ENERGY AUDIT – FINAL REPORT

MILLVILLE BOARD OF EDUCATION
WOOD SCHOOL

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CEG PROJECT NO. 9C09072

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Table of Contents

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I. EXECUTIVE SUMMARY

This report presents the findings of the energy audit conducted for:

Millville Board of Education
Wood School
700 Archer Street
Millville, NJ 08332

Municipal Contact Person: Toni Basich
Facility Contact Person: Esteban Garcia

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program. The energy audit is conducted to promote the mission of the office of Clean Energy, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs at this facility are as follows:

Electricity	$ 45,165
Natural Gas	$ 29,102
Total	$ 74,267

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that the ECM's and REM' are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	DDC Controls Upgrade	$160,000	$10,427	15.3	-2.2%
ECM #2	Premium Efficient Motor Replacement	$1,818	$95	19.1	-5.9%
ECM #3	Domestic Hot Water Heater Replacement	$7,872	$109	72.2	-83.4%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	42.78 KW PV System	$385,020	$27,843	13.8	80.8%

Notes: A. Cost takes into consideration applicable NJ Smart StartTM incentives.
B. Savings takes into consideration applicable maintenance savings.

The estimated demand and energy savings for each ECM and REM is shown below in Table 2. The descriptions in this table correspond to the ECM's and REM's listed in Table 1.

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	DDC Controls Upgrade	0.0	25788.0	2414.0
ECM #2	Premium Efficient Motor Replacement	0.2	661.0	0.0
ECM #3	Domestic Hot Water Heater Replacement	0.0	0.0	71.0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	42.78 KW PV System	0.0	56362.0	0.0

Although there are no ECM's that provide a payback of less than 10 years, it is recommended to proceed with the installation of a DDC system as suggested in ECM #1 (or equal) for the Wood School. Since there is no existing control system for the school, energy savings from this ECM would further the energy efficiency of the school.

CEG strongly advises the school district undergo a feasibility study to determine the possibility of replacing the HVAC system serving the Wood School. Discussion of replacing the system is scope the bounds of this energy audit and requires further study and modeling to determine the type of system that would most benefit the school. Many system design options are available, all will require major construction, time and capital cost.

In addition to the ECMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit. The ECMs listed above represent investments that can be made to the facility which are justified by the savings seen overtime. However, the maintenance items and small operational improvements below are typically achievable with on site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building:

1. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
2. Maintain all weather stripping on entrance doors.
3. Clean all light fixtures to maximize light output.
4. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

II. INTRODUCTION

The comprehensive energy audit covers the 40,000 square foot Millville Wood School, which includes the following spaces: classrooms, offices, library, kitchen, and cafeteria.

Electrical and natural gas utility information is collected and analyzed for one full year's energy use of the building. The utility information allows for analysis of the building's operational characteristics; calculate energy benchmarks for comparison to industry averages, estimated savings potential, and baseline usage/cost to monitor the effectiveness of implemented measures. A computer spreadsheet is used to calculate benchmarks and to graph utility information (see the utility profiles below).

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft^2/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

Existing building architectural and engineering drawings (where available) are utilized for additional background information. The building envelope, lighting systems, HVAC equipment, and controls information gathered from building drawings allow for a more accurate and detailed review of the building. The information is compared to the energy usage profiles developed from utility data. Through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc.

The preliminary audit information is gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is spent and opportunities exist within a facility. The entire site is surveyed to inventory the following to gain an understanding of how each facility operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Facility-specific equipment

The building site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

III. METHOD OF ANALYSIS

Post site visit work includes evaluation of the information gathered, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on HVAC, lighting and building envelope improvements. Data collected is processed using energy engineering calculations to anticipate energy usage for each of the proposed energy conservation measures (ECMs). The actual building's energy usage is entered directly from the utility bills provided by the owner. The anticipated energy usage is compared to the historical data to determine energy savings for the proposed ECMs.

It is pertinent to note, that the savings noted in this report are not additive. The savings for each recommendation is calculated as standalone energy conservation measures. Implementation of more than one ECM may in some cases affect the savings of each ECM. The savings may in some cases be relatively higher if an individual ECM is implemented in lieu of multiple recommended ECMs. For example implementing reduced operating schedules for inefficient lighting will result in a greater relative savings. Implementing reduced operating schedules for newly installed efficient lighting will result in a lower relative savings, because there is less energy to be saved. If multiple ECM's are recommended to be implemented, the combined savings is calculated and identified appropriately.

ECMs are determined by identifying the building's unique properties and deciphering the most beneficial energy saving measures available that meet the specific needs of the facility. The building construction type, function, operational schedule, existing conditions, and foreseen future plans are critical in the evaluation and final recommendations. Energy savings are calculated base on industry standard methods and engineering estimations. Energy consumption is calculated based on manufacturer's cataloged information when new equipment is proposed.

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment costs to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ Smart Start Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The costs and savings are applied and a simple payback, simple lifetime savings, and simple return on investment are calculated. See below for calculation methods:

ECM Calculation Equations:

$$Simple\ Payback = \left(\frac{Net\ Cost}{Yearly\ Savings} \right)$$

$$Simple\ Lifetime\ Savings = \left(Yearly\ Savings \times ECM\ Lifetime \right)$$

$$Simple\ Lifetime\ ROI = \frac{(Simple\ Lifetime\ Savings - Net\ Cost)}{Net\ Cost}$$

$$Lifetime\ Ma\,\mathrm{int}\,enance\ Savings = \left(Yearly\ Ma\,\mathrm{int}\,enance\ Savings \times ECM\ Lifetime \right)$$

$$Internal\ Rate\ of\ \mathrm{Re}\,turn = \sum_{n=0}^{N} \left(\frac{Cash\ Flow\ of\ Period}{(1 + IRR)^n} \right)$$

$$Net\ \mathrm{Pr}\,esent\ Value = \sum_{n=0}^{N} \left(\frac{Cash\ Flow\ of\ Period}{(1 + DR)^n} \right)$$

Net Present Value calculations based on Interest Rate of 3%.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner.

The electric usage profile represents the actual electrical usage for the facility. Atlantic City Electric provides electricity to the facility under their Basic Generation Service (BGS) rate structure. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile shows the actual natural gas energy usage for the facility. South Jersey Gas provides natural gas to the facility under the Basic Gas Supply Service (BGSS) rate structure. PEPCO Energy Services, Inc. is the third party supplier. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provided, the average cost for utilities at this facility is as follows:

Description	Average
Electricity	14.4¢ / kWh
Natural Gas	$1.54 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: Annual General Service (AGS)
Meter No: 28311458
Customer ID No: -
Third Party Utility -
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-09	29,040	83.2	$3,996
Feb-09	28,320	90.4	$4,027
Mar-09	25,520	82.4	$3,633
Apr-09	28,040	98.4	$3,420
May-09	30,560	114.4	$3,207
Jun-08	27,680	51.2	$4,429
Jul-08	15,120	56.0	$2,696
Aug-08	24,400	128.8	$4,283
Sep-08	28,560	92.8	$4,421
Oct-08	23,968	90.8	$3,556
Nov-08	24,440	90.8	$3,626
Dec-08	27,280	88.8	$3,872
Totals	**312,928**	**128.8 Max**	**$45,165**

AVERAGE DEMAND **89.0 KW average**
AVERAGE RATE **$0.144** **$/kWh**

Estimate Value, Utility Information Not Provided

Figure 1
Electricity Usage Profile

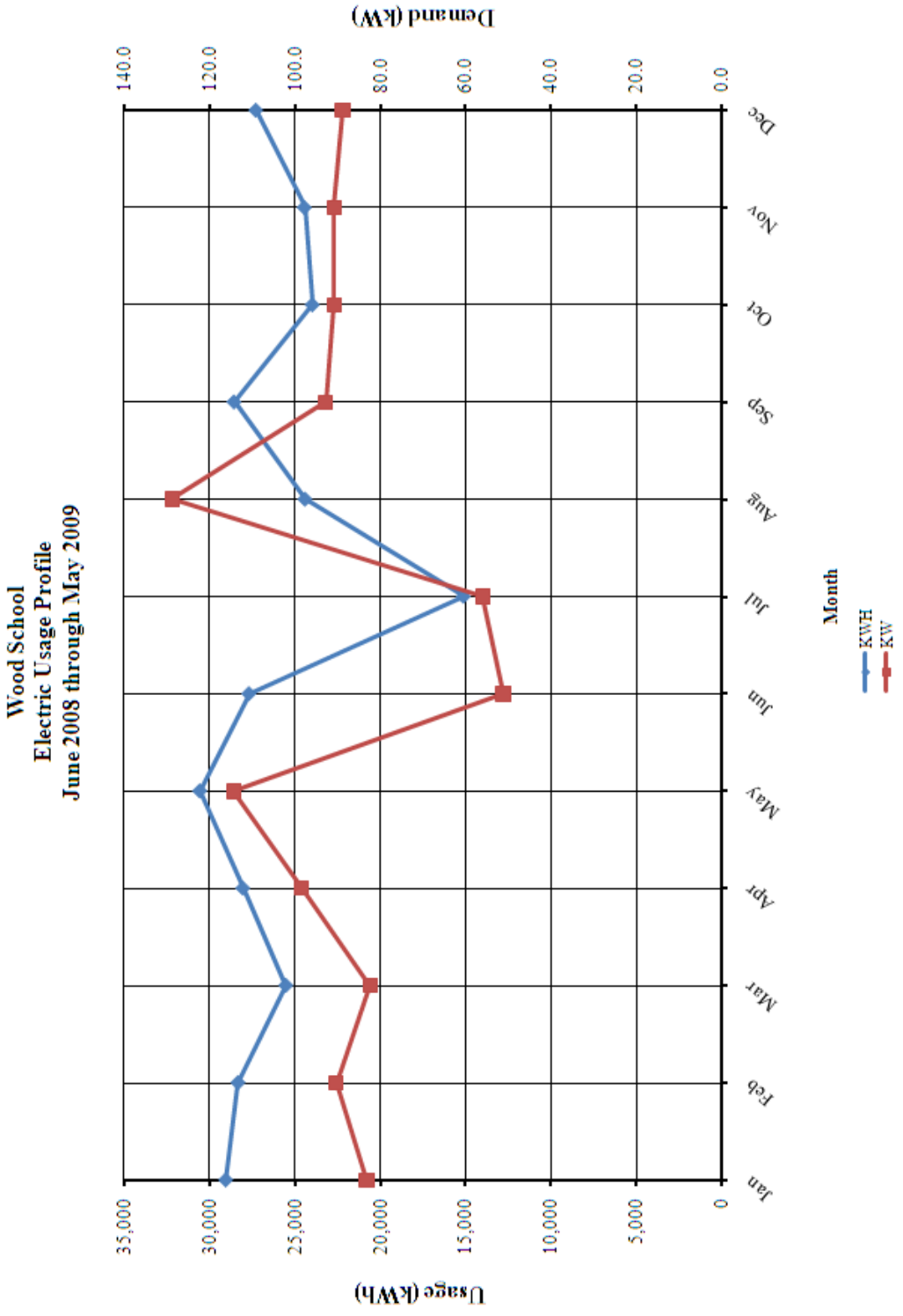
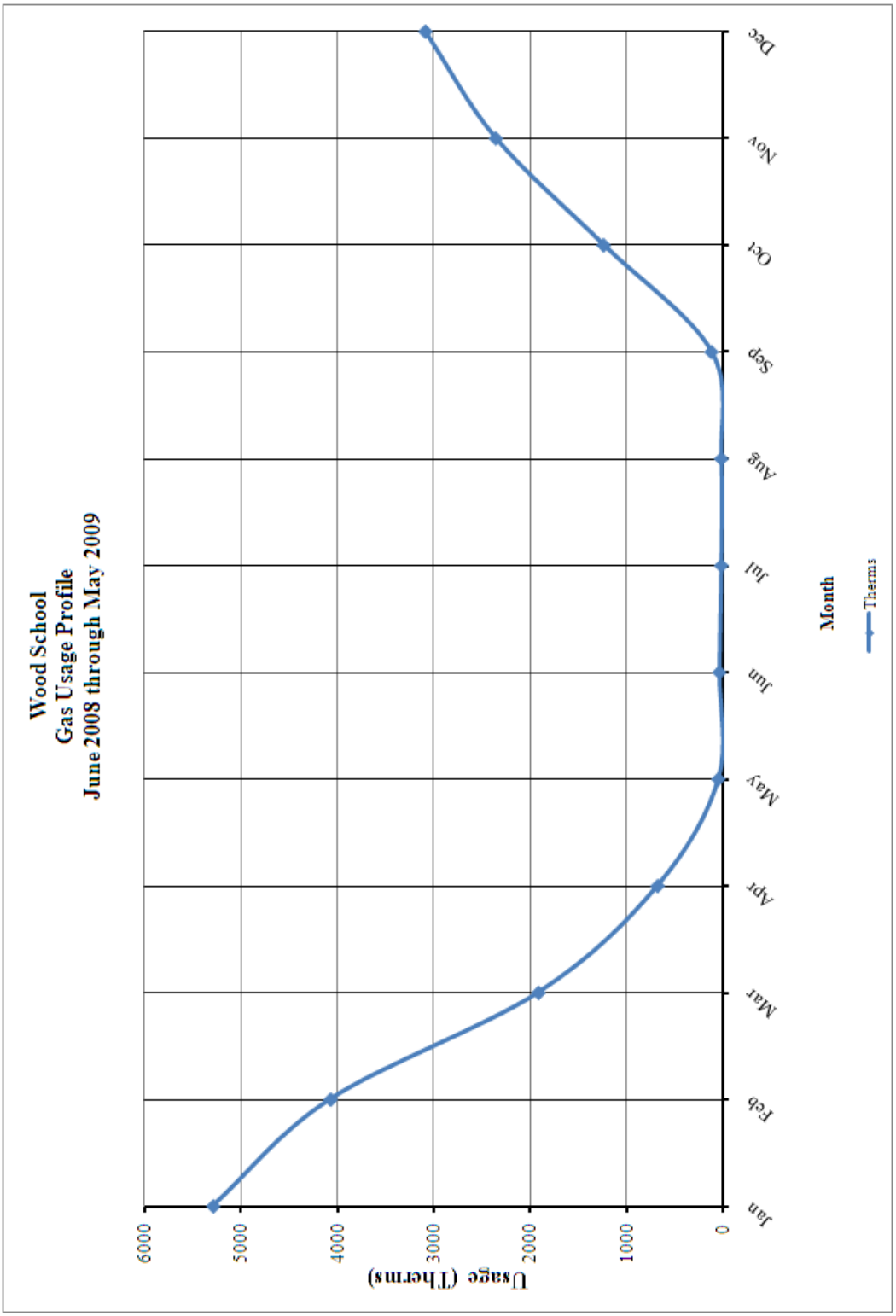


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	South Jersey Gas	
Rate:	BGSS	
Meter No:	341159	
Point of Delivery ID:	-	
Third Party Utility Provider:	PEPCO Energy Services Inc.	
TPS Meter No:	-	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Jan-09	5,293.96	$8,118.09
Feb-09	4,076.40	$6,399.34
Mar-09	1,917.66	$3,019.15
Apr-09	681.78	$1,092.47
May-09	51.75	$101.17
Jun-08	41.48	$101.61
Jul-08	20.64	$60.78
Aug-08	20.56	$54.53
Sep-08	124.32	$213.54
Oct-08	1,243.20	$1,606.03
Nov-08	2,362.08	$3,609.82
Dec-08	3,093.24	$4,726.01
TOTALS	**18,927.07**	**$29,102.54**
AVERAGE RATE:	**$1.54**	**$/THERM**

Estimate Value, Utility Information Not Provided

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (BTU) and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.

The site and source EUI for this facility is calculated as follows:

$$Building\ Site\ EUI = \frac{(Electric\ Usage\ in\ kBtu + Gas\ Usage\ in\ kBtu)}{Building\ Square\ Footage}$$

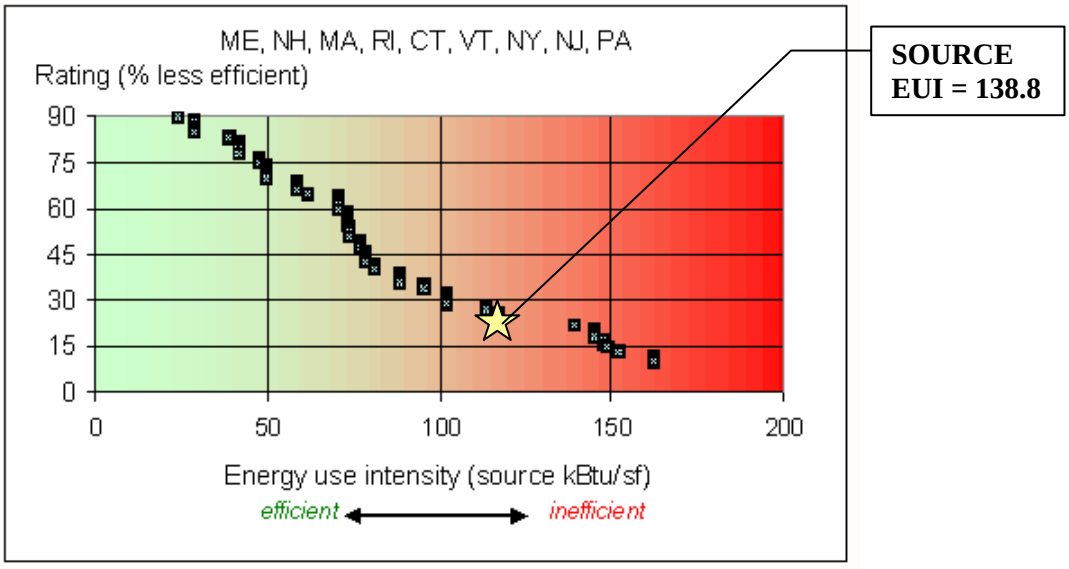
$$Building\ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ X\ SS\ Ratio + Gas\ Usage\ in\ kBtu\ X\ SS\ Ratio)}{Building\ Square\ Footage}$$

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	312928.0			1,068,336	3.340	3,568,243
NATURAL GAS		18927.1		1,892,707	1.047	1,981,664
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				2,961,043		5,549,907
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		40,000	SQUARE FEET			
BUILDING SITE EUI		*74.03*	kBtu/SF/YR			
BUILDING SOURCE EUI		*138.75*	kBtu/SF/YR			

Figure 3 below depicts a national EUI grading for the source use of *Elementary School*

Figure 3
Source Energy Use Intensity Distributions: Elementary School



C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the municipality to access and monitoring the facility's yearly energy usage as it compares to facilities of similar type. The login page for the account can be accessed at the following web address; the username and password are also listed below:

https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.login

User Name: millvilleboe
Password: lgeaceg2009

Security Question: What city were you born in?
Security Answer: "millville"

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

Table 6
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	**ENERGY PERFORMANCE RATING**	**NATIONAL AVERAGE**
Wood School	73	50

Refer to **Statement of Energy Performance Appendix** for the detailed energy summary.

V. FACILITY DESCRIPTION

The 40,000 SF Wood School is a four story facility comprised of classrooms, kitchen, multi-purpose room, administration/faculty offices, a library and computer labs. The typical hours of operation for this facility are between 9:00 am and 3:30 pm. Exterior walls are brick and block construction with minimum insulation typical of the time period. The total amount of insulation within the wall is unknown. The windows throughout the facility are in good condition and appear to be maintained. Typical windows throughout the facility are double pane, ¼" clear glass with wood frames. Integral blinds are utilized throughout the facility per occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat gain in the summer. The roof is a tar coating with a light gray stone covering. The amount of insulation below the roofing is unknown. The facility was built in 1915 with no additions since the original construction.

HVAC Systems

Heating is provided to all areas of the school via a large forced hot air distribution system that is original to the building. Four (4) American Heating & Ventilation, Co – Superfin Heaters equipped with Preferred Utilities natural gas burners supply heating air to the school. Furnaces are mounted side by side in pairs directly into the structure of the building. Each furnace is rated at approximately 2,355 MBH gross heating output, the actual heat delivered to the space is substantially less due to system inefficiently. Two (2) furnaces are assigned to each side of the school; each set of furnaces has one six-foot diameter propeller fan that blows 100% outdoor air across the furnaces heat exchanger then up to the classrooms. All areas of the school are heated in this fashion. This system is original to the initial construction of the school; no modifications have been made over then fan motor replacements and the conversion from coal to natural gas heating.

Air conditioning in all areas of the facility is provided by window air conditioning units. With exception to a few cases all units are 2-ton Frigidaire R-22 window units with an approximate efficiency of 9.4 EER.

HVAC System Controls

The HVAC system within the facility is controlled via a Honeywell control system. Pneumatic Honeywell thermostats are located throughout the facility, although there is no individual control of independent spaces. The entire system is either on or off; no control in between these two point is currently available in the current system design. Integral window air conditioning controls located on individual pieces of equipment are used to control the schools air conditioning systems.

Domestic Hot Water

Domestic hot water for the facility is provided by a 80 gallon Bradford White natural gas fired hot water heater, capacity of 200 MBH located in the furnace room. The domestic hot water piping insulation appeared to be in good condition.

Lighting

Typical lighting throughout the building is fluorescent tube lay-in fixtures with T-8 lamps and electronic ballasts. Storage rooms and closets are lit with a mixture of incandescent lamps and compact fluorescent lamps. A detailed list containing all building light fixtures can be found in the **Investment Grade Lighting Audit Appendix** of this report.

VI. MAJOR EQUIPMENT LIST

The equipment list is considered major energy consuming equipment and through energy conservation measures could yield substantial energy savings. The list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment in some cases if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Refer to the **Major Equipment List Appendix** for this facility.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Convert Pneumatic Controls to DDC

Description:

Throughout the building there are pneumatic manual wall thermostats for various HVAC units and local pneumatic controls with adjustable settings on the heating units. These indoor temperature controls are inaccurate due to temperature drift, age, cost of maintenance of pneumatics and not having been re-calibrated. These units also do not have night time setback features. In addition, the pneumatic controllers don't have the ability to maintain the temperature at setpoint under changing load conditions.

This energy conservation measure would replace the existing pneumatic temperature control system with a Direct Digital Control System. The Direct Digital Control System will consist of multiple controllers networked over an Ethernet system that will display data at a standard PC via a web browser to allow the School District remote control and monitoring of the HVAC equipment. The advantages of a DDC system include deleting the air compressor, air dryer, and controls along with the maintenance costs of pneumatic systems. With a DDC system, it is possible to develop historical records on the operating characteristics of a building; identifying trends which can lead to better performance.

Energy Savings Calculations:

Studies have shown that the installation of a full DDC system could save an estimated 10% of the total energy costs for this facility which is approximately $74,267.

Annual Savings = 10% x $74,267 = $7427.

Assuming one-half of the total energy savings is natural gas and the other half is electric savings, this equates to 25,788 kWh and 2,414 Therms saved. We have also assumed a maintenance savings of $3,000 per year for the pneumatic devices.

The cost of a full DDC system with new field devices, thermostats, controllers, computer, software, engineering, etc. is approximately $4 per SF based on recent project cost data and a control contractor's budget pricing. For this facility, the estimated cost of a DDC system for the facility is approximately $160,000 (based on 40,000 SF).

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$160,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$160,000
Maintenance Savings ($/Yr):	$3,000
Energy Savings ($/Yr):	$7,427
Total Yearly Savings ($/Yr):	$10,427
Estimated ECM Lifetime (Yr):	15
Simple Payback	15.3
Simple Lifetime ROI	-2.2%
Simple Lifetime Maintenance Savings	$45,000
Simple Lifetime Savings	$156,405
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($35,523.15)

ECM #2: Premium Efficient Motor Replacement

Description:

Replacing the hot water circulation pump motors with new NEMA premium efficient motors is a simple change that can provide substantial savings.

Existing electric motors equal to or greater than one horsepower ranged from 78 to 93% efficient. The improved efficiency of the NEMA premium efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95 % of its total lifetime operating cost. Because many motors operate 40-80 hours per week, even small increases in efficiency can yield substantial energy and dollar savings.

This energy conservation measure would replace all motors equal to or greater than 1 HP with NEMA Premium® Efficient Motors. NEMA Premium® is the most efficient motor designation in the marketplace today. Using MotorMaster+, Version 4, the energy & cost savings were calculated for the fan/pump motors in this facility that are greater than or equal to 1 HP.

Energy Savings Calculations:

The following calculation was used to calculate the efficiency increase for switching to a NEMA Premium® Efficient Motor.

1 HP = 0.746 kW
Load Factor = 75%
Annual Hours of Operations = 3,696(Average)
Cost of electricity = $0.144/ kWh

$$Motor\ \ Savings\ = \frac{(0.746\,kW\ /1HP)\times(Motor\ \ HP)\times(Load\ \ Factor\ )\times(Hrs\ \ of\ \ Operation\ )}{(New\ \ Motor\ \ Efficiency\ )}$$
$$- \frac{(0.746\,kW\ /1HP)\times(Motor\ \ HP)\times(Load\ \ Factor\ )\times(Hrs\ \ of\ \ Operation\ )}{(Old\ \ Motor\ \ Efficiency\ )}$$

NEMA Premium Efficient Motor Replacement						
Equipment Tag	**Motor HP**	**Existing Efficiency**	**NEMA Premium Efficiency**	**kW Savings**	**kWh Savings**	**Cost Savings**
HF-B01	7.5	88.5%	90.2%	0.09	330	$48
HF-B02	7.5	88.5%	90.2%	0.09	330	$48
Total Savings				**0.2**	**661**	**$95**

$$\text{Smart Start®}\ \textit{Incentive} = (\#\ 7.5\ \textit{HP Motors} \times\ \$\,81) = (2 \times \$\,81) = \$162$$

The total cost to install two (2) 7.5 HP motors is $1,980.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,980
NJ Smart Start Equipment Incentive ($):	$162
Net Installation Cost ($):	$1,818
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$95
Total Yearly Savings ($/Yr):	$95
Estimated ECM Lifetime (Yr):	18
Simple Payback	19.1
Simple Lifetime ROI	-5.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,710
Internal Rate of Return (IRR)	-1%
Net Present Value (NPV)	($511.42)

ECM #3: Domestic Water Heater Replacement

Description:

The existing Bradford White model 80T-199-3N with an 80 gallon tank, 199,999 BTUH input natural gas heater with 80% thermal efficiency and a nameplate recovery rate of 181.8 gallon per hour.

This energy conservation measure will replace each of the existing water heater with a 92% thermal efficient Bradford White model EF-60T-199E-3N gas fired domestic hot water heater having 199 MBH input and 60-gallon storage capacity or equivalent.

Energy Savings Calculations:

Existing Natural Gas DW Heater (WH1)
Rated Capacity = 199 MBH input; 80 gallons storage
Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Proposed Natural Gas-Fired, High-Efficiency DW Heater
Rated Capacity = 199 MBH input; 60 gallons storage
Thermal Efficiency = 92%
Radiation Losses = 0.5%
Net Efficiency = 91.5%

Operating Data for Domestic Water Heater

Estimate Natural Gas Usage is as follows:

Natural Gas Equipment List - Estimated Annual Usage per unit

Concord Engineering Group

Woods School

Manufacturer	Qty.	Model #	Serial #	Input (MBh)	% of Total Input	Estimated Annual Therms
American Heating	1	-	-	2355	24.48%	4,633.39
American Heating	1	-	-	2355	24.48%	4,633.39
American Heating	1	-	-	2355	24.48%	4,633.39
American Heating	1	-	-	2355	24.48%	4,633.39
Bradford White	**1**	**-**	-	**200**	**2.08%**	**393.49**
Total Input MBH				**9,620**	**1.00**	**18,927.07**
Total Input Therms				96.2		
Total Gas Consumption Therms / yr.				18927.07		

Energy Savings = Old Water Heater Energy Input x ((New Water Heater Efficiency – Old Water Heater) / New Water Heater Efficiency))

Energy Savings = 393.49 Therms x $\frac{91.5\% - 75\%}{(91.5\%)}$ = 71 Therms

Average Cost of Natural Gas = $1.54/Therm

Yearly Savings = 71 Therm x $1.54/ Therm = $109/year

Cost of one (1) Commercial Domestic Water Heater and Installation = $8,270

Smart Start Incentive = $2.00/MBh x (199) /installed MBh = $398.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,270
NJ Smart Start Equipment Incentive ($):	$398
Net Installation Cost ($):	$7,872
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$109
Total Yearly Savings ($/Yr):	$109
Estimated ECM Lifetime (Yr):	12
Simple Payback	72.2
Simple Lifetime ROI	-83.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,308
Internal Rate of Return (IRR)	-21%
Net Present Value (NPV)	($6,787.01)

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy technologies for the Millville Board of Education, to evaluate if there is any potential for solar or wind energy generation.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which can be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). Parking lots can also be utilized for the installation of a solar array. A truss system can be installed that is high enough to park a vehicle under the array, this way no parking lot area is lost. The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the facility and believes a roof mounted system is best suited. A depiction of the proposed area layouts is shown in **Renewable / Distributed Energy Measures Calculation, Appendix**. Based on measurements of the roof it was determined that a system size of 42.78 kilowatts could be installed. The total system has an estimated kilowatt hour production of 56,362 KWh annually, reducing the overall electric consumption by approximately 18%. A detailed financial analysis can be found in **Renewable / Distributed Energy Measures Calculation, Appendix**. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The proposed photovoltaic array layout is designed based on the specifications for the Sun Power SPR-230 panel. This panel has a "DC" rated full load output of 230 watts, and has a total panel conversion efficiency of 18%. Although panels rated at higher wattages are available through Sun Power and other various manufacturers, in general most manufacturers who produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the public entity if they wish to pursue the proposed solar recommendation without losing significant system capacity.

Estimated solar array generation was then calculated based on the National Renewable Energy Laboratory PVWatts Version 1.0 Calculator. In order to calculate the array generation an

appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%), mismatch factor (98%), diodes and connections (100%), dc and ac wiring(98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age(new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 81%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the Renewable/Distributed Energy Measures Calculation appendix.

The proposed solar array is qualified by the New Jersey Board of Public Utilities Net Metering Guidelines as a Class I Renewable Energy Source. These guidelines allow onsite customer generation using renewable energy sources such as solar and wind with a capacity of 2 megawatts (MW) or less. This limits a customer system design capacity to being a net user and not a net generator of electricity on an annual basis. Although these guidelines state that if a customer does net generate (produce more electricity than they use), the customer will be credited those kilowatt-hours generated to be carried over for future usage on a month to month basis. Then, on an annual basis if the customer is a net generator the customer will then be compensated by the utility the average annual PJM Grid LMP price per kilowatt-hour for the over generation. Due to the aforementioned legislation, the customer is at limited risk if they generate more than they use at times throughout the year. With the inefficiency of today's energy storage systems, such as batteries, the added cost of storage systems is not warranted and was not considered in the proposed design.

Direct purchase involves the BOE paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following is the payback period:

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM				
PAYMENT TYPE	**SIMPLE PAYBACK**	**SIMPLE ROI**	**NET PRESENT VALUE**	**INTERNAL RATE OF RETURN**
Direct Purchase	13.8 Years	80.8%	$364,224	5.7 %

*The solar energy measure is shown for reference in the executive summary REM table as REM#1.

Given the large amount of capital required by the BOE to invest in a solar system through a Direct Purchase CEG does not recommend the BOE pursue this route. It would be more advantageous for the BOE to solicit Power Purchase Agreement (PPA) Providers who will own, operate, and maintain the system for a period of 15 years. During this time the PPA Provider would sell all of the electric generated by Solar Arrays to the BOE at a reduced rate compared to their existing electric rate.

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the facility. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG's review of the applicability of wind energy for the facility found; the low average wind speed and proximity to residential neighborhoods make facility a poor candidate for wind energy production.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to the Electric and Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profiles.

Electricity:

This facility is comprised of classrooms, kitchen, multi-purpose room, administration/faculty offices, library and computer labs. The typical hours of operation for this facility are between 9:00 am and 3:30 pm. The facility was built in 1915 with no additions since the original construction.

The Electric Usage Profile demonstrates a fairly typical load consumption profile for a school. Schools typically close for the summer (May-July) and in this case the load profile demonstrates an extreme drop off of electric consumption. Consumption escalates late July and peaks in September. The profile becomes flat and fairly consistent thereafter continuing through June.
Air conditioning in all areas of the facility is provided by window air conditioning units. With exception to a few cases all units are 2-ton Frigidaire R-22 window units with an approximate efficiency of 9.4 EER.

This facility receives its electric delivery service via Atlantic City Electric (ACE) on an AGS rate schedule. This facility receives its electric commodity service from South Jersey Energy Company through the ACES agreement. A flat (base-load) shaping is important because it will yield more competitive pricing when shopping for alternative energy supply.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical heating load profile, with increasing consumption in the winter months (October – March) and a dramatic drop in consumption in the summer months (May – September). Heating is the obvious reason for the winter consumption and in this facility heating is provided to all areas of the school via large, forced hot air distribution systems that are original to the building. Four (4) American Heating & Ventilation, Co – Superfin Heaters equipped with Preferred Utilities natural gas burners supply heating air to the school. Furnaces are mounted side by side in pairs directly into the structure of the building. Each furnace is rated at approximately 2,355 MBH gross heating output, the actual heat delivered to the space is substantially less due to system inefficiency. Two (2) furnaces are assigned to each side of the school; each set of furnaces has one six-foot diameter propeller fan that blows 100% outdoor air across the furnaces heat exchanger then up to the classrooms. All areas of the school are heated in this fashion.

Domestic hot water for the facility is provided by an 80 gallon Bradford White natural gas fired hot water heater, capacity of 200 MBH located in the furnace room.

Natural gas delivery service in this facility is provided by South Jersey Gas Company on a GSG rate schedule. The natural gas commodity service is provided by PEPCO Energy Services through the ACES agreement. A flat load profile will always allow for the most competitive price available when shopping for alternative energy supplies.

Tariff Analysis:

Electricity:

This facility receives electrical delivery Service from Atlantic City Electric on an AGS Secondary (Annual General Service) utility rate. This rate is available at any point in the utility's system where facilities of adequate character and capacity exist for the entire electric service requirements of any customer contracting for annual service delivered at one point and metered at or compensated to the voltage of delivery. This delivery service includes the following charges: Delivery Service Charges, Distribution Demand Charges, Reactive Demand Charges, Distribution Rates, Non-Utility Generation Charges, Societal Benefits Charges, Regulatory Assets Recovery Charges, Transition Bond Charges, Market Transition Charge Tax, Transmission Demand Charge, Regional Greenhouse Gas Initiative Recovery Charge, and Infrastructure Investment Surcharge.

This facility receives electrical supply service through the ACES agreement (Alliance for Competitive Energy Services). ACES, is an alliance composed of the NJSBA and the NJASBO and is administered by Gable Associates. CEG believes that if the BOE wants to procure alternative energy, they must through the ACES agreement. CEG will make a recommendation that is counter to this agreement. The term of the ACES agreement is the first meter read date on or after April 30, 2009 until the last meter read date, May, 2011.

The ACES agreement provides for NJSBA to adopt a resolution for renewal for no more than a (5) consecutive year term. CEG will recommend against such a renewal and believes that a 5 – year term may not be allowed under local government law.

Natural Gas:

This facility is serviced by South Jersey Gas Company (SJG) on its firm delivery rate, General Service Gas (GSG) from the utility and BGSS (Basic Generation Supply Service) when not being served by a Third Party Supplier (TPS). Currently The BOE is procuring natural gas from a Third Party Supplier (TPS), PEPCO Energy Services. This Delivery Rate has the following charges: Customer Charge, Delivery Charge, BSC Volume Charge and Commodity Charge under this rate structure. The BGSS Supply rates are designed to recover SJG's cost of gas applicable to customers who purchase gas from SJG. The company earns no profit from BGSS. BGSS consists of two (2) pricing mechanisms: Residential and Commercial customers that use less than 5,000 therms annually and Commercial and Industrial customers that consume at least 5,000 therms annually.

Imbalances occur when Third Party Suppliers (TPS) are used to supply natural gas and full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. Note: It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used otherwise, imbalances can occur, jeopardizing economics and scheduling. If the supplier does not deliver they can be placed on a very costly rate. A customer can automatically be put on an alternative supply rate by the utility.

A "firm account" refers to the type of interstate pipeline service that the utility has subscribed for and delivered on behalf of the customer. Much like the telecom industry, the pipeline space (capacity) has been deregulated. The pipeline capacity is broken down into reliability of service. "Firm service" is the highest level of reliability and is the last, in pecking order, for interruption.
Recommendations:

CEG recommends a global approach that will be consistent with all facilities within the scope of this project. Therefore, CEG recommends aggregating all energy loads. CEG's observations are seen in both the electric and natural gas costs. The average "price to compare" per kWh (kilowatt hour) for all buildings is $.1058/ kWh (kWh is the common unit of electric measure). The average "price to compare" per decatherm for natural gas is $10.90 /dth (dth is the common unit of measure). These Weighted Average Prices are as supplied via Third Party Suppliers (TPS) for electricity (South Jersey Energy Company) and for natural gas (PEPCO Energy services), as administered through the ACES (Alliance for Competitive Energy Services) and the lead agency, The New Jersey School Boards Association, with administration from Gable Associates.

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The BOE could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on last year's historical consumption (January – December 2009) and current electric rates, the BOE could see an improvement of up to 15 % or up to $150,000 in its electric costs annually. (Note: Savings were calculated using an Average Annual Consumption of 9,776,921 kWh and an Average fixed one-year commodity contract). CEG recommends aggregating the entire electric load to gain the most optimal energy costs. CEG recommends that the BOE seek an energy advisor to maximize energy savings and to apply a "managed approach" to procuring energy. .

CEG's secondary recommendation coincides with the BOE's natural gas costs. Based on the current market, (which is very competitive), the BOE could see a savings of over 20% or up to $90,000 annually in its natural gas expenditures. Again, CEG recommends the use of any energy advisor to review alternative energy sourcing strategies and to install a "managed approach" to energy procurement.

CEG also recommends that The BOE not renew its energy supply contract with the ACES aggregation and PEPCO Energy Services, and the ACES agreement with South Jersey Energy and its fixed price contract. The fixed priced contract does not accomplish the needs of the BOE. The BOE needs budget protection and CEG has shown that these energy prices are not competitive to the market. The ACES agreement has demonstrated that the price is much above market and the BOE has no way of adjusting the price should prices fall.

CEG further recommends that the BOE create an energy program through a "managed approach." The "managed approach" will take into account creating an "energy budget" that is in line with the BOE's budget year and risk tolerance. Risk tolerance is the appetite that a customer has for risk. Based on the reduced state and local government budgets and the general aversion for risk, the local government is required to manage this risk.

CEG recommends the BOE schedule a meeting with their current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), they will learn more about the competitive supply process. They can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, the BOE should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if the BOE frequently changes its supplier for energy, CEG recommends it closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the facility owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and par for the costs using the value of energy savings that result from the improvements. The "Energy Savings Improvement Program (ESIP)" law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.

ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.

iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as "power purchase agreements." These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party's work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

XI. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Wood School

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	DDC Controls Upgrade	$160,000	$0	$0	$160,000	$7,427	$3,000	$10,427	15	$156,405	$45,000	-2.2%	15.3	-0.28%	($35,523.15)
ECM #2	Premium Efficient Motor Replacement	$1,980	$0	$162	$1,818	$95	$0	$95	18	$1,710	$0	-5.9%	19.1	-0.64%	($511.42)
ECM #3	Domestic Hot Water Heater Replacement	$8,270	$0	$398	$7,872	$109	$0	$109	12	$1,308	$0	-83.4%	72.2	-20.57%	($6,787.01)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	42.78 KW PV System	$385,020	$0	$0	$385,020	$8,116	$19,727	$27,843	25	$696,075	$493,175	80.8%	13.8	5.19%	$99,814.27

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

Water-Cooled Chillers	$12 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Gas Cooling

Gas Absorption Chillers	$185 - $400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per hp
Compressors	$5,250 to $12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters >50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 - $30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Wood School

Building ID: 1875047
For 12-month Period Ending: May 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: October 12, 2009

Facility
Wood School
700 Archer St.
Millville, NJ 08332

Facility Owner
Millville Board of Education
110 N. Third Street
Millville, NJ 08332

Primary Contact for this Facility
Toni Basich
110 N. Third Street
Millville, NJ 08332

Year Built: 1915
Gross Floor Area (ft²): 40,000

Energy Performance Rating[2] (1-100) 73

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,067,710
Natural Gas (kBtu)[4]	1,892,707
Total Energy (kBtu)	2,960,417

Energy Intensity[5]

Site (kBtu/ft²/yr)	74
Source (kBtu/ft²/yr)	139

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	263

Electric Distribution Utility
Atlantic City Electric Co

National Average Comparison

National Average Site EUI	93
National Average Source EUI	175
% Difference from National Average Source EUI	-21%
Building Type	K-12 School

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Raymond Johnson
520 South Burnt Mill Rd.
Voorhees, NJ 08332

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Wood School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	700 Archer St., Millville, NJ 08332	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Wood School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	40,000 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	No	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	85	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	1	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	N/A(Optional)	Is this school in operation for at least 8 months of the year?		☐

High School?	No	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.		

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Atlantic City Electric Co

Fuel Type: Electricity

Meter: Electric Meter (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
05/01/2009	05/31/2009	30,560.00
04/01/2009	04/30/2009	28,040.00
03/01/2009	03/31/2009	25,520.00
02/01/2009	02/28/2009	28,320.00
01/01/2009	01/31/2009	29,040.00
12/01/2008	12/31/2008	27,280.00
11/01/2008	11/30/2008	24,440.00
10/01/2008	10/31/2008	23,968.00
09/01/2008	09/30/2008	28,560.00
08/01/2008	08/31/2008	24,400.00
07/01/2008	07/31/2008	15,120.00
06/01/2008	06/30/2008	27,680.00
Electric Meter Consumption (kWh (thousand Watt-hours))		**312,928.00**
Electric Meter Consumption (kBtu (thousand Btu))		**1,067,710.34**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,067,710.34**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Natural Gas Meter (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
05/01/2009	05/31/2009	51.75
04/01/2009	04/30/2009	681.78
03/01/2009	03/31/2009	1,917.66
02/01/2009	02/28/2009	4,076.40
01/01/2009	01/31/2009	5,293.96
12/01/2008	12/31/2008	3,093.24
11/01/2008	11/30/2008	2,362.08
10/01/2008	10/31/2008	1,243.20
09/01/2008	09/30/2008	124.32
08/01/2008	08/31/2008	20.56

07/01/2008	07/31/2008	20.64
06/01/2008	06/30/2008	41.48
Natural Gas Meter Consumption (therms)		**18,927.07**
Natural Gas Meter Consumption (kBtu (thousand Btu))		**1,892,707.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**1,892,707.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Wood School
700 Archer St.
Millville, NJ 08332

Facility Owner
Millville Board of Education
110 N. Third Street
Millville, NJ 08332

Primary Contact for this Facility
Toni Basich
110 N. Third Street
Millville, NJ 08332

General Information

Wood School	
Gross Floor Area Excluding Parking: (ft^2)	40,000
Year Built	1915
For 12-month Evaluation Period Ending Date:	May 31, 2009

Facility Space Use Summary

Wood School	
Space Type	K-12 School
Gross Floor Area(ft^2)	40,000
Open Weekends?	No
Number of PCs	85
Number of walk-in refrigeration/freezer units	1
Presence of cooking facilities	Yes
Percent Cooled	100
Percent Heated	100
Months°	N/A
High School?	No
School District°	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 05/31/2009)	**Baseline** (Ending Date 05/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	73	73	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	74	74	73	N/A	93
Source (kBtu/ft^2)	139	139	137	N/A	175
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/$ft^2$/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	263	263	260	N/A	332
$kgCO_2e/ft^2$/year	7	7	7	N/A	9

More than 50% of your building is defined as K-12 School. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.

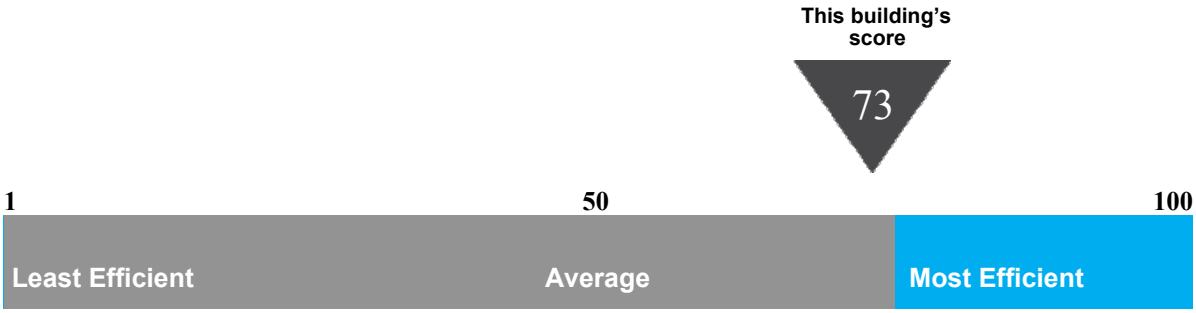
Statement of Energy Performance

2009

Wood School
700 Archer St.
Millville, NJ 08332

Portfolio Manager Building ID: 1875047

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 139 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending May 2009

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 10/12/2009

MAJOR EQUIPMENT LIST

Concord Engineering Group

"Millville B.O.E. - Wood School"

Furnace

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Furnace Room	NW Half of School	American Heating & Ventilating Co	1	1	-	-	2355	-	60%	Nat. Gas	94	35	-59
Furnace Room	NW Half of School	American Heating & Ventilating Co	1	2	-	-	2355	-	60%	Nat. Gas	94	35	-59
Furnace Room	SE Half of School	American Heating & Ventilating Co	1	3	-	-	2355	-	60%	Nat. Gas	94	35	-59
Furnace Room	SE Half of School	American Heating & Ventilating Co	1	4	-	-	2355	-	60%	Nat. Gas	94	35	-59

Furnace Burner

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	Input (MBh)	Max C.F.H.	Fuel	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Furnace Room	NW Half of School	Preferred Utilities	1	1	BP 16.5 3M4 RP 16.5 3M4	30211	2356	2279	Nat. Gas	208	3	60	17	21	4	Furnace Set #1
Furnace Room	NW Half of School	Preferred Utilities	1	2	BP 16.5 3M4 RP 16.5 3M4	30212	2356	2279	Nat. Gas	208	3	60	17	21	4	Furnace Set #1
Furnace Room	SE Half of School	Preferred Utilities	1	3	BP 16.5 3M4 RP 16.5 3M4	30213	2356	2279	Nat. Gas	208	3	60	17	21	4	Furnace Set #2
Furnace Room	SE Half of School	Preferred Utilities	1	4	BP 16.5 3M4 RP 16.5 3M4	30214	2356	2279	Nat. Gas	208	3	60	17	21	4	Furnace Set #2

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Equipment Tag	Model #	Serial #	Input (Btu)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Furnace Room	Entire School	Bradford White	1	-	80T-199-3N	JL0631542	199,999	181.8	80	80%	Nat. Gas	17	12	-5

Supply Fans

Location	Area Served	Manufacturer	Qty	Equipment Tag	Model #	Serial #	CFM	Motor HP	RPM	NEMA Motor Eff	Fan Type	Fan Diameter (ft)	Frame Size	Amp	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Furnace Room	Furnace Set #1		1	HF-B01	-	-	-	7.5	1165	-	Axial	6	254T	20.6/10.3	230/460	3	60	94	15	-79
Furnace Room	Furnace Set #2		1	HF-B02	-	-	-	7.5	1165	-	Axial	6	254T	20.6/10.3	230/460	3	60	94	15	-79

Window Air Conditioning Units

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Various	Various	Frigidaire	13	-	FAM156R1A	-	15000 Btu	10.7 EER	R-22	115	1	60	3	10	7
Various	Various	Gibson	12	-	-	-	12000 Btu	9.5 EER	R-22	115	1	60	8	10	2
Various	Various	GE	1	-	ASV05LKS1	-	5050 Btu	9.7	R-22	115	1	60	8	10	2

INVESTMENT GRADE LIGHTING AUDIT

CEG Job #: 9C09072
Project: Millville B.O.E.
Address: 700 Archer St.
Millville, NJ 08332
Building SF: 40,000

"Millville - Wood School"

KWH COST: $0.144

EXISTING LIGHTINC										PROPOSED LIGHTING								SAVINGS			
Line #	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1	Furnace Room	3750	5	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.29	1,087.5	$156.60	0	0	No Change Required (NCR)	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2	Furnace Room #1	3750	2	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.12	435.0	$62.64	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3	Furnace Room #2	3750	2	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.12	435.0	$62.64	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
4	Ramp	3750	1	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.06	217.5	$31.32	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
5	Cafeteria	3750	25	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	1.45	5,437.5	$783.00	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
6	Café. - Stage	3750	5	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.55	2,043.8	$294.30	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
7	Café. - Stage	3750	3	1	1-Lamp, RC 150W	150	0.45	1,687.5	$243.00	3	1	40 W CFL Lamp	40	0.12	450	$64.80	$15.00	$45.00	0.33	1237.5	$178.20	0.25
8	19	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
9	19	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
10	Corridor	3750	7	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.76	2,861.3	$412.02	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
11	Boys Bathroom	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
12	Boys Bathroom	3750	1	1	12' Round, 1-Lamp, 32W	28	0.03	105.0	$15.12	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
13	Girls Bathroom	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
14	Girls Bathroom	3750	1	1	12" Round, 1-Lamp, 32W	28	0.03	105.0	$15.12	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

15	Office	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
16	Room 15	3750	8	2	1' x 4', Gibson AC, 2-Lamp, T8 32W, Pendant Ballast, Direct/Indirect Lens	58	0.46	1,740.0	$250.56	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
17	22	3750	14	2	1' x 4', Gibson AC, 2-Lamp, T8 32W, Pendant Ballast, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
18	22 Closet	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
19	Corridor	3750	8	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.87	3,270.0	$470.88	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
20	Teachers Dining	3750	3	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.33	1,226.3	$176.58	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
21	Teachers Bathroom	3750	1	1	1-Lamp, RC 60W	60	0.06	225.0	$32.40	1	1	18 W CFL Lamp	18	0.02	67.5	$9.72	$10.00	$10.00	0.04	157.5	$22.68	0.44
22	Kitchen	3750	12	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.31	4,905.0	$706.32	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
23	Kitchen Office	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
24	Kitchen Storage Room	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
25	20	3750	10	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.58	2,175.0	$313.20	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
26	Stairs	3750	1	1	12" Round 1-Lamp, T8 32W, Electronic Ballast, Surface Mount	28	0.03	105.0	$15.12	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
27	Stairs	3750	4	4	4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$235.44	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
28	Corridor	3750	15	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.64	6,131.3	$882.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
29	9	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
30	9 Coat Closet	3750	1	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

31	9 Bathroom	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
32	8	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
33	8 Bathroom	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$31.32	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
34	8 Coat Closet	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$31.32	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
35	7	3750	6	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.35	1,305.0	$187.92	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
36	7 Bathroom	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$31.32	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
37	7 Bathroom	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$31.32	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
38	6	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
39	6 Coat Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
40	5	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
41	5 Coat Closet	3750	2	4	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.12	435.0	$62.64	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
42	4	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
43	4 Coat Closet	3750	2	4	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.12	435.0	$62.64	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
44	Library	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

45	Library Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
46	2	3750	12	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	109	1.31	4,905.0	$706.32	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
47	2 Coat Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
48	Nurse	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
49	Nurse's Bathroom	3750	2	2	2' x 2', U Lamp, 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	73	0.15	547.5	$78.84	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
50	Guidance Counselor	3750	4	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.23	870.0	$125.28	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
51	Office	3750	3	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.33	1,226.3	$176.58	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
52	Principal	3750	3	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.33	1,226.3	$176.58	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
53	Work Room	3750	3	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.17	652.5	$93.96	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
54	Office Bathroom	3750	1	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
55	Office Bathroom	3750	1	2	2' x 2', U Tube, 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	73	0.07	273.8	$39.42	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
56	18	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
57	18 Coat Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
58	17	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

59	17 Coat Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
60	16	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
61	16 Coat Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
62	Boys Bathroom	3750	1	1	12" Round, 1-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	28	0.03	105.0	$15.12	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
63	Boys Bathroom	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
64	15	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
65	15 Coat Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
66	14	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
67	14 Coat Closet	3750	1	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
68	13	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
69	13 Coat Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
70	12	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
71	12 ? Room	3750	1	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.11	408.8	$58.86	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
72	Girls Bathroom	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

73	Girls Bathroom	3750	1	1	12" Round, 1-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	28	0.03	105.0	$15.12	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
74	Teachers Bathroom	3750	1	1	12" Round, 1-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	28	0.03	105.0	$15.12	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
75	11	3750	14	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.81	3,045.0	$438.48	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
76	11 Coat Closet	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
77	10	3750	16	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.93	3,480.0	$501.12	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
78	10 Coat Closet	3750	2	4	4-Lamp, T8 32W, Surface Mount, Prismatic Lens	109	0.22	817.5	$117.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
79	Teachers ? Room	3750	4	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Direct/Indirect Lens	58	0.23	870.0	$125.28	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
80	Corridor	3750	15	4	2' x 4', 4-Lamp, T8 32W, Recessed Mount, Prismatic Lens	109	1.64	6,131.3	$882.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		459	226			33.29	124,848.8	$17,978.22	4	2			0.138	517.5	$74.52		$55.00	0.37	1395.0	$200.88	0.27

Project Name: **Millville BOE - Wood School**
Location: **Millville, NJ 08332**
Description: **Photovoltaic System - Direct Purchase**

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$385,020
Annual kWh Production	56,362
Annual Energy Cost Reduction	$8,116
Annual SREC Revenue	$19,727
First Cost Premium	**$385,020**
Simple Payback:	**13.83** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.144**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	$385,020	0	0	0	$0	(385,020)	0
1	$0	56,362	$8,116	$0	$19,727	$27,843	($357,177)
2	$0	56,080	$8,360	$0	$19,628	$27,988	($329,189)
3	$0	55,800	$8,610	$0	$19,530	$28,140	($301,049)
4	$0	55,521	$8,869	$0	$19,432	$28,301	($272,748)
5	$0	55,243	$9,135	$569	$19,335	$27,901	($244,847)
6	$0	54,967	$9,409	$566	$19,238	$28,081	($216,766)
7	$0	54,692	$9,691	$563	$19,142	$28,270	($188,496)
8	$0	54,419	$9,982	$561	$19,047	$28,468	($160,028)
9	$0	54,147	$10,281	$558	$18,951	$28,675	($131,353)
10	$0	53,876	$10,590	$555	$18,857	$28,891	($102,462)
11	$0	53,606	$10,907	$552	$18,762	$29,118	($73,345)
12	$0	53,338	$11,235	$549	$18,668	$29,354	($43,991)
13	$0	53,072	$11,572	$547	$18,575	$29,600	($14,391)
14	$0	52,806	$11,919	$544	$18,482	$29,857	$15,466
15	$0	52,542	$12,276	$541	$18,390	$30,125	$45,591
16	$0	52,280	$12,645	$538	$18,298	$30,404	$75,995
17	$0	52,018	$13,024	$536	$18,206	$30,695	$106,690
18	$0	51,758	$13,415	$533	$18,115	$30,997	$137,687
19	$0	51,499	$13,817	$530	$18,025	$31,311	$168,998
20	$0	51,242	$14,232	$528	$17,935	$31,639	$200,637
21	$1	50,986	$14,659	$525	$17,845	$31,978	$232,615
22	$2	50,731	$15,098	$523	$17,756	$32,332	$264,947
23	$3	50,477	$15,551	$520	$17,667	$32,698	$297,645
24	$4	50,225	$16,018	$517	$17,579	$33,079	$330,725
25	$5	49,974	$16,498	$515	$17,491	$33,474	$364,199
	Totals:	1,075,269	$218,083	$8,771	$376,344	$749,219	$585,657
				Net Present Value (NPV)		**$364,224**	
				Internal Rate of Return (IRR)		**5.7%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Wood School	3025	Sunpower SPR230	186	14.7	2,735	42.78	56,362	6,138	15.64

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	42.8 kW
DC to AC Derate Factor:	0.810
AC Rating:	34.7 kW
Array Type:	Fixed Tilt
Array Tilt:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	14.4 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	3.61	4032	580.61
2	4.20	4198	604.51
3	4.78	5065	729.36
4	5.23	5202	749.09
5	5.44	5461	786.38
6	5.48	5111	735.98
7	5.55	5284	760.90
8	5.41	5207	749.81
9	5.23	4983	717.55
10	4.60	4660	671.04
11	3.59	3702	533.09
12	3.17	3456	497.66
Year	4.69	56362	8116.13

.= Proposed PV Layout

Notes:

1. Estimated kWH based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.