

BALTIMORE COUNTY PUBLIC SCHOOLS

DATE: February 7, 2012

TO: **BOARD OF EDUCATION**

FROM: Dr. Joe A. Hairston, Superintendent

SUBJECT: **REPORT ON ENERGY CONSERVATION**

ORIGINATOR: Renee A. Foose, Deputy Superintendent

RESOURCE

PERSON(S): Michael G. Sines, Executive Director, Department of Physical Facilities

RECOMMENDATION

To apprise the Board of Education of the Baltimore County Public Schools' Energy Program.

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Attachment I – Executive Summary

Attachment II – PowerPoint

Baltimore County Public Schools

Department of Physical Facilities

Energy Program

Executive Summary

Baltimore County Public Schools (BCPS) has an active energy program whose mission is to continuously seek methods, procedures, processes, and technology to reduce energy costs and consumption while maintaining an environment conducive to high student achievement. The program supports systemwide goals as identified in the *Blueprint for Progress*

The presentation includes major energy commodities used in the school system and the factors which impact energy demand and energy consumption. In highlighting the increasing cost for energy, the report focuses on the energy conservation guidelines, strategies utilized by various offices to achieve energy efficiency, and the oversight provided to maintain and review the energy database. In the final segment of the presentation, statistics are included on total cost avoidance to date, program accomplishments, and a description of future initiatives including the challenges faced by BCPS.

BCPS has a successful energy program resulting in consistent energy consumption amid increasing demand while maintaining a process to manage volatility in energy commodity prices by minimizing the risk associated with it.



Baltimore County Public Schools

Department of Physical Facilities

Energy Program

February 7, 2012



Contents

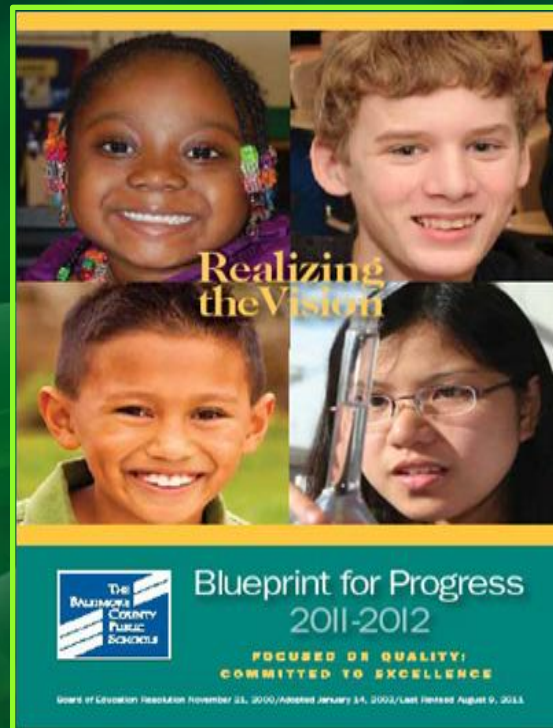


- System-wide goals and energy program mission
- Major energy commodities
- Factors increasing energy demand
- Impacts on energy demand
- Standardizing consumption data
- Consumption and cost comparison
- Energy conservation guidelines
- Strategies to achieve efficiency
- Energy data oversight
- Energy program accomplishments
- Cost avoidance totals since FY-07
- Future initiatives
- Challenges of the future
- Conclusion

Support System Wide Goals



- Improve achievement for all students
- Maintain safe and orderly learning environments
- Use resources effectively and efficiently



Energy Program



Mission Statement

Continuously seek methods, procedures, processes, and technology to reduce energy costs and consumption while maintaining an environment conducive to high student achievement

Major Energy Commodities

- Electricity
- Natural Gas
- Heating Oil



("Cash incentives and," 2011)

Electricity Data (FY-11)

- **Electricity** (Kilowatt - Hour) kWh = 1000 watts over 1 hour
 - Consumption – 190,000,000 (kWh)
 - Cost – \$20,000,000
 - Unit Cost – \$0.105 per (kWh)



("Featured articles: Contact ," 2011)

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("Featured articles: Contact ," 2011)

Natural Gas Data (FY-11)

- **Natural Gas** (Therm) 100,000 cubic feet
 - Consumption – 7,200,000 Therms
 - Cost – \$7,600,000
 - Unit Cost – \$1.05 per Therm



(Freedman, 2011)

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Heating Oil Data (FY-11)

- **Heating Oil** (Gallon)
 - Consumption – 505,000 Gallons
 - Cost – \$1,365,000
 - Unit Cost – \$2.70 per Gallon



(Crowley, 2011)

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Factors Increasing Energy Demand



- **Age of Facility**

- Baltimore County continues to have one of the largest and oldest inventories of school facilities in the state

- **Thermal Properties of Facilities**

- Inefficient window systems
- Inefficient roofing systems

- **Antiquated Mechanical Systems**

- Outdated HVAC controls
- Boilers, chillers, and air-distribution equipment

Impacts on Energy Demand

Overall Square Footage Increase *



* Includes all owned and leased square footage *

Impacts on Energy Demand

Increase in Air Conditioned Square Footage



Impacts on Energy Demand

Increase in After School Use of Facilities



Impacts on Energy Demand

Student Enrollment



Standardizing Consumption Data

- **Therm** – Metric of a commodity's energy content equal to 100,000 British Thermal Units (BTU's). Most commonly associated with natural gas
 - **Natural gas** – 100 cubic feet
 - **Electricity** – 29.3 Kilowatt hours (kWh)
 - **#2 Heating Oil** – 0.72 gallons
- **Total Therms** – Representation of total energy consumption by all commodities



("Meters," 2011)

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("Meters," 2011)

Consumption and Cost Comparison



	FY-04	FY-05	FY-06	FY-07	FY-08	FY-09	FY-10	FY-11
Therms <i>Millions</i>	14.1	13.9	13.6	13.7	13.9	13.9	13.4	14.4
Cost <i>Millions</i>	18.3	21.6	26.4	29.7	30.4	31.1	30.5	29.0
Unit Cost	\$1.29	\$1.55	\$1.94	\$2.16	\$2.18	\$2.23	\$2.28	\$2.01



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Energy Conservation Guidelines



- Turn off lights when not in use
- Encourage participation of students and staff
- Prohibit use of personal appliances unless authorized
- Maintain occupied heating temperatures between 68° – 70°F
- Maintain occupied cooling temperatures between 76° – 78°F
- Maintain unoccupied heating temperatures between 55° – 58°F
- Maintain unoccupied cooling temperatures between 82° – 86°F
- Maintain unoccupied HVAC settings on holidays and off hours
- Consider lifecycle costs in new equipment purchases
- Maintain domestic hot water temperature between 110° - 120°F

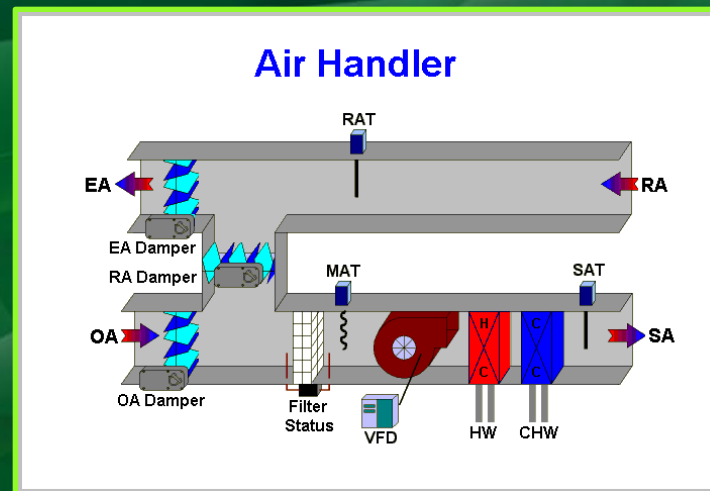
Strategies to Achieve Efficiency

- Engineering and Construction
- Maintenance and Grounds
- Operations
- Procurement and Deregulation



Strategies to Achieve Efficiency

- **Office of Engineering and Construction**
 - **State of the Art Technological Advances**
 - Building Automation Systems
 - Direct Digital Controls (DDC)
 - Monitor HVAC systems centrally
 - Comprehensive HVAC scheduling done centrally
 - Variable Frequency Drives
 - Reduce electric motor power consumption



("Air handler," 2011)

Strategies to Achieve Efficiency

- **Office of Engineering and Construction**
 - **State of the Art HVAC Equipment**
 - **Building Mechanical Systems**
 - Geothermal heating and cooling systems
 - Energy efficient chillers and boilers
 - Energy efficient air distribution systems



Strategies to Achieve Efficiency

- **Office of Engineering and Construction**
 - **Energy Efficient Lighting**
 - Energy efficient bulbs and fixtures
 - Indirect lighting / day-lighting



Strategies to Achieve Efficiency

- Office of Engineering and Construction
 - Building Envelope
 - Energy efficient window systems
 - Energy efficient roofing systems



Strategies to Achieve Efficiency

- **Office of Engineering and Construction**
 - **Leadership in Energy and Environmental Design (LEED)**
 - Internationally recognized third party verification that a building was designed using strategies that improve energy efficiency, water efficiency, reduces CO² emissions, and improves indoor environmental quality
 - **West Towson Elementary School**
 - **George Washington Carver Center for Arts and Technology**
 - **Dundalk / Sollers Point High Schools**



("LEED certified," 2011)

Strategies to Achieve Efficiency

- **Office of Maintenance and Grounds**
 - **Scheduled Maintenance**
 - Preventive Maintenance
 - Ensure equipment and systems operate at optimum efficiency
 - Identify potential problems at an early stage



Strategies to Achieve Efficiency



- **Office of Maintenance and Grounds**
 - **Scheduled Maintenance**
 - Preventive Maintenance
 - Ensure equipment and systems operate at optimum efficiency
 - Identify potential problems at an early stage
 - **Unscheduled Maintenance**
 - Conduct emergency repairs
 - Correct day-to-day breakdowns and failures
 - **Deferred Maintenance**
 - Postpone scheduled activities due to lack of resources

Strategies to Achieve Efficiency

- **Office of Operations**
 - **Preventive Maintenance**
 - Quarterly air filter maintenance
 - Lubrication of mechanical equipment
 - Evaluate and replace belts
 - **Identify and Report Deficiencies**
 - Unscheduled and emergency repairs
 - Thermally uncomfortable areas
 - Apply energy conservation guidelines



Strategies to Achieve Efficiency

- **Procurement and Deregulation**

- **Deregulation**

- Increased market competition
 - Purchased commodities on futures market
 - Managed risk and cost

- **Purchasing Cooperative**

- Baltimore Regional Cooperative Purchasing Committee (BRCPC)



("Featured articles: Contact ," 2011)



(Freedman, 2011)



(Crowley, 2011)

Energy Data Oversight

- Energy Database and Building Audits
- Invoice Review and Management
- Consulting Services
- Energy Data Management



("Scary graphs," 2010)

Energy Data Oversight

- **Energy Database → Building Audits**
 - Developed Energy Efficiency Index (EEI) for all facilities
 - Created priority list for audits based on EEI
 - Conducted comprehensive facility audits
 - Audited 77 buildings since FY-04
 - Audits reveal deficiencies in maintenance and operating practices, equipment out of calibration, and identify the need for repair and replacement
 - Identified low cost and no cost improvements
 - Recommended projects for Capital Improvement Plan, Aging School Program , and Qualified Zone Academy Bonds



("Energy audit," 2010)

Energy Data Oversight

- **Invoice Review and Management**
 - **Separate commodity and distribution accounts**
 - 328 electrical accounts
 - 206 natural gas accounts
 - 23 heating oil accounts
 - **Inconsistent billing periods**
 - **Invoices are reviewed for accuracy prior to payment**
 - **Significant variations in invoices prompts visits to facilities to quickly identify potential issues**



Energy Data Oversight

- **Consulting Services**

- **ENERNOC**

- BRCPC consultant
 - Peak Load Reduction program
 - 10 high schools and 1 middle school
 - \$123,228 received to date

- **CQI Associates**

- Data Analysis
 - BGE rebate program
 - \$397,790 commitment
 - \$47,183 received to date

- **Utilivision – Energy Watchdog[®]**

- Energy tracking software
 - Web-based utility management



("Generating income from," 2011)

Energy Data Oversight

- **Energy Data Management**
 - Consumption and Cost Analyzed Monthly
 - Consumption and Cost Projections Generated Monthly
 - Review of data and accounts resulted in adjustment of electric tariff schedule transferring several accounts to BRCPC and overcharges in water invoices resulted in combined cost avoidance over \$250,000
 - **Energy Watchdog[®]**
 - System-wide cost and consumption reports
 - Building specific cost and consumption reports



Energy Program Accomplishments

- Developed a comprehensive energy database
- Bulk purchase of electricity and natural gas through regional cooperative BRCPC
- Purchase of oil on futures market to manage risk and costs
- Implemented monthly energy cost projection system
- Baltimore County Public Schools has a program in place at all schools to manage energy and cost



("China to phase," 2011)

Energy Program Accomplishments

- Participation in BGE lighting retrofit programs for eligible accounts
- Participation in BGE SmartSavers program by incorporating energy efficient features in new construction
- Participation in Peak Load Reduction program incentives for electricity
- Consistent consumption trends since FY-04



("China to phase," 2011)

Cost Avoidance Totals Since FY-07

- **Commodity cost savings as a result of participation in BRCPC.....**\$14,196,994
- **Purchasing oil futures.....** \$400,000
- **Energy efficiency improvements of facilities.....** \$6,015,152



Cost Avoidance Totals Since FY-07

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- BGE Lighting retrofit program..... \$274,700
- Peak Load Reduction program..... \$123,228
- BGE SmartSavers program..... \$47,183

For a total cost avoidance of

\$21 Million

Future Initiatives

- Continue participation in BGE SmartSavers program
- Pursue BGE enhanced operations and maintenance incentive
- Focus efforts on energy efficient lighting
- Investigate / pursue emerging technologies
- Performance contracting
- Renewable energy sources

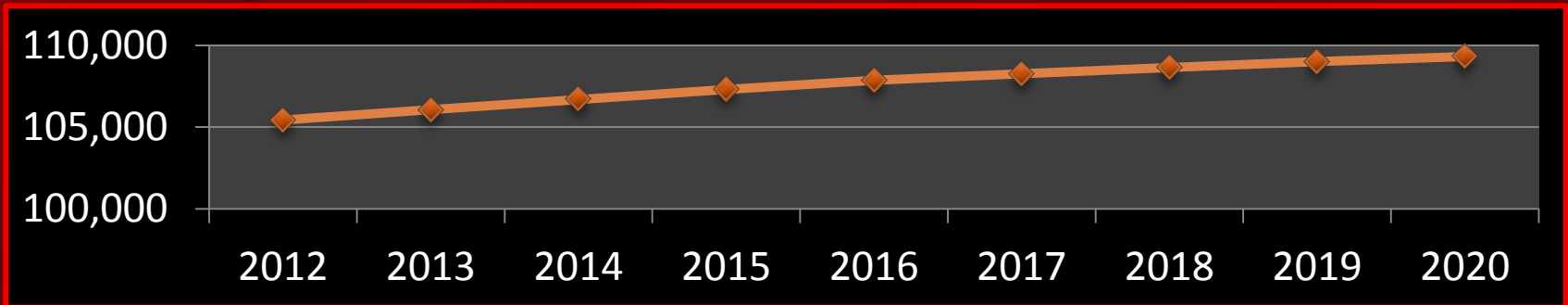


("Renewable energy education," 2011)

Challenges of the Future

Increasing Student Enrollment

Projected 3.6% increase 2012-2020

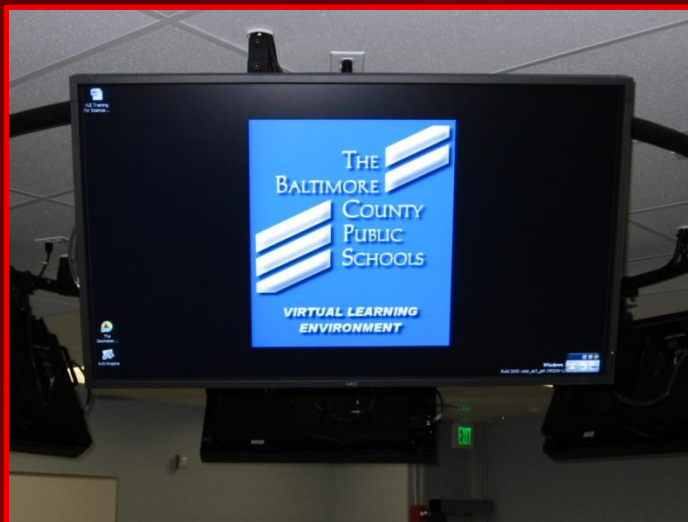


Challenges of the Future

- Increasing Student Enrollment
 - Projected 3.6% increase 2012-2020



- Educational Program Requirements



Challenges of the Future

Market Volatility



(Garrett, 2011)



("Market volatility," 2011)

After School Use of Facilities



(Yeo, 2009)



("How to coach," 2011)

Challenges of the Future



❖ Installation of Central Air Conditioning

❖ Projection based on current cost

Air-Conditioned

Non Air-Conditioned

School	SQ/FT	Cost		School	SQ/FT	Cost
Loch Raven HS	190,600	\$2.32		Pikesville HS	186,520	\$1.52
Towson HS	205,313	\$2.42		Overlea HS	203,505	\$1.53
Windsor Mill MS	116,645	\$2.25		Golden Ring MS	119,359	\$1.35
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❖ *\$0.76 average difference per Sq/Ft * 6.2 million square feet =*

\$4.7 Million

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Holabird MS	124,525	\$2.18		Middle River MS	125,410	\$1.48	\$0.70
Woodholme ES	82,837	\$2.04		Hawthorne ES	78,965	\$1.40	\$0.64
Powhatan ES	46,290	\$2.08		Colgate ES	48,100	\$1.43	\$0.65

❖ *\$0.76 average difference per Sq/Ft * 6.2 million square feet =*

\$4.7 Million - Annually

Conclusion

- Successful Energy Program
- Consistent Consumption amid Increased Demand
- Managed Cost
- Reduced Risk



References



- *Air handler* . (2011). [Web Photo]. Retrieved from <http://www.reedcontroltechnologies.com/AirHandler.bmp>
- *Cash incentives and financing* . (2011). [Web Photo]. Retrieved from <http://olsonandjones.com/services/home-performance/cash-incentives-and-financing/>
- *China to phase out energy-inefficient light bulbs* . (2011). [Web Photo]. Retrieved from <http://www.telegraph.co.uk/earth/environment/climatechange/8870407/China-to-phase-out-energy-inefficient-light-bulbs.html>
- Cottam, G. (2011). *Dealing with ranking fluctuations*. [Web Photo]. Retrieved from <http://www.phoenixrealm.com/dealing-with-ranking-fluctuations/>
- Crowley, E. (2011). *Greasing the drug war: Laundering money and black gold in mexico*. [Web Photo]. Retrieved from <http://www.financialtaskforce.org/2010/07/15/greasing-the-drug-war-laundering-money-and-'black-gold'-in-mexico/>
- *Energy audit* . (2010). [Web Photo]. Retrieved from <http://engineering.missouri.edu/imse/>
- *Featured articles: Contact* . (2011). [Web Photo]. Retrieved from <http://www.inrefco.com/>
- *Financing your business with accounts receivable factoring* . (2010). [Web Photo]. Retrieved from <http://www.hypercup.org/accounts-receivable-factoring-5712/>
- Freedman, J. (2011). *How does the next generation change the natural gas world*. [Web Photo]. Retrieved from <http://blogs.constellation.com/energy4business/tag/natural-gas-markets/>

References



- Garrett, J. (2011). *Dealer: Volatile energy markets adding 37 cents per gallon to price of heating oil*. [Web Photo]. Retrieved from <http://www.heatingoil.com/blog/dealer-volatile-energy-markets-adding-37-cents-per-gallon-to-price-of-heating-oil-0506/>
- *Generating income from your podcast*. (2011). [Web Photo]. Retrieved from <http://www.voices.com/podcasting/making-money.html>
- *How to coach youth basketball*. (2011). [Web Photo]. Retrieved from <http://www.howtocoachyouthbasketball.com/>
- *LEED certified*. (2011). [Web Photo]. Retrieved from <http://ccmcornerstone.com/>
- *Market volatility* . (2011). [Web Photo]. Retrieved from www.shutterstock.com
- *Meters*. (2011). [Web Photo]. Retrieved from <http://www.bge.com/myaccount/aboutservice/meters/Pages/default.aspx>
- *Renewable energy education set* . (2011). [Web Photo]. Retrieved from http://www.inds.co.uk/energy/renewable_set.htm
- *Scary graphs* . (2010). [Web Photo]. Retrieved from <http://www.hearye.org/2008/10/>
- Yeo, K. H. (Photographer). (2009). *Pta meeting*. [Web Photo]. Retrieved from <http://positivemen.blogspot.com/2009/03/pta-meeting.html>