ENERGY AUDIT – FINAL REPORT

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BACON SCHOOL

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I. EXECUTIVE SUMMARY

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

Millville Board of Education
Bacon School
501 South Third St.
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	$43,518
Natural Gas	$31,351
Total	$74,869

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	Lighting Controls	$6,860	$1,102	6.2	141.0%
ECM #2	DDC Controls System Upgrade	$59,880	$1,763	34.0	-55.8%
ECM #3	Premium Efficient Motor Replacement	$2,534	$204	12.4	61.0%
ECM #4	Programmable Thermostats	$7,200	$5,040	1.4	950.0%
ECM #5	AC Upgrade	$253,464	$4,590	55.2	-63.8%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Photovoltaic Panel Installation	$254,610	$18,375	13.9	8.3%

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	Lighting Controls	2.1	7710.0	0.0
ECM #2	DDC Controls System Upgrade	0.0	0.0	1160.0
ECM #3	Premium Efficient Motor Replacement	0.4	1426.0	0.0
ECM #4	Programmable Thermostats	0.0	0.0	3315.0
ECM #5	AC Upgrade	17.8	32100.0	0.0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	Photovoltaic Panel Installation	28.3	37271.0	0.0

Concord Engineering Group (CEG) recommends proceeding with the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The following Energy Conservation Measures are recommended for the facility:

- **ECM #1:** Lighting Controls
- **ECM #4:** Programmable Thermostats

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 37,500 square foot Bacon School, which includes the following spaces: classrooms, gymnasium, cafeteria and administration offices.

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 General 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 Natural Gas provides the natural gas to the facility under the Basic General Supply Service (BGSS) rate structures. 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 third party commodity provider PEPCO Energy Service, Co is responsible for providing the commodities of Natural Gas to the Board of Education. Commodity and delivery is billed separately for each respective utility service.

Description	Average
Electricity	14.3¢ / kWh
Natural Gas	$1.52 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: Annual General Service (AGS)
Meter No: 84534323
Customer ID No: -
Third Party Utility -
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-09	30,480	77.6	$4,095
Feb-09	30,320	75.2	$4,129
Mar-09	28,320	76.8	$3,933
Apr-09	27,640	91.2	$3,381
May-09	26,960	105.6	$2,829
Jun-08	20,880	117.6	$3,732
Jul-08	16,400	53.6	$2,892
Aug-08	14,480	101.6	$2,710
Sep-08	27,040	116.8	$4,429
Oct-08	26,160	96.0	$3,597
Nov-08	29,440	77.6	$4,007
Dec-08	26,880	76.8	$3,783
Totals	**305,000**	**117.6 Max**	**$43,518**

AVERAGE DEMAND **88.9 KW average**

AVERAGE RATE **$0.143** **$/kWh**

Estimate Value, Utility Information Not Provided

Figure 1
Electricity Usage Profile

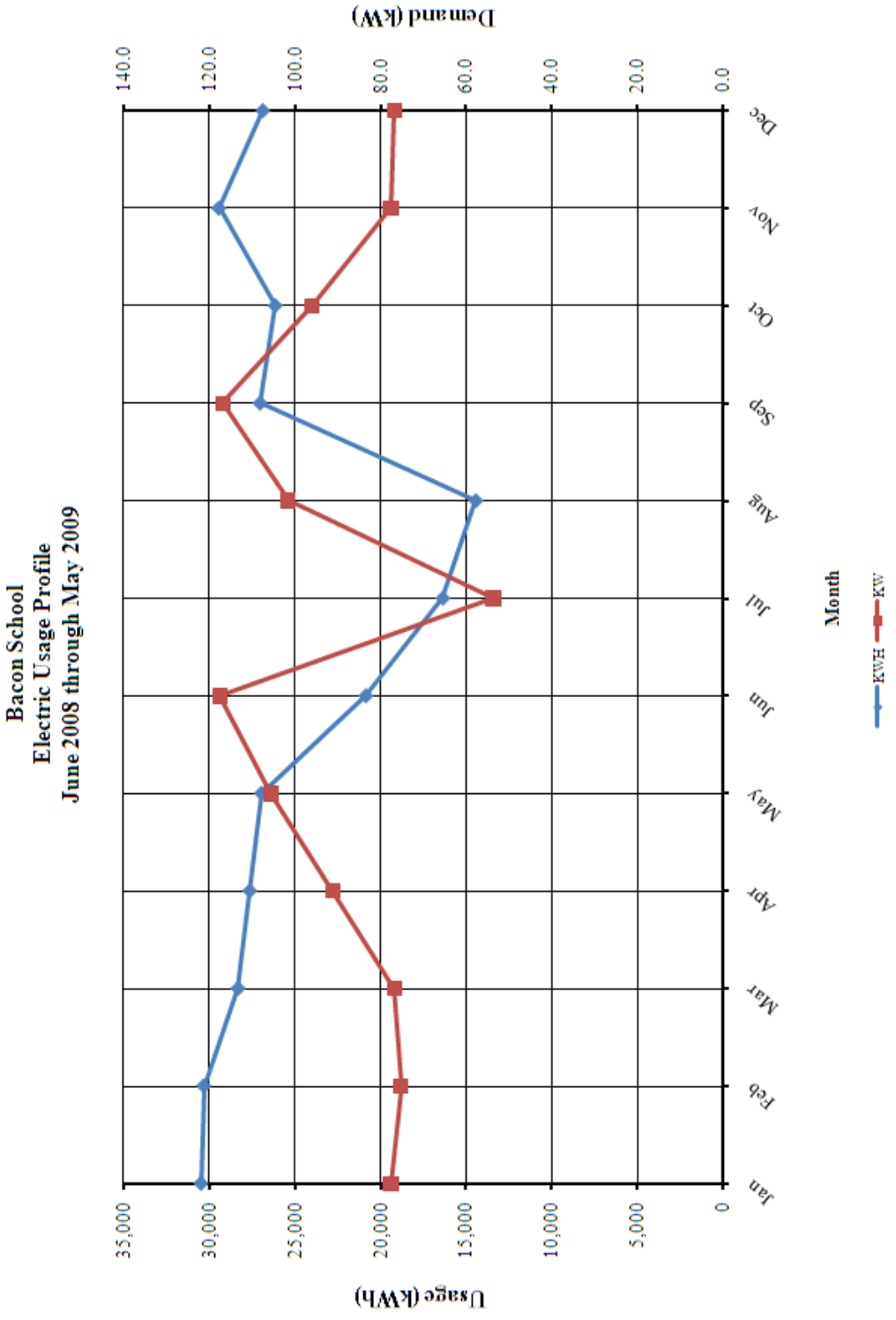
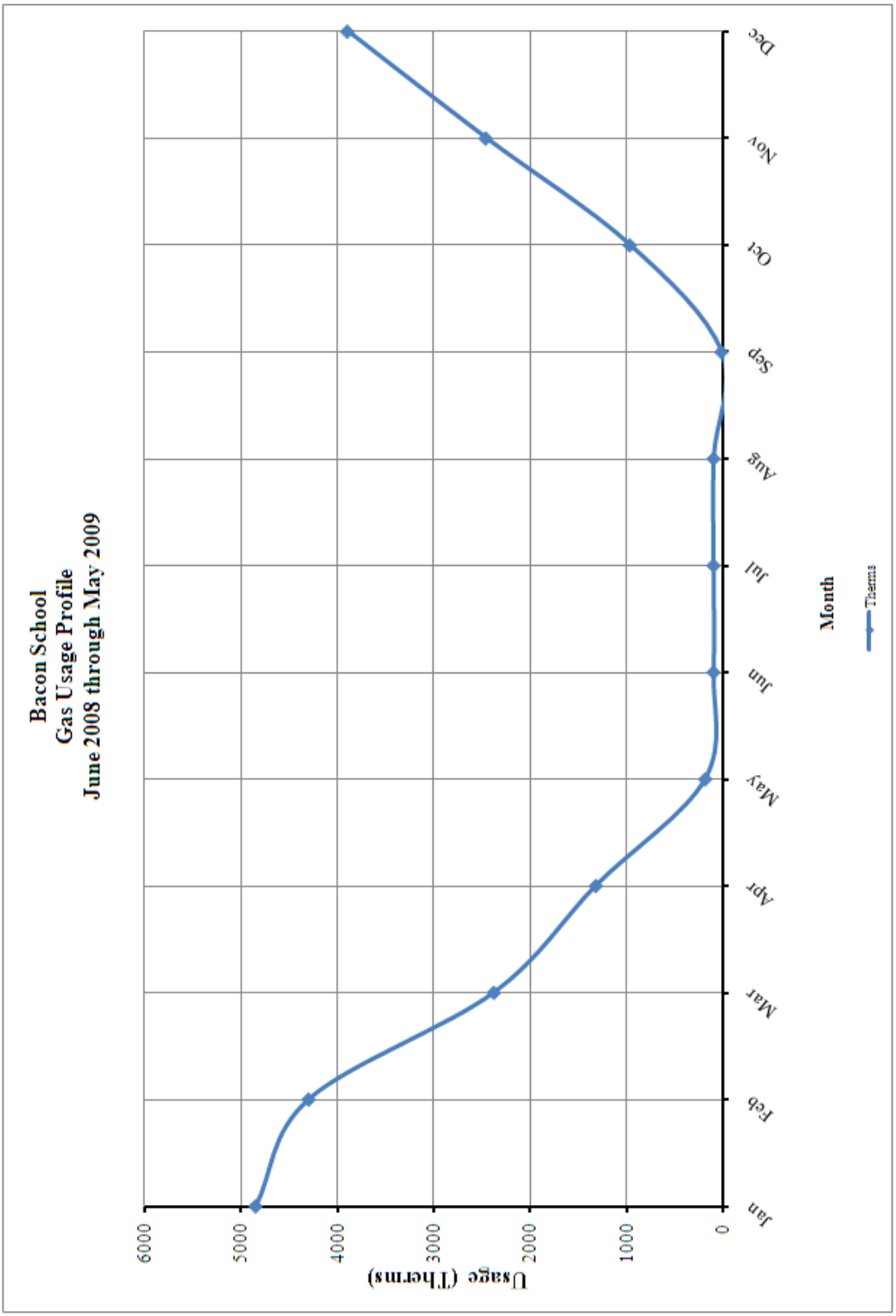


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	South Jersey Gas	
Rate:	BGSS	
Meter No:	254887	
Point of Delivery ID:	-	
Third Party Utility Provider:	PEPCO Energy Services Inc.	
TPS Meter No:	-	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Jan-09	4,850.00	$7,231.31
Feb-09	4,300.00	$6,559.40
Mar-09	2,376.00	$3,632.18
Apr-09	1,318.00	$2,039.19
May-09	181.00	$295.71
Jun-08	96.00	$200.03
Jul-08	96.00	$215.19
Aug-08	95.00	$172.01
Sep-08	13.90	$230.90
Oct-08	966.00	$1,363.58
Nov-08	2,462.00	$3,644.89
Dec-08	3,898.00	$5,766.21
TOTALS	**20,651.90**	**$31,350.60**
AVERAGE RATE:	**$1.52**	**$/THERM**

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:

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

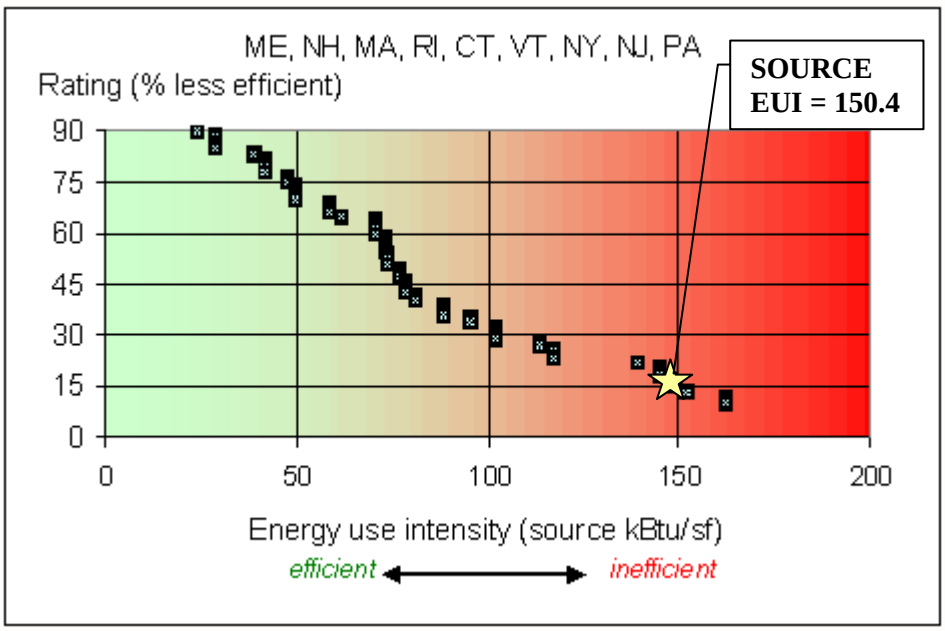
$$Building\ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ X\ SS\ Ratio + Gas\ Usage\ in\ kBtu\ X\ SS\ Ratio)}{Building\ Square\ Footage}$$

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	305000.0			1,041,270	3.340	3,477,842
NATURAL GAS		20651.9		2,065,190	1.047	2,162,254
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				3,106,460		5,640,096
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		37,500	SQUARE FEET			
BUILDING SITE EUI		*82.84*	kBtu/SF/YR			
BUILDING SOURCE EUI		*150.40*	kBtu/SF/YR			

Figure 3 below depicts a national EUI grading for the source use of Elementary Schools.

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**
Bacon School	66	50

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

V. FACILITY DESCRIPTION

The 37,500 SF Bacon School is a three story facility comprised of classrooms, cafeteria, 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 4:00 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. Blinds are utilized through 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 of typical built up rubber construction with light gray stone covering. The amount of insulation below the roofing is unknown. The building was built in 1929 with no additions since the original construction.

HVAC Systems

A hot water heating plant exists in the basement of the school that satisfies the buildings heating requirements. The plant is comprised of two (2) HB Smith, 450 Mills, 12 section hot water boilers with a gross heating output of 2,487 MBH per each for a hot water system. The boilers are 1989 vintage and have served twenty (20) years of their estimated thirty-five year (35) service life. Hot water sectional boilers were the bread and butter design for decades, due to outstanding reliability and ease of operation, although inefficient according to today's standards. Hot water is distributed through the building via seven (7) end-suction pumps ranging in size from two (2) too five (5) Horse Power.

Standard AAF unit ventilators equipped with hot water coils satisfy space heating and ventilation requirements. The multi-purpose room is conditioned by two (2) large air handling units mounted above the stage ceiling. These units are equipped with hot water coils and are heating only units.

Air conditioning in all areas of the facility with exception of the administration area 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 efficiency of 9.4 EER.

The office administration area is conditioned by an above ceiling mounted, cooling only air handling unit by the Trane Company. The packaged unit includes a DX cooling coil to provide conditioned air to the space. A remote one (1) ton condensing unit is located on grade outside the exterior of the office. Conditioned air is distributed to office through ductwork to ceiling diffusers. Standard wall mounted hot water heating coils provided heat to the space.

Entrance doorways are conditioned via hot water cabinet heaters.

HVAC System Controls

The HVAC system within the facility is controlled via a Honeywell control system. The Honeywell Company monitors and controls the system from a central plant offsite. All building equipment utilizes electronic controls, only the boiler remains under pneumatic control. During the survey it was noted that only one central temperature sensor exists. This design over heats the upper floor and under heats the lower floor when the central floor is satisfied.

Domestic Hot Water

Domestic hot water for the facility is provided by a 100 gallon Bradford White natural gas fired hot water heater, capacity of 200 MBH. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The circulation pump is controlled by an aqua stat. The domestic hot water piping insulation appeared to be in good condition.

Lighting

Typical lighting throughout the building is fluorescent tube lay-in and surface mount fixtures with T-8 lamps and electronic ballasts. Storage rooms and closets lit with a mixture of incandescent lamps and compact fluorescent lamps. All incandescent lamps located throughout the facility should be replaced with their compact fluorescent equivalent. 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: Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights on when the room is first occupied. This is common in storage rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas. Photocell control senses light levels and turn off or reduce lights when there is adequate daylight. Photocells are mostly used outside, but are becoming more popular in energy-efficient interior lighting designs as well.

ASHRAE Standard 90.1-2004, Appendix G is a reference standard for modeling building efficiency. The standard estimates that lighting controls provide a 10% reduction in lighting power usage for daytime occupancies in buildings over 5,000 SF, and 15% reduction in buildings under 5,000 SF. This ECM implements dual technology occupancy sensors in classrooms (that are not already controlled), offices, private study rooms and storage areas.

The ECM includes replacement of standard wall switches with sensors wall switches for individual rooms, ceiling mount sensors for large areas or restrooms. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent.

The "Investment Grade Lighting Audit" appendix of this indicates which areas of the facility would benefit from lighting control. The calculations adjust the lighting power usage by 10% for all areas that include occupancy sensor lighting controls.

Energy Savings Calculations:

$$Energy\ Savings = 10\% \times Occuapancy\ Sensored\ Light\ Energy\ \left(kWh/Yr\right)$$

$$Energy\ Savings = 10\% \times 77{,}065\ \left(kWh\right) = 7{,}710\ \left(kWh\right)$$

$$Savings. = Energy\ Savings\ (kWh) \times Ave\ Elec\ Cost\left(\frac{\$}{kWh}\right)$$

$$Savings. = 7{,}710\ (kWh) \times 0.143\left(\frac{\$}{kWh}\right) = \$1{,}102$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is $160/unit including material and labor.

$$Installation\ Cost = (\#\ of\ \ sensors \times\ \ \$\ \ per\ sensor) = (49 \times \$160) = \underline{\$\ 7{,}840}$$

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the incentive for installing a lighting control is $20 per controller.

$$\text{Smart Start®}\ \ Incentive = (\#\ of\ \ controller \times\ \ \$\ 20) = (49 \times \$\ 20) = \underline{\$980}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,840
NJ Smart Start Equipment Incentive ($):	$980
Net Installation Cost ($):	$6,860
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,102
Total Yearly Savings ($/Yr):	$1,102
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.2
Simple Lifetime ROI	141.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$16,530
Internal Rate of Return (IRR)	14%
Net Present Value (NPV)	$6,295.60

ECM #2: DDC Control System Upgrade

Description:

The HVAC systems within the school are controlled by a Honeywell control system that is monitored off site. It was noted, after discussion with the building manager that only one temperature sensor exists, in the core of the facility. This design causes over conditioning of the upper floors and under conditioning of the lower floor when the core is satisfied. Classrooms throughout the building are outfitted with standard pneumatic thermostats that operate the equipment within the set points. The thermostats do not utilize programmability such as night set back, or morning warm-up features. Modern thermostats and control systems have the capability of saving significant energy as well as improved occupant comfort. This control system will maintain an even temperature through the facility.

This ECM recommends expanding the Building Automation System through Direct Digital Controls (DDC) to the heating and ventilating equipment serving the gymnasium and cafeteria (heating only). The front end device will provide communication between the devices as well as the main boiler plant. The system will respond to the overall classroom's needs and operating schedules as defined by the building operator. The DDC system will provide features such as space averaging, temperature override control, night set-back, morning warm-up mode, etc.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings are based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Energy Management and Control System Savings - 5%-15%.

Energy savings achieved for "Energy Management and Control Systems," average 5%-15%. Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total HVAC energy cost for the facility.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $4.00 per SF (per recent contractor pricing.) Savings from the implementation of this ECM will be achieved through reduced fuel consumption from reduced heating energy as well as reduced electric consumption from reduced air conditioning energy. The gymnasium and cafeteria are approximately 14,970 SF.

Cost of complete DDC System = ($4.00/SF x 14,970 SF) = $59,880.

Heating Assumptions:

Total Classroom Heating Capacity ($H_{L)}$ = (748.5 MBH)
(Estimated 50 Btu/SF)

Average Unit Efficiency = 65% for Sectional Boilers
Average Cost of Electricity = $0.143/kWh
Average Cost of Gas = $1.52/Therm

Energy Savings Calculations:

Heating Savings Calculations

$$Heating\ Energy\ Used = \frac{H_L \times HDD \times Hrs}{\Delta t \times Eff \times V}$$

Where:

HDD = number of Heating Degree Days as Specified Base Temperature
(Warm Air $HDD_{65^\circ F}$ = 4,604, Millville, NJ Airport)

Hrs = Hours per Day

Δt = Design temperature difference, º F (Warm Air = 70 º F)

Eff = Efficiency of Energy Utilization (Existing NG Boiler = 0.85)

V = Heating value of fuel, BTU/Therm (Natural Gas = 100,000 Btu = 1 Therm)

Estimated Energy Consumption of Blower Coils:

$$Electric\ Heating\ Energy\ Used = \frac{(748{,}500\,Btu/h) \times (4{,}604^\circ F) \times 16.5h}{70^\circ F \times 70\%} = 1{,}160{,}419{,}408\ Btu/Year$$

Electric Energy Used = 1,160,419,408 Btu/Year x 1Therm/100,000 Btuh = 11,604 Therm/Year

$$Savings. = Heating\ Input(Therm) \times 10\%\ Savings \times Ave\ Cost(\$/Therm)$$

$$Savings. = 11{,}604\,(Therm) \times 10\% \times \$1.52\,(\$/Therm) = \$1{,}763$$

There are currently no Smart Start® *Incentives* available for a demand control ventilation system.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$59,880
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$59,880
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,763
Total Yearly Savings ($/Yr):	$1,763
Estimated ECM Lifetime (Yr):	15
Simple Payback	34.0
Simple Lifetime ROI	-55.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$26,445
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($38,833.42)

ECM #3: 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:

Existing: A 2 HP hot water circulation pump motor with the following characteristics:
Existing Motor Efficiency = 82.5%
Annual Hours of Operations = 3,696(Average)
1 HP = 0.746 kW
Load Factor = 75%
Cost of electricity = $0.143/ kWh

Existing 2 HP Motor Operating Cost =
{0.746 kW/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency
= [0.746 kW x 2 HP x 75% x 3,696 hrs x $0.143] ÷ 82.5% = $717 / Year

New NEMA Premium Motor Efficiency = 86.5%

New NEMA Premium Efficiency 5HP Motor Operating Cost =
= [0.746 kW x 2 HP x 75% x 3,696 hrs x $0.143] ÷ 86.5% = $683 / Year

Savings = $717 - $683 = $34 / Year x 4 (2 HP) motors = $136 / Year

Existing: A 3 HP system circulation pump motor with the following characteristics:
Existing Motor Efficiency = 86.5%
Annual Hours of Operations = 3,696(Average)
1 HP = 0.746 kW
Load Factor = 75%
Cost of electricity = $0.143/ kWh

Existing 3 HP Motor Operating Cost =

{0.746 kW/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency
= [0.746 kW x 3 HP x 75% x 3,696 hrs x $0.143] ÷ 86.5% = $1,025 / Year

New NEMA Premium Motor Efficiency = 89.5%

New NEMA Premium Efficiency 5HP Motor Operating Cost =
= [0.746 kW x 3 HP x 75% x 3,696 hrs x $0.143] ÷ 89.5% = $991 / Year

Savings = $1,025 - $991 = $34 / Year x 2 (3 HP) motors = $68 / Year

Total Annual Savings = $136 + $68 = $204

kWh saved = $204 / $0.143/kWh = 1,426 kWh

kW saved = 1,426 kWh / 3,696 hrs./yr. = 0.4 kW

$$\text{Smart Start®}\ \textit{Incentive} = (\#\ 2\ \textit{HP Motors} \times\ \$\ 54) = (4 \times \$\ 54) = \$216$$

$$\text{Smart Start®}\ \textit{Incentive} = (\#\ 3\ \textit{HP Motors} \times\ \$\ 54) = (2 \times \$\ 54) = \$108$$

Total Smart Start Incentive = $216 + $108 = $324

The total cost to install four (4) 2 HP motors and two (2) 3 HP motors is $2,858.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,858
NJ Smart Start Equipment Incentive ($):	$324
Net Installation Cost ($):	$2,534
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$204
Total Yearly Savings ($/Yr):	$204
Estimated ECM Lifetime (Yr):	20
Simple Payback	12.4
Simple Lifetime ROI	61.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,080
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$501.00

ECM #4: Programmable Thermostat

Description:

Typical operating hours of the school are from 9:00 AM to 4:00 PM Monday through Friday, with minimum weekend operation.

Throughout the building there are standard, manual wall thermostats for various HVAC units that provide local control with adjustable settings for the conditioning equipment. These aged, indoor temperature controls are inaccurate due to temperature drift, age, and not having been re-calibrated. These thermostats also do not have unoccupied setback features.

New programmable thermostats are available that utilize programming schedules for occupied and unoccupied times and can be set to vary space temperature at these respective times. This control system approach is ideal for facilities that do not vary in day to day operation.

This energy conservation measure would replace the various HVAC unit thermostats with programmable 7-day thermostats with night time setback control. The recommended thermostat set points for heating are as follows:

Occupied Heating =	70° F
Unoccupied Heating =	60° F

CEG recommends replacement of the twenty four (24) existing remote thermostats that control the AAF hot water unit ventilators with Honeywell RTH7500D 7-day programmable thermostat or equivalent.

Energy Savings Calculations:

The energy savings of a 7-day programmable thermostat was calculated by using Energy Star Life Cycle Cost Estimate software for qualified programmable thermostats. The referenced calculator can be found at www.energystar.gov.

Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and the U.S. Department of Energy.
www.energystar.gov

CHANGE FOR THE BETTER WITH ENERGY STAR

Life Cycle Cost Estimate for 1 ENERGY STAR Qualified Programmable Thermostat(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

Number of Units	1
Initial Cost per ENERGY STAR Unit (retail price)	$92
Initial Cost per Conventional Unit (retail price)	$73
Unit Fuel Cost (Cooling) ($/kWh)	$0.143
Unit Fuel Cost (Heating) ($/Therm)	$1.52

City: NJ-Atlantic City

24 Hour Typical Usage Patterns*

	Weekday	Weekend
Nighttime Set-Back/Set-Up Hours	15	24
Daytime Set-Back/Set-Up Hours	0	0
Hours without Set-Back/Set-Up	9	0

Heating Season*

Typical Indoor Temperature w/o Set-Back	70
Nighttime Set-Back Temperature (Average)	60
Daytime Set-Back Temperature (Average)	70
Heating System Type	Gas Boiler

Cooling Season*

Typical Indoor Temperature w/o Set-Up	78
Nighttime Set-Up Temperature (Average)	82
Daytime Set-Up Temperature (Average)	85
Cooling System Type	None

Annual and Life Cycle Costs and Savings for 1 Programmable Thermostat(s)

	1 ENERGY STAR Unit(s)	1 Conventional Unit(s)	Savings with ENERGY STAR
Annual Energy Costs			
Heating Energy Cost	$745	$954	$210
Heating Energy Consumption (MBTU)	*49*	*63*	*14*
Cooling Energy Cost	$0	$0	$0
Cooling Energy Consumption (MBTU)	*0.0*	*0.0*	*0*
Total	$745	$954	$210

Calculated energy savings for heating = $210/Unit x 24 units = $5,040

Cost of a 7-day programmable thermostat (installed) = $300/unit x 24 units = $7,200

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,200
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$7,200
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$5,040
Total Yearly Savings ($/Yr):	$5,040
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.4
Simple Lifetime ROI	950.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$75,600
Internal Rate of Return (IRR)	70%
Net Present Value (NPV)	$52,967.19

ECM #5: AC Upgrade

Description:

The classrooms are conditioned by standard AAF Units ventilators and window air conditioning units. Each classroom has an approximate 30 MBh hot water heating coil and 2-Ton DX cooling capacity. The unit ventilators were installed approximately twenty (20) years ago and have reached their expected service life.

This ECM involves the replacement of the existing unit ventilators with new Trane unit ventilators equipped with hot water heating coil and DX cooling coil and remote condensing unit or equivalent. The DX cool will be attached to a remote condensing unit located on the exterior of the building. Utility savings will only be seen on the cooling side of the equipment, heating side efficiencies will remain the same.

Energy Savings Calculations:

Cooling Assumptions:

Total Classroom Cooling Capacity (24 Classrooms @ 2 Ton/classroom)	= 48 Tons
Average Unit Efficiency	= 9.4 EER = 10.7 SEER
New Unit Efficiency	= 16 SEER
Average Cost of Electricity	= \$0.143/kWh

Cooling Savings Calculation:

$$EnergySavings = \frac{Cooling(Tons) \times 12{,}000\left(\frac{Btu}{Ton\ hr}\right)}{1000\left(\frac{Wh}{kWh}\right)} \times \left(\frac{1}{SEER_{OLD}} - \frac{1}{SEER_{NEW}}\right) \times Cooling\ \ Hrs.$$

$$EnergySavings = \frac{48\,(Tons) \times 12{,}000\left(\frac{Btu}{Ton\ hr}\right)}{1000\left(\frac{Wh}{kWh}\right)} \times \left(\frac{1}{10.7\left(\frac{Btu}{W}\right)} - \frac{1}{16\left(\frac{Btu}{W}\right)}\right) \times 1{,}800\ hours$$

$$= \underline{32{,}100\ kWh}$$

$$Demand\ \ Savings = \frac{Energy\ \ Savings\ (kWh)}{Hrs\ of\ \ Cooling}$$

$$Demand\ Savings = \frac{32{,}100\ (kWh)}{1{,}800\ Hrs.} = \underline{17.8\ kW}$$

Total Energy Cost Savings = 32,100 kWh x $0.143/kWh = $4,590 per year

$$\text{Smart Start®}\ Incentive = (Number\ of\ Tons \times\ \$\ 92/Ton) = (48 \times \$\ 92) = \underline{\$4{,}416}$$

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$257,880
NJ Smart Start Equipment Incentive ($):	$4,416
Net Installation Cost ($):	$253,464
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$4,590
Total Yearly Savings ($/Yr):	$4,590
Estimated ECM Lifetime (Yr):	20
Simple Payback	55.2
Simple Lifetime ROI	-63.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$91,800
Internal Rate of Return (IRR)	-8%
Net Present Value (NPV)	($185,176.39)

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 28.29 kilowatts could be installed. The total system has an estimated kilowatt hour production of 37,271 KWh annually, reducing the overall electric consumption by approximately 12%. 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	13.86 Years	7.2%	$239,499	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, cafeteria, kitchen, multi-purpose room, administration/faculty offices a library and computer labs. The typical hours of operation for this facility are 9:00 a.m. to 4:00 p.m. No additions have been observed.

The Electric Usage Profile demonstrates a typical load consumption profile for a school. Schools typically close for the summer (May-August) and in this case the load profile demonstrates the drop off of electric consumption. Consumption is elevated, but very consistent throughout the balance of the year. The cooling in this facility is provided by window air conditioning units. The office administration area is an exception and is cooled by a ceiling mounted, cooling only air handling unit by Trane. This packaged unit includes a DX cooling coil. One remote condenser is located outside. 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 supplied via a hot water heating plant in the basement. The plant consists of (2) HB Smith, 12 section hot water boilers. Unit ventilators with hot water coils satisfy space heating. The multi-purpose room is conditioned by (2) air handling units. The units are equipped with hot water coils and are heating only units.

Natural gas prices will be higher in the winter period as they are related to heating demand and the increase in use during this time. The office administration area has standard hot water heating coils to heat this space. The entrance doorways are heated by hot water cabinet heaters. Domestic hot water in this facility is provided by a 100 gallon Bradford White natural gas-fired hot water heater. 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

Millville Board of Education - Bacon School

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
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 #1	Lighting Controls	$3,920	$3,920	$980	$6,860	$1,102	$0	$1,102	15	$16,530	$0	141.0%	6.2	13.73%	$6,295.60
ECM #2	DDC Controls System Upgrade	$39,920	$19,960	$0	$59,880	$1,763	$0	$1,763	15	$26,445	$0	-55.8%	34.0	-8.82%	($38,833.42)
ECM #3	Premium Efficient Motor Replacement	$1,429	$1,429	$324	$2,534	$204	$0	$204	20	$4,080	$0	61.0%	12.4	5.04%	$501.00
ECM #4	Programmable Thermostats	$2,400	$4,800	$0	$7,200	$5,040	$0	$5,040	15	$75,600	$0	950.0%	1.4	69.98%	$52,967.19
ECM #5	AC Upgrade	$185,880	$72,000	$4,416	$253,464	$4,590	$0	$4,590	20	$91,800	$0	-63.8%	55.2	-8.19%	($185,176.39)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Photovoltaic Panel Installation	$127,305	$127,305	$0	$254,610	$5,330	$13,045	$18,375	15	$275,625	$195,675	8.3%	13.9	1.01%	($35,250.44)

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
Bacon School

Building ID: 1872436
For 12-month Period Ending: May 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 07, 2009

Facility
Bacon School
501 S. Third 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: 1929
Gross Floor Area (ft²): 37,500

Energy Performance Rating[2] (1-100) 66

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,040,660
Natural Gas (kBtu)[4]	2,065,190
Total Energy (kBtu)	3,105,850

Energy Intensity[5]

Site (kBtu/ft²/yr)	83
Source (kBtu/ft²/yr)	150

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	268

Electric Distribution Utility
Atlantic City Electric Co

National Average Comparison

National Average Site EUI	96
National Average Source EUI	175
% Difference from National Average Source EUI	-14%
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	Bacon 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	501 S. Third 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		☐
Bacon School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	37,500 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	123	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	70 %	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	12 (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	26,960.00
04/01/2009	04/30/2009	27,640.00
03/01/2009	03/31/2009	28,320.00
02/01/2009	02/28/2009	30,320.00
01/01/2009	01/31/2009	30,480.00
12/01/2008	12/31/2008	26,880.00
11/01/2008	11/30/2008	29,440.00
10/01/2008	10/31/2008	26,160.00
09/01/2008	09/30/2008	27,040.00
08/01/2008	08/31/2008	14,480.00
07/01/2008	07/31/2008	16,400.00
06/01/2008	06/30/2008	20,880.00

Electric Meter Consumption (kWh (thousand Watt-hours))	**305,000.00**
Electric Meter Consumption (kBtu (thousand Btu))	**1,040,660.00**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))	**1,040,660.00**
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	181.00
04/01/2009	04/30/2009	1,318.00
03/01/2009	03/31/2009	2,376.00
02/01/2009	02/28/2009	4,300.00
01/01/2009	01/31/2009	4,850.00
12/01/2008	12/31/2008	3,898.00
11/01/2008	11/30/2008	2,462.00
10/01/2008	10/31/2008	966.00
09/01/2008	09/30/2008	13.90
08/01/2008	08/31/2008	95.00

07/01/2008	07/31/2008	96.00
06/01/2008	06/30/2008	96.00
Natural Gas Meter Consumption (therms)		**20,651.90**
Natural Gas Meter Consumption (kBtu (thousand Btu))		**2,065,190.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**2,065,190.00**
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
Bacon School
501 S. Third 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

Bacon School	
Gross Floor Area Excluding Parking: (ft^2)	37,500
Year Built	1929
For 12-month Evaluation Period Ending Date:	May 31, 2009

Facility Space Use Summary

Bacon School	
Space Type	K-12 School
Gross Floor Area(ft^2)	37,500
Open Weekends?	No
Number of PCs	123
Number of walk-in refrigeration/freezer units	1
Presence of cooking facilities	Yes
Percent Cooled	70
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	Millville

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	66	66	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	83	83	75	N/A	96
Source ($kBtu/ft^2$)	150	150	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	268	268	244	N/A	311
$kgCO_2e/ft^2$/year	7	7	6	N/A	8

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.

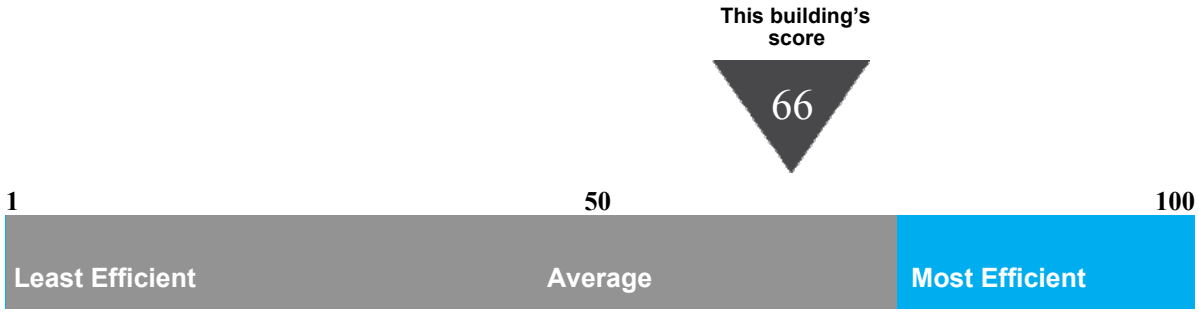
Statement of Energy Performance

2009

Bacon School
501 S. Third St.
Millville, NJ 08332

Portfolio Manager Building ID: 1872436

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 150 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: 10/07/2009

MAJOR EQUIPMENT LIST

Concord Engineering Group

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

Boiler

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)		Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	HB Smith	2	450 Mills	89-2163-H 89-2162-H	3104	2111.3	68%	Natural Gas	20	35	15

Boiler - Burner

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	Preferred Utilities	2	BHE 35 3M4	30237 30236	3104	Natural gas	20	21	1

Boiler - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Frame Size	NEMA Motor Eff	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	-	Bell & Gosset	3	3AB 6-3/8 B F	-	3	1730	300	26	182T	-	208-230/460	3	60	20	20	0
Boiler Room	-	Bell & Gosset	2	-	-	2	1740	60	50	145T-80	-	208-230/460	3	60	20	20	0
Boiler Room	-	Bell & Gosset	2	-	-	5	-	-	-	-	-	208-230/460	3	60	20	20	0

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	Bradford White	1	D100L199GN	PC0813399	200	181.9	100	80%	Natural Gas	12	12	0

DHW - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	ITT	1	-	-	-	115	1	12	10	-2

AC Condensers

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
On Grade	Front Office	Trane	1	TTB12C100AO	-	1-Ton	13.25 SEER	R-22	208-230	1	1	3	20	17

Window Air Conditioning Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Classroom	Classroom	Friedrich	1	SL24J30	-	2-Ton	9.1 EER	R-22	230	1	60			0
Classroom	Classroom	Frigidaire	28	FAS	256R2A	2-Ton	9.4 EER	R-22	208-230	1	60			0

Heating and Ventilation Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Heating Coil	Capacity	Fan HP	Fan RPM	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life
Room 22	Room 18 & 22	Environmental Technologies	1	-	-	Electric	24.93 Amp	-	-	208	3	60	14	18	4

INVESTMENT GRADE LIGHTING AUDIT

CEG Job #: 9C09072
Project: Millville B.O.E.
Address: 501 S. Third St.
Millville, NJ 08332
Building SF: 37,500

"Millville - Bacon School"

KWH COST: $0.143

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	Boiler Storage	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	No Change Required (NCR)	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2	Boiler Room	3750	1	2	6" x 8', 2-Lamp, T12 60W, Magnetic Ballast, Pendant Mount, Prismatic Lens	126	0.13	472.5	$67.57	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3	Boiler Room	3750	8	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.46	1,740.0	$248.82	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
4	Corridor	3750	2	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.12	435.0	$62.21	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
5	Corridor	3750	1	1	1-Lamp, Incandescent 60W	60	0.06	225.0	$32.18	1	1	18 W CFL Lamp	18	0.02	67.5	$9.65	$10.00	$10.00	0.04	157.5	$22.52	0.44
6	Library	3750	14	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	1.53	5,722.5	$818.32	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
7	Boys Bathroom	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8	Janitor	3750	1	1	1-Lamp, Incandescent 60W	60	0.06	225.0	$32.18	1	1	18 W CFL Lamp	18	0.02	67.5	$9.65	$10.00	$10.00	0.04	157.5	$22.52	0.44
9	Café	3750	21	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	1.22	4,567.5	$653.15	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
10	Kitchen	3750	10	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.58	2,175.0	$311.03	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
11	Kitchen Storage	3750	2	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.12	435.0	$62.21	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
12	Kitchen Elec.	3750	1	1	1-Lamp, Incandescent 60W	60	0.06	225.0	$32.18	1	1	18 W CFL Lamp	18	0.02	67.5	$9.65	$10.00	$10.00	0.04	157.5	$22.52	0.44
13	Kitchen Office	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$31.10	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
14	Kitchen	3750	2	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.12	435.0	$62.21	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	Faculty Dining	3750	5	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.29	1,087.5	$155.51	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
16	Comp. Lab.	3750	6	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.65	2,452.5	$350.71	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
17	Comp. Lab. Bathroom	3750	1	2	Vanity Light, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$31.10	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
18	Kindergarten	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.98	3,678.8	$526.06	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
19	Kindergarten	3750	10	4	4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	1.09	4,087.5	$584.51	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
20	Bathroom	3750	1	1	1-Lamp, Incandescent 60W	60	0.06	225.0	$32.18	1	1	18 W CFL Lamp	18	0.02	67.5	$9.65	$10.00	$10.00	0.04	157.5	$22.52	0.44
21	Bathroom	3750	1	2	Vanity Light, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$31.10	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
22	Girls Bathroom	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
23	Janitor	3750	1	1	Incandescent 60W	60	0.06	225.0	$32.18	1	1	18 W CFL Lamp	18	0.02	67.5	$9.65	$10.00	$10.00	0.04	157.5	$22.52	0.44
24	Custodian Storage	3750	2	2	2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.12	435.0	$62.21	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
25	Custodian Storage	3750	1	4	4', 4-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	109	0.11	408.8	$58.45	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
26	8	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
27	8	3750	2	4	4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
28	Staff Bathroom	3750	1	2	2' x 2', U Tube, 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	73	0.07	273.8	$39.15	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
29	Girls Bathroom	3750	1	2	2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$31.10	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
30	Custodian Closet	3750	1	1	1-Lamp, Incandescent 60W	60	0.06	225.0	$32.18	1	1	18 W CFL Lamp	18	0.02	67.5	$9.65	$10.00	$10.00	0.04	157.5	$22.52	0.44
31	7	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	1.31	4,905.0	$701.42	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

32	6	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
33	5	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
34	Book Storage	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$58.45	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
35	Nurse	3750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$233.81	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
36	Nurse Bathroom	3750	1	2	6" x 2', 2-Lamp, T8 17W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$31.10	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
37	Gym	3750	32	4	4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	3.49	13,080.0	$1,870.44	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
38	Gym Copy Room	3750	1	2	4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.11	408.8	$58.45	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
39	Phs. Ed. Office	3750	1	4	4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$58.45	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
40	Music Office	3750	2	4	1' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
41	Main Office	3750	6	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.65	2,452.5	$350.71	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
42	4	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
43	3	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
44	2	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
45	Supply Closet	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
46	Boys Bathroom	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
47	1	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

48	Corridor	3750	16	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.93	3,480.0	$497.64	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
49	Stair 1	3750	2	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.12	435.0	$62.21	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
50	16	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
51	23	3750	1	2	8', 2-Lamp, T12 96W, Magnetic Ballast, Surface Mount	222	0.22	832.5	$119.05	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
52	23	3750	1	4	4-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	109	0.11	408.8	$58.45	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
53	Girls Bathroom	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$58.45	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
54	Janitor	3750	1	1	1-Lamp, Incandescent 60W	60	0.06	225.0	$32.18	1	1	18 W CFL Lamp	18	0.02	67.5	$9.65	$10.00	$10.00	0.04	157.5	$22.52	0.44
55	15	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
56	14	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
57	13A	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$31.10	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
58	13	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
59	Teacher's Work Room	3750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$233.81	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
60	Teacher's Bathroom	3750	1	2	2' x 6", 2-Lamp, T8 17W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$31.10	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
61	Server Room	3750	1	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$31.10	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
62	17	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
63	12	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

64	11	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
65	10	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
66	10A	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
67	Boys Bathroom	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$116.90	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
68	9	3750	12	2	6" x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.70	2,610.0	$373.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
69	Corridor	3750	14	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.81	3,045.0	$435.44	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
70	Corridor	3750	10	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.58	2,175.0	$311.03	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
71	Kitchen Supply	3750	4	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.23	870.0	$124.41	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
72	Exterior	3750	7	2	2-Lamp, Incandescent 150W	300	2.10	7,875.0	$1,126.13	7	2	40 W CFL Lamp	40	0.28	1050	$150.15	$30.00	$210.00	1.82	6825	$975.98	0.22
73	Exterior	3750	2	1	1-Lamp, Metal Halide 175W	213	0.43	1,597.5	$228.44	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		438	182			33.84	126,900.0	$18,146.70	14	9			0.406	1522.5	$217.72		$280.00	2.11	7927.5	$1,133.63	0.25

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

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$254,610
Annual kWh Production	37,271
Annual Energy Cost Reduction	$5,330
Annual SREC Revenue	$13,045
First Cost Premium	**$254,610**
Simple Payback:	**13.86** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.143**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$254,610	0	0	0	$0	(254,610)	0
1	$0	37,271	$5,330	$0	$13,045	$18,375	($236,235)
2	$0	37,085	$5,490	$0	$12,980	$18,469	($217,766)
3	$0	36,899	$5,654	$0	$12,915	$18,569	($199,197)
4	$0	36,715	$5,824	$0	$12,850	$18,674	($180,523)
5	$0	36,531	$5,999	$376	$12,786	$18,408	($162,115)
6	$0	36,348	$6,179	$374	$12,722	$18,526	($143,588)
7	$0	36,167	$6,364	$373	$12,658	$18,650	($124,939)
8	$0	35,986	$6,555	$371	$12,595	$18,779	($106,159)
9	$0	35,806	$6,752	$369	$12,532	$18,915	($87,244)
10	$0	35,627	$6,954	$367	$12,469	$19,057	($68,188)
11	$0	35,449	$7,163	$365	$12,407	$19,205	($48,983)
12	$0	35,272	$7,378	$363	$12,345	$19,359	($29,624)
13	$0	35,095	$7,599	$361	$12,283	$19,521	($10,103)
14	$0	34,920	$7,827	$360	$12,222	$19,689	$9,586
15	$0	34,745	$8,062	$358	$12,161	$19,865	$29,451
16	$0	34,571	$8,304	$356	$12,100	$20,047	$49,498
17	$0	34,399	$8,553	$354	$12,039	$20,238	$69,736
18	$0	34,227	$8,809	$353	$11,979	$20,436	$90,172
19	$0	34,055	$9,074	$351	$11,919	$20,642	$110,815
20	$0	33,885	$9,346	$349	$11,860	$20,857	$131,671
21	$1	33,716	$9,626	$347	$11,801	$21,079	$152,750
22	$2	33,547	$9,915	$346	$11,742	$21,311	$174,061
23	$3	33,379	$10,212	$344	$11,683	$21,551	$195,613
24	$4	33,213	$10,519	$342	$11,624	$21,801	$217,414
25	$5	33,046	$10,834	$340	$11,566	$22,060	$239,474
	Totals:	711,053	$143,212	$5,800	$248,868	$494,084	$386,281
				Net Present Value (NPV)		**$239,499**	
				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
Bacon School	2000	Sunpower SPR230	123	14.7	1,809	28.29	37,271	4,059	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:	28.3 kW
DC to AC Derate Factor:	0.810
AC Rating:	22.9 kW
Array Type:	Fixed Tilt
Array Tilt:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	14.3 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	3.61	2667	381.38
2	4.20	2776	396.97
3	4.78	3349	478.91
4	5.23	3440	491.92
5	5.44	3611	516.37
6	5.48	3380	483.34
7	5.55	3495	499.79
8	5.41	3443	492.35
9	5.23	3295	471.19
10	4.60	3082	440.73
11	3.59	2448	350.06
12	3.17	2286	326.90
Year	4.69	37271	5329.75

.= Proposed PV Layout

Notes:

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