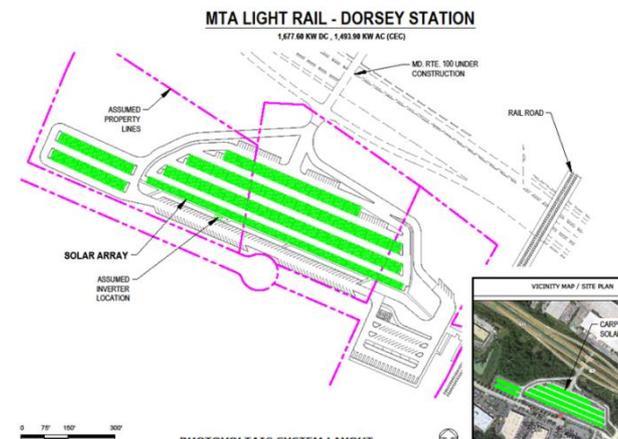


○ Installed 0.5 Aerators



## PV Solar Systems:

- Northwest Bus Facility, 530 KW PV Solar System, put in operation in 2012. Generated 1.09 GWh of energy by December 2013.
- Looking at options for 1MW Canopy Solar system for MARC Dorsey Station
- Considering additional sites.





## Facilities Submetering

- Remote monitoring
- Historical database of energy consumption, power, power quality and other electrical variables.
- Tool to establish and measure future energy saving initiatives.
- In process pilot test at the Bush St. Bus facility.
- Next pilot test for a Metro traction power substation.





## Lighting Retrofits

- Involved 29 facilities
- Replaced or retrofitted 14,100 lighting fixtures.
- Annual savings of 3.8 million kWh (about \$500k).
- Measuring & Validating energy savings.



- MVA Management, & Engineering Department (FME) has been implementing phased systems preservation approach to existing facilities and infrastructure during renovations
- Energy Performance Contract in development phase
- Replaced 60-year-old antiquated HVAC System (e.g., power feeders, controls, intake and exhaust fans, motors, pumps)
- Installation & utilization of various energy efficient devices which reduces consumption and demand:
  - Testing 2' by 4' LED light fixtures for future installation
  - Installation of more energy efficient 2' by 4' T5 & T8 Light Fixtures
  - Low water flush toilets and valves



- Installation of Solar Light Pole.
- Installation of sensor flush valves on toilets and urinals.
- Installed sensor wall and ceiling mounted occupancy sensors.
- Installed Variable Frequency Drives (VFD'S) to controls various HVAC fans, motors, and pumps.
- Installation of high efficiency motors, fans, and pumps.
- Installation of compact florescent lights (CFL's).
- Installation of LED exit signs.
- Replacing cooling tower with more efficient air-to-air condensing unit.





Energy conservation measures are already in place. The Energy Performance Contract (EPC) currently in the development phase will benefit MVA tremendously.

MVA shall reduce energy consumption and demand by 15% by 2015 while simultaneously creating functional facilities that will improve the interior environment for State Employees and the general public while maintaining Energy Efficiency and Environmental Compliance Statues and Regulations.





## New Cambridge Shop (bids 2/18/14)

- Entire building is heated by radiant floor heat.
- DOAS (Dedicated Outdoor Air System) with heat recovery for ventilation
- Separate cooling system so DOAS can supply cooling needs in winter and mild spring and fall days without operating cooling system.
- 34% savings over baseline, actually higher since LEED calculation methods do not model radiant heat effectively.



## Energy Performance Contract (EPC)

- Involved replacement of facility lighting, controls replacements for night setback, 4 boiler replacements, building envelope improvements and highway sign lighting replacement with LEDs
- 
- Total energy saved over 15 years of EPC in dollars \$34,587,726.42
- Sign light conversions completed in Oct 2013.





## LED Signals

- SHA has been replacing traffic signals with LED signals since 2008
- Currently at 98% of traffic control devices equipped with LEDs
- All new signals have been LED since 2005
- Energy savings of 43,000,000 KWH per year over incandescent

## LED Roadway Lighting

- Destruction/knockdowns of existing lighting poles are being replaced with LED lighting
- All new overhead Roadway lighting will be LED
- Currently programmed so that all overhead roadway lighting will be LED within the next 5 years



## State Energy Loan Program (SALP)

- Established in 1991
- For cost effective energy efficiency improvements in State facilities
- In the past for up to \$1.5 million
- Loans are 0% interest
- A 1% Administrative fee is incurred
- Loans are repaid through reduced utility and fuel costs
- Supports SB267 and EmPOWER Maryland goals

For More information Please visit:  
<http://energy.maryland.gov/>