ENERGY AUDIT – FINAL REPORT

MILLVILLE BOARD OF EDUCATION
SILVER RUN SCHOOL

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MILLVILLE, NJ 08332
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CEG PROJECT NO. 9C09072

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I. EXECUTIVE SUMMARY

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

Millville Board of Education
Silver Run School
301 Silver Run Road
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	$213,694
Natural Gas	$134,498
Total	$348,192

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	Gymnasium Lighting Replacement	$7,200	$2,867	2.5	497.3%
ECM #2	Cafeteria Lighting Replacment	$6,000	$2,390	2.5	497.5%
ECM #3	Lighting Controls	$9,800	$2,638	3.7	303.8%
ECM #4	Premium Efficient Motor Replacment	$11,179	$853	13.1	52.6%
ECM #5	Variable Speed Chilled Water Punmp Control	$7,600	$1,165	6.5	129.9%
ECM #6	Geothermal System Conversion	$3,056,080	$188,762	16.2	23.5%
ECM #7	Demand Control Ventilation	$133,500	$24,107	5.5	170.9%
ECM #8	DDC Control System Upgrade	$356,000	$24,107	14.8	1.6%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Photovoltaic Panel Installation	$1,952,010	$140,301	13.9	79.7%

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	Gymnasium Lighting Replacement	5.4	20,340.0	0.0
ECM #2	Cafeteria Lighting Replacment	4.5	16,950.0	0.0
ECM #3	Lighting Controls	0.0	18,710.0	0.0
ECM #4	Premium Efficient Motor Replacment	2.7	6,047.0	0.0
ECM #5	Variable Speed Chilled Water Punmp Control	4.5	8,262.0	0.0
ECM #6	Geothermal System Conversion	689,014.0	150.0	61,075.0
ECM #7	Demand Control Ventilation	49,235.0	27.0	12,111.0
ECM #8	DDC Control System Upgrade	49,235.0	27.0	12,111.0
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	0.0	285,747.0	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:** Gymnasium Lighting Replacement
- **ECM #2:** Cafeteria Lighting Replacement
- **ECM #3:** Lighting Controls
- **ECM #5:** Variable Speed Chilled Water Pump Control
- **ECM #7:** Demand Control Ventilation

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.

Additionally, based on the review of the facility's energy bills (which indicate and discussions with the School District, the energy audit team recommends Retro-Commissioning of this facility to meet the following objectives:

- Bring existing HVAC equipment to its proper operational state including air and water distribution systems
- Reduce energy use and energy costs
- Improve indoor air quality
- Verify the installation and performance of identified system upgrades
- Address overall building energy use and demand and identify areas of highest energy use and demand
- Identify the location of the most comfort problems or trouble spots in the building
- Review current O&M practices

Through the implementation of a Retro-Commissioning Plan, the School District will be able to continue with their vision of reducing energy usage and operating efficient facilities. CEG

believes the Retro-Commissioning process will help regulate the high historical energy consumption that was unearthed as part of the energy audit process. By returning the HVAC equipment to design parameters and original control sequences the equipment will be able to maintain a better conditioned environment and eventually provide energy savings that the Owner will benefit from.

All in all, incentives provide financial motivation and much needed support for the implementation of energy conservation measures. Along with the NJ Smart Start program, the Pay for Performance Program incentives, sponsored by NJ Clean Energy Program, are applicable for this facility. The existing average operating demand above 200 KW and high energy consumption qualifies for the Pay for Performance Program. The incentive based on a 15% electrical energy reduction for this facility would qualify for an additional $15,075 in the Pay for Performance Program. If natural gas consumption could be reduced by 15% the resultant incentive would be approximately $9,420. This would equate to a total incentive equal to approximately $24,495. This option is one to consider for a whole-building approach to energy reduction. The Pay for Performance Program represents a significant commitment to energy reduction of a facility. This option should be reviewed in more detail with a Pay for Performance Program partner.

As a final note, during CEG's energy audit survey it was documented that there was an appearance of a humidity control issue at the Silver Run School. CEG recommends that the Owner review the current operation of their mechanical systems with an HVAC consulting engineering firm in order to review the current process and modifications that could help the Owner in addressing energy and comfort issues in regards to seasonal operation. CEG would be happy to aid the Millville BOE in reviewing feasible alternatives in regards to moisture control and/or removal outside of the energy audit process.

II. INTRODUCTION

The comprehensive energy audit covers the 89,000 SF Silver Run School, a one story facility comprised of classrooms, gymnasium, kitchen, administration/faculty offices, music room, a library and computer labs.

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.

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

Description	Average
Electricity	14.1¢ / kWh
Natural Gas	$1.50 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: Annual General Service (AGS)
Meter No: 82890641
Customer ID No: -
Third Party Utility -
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-09	73,516	194.6	$23,144
Feb-09	80,347	384.5	$27,780
Mar-09	90,439	380.9	$26,330
Apr-09	109,599	387.5	$28,111
May-09	150,364	386.5	$19,424
Jun-08	156,374	381.6	$13,248
Jul-08	162,807	305.3	$11,889
Aug-08	179,770	332.8	$10,531
Sep-08	189,258	399.6	$11,794
Oct-08	145,881	375.1	$12,983
Nov-08	97,199	363.1	$11,500
Dec-08	85,357	278.8	$16,959
Totals	**1,520,911**	**399.6 Max**	**$213,694**

AVERAGE DEMAND **347.5 KW average**
AVERAGE RATE **$0.141 $/kWh**

Figure 1
Electricity Usage Profile

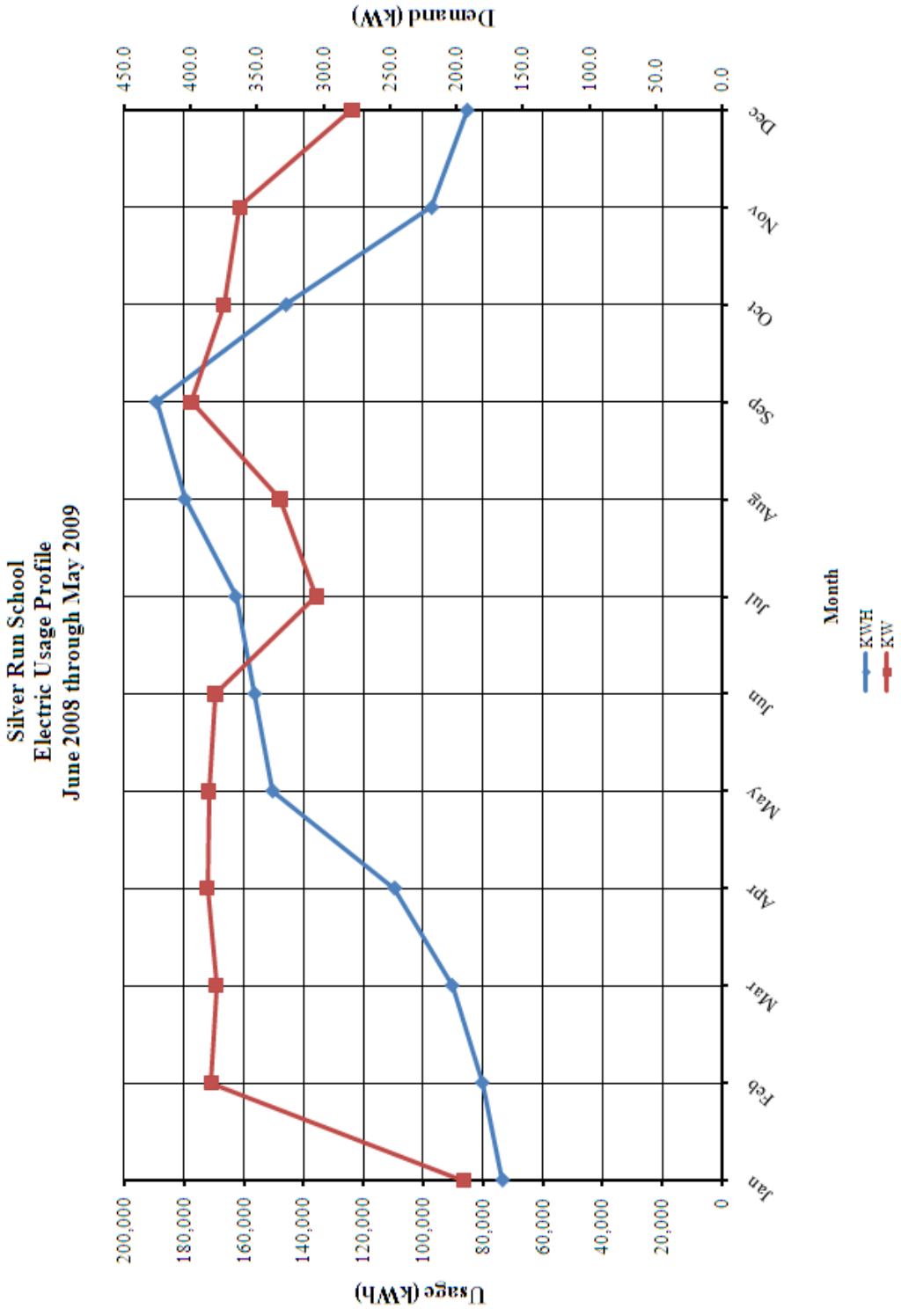


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY

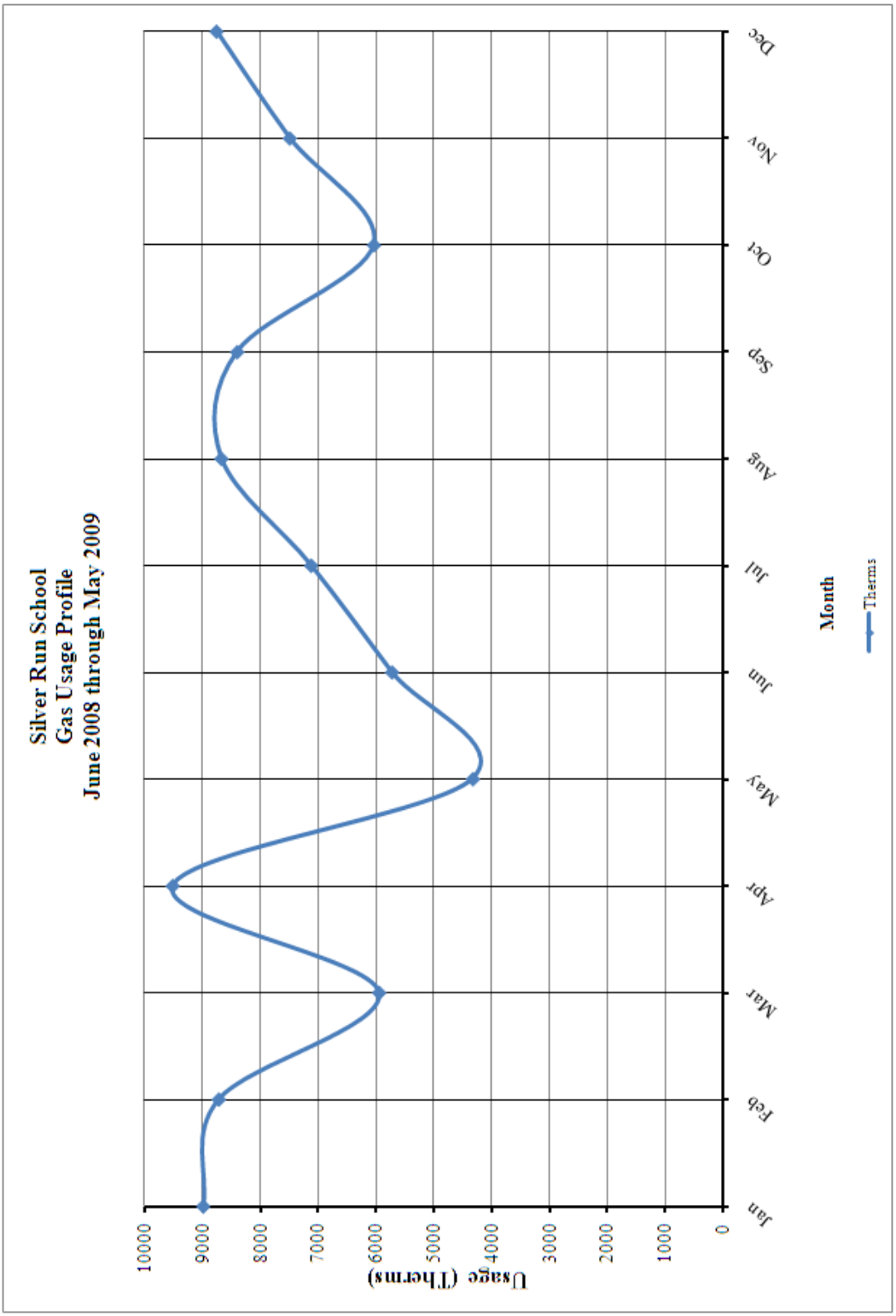
Utility Provider: South Jersey Gas
Rate: BGSS
Meter No: 463304
Point of Delivery ID: -
Third Party Utility Provider: PEPCO Energy Service, Inc.
TPS Meter No: -

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Jan-09	8,985.00	$12,576.44
Feb-09	8,717.00	$12,518.62
Mar-09	5,951.00	$8,653.06
Apr-09	9,512.00	$13,786.12
May-09	4,334.00	$6,490.42
Jun-08	5,729.00	$9,602.29
Jul-08	7,124.00	$14,074.90
Aug-08	8,672.00	$13,413.35
Sep-08	8,399.00	$12,313.19
Oct-08	6,041.00	$8,102.75
Nov-08	7,493.00	$10,602.54
Dec-08	8,757.00	$12,363.93
TOTALS	**89,714.00**	**$134,497.61**

AVERAGE RATE: **$1.50** **$/THERM**

Estimate Value, Utility Information Not Provided

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

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

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

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

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

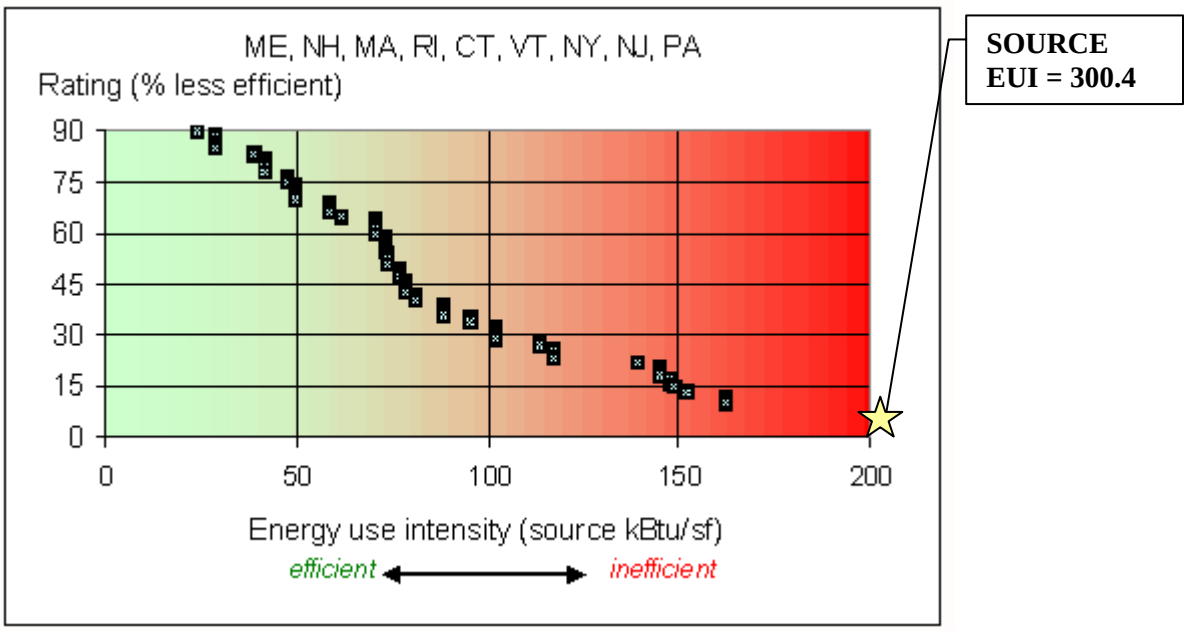
$$Building\ \ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio + Gas\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio)}{Building\ \ Square\ \ Footage}$$

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	1520911.0			5,192,390	3.340	17,342,583
NATURAL GAS		89714.0		8,971,400	1.047	9,393,056
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				14,163,790		26,735,639
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		89,000	SQUARE FEET			
BUILDING SITE EUI		*159.14*	kBtu/SF/YR			
BUILDING SOURCE EUI		*300.40*	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**
Silver Run School	2	50

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

V. FACILITY DESCRIPTION

The 89,000 SF Silver Run School is a one story facility comprised of classrooms, gymnasium, kitchen, administration/faculty offices, music room, 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 rigid R-10 insulation between the brick and the block. The windows throughout the facility are in good condition and appear to be maintained. Typical windows throughout the facility are double pane, ¼" tinted glass with aluminum frames. Integral blinds are utilized throughout the facility per occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat gain in the summer. The roof is of typical steel construction which is coated in red paint; R-30 insulation is installed below the ceiling. The facility was built in 1992 with no additions since initial construction.

HVAC Systems

The building is conditioned by a 4-pipe heating and cooling system. Hot water and chilled water are piped independently around the facility to provide heating or cooling water as needed. A boiler plant containing two (2) identical HB Smith Series 28A-6 boilers, each rated at 1,433 MBH gross output, provide heating hot water for the facility. Two (2) 7-1/2 HP Peerless end-suction pumps are dedicated to circulating hot water throughout the facility.

Chilled water is provided by a Trane air-cooled chiller located on a pad outside the boiler room. Two (2) 20 HP Peerless end-suction pumps circulate the chilled water throughout the facility. This facility utilizes an ice storage system to offset some of the chillers electrical load during peak operating hours. The system uses five (5) CALMAC 1,655 gallon ice storage tanks and has two (2) 15 horsepower pumps dedicated to system circulation. This type of system runs the chiller in an ice producing mode at night when building electrical demand is the lowest, intern lowering electrical costs. The ice created at night is then used to aid the chiller during peak cooling loads during the day. This process reduces the load on the chiller and allows the chiller to operate more efficiently.

Trane unit ventilators (UVs) equipped with hot and chilled water coils provide conditioned air to all areas of the school. In big box areas such as the cafeteria and the gymnasium the UVs are ducted into an over head distribution system, standard installation is used in all classroom areas. It was observed during the site survey that an ongoing humidity problem plagues the facility. UVs throughout the school were observed to be simultaneously heating and cooling the air in an effort to draw humidity from the air. Classroom areas seemed to be over pressured; drawing in more outside air then is needed, while the exhaust system seemed to be shut down. A serious problem exists in the control system that is causing the building to run very inefficiently. Further investigation is necessary in order to correct the problem.

Entrance doorways are heated via hot water cabinet heaters.

HVAC System Controls

The HVAC systems within the facility are controlled via a Honeywell control system. The Honeywell Company monitors and controls the system from a central plant offsite. The unit ventilators throughout the facility are controlled by pneumatics.

Domestic Hot Water

Domestic hot water for the facility is provided by two (2) 250 gallon PVI-Turbo Power, natural gas fired DHWH's, each having a capacity of 1,000 MBH. The units are located in the boiler room. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The circulation pumps are 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 fixtures with T-8 lamps and electronic ballasts. Storage rooms and closets lit with a mixture of incandescent lamps and compact fluorescent lamps. A detailed list containing all building light fixtures can be found in the **Investment Grade Lighting Audit Appendix** of this report.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Gymnasium Lighting Replacement

Description:

The existing Gymnasium lighting system is comprised of a total of twenty-four (24) 400-Watt Metal-Halide (MH) fixtures which have poor lumen maintenance (approximately 30% reduction in lighting output at 40% of rated lamp life). Also, the fixture ballast can be very noisy, require up to 10 minutes to re-strike after shutdown, and there is a noticeable color shift as the lamp approaches the end of its life. The current lighting system is inefficient compared to today's standard, the facility would benefit by replacing these lighting with a more efficient alternative

This ECM would replace each of the existing Gymnasium light fixtures with new T-5 high-bay fixtures with, 4-foot T5 High Output (HO) lamps. The T-5 HO lighting system will utilize 50% of the energy used by the metal halide fixtures. The T-5 HO lamps are rated for 20,000 hours versus the 10,000 hours for the 400-Watt MH lamps so there would be a savings in replacement cost/labor. In addition, the T-5 HO lamps have better lighting quality and lumen maintenance.

Energy Savings Calculations:

The SmartStart Building® incentive is $100 per fixture which equates to: $100 x 24 fixtures = $2,400.

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed energy savings calculation for the replacement of the gymnasium fixtures.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$9,600
NJ Smart Start Equipment Incentive ($):	$2,400
Net Installation Cost ($):	$7,200
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,867
Total Yearly Savings ($/Yr):	$2,867
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.5
Simple Lifetime ROI	497.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$43,005
Internal Rate of Return (IRR)	40%
Net Present Value (NPV)	$27,026.06

ECM #2: Cafeteria Lighting Replacement

Description:

The existing Cafeteria lighting system is comprised of a total of twenty (20) 400-Watt Metal-Halide (MH) fixtures which have poor lumen maintenance (approximately 30% reduction in lighting output at 40% of rated lamp life). Also, the fixture ballast can be very noisy, require up to 10 minutes to re-strike after shutdown, and there is a noticeable color shift as the lamp approaches the end of its life. The current lighting system is inefficient compared to today's standard, the facility would benefit by replacing these lighting with a more efficient alternative

This ECM would replace each of the existing Gymnasium light fixtures with new T-5 high-bay fixtures with, 4-foot T5 High Output (HO) lamps. The T-5 HO lighting system will utilize 50% of the energy used by the metal halide fixtures. The T-5 HO lamps are rated for 20,000 hours versus the 10,000 hours for the 400-Watt MH lamps so there would be a savings in replacement cost/labor. In addition, the T-5 HO lamps have better lighting quality and lumen maintenance.

Energy Savings Calculations:

The SmartStart Building® incentive is $100 per fixture which equates to: $100 x 20 fixtures = $2,000.

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed energy savings calculation for the replacement of the gymnasium fixtures.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,000
NJ Smart Start Equipment Incentive ($):	$2,000
Net Installation Cost ($):	$6,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,390
Total Yearly Savings ($/Yr):	$2,390
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.5
Simple Lifetime ROI	497.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$35,850
Internal Rate of Return (IRR)	40%
Net Present Value (NPV)	$22,531.66

ECM #3: 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:

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

$$Energy\ Savings = 10\% \times 187{,}102\ \left(kWh\right) = 18{,}710\ \left(kWh\right)$$

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

$$Savings. = 18{,}710\ (kWh) \times 0.141 \left(\frac{\$}{kWh} \right) = \$2{,}638$$

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

$$Installation\ Cost = (\#\ of\ \ sensors \times\ \ \$\ \ per\ sensor) = (70 \times \$160) = \underline{\$\,11{,}200}$$

NJ Smart Start® Program Incentives are calculated as follows:

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

$$\text{Smart Start®}\ \ Incentive = (\#\ of\ \ controller \times\ \ \$\ 20) = (70 \times \$\ 20) = \underline{\$1{,}400}$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,200
NJ Smart Start Equipment Incentive ($):	$1,400
Net Installation Cost ($):	$9,800
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,638
Total Yearly Savings ($/Yr):	$2,638
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.7
Simple Lifetime ROI	303.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$39,570
Internal Rate of Return (IRR)	26%
Net Present Value (NPV)	$21,692.27

ECM #4: Premium Efficient Motor Replacement

Description:

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

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

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

Energy Savings Calculations:

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

1 HP = 0.746 kW
Load Factor = 75%
Annual Hours of Operations Cooling = 1,800 (Average)
Annual Hours of Operations Heating = 3,696 (Average)
Cost of electricity = $0.111/ kWh

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

NEMA Premium Efficient Motor Replacement						
Equipment Tag	**Motor HP**	**Existing Efficiency**	**NEMA Premium Efficiency**	**kW Savings**	**kWh Savings**	**Cost Savings**
P-1	7.5	85.5%	91.0%	0.30	1,096	$155
P-2	7.5	85.5%	91.0%	0.30	1,096	$155
P-5	20	88.5%	93.0%	0.61	1,101	$155
P-6	20	88.5%	93.0%	0.61	1,101	$155
P-7	15	88.5%	93.0%	0.46	826	$116
P-8	15	88.5%	93.0%	0.46	826	$116
Total Savings				**2.7**	**6,047**	**$853**

Smart Start® *Incentive* $= (\#\ 7.5\ HP\ Motors \times\ \$\,81) = (2 \times \$\,81) = \$162$

Smart Start® *Incentive* $= (\#\ 20\ HP\ Motors \times\ \$\,113) = (2 \times \$\,113) = \$226$

Smart Start® *Incentive* $= (\#\ 15\ HP\ Motors \times\ \$\,104) = (2 \times \$\,104) = \$208$

Total Smart Start Incentive = $162 + $226 + $208 = $596

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,775
NJ Smart Start Equipment Incentive ($):	$596
Net Installation Cost ($):	$11,179
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$853
Total Yearly Savings ($/Yr):	$853
Estimated ECM Lifetime (Yr):	20
Simple Payback	13.1
Simple Lifetime ROI	52.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$17,060
Internal Rate of Return (IRR)	4%
Net Present Value (NPV)	$1,511.49

ECM #5: Variable Speed Chilled Water Pump Replacement

Description:

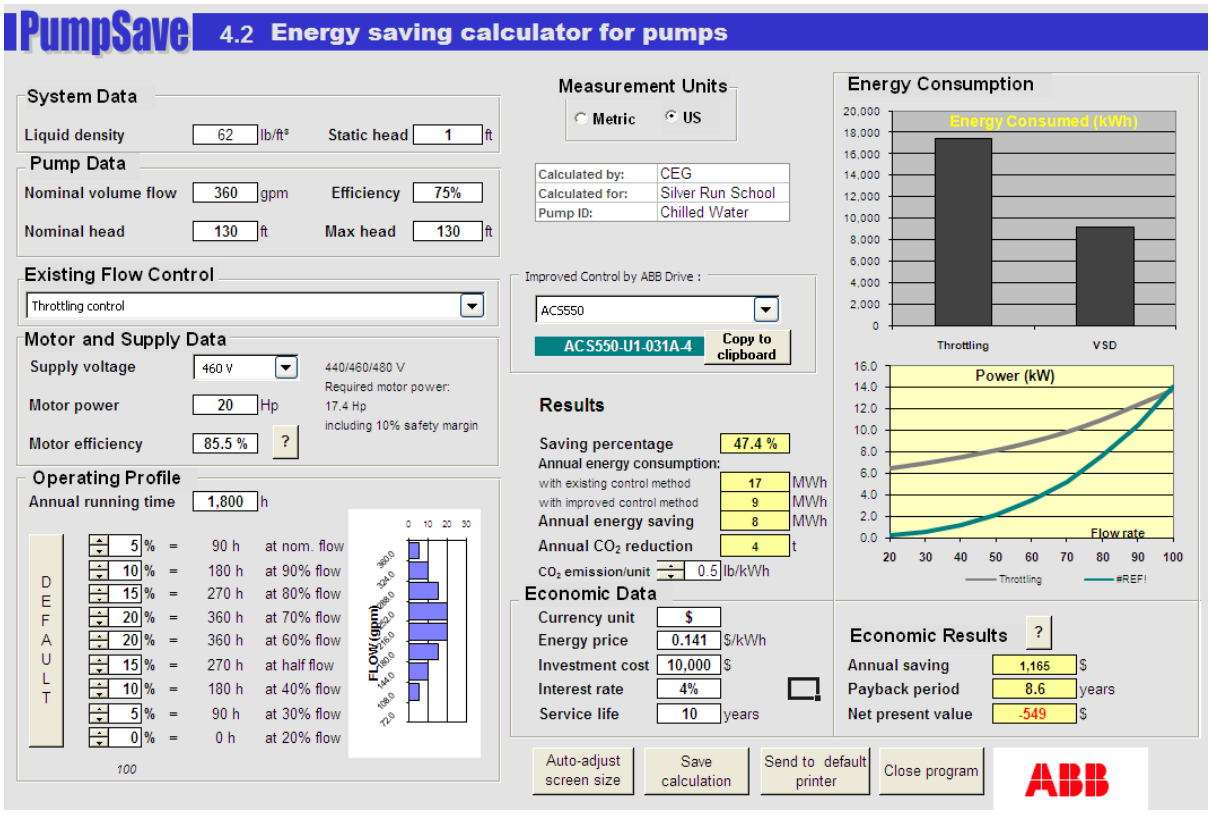
The school is cooled by a 155 ton air cooled chiller. The chiller is pad mounted on the exterior of the boiler room. The chilled water is distributed throughout the facility by two (2) 20 HP Bell and Gossett end-suction pumps (only one pump operates at a time). The chilled water feeds all building unit ventilators. Each piece of equipment is capable of modulating the chilled water flow, reducing or increasing the total flow as required to satisfy the space. The equipment does not require full flow for the majority of the hours of operation; however the existing pumping system does not have variable speed control, the pumps operate at 100% capacity all the time. The pumping energy of the existing system stays relatively constant, on/off operation, throughout the cooling season.

This ECM includes the installation of two new variable frequency drives (VFDs) for each chilled water pump, although the savings will be for a singular pump (only one pump is needed for system distribution). The reduction in chilled water flow reduces the pumping energy by a significant quantity. As equipment control valves modulate, the VFDs respond by varying the pump motor to match the building's load. This ECM is based on two ABB VFDs model number ACS550, as well as a differential pressure sensor installed in the chilled water piping.

Energy and cost savings calculations are based on calculation software "PumpSave v4.2," provided by ABB.

Cooling Season Run Hrs.	= 1,800 hrs/yr.
Average Cost of Electricity	= $0.141/kWh
Motor HP (EA.)	= 20 HP
Total GPM	= 360 GPM
Nominal Piping System Head	= 130 Ft Head
Motor Efficiency	= 88.5%
Pump Efficiency	= 75%

Energy Savings Calculations:



Installation cost for the two VFDs and bypass valve installation is estimated to be $10,000 ($6,000 Materials).

From the NJ Smart Start® Program appendix, the unit falls under the category "Variable Frequency Drive" and warrants an incentive based on horsepower. The program incentives are calculated as follows:

$$\text{Smart Start®}\ Incentive = (HorsePower \times \$/HP) = (2\ Pumps \times 20\ HP \times \$60/HP) = \$2{,}400$$

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$10,000
NJ Smart Start Equipment Incentive ($):	$2,400
Net Installation Cost ($):	$7,600
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,165
Total Yearly Savings ($/Yr):	$1,165
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.5
Simple Lifetime ROI	129.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$17,475
Internal Rate of Return (IRR)	13%
Net Present Value (NPV)	$6,307.69

ECM #6: Geothermal System Conversion

Description:

The classrooms are conditioned by Trane unit ventilators. Each unit is equipped with a hot and chilled water coil. The unit ventilators are original to the school which makes them 18 years of old; they are approaching their expected service live of 20 years. Due to humidity control issues these units have more than expected levels of rust, inside and out. It is unknown whether the dampers are still in proper working order. A thorough evaluation of the heating and cooling system needs to be undertaken to determine the extent of equipment damage from the humidity problem

This ECM involves the demolition of the existing unit ventilator system. The system will be replaced with vertical ground source heat pumps. Each classroom will have a 3'x3' closet built into the corner of the room to house the new equipment. A dedicated outdoor air system utilizing energy recovery technology will be installed. A bore field will be installed in the field adjacent to the school. The schools chilled water piping will be utilized for the condenser water loop piping. The hot water loop will be used for reheat, if necessary. The heat pump units are self contained making for easy one for one replacement with the existing equipment.

The design of the geothermal system would include the entire facility approximately 89,000 SF. The geothermal system would require (not limited to) the following major components:

1. 120-Ton bore field located in field adjacent to the School.
2. (2) Loop condenser water pumps.
3. Condenser water piping distribution system from the well field to the mechanical room
4. Installation of approximately forty-five (45) high-efficiency (20.2 EER) water to water heat pumps. Basis of design: Climate Master TS Series or equivalent.

Energy Model Comparison Results:

Heating and cooling calculations were performed using the Trane Trace® 700 comprehensive building analysis software. The existing building cooling load was calculated to 200 Tons and the heating load was 1,250 MBH.

Existing System Usage	= 1,520,911 kWh
Existing System Demand	= 399.6 kW
Existing Natural Gas Usage	= 89,714 Therms
New System Usage	= 831,897 kWh
New System Demand	= 249.6 kW
New Natural Gas Usage	= 28,639 Therms

Annual Energy Savings = Existing Usage – New Usage

Annual Electric Savings = 1,520,911 kWh - 831,897 kWh = 689,014 kWh

Annual Demand Savings = 399.6 kW – 249.6 kW = 150 kW

Annual Natural Gas Savings = 89,714 Therms - 28,639 Therms = 61,075 Therms

Annual Electric Cost Savings = 689,014 kWh x $0.141/kWh = $97,150

Annual Natural Gas Cost Savings = 61,075 Therms x $1.50 = $91,612

Total Cost Savings = $97,150 + $91,612 = $188,762

Note: Sizing indicated within the calculation of this ECM is based on a one for one replacement of the existing equipment. Owner should have a Professional Engineer verify heating and cooling loads prior to moving forward with this ECM.

$$\text{Smart Start®}\ Incentive = (Number\ of\ Tons \times \$\,81/Ton) = (200 \times \$\,81) = \$16{,}200$$

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,072,280
NJ Smart Start Equipment Incentive ($):	$16,200
Net Installation Cost ($):	$3,056,080
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$188,762
Total Yearly Savings ($/Yr):	$188,762
Estimated ECM Lifetime (Yr):	20
Simple Payback	16.2
Simple Lifetime ROI	23.5%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$3,775,240
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	($247,778.09)

ECM #7: Demand Control Ventilation

Description:

The existing unit ventilators condition their individual spaces with chilled and hot water. The outside air is set to a maximum damper position to provide outside air to the space whenever the supply fan is set to run. The outside air volume is typically based on the maximum occupancy of the space conditioned. When a given space is not fully occupied the outside air quantity delivered to the space is greater than the amount needed for adequate ventilation.

This ECM includes the installation of CO_2 sensors integrated into a demand control ventilation system, for all air handling units serving the facility. This system allows the air handling unit to respond to changes in occupancy and therefore reduce the amount of outside air that has to be conditioned. Outside air accounts for a large portion of the energy consumption in the HVAC system, especially in high occupancy spaces. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is 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:

- Demand Control Ventilation - 10%-15%.

Energy savings achieved through "Demand Control Ventilation" average 10%-15%. Savings resulting from the implementation of this ECM for energy management controls are estimated to be 15% of the total HVAC energy cost for the facility. 15% was used for this facility due to the large humidity problems the facility is undergoing. The excess outside air being brought into the building worsens the humidity problem.

The components included to install a demand control ventilation system include controllers, software programming, and CO_2 sensors. Each occupied zone would require a CO_2 sensor installed to monitor occupancy levels. This ECM is based on wireless sensors to minimize on installation cost. Savings from the implementation of this ECM will be achieved through reduced gas consumption from reduced heating energy as well as reduced electric consumption from reduced air conditioning energy.

Cost of Demand Control Ventilation System Controls = ($1.50/SF x 89,000 SF) = $133,500.
Cost of CO2 Sensors for all spaces = ($450/Sensor x 45 Sensors) = $20,250
Total = $83,250

Total Natural Gas Usage	= 89,715 Therm
Total Natural Gas Used for heating (90% of Total heating Load)	= 80,743 Therm
Average Cost of Gas	= $1.50/Therm
Boiler Efficiency	= 70%

Total Cooling Capacity (Total from equipment list)	= 155 tons
Cooling Season Full Load Cooling Hrs.	= 1,800 hrs/yr.
Average Cooling Equipment EER (Est. based on all equipment)	= 10.2 EER
Average Cost of Electricity	= $0.141/kWh

Energy Savings Calculations:

Heating Savings Calculations

$$Savings. = Heating\ Input(Therms) \times 15\%\ Savings \times Ave\ Cost(\$/Therm)$$

$$Savings. = 80{,}743\ (Therm) \times 15\% \times 1.50\ (\$/Therm) = \$18{,}165$$

Cooling Savings Calculations

$$Est\ Cool\ Cons. = \frac{Cool\ Load\ (Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times Full\ Load\ Cooling\ Hrs.}{Ave\ Energy\ Efficiency\ Ratio\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)}$$

$$Est\ Cool\ Cons. = \frac{155\ (Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times 1{,}800\ Hrs.}{10.2\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)} = 328{,}235\ (kWh)$$

$$Savings. = Cool\ Cons.(kWh) \times 15\%\ Savings \times Ave\ Elec\ Cost\left(\frac{\$}{kWh}\right)$$

$$Savings. = 328{,}235\ (kWh) \times 15\% \times 0.141\left(\frac{\$}{kWh}\right) = \$6{,}942$$

$$Total\ ECM\ \ Savings = \$18{,}165 + \$6{,}942 = \$24{,}107$$

There are currently no Smart Start® *Incentives* available for a Demand Control Ventilation System.

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$133,500
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$133,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$24,107
Total Yearly Savings ($/Yr):	$24,107
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.5
Simple Lifetime ROI	170.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$361,605
Internal Rate of Return (IRR)	16%
Net Present Value (NPV)	$154,287.80

ECM #8: DDC Control System Upgrade

Description:

Classroom unit ventilators are still being controlled with outdated pneumatic controllers throughout this facility. Standard non-programmable pneumatic thermostats that do not utilize night set back, or morning warm-up features are responsible for controlling the classroom conditioning. Modern thermostats and control systems have the capability of saving significant energy as well as improved occupant comfort.

This ECM recommends converting all pneumatic controls to Direct Digital Controls (DDC) in all classrooms. A front end device will provide communication between building equipment the chilled water and hot water 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 through "Energy Management and Control Systems," average 5%-15%. Savings resulting from the implementation of this ECM for energy management controls are estimated to be 15% 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 natural gas consumption from reduced heating energy as well as reduced electric consumption from reduced air conditioning energy, total approximately 89,000 SF.

Cost of complete DDC System = ($4.00/SF x 89,000 SF) = $356,000.

Heating Savings Calculations

$$Savings. = Heating\ Input(Therms) \times 15\%\ Savings \times Ave\ Cost(\$/Therm)$$

$$Savings. = 80{,}743\,(Therm) \times 15\% \times 1.50\,(\$/Therm) = \$18{,}165$$

Cooling Savings Calculations

$$Est\ Cool\ Cons. = \frac{Cool\ Load\ (Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times Full\ Load\ Cooling\ Hrs.}{Ave\ Energy\ Efficiency\ Ratio\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)}$$

$$Est\ Cool\ Cons. = \frac{155\ (Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times 1{,}800\ Hrs.}{10.2\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)} = 328{,}235\ (kWh)$$

$$Savings. = Cool\ Cons.(kWh) \times 15\%\ Savings \times Ave\ Elec\ Cost\left(\frac{\$}{kWh}\right)$$

$$Savings. = 328{,}235\ (kWh) \times 15\% \times 0.141\left(\frac{\$}{kWh}\right) = \$6{,}942$$

$$Total\ ECM\ \ Savings = \$18{,}165 + \$6{,}942 = \$24{,}107$$

There are currently no Smart Start® *Incentives* available for a DDC Control System installation.

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$356,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$356,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$24,107
Total Yearly Savings ($/Yr):	$24,107
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.8
Simple Lifetime ROI	1.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$361,605
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($68,212.20)

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 216.9 kilowatts could be installed. The total system has an estimated kilowatt hour production of 285,747 KWh annually, reducing the overall electric consumption by approximately 20%. 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	13.9 Years	7.1%	$1,815,191	5.6 %

*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, gymnasium, kitchen, administration/faculty offices, music room, library and computer labs. The typical hours of operation for this facility are between 9:00 am and 4:00 pm. The facility was built in 1992 with no additions since initial construction.

The Electric Usage Profile demonstrates a very atypical load consumption profile for a school. Schools typically close for the summer (May-August) and in this case the load profile demonstrates an escalation in usage beginning in February and continuing to an annual peak in September, with a very sharp drop off thereafter, continuing to little or no usage in December.

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. The summer usage can be associated with a cooling load. In this facility, air conditioning is provided by a 4-pipe heating and cooling system. Hot water and chilled water are piped independently around the facility to provide heating or cooling water as needed.

Chilled water is provided by a Trane air-cooled chiller located on a pad outside the boiler room. Two (2) 20 HP Peerless end-suction pumps circulate the chilled water throughout the facility. This facility utilizes an ice storage system to offset some of the chillers electrical load during peak operating hours. The system uses five (5) CALMAC 1,655 gallon ice storage tanks and has two (2) 15 horsepower pumps dedicated to system circulation. This type of system runs the chiller in an ice producing mode at night when building electrical demand is the lowest, intern lowering electrical costs. The ice created at night is then used to aid the chiller during peak cooling loads during the day. This process reduces the load on the chiller and allows the chiller to operate more efficiently.

Trane unit ventilators (UVs) equipped with hot and chilled water coils provide conditioned air to all areas of the school. In big box areas such as the cafeteria and the gymnasium the UVs are ducted into an over head distribution system. It was observed during the site survey that an

ongoing humidity problem plagues the facility. UVs throughout the school were observed to be simultaneously heating and cooling the air in an effort to draw humidity from the air.

Electric Delivery service is provided by Atlantic City Electric (ACE) through an AGS rate schedule. The supply service is provided by a Third Party Supplier (South Jersey Energy Company), and is administered by the ACES program. A flat load profile will provide for the more competitive price when shopping for alternative energy suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very atypical heating load profile, with an average load profile that might be fairly consistent, but not with a definite load increase in the winter and a solo peak in April, followed by a deep decline in May, with a gradual increase from June, peaking in August. Once again the building is conditioned by a (4) pipe system. Hot water and chilled water are piped independently around the facility to provide heating or cooling water as needed. A boiler plant containing two (2) identical HB Smith Series 28A-6 boilers, each rated at 1,433 MBH gross output, provide heating hot water for the facility. Two (2) 7-1/2 HP Peerless end-suction pumps are dedicated to circulating hot water throughout the facility.

Trane unit ventilators (UVs) equipped with hot and chilled water coils provide conditioned air to all areas of the school.

Entrance doorways are heated via hot water cabinet heaters.

Domestic hot water for the facility is provided by two (2) 250 gallon PVI-Turbo Power, natural gas fired DHWH's, each having a capacity of 1,000 MBH. The units are located in the boiler room. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The circulation pumps are controlled by an aqua stat.

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.

iv. *Pay For Performance – The New Jersey Smart Start Pay for Performance program includes incentives based on savings resulted from implemented ECMs. The program is available for all buildings with average demand loads above 200 KW. The facility's participation in the program is assisted by an approved program partner. An "Energy Reduction Plan" is created with the facility and approved partner to shown at least 15% reduction in the building's current energy use. Multiple energy conservation measures implemented together are applicable toward the total savings of at least 15%. No more than 50% of the total energy savings can result from lighting upgrades / changes.*

Total incentive is capped at 50% of the project cost. The program savings is broken down into three benchmarks; Energy Reduction Plan, Project

Implementation, and Measurement and Verification. Each step provides additional incentives as the energy reduction project continues. The benchmark incentives are as follows:

1. *Energy Reduction Plan – Upon completion of an energy reduction plan by an approved program partner, the incentive will grant $0.10 per square foot between $5,000 and $50,000, and not to exceed 50% of the facility's annual energy expense. (Benchmark #1 is not provided in addition to the local government energy audit program incentive.)*

2. *Project Implementation – Upon installation of the recommended measures along with the "Substantial Completion Construction Report," the incentive will grant savings per KWH or Therm based on the program's rates. Minimum saving must be 15%. (Example $0.11 / kWh for 15% savings, $0.12/ kWh for 17% savings, … and $1.10 / Therm for 15% savings, $1.20 / Therm for 17% saving, …) Increased incentives result from projected savings above 15%.*

3. *Measurement and Verification – Upon verification 12 months after implementation of all recommended measures, that actual savings have been achieved, based on a completed verification report, the incentive will grant additional savings per kWh or Therm based on the program's rates. Minimum savings must be 15%. (Example $0.07 / kWh for 15% savings, $0.08/ kWh for 17% savings, … and $0.70 / Therm for 15% savings, $0.80 / Therm for 17% saving, …) Increased incentives result from verified savings above 15%.*

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.

E. Confirm that outside air economizers on the rooftop units are functioning properly to take advantage of free cooling and avoid excess outside air during occupied periods.

In addition to the recommendations above, implementing Retro-Commissioning would be beneficial for this facility. Retro-Commissioning is a means to verify your current equipment is operating at its designed efficiency, capacity, airflow, and overall performance. Retro-Commissioning provides valuable insight into systems or components not performing correctly or efficiently. The commissioning process defines the original system design parameters and recommends revisions to the current system operating characteristics.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Millville Board of Education - Silver Run 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	Gymnasium Lighting Replacement	$7,200	$2,400	$2,400	$7,200	$2,867	$0	$2,867	15	$43,005	$0	497.3%	2.5	39.55%	$27,026.06
ECM #2	Cafeteria Lighting Replacment	$6,000	$2,000	$2,000	$6,000	$2,390	$0	$2,390	15	$35,850	$0	497.5%	2.5	39.57%	$22,531.66
ECM #3	Lighting Controls	$7,000	$4,200	$1,400	$9,800	$2,638	$0	$2,638	15	$39,570	$0	303.8%	3.7	26.09%	$21,692.27
ECM #4	Premium Efficient Motor Replacment	$7,850	$3,925	$596	$11,179	$853	$0	$853	20	$17,060	$0	52.6%	13.1	4.41%	$1,511.49
ECM #5	Variable Speed Chilled Water Punmp Control	$6,000	$4,000	$2,400	$7,600	$1,165	$0	$1,165	15	$17,475	$0	129.9%	6.5	12.82%	$6,307.69
ECM #6	Geothermal System Conversion	$2,048,190	$1,024,090	$16,200	$3,056,080	$188,762	$0	$188,762	20	$3,775,240	$0	23.5%	16.2	2.10%	($247,778.09)
ECM #7	Demand Control Ventilation	$89,000	$44,500	$0	$133,500	$24,107	$0	$24,107	15	$361,605	$0	170.9%	5.5	16.14%	$154,287.80
ECM #8	DDC Control System Upgrade	$237,300	$118,700	$0	$356,000	$24,107	$0	$24,107	15	$361,605	$0	1.6%	14.8	0.20%	($68,212.20)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Photovoltaic Panel Installation	$1,301,340	$650,670	$0	$1,952,010	$40,290	$100,011	$140,301	25	$3,507,525	$2,500,275	79.7%	13.9	5.13%	$491,072.03

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
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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
Silver Run School

Building ID: 1875040
For 12-month Period Ending: May 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 12, 2009

Facility
Silver Run School
301 Silver Run Rd.
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: 1992
Gross Floor Area (ft²): 89,000

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	5,189,352
Natural Gas (kBtu)[4]	8,971,400
Total Energy (kBtu)	14,160,752

Energy Intensity[5]

Site (kBtu/ft²/yr)	159
Source (kBtu/ft²/yr)	300

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	1,268

Electric Distribution Utility
Atlantic City Electric Co

National Average Comparison

National Average Site EUI	80
National Average Source EUI	151
% Difference from National Average Source EUI	99%
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	Silver Run 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	301 Silver Run Rd., 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		☐
Silver Run School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	89,000 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	No	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	175	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	1	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	N/A(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Atlantic City Electric Co

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
05/01/2009	05/31/2009	150,364.00
04/01/2009	04/30/2009	109,599.00
03/01/2009	03/31/2009	90,439.00
02/01/2009	02/28/2009	80,347.00
01/01/2009	01/31/2009	73,516.00
12/01/2008	12/31/2008	85,358.00
11/01/2008	11/30/2008	97,199.00
10/01/2008	10/31/2008	145,881.00
09/01/2008	09/30/2008	189,258.00
08/01/2008	08/31/2008	179,770.00
07/01/2008	07/31/2008	162,807.00
06/01/2008	06/30/2008	156,374.00

Electric Meter Consumption (kWh (thousand Watt-hours))	**1,520,912.00**
Electric Meter Consumption (kBtu (thousand Btu))	**5,189,351.74**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))	**5,189,351.74**
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	4,334.00
04/01/2009	04/30/2009	9,512.00
03/01/2009	03/31/2009	5,951.00
02/01/2009	02/28/2009	8,717.00
01/01/2009	01/31/2009	8,985.00
12/01/2008	12/31/2008	8,757.00
11/01/2008	11/30/2008	7,493.00
10/01/2008	10/31/2008	6,041.00
09/01/2008	09/30/2008	8,399.00
08/01/2008	08/31/2008	8,672.00

07/01/2008	07/31/2008	7,124.00
06/01/2008	06/30/2008	5,729.00
Natural Gas Meter Consumption (therms)		**89,714.00**
Natural Gas Meter Consumption (kBtu (thousand Btu))		**8,971,400.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**8,971,400.00**
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
Silver Run School
301 Silver Run Rd.
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

Silver Run School	
Gross Floor Area Excluding Parking: (ft^2)	89,000
Year Built	1992
For 12-month Evaluation Period Ending Date:	May 31, 2009

Facility Space Use Summary

Silver Run School	
Space Type	K-12 School
Gross Floor Area(ft^2)	89,000
Open Weekends?	No
Number of PCs	175
Number of walk-in refrigeration/freezer units	1
Presence of cooking facilities	Yes
Percent Cooled	100
Percent Heated	100
Months[o]	N/A
High School?	No
School District[o]	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 05/31/2009)	**Baseline** (Ending Date 05/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	2	2	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	159	159	63	N/A	80
Source ($kBtu/ft^2$)	300	300	118	N/A	151
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	1,268	1,268	498	N/A	637
$kgCO_2e/ft^2$/year	14	14	6	N/A	7

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.

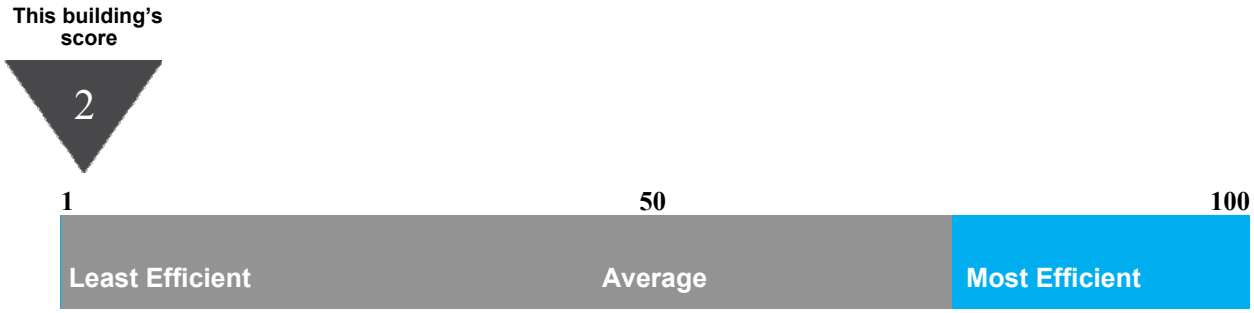
Statement of Energy Performance

2009

Silver Run School
301 Silver Run Rd.
Millville, NJ 08332

Portfolio Manager Building ID: 1875040

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 300 kBtu per square foot per year.*

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

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

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

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 10/12/2009

MAJOR EQUIPMENT LIST

Concord Engineering Group

"Millville B.O.E. - Silver Run School"

Boiler

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire Facility	HB Smith	1	B-1	Series 28A-6	N92 264	1827	1246	70%	Nat. Gas	17	35	18
Boiler Room	Entire Facility	HB Smith	1	B-2	Series 28A-6	N92 265	1827	1246	70%	Nat. Gas	17	35	18

Boiler - Burner

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	Input (MBh)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	B-1	Power Flame	1		C2-G-15	030203610	1827	Nat. Gas	7	21	14
Boiler Room	B-2	Power Flame	1		C2-G-15	030203609	1827	Nat. Gas	7	21	14

Hot Water Pumps

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Nema Motor Eff	Frame Size	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire Facility	Peerless Pump	1	P-1	1-1025AMBF	473072	7.5	1745	160	95	85.50%	213T	200-230/460	3	60	17	20	3
Boiler Room	Entire Facility	Peerless Pump	1	P-2	1-1025AMBF	473072	7.5	1745	160	95	85.50%	213T	200-230/460	3	60	17	20	3

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Equipment Tag	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire Facility	PVI	1	HW-B01	1250P250ATP	49275930	1000	1250	250	83%	Nat. Gas	17	24	7
Boiler Room	Entire Facility	PVI	1	HW-B02	1250P250ATP	59275930	1000	1250	250	83%	Nat. Gas	17	24	7

Air Cooled Chiller

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Building Exterior	Entire School	Trane	1	CH-1	RTA155	-	155 Ton	9.8 EER	R-22	480	3	60	17	23	6

Chiller Water Pumps

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Nema Motor Eff	Frame Size	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire Facility	Peerless Pump	1	P-5	-	-	20	1755	360	130	88.50%	256T	200-230/460	3	60	17	20	3
Boiler Room	Entire Facility	Peerless Pump	1	P-6	-	-	20	1755	360	130	88.50%	256T	200-230/460	3	60	17	20	3

Ice Storage Pumps

Location	Area Served	Manufacturer	Qty.	Equipment Tag	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Nema Motor Eff	Frame Size	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire Facility	Peerless Pump	1	P-7	-	-	15	1745	450	70	88.50%	-	230/460	3	60	17	20	3
Boiler Room	Entire Facility	Peerless Pump	1	P-8	-	-	15	1745	450	70	88.50%	-	230/460	3	60	17	20	3

INVESTMENT GRADE LIGHTING AUDIT

CEG Job #: 9C09072
Project: Millville B.O.E.
Address: 301 Silver Run Road
Millville, NJ 08332
Building SF: 89,000

"Millville - Silver Run School"

KWH COST: $0.141

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 Room	3750	6	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.35	1,305.0	$184.01	0	0	No Change Required (NCR)	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2	123 A	3750	4	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.23	870.0	$122.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3	Corridor A Storage	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$57.63	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
4	Women's Bathroom	3750	3	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.17	652.5	$92.00	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
5	123	3750	21	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	1.22	4,567.5	$644.02	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
6	Paper Storage	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$115.27	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
7	Menes Bathroom	3750	3	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.17	652.5	$92.00	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8	Paper Storage	3750	2	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.12	435.0	$61.34	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
9	125	3750	22	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	2.40	8,992.5	$1,267.94	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
10	125 Storage	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
11	127	3750	12	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.31	4,905.0	$691.61	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
12	127 Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
13	127 Prep. Room	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$115.27	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

14	Women's Bathroom	3750	4	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.23	870.0	$122.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
15	Janitor Closet	3750	1	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
16	Men's Bathroom	3750	4	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.23	870.0	$122.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
17	Corridor A	3750	22	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	1.28	4,785.0	$674.69	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
18	Corridor A	3750	5	6	4' x 4', 6-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	167	0.84	3,131.3	$441.51	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
19	144 Copy Room	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$115.27	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
20	144 Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
21	142	3750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$230.54	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
22	Library	3750	36	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	2.09	7,830.0	$1,104.03	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
23	Library Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
24		3750	25	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	1.45	5,437.5	$766.69	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
25	Gym	3750	24	1	1-Lamp, Metal Halide 400W	455	10.92	40,950.0	$5,773.95	24	1	4-Lamp T-5 HO Cooper F-Bay	229	5.50	20610	$2,906.01	$400.00	$9,600.00	5.42	20340	$2,867.94	3.35
26	Gym Storage #1	3750	2	3	2' x 4', 3-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	82	0.16	615.0	$86.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
27	Boys Locker Room	3750	7	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.41	1,522.5	$214.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
28		3750	2	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.12	435.0	$61.34	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
29	Boys Shower	3750	2	3	2' x 4', 3-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	82	0.16	615.0	$86.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

30	Boys Office	3750	2	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.12	435.0	$61.34	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
31	Boys Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
32	Boys Shower	3750	1	1	High-hat over shower, 1-Lamp, Compact Fluorescent 13W, Recessed Mount	13	0.01	48.8	$6.87	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
33	Boys Storage #2	3750	2	3	2' x 4', 3-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	82	0.16	615.0	$86.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
34	Cafeteria	3750	20	1	Mounted on 2' x 2' grill, 1-Lamp, Metal Halide 400W	455	9.10	34,125.0	$4,811.63	20	1	4-Lamp T-5 HO Cooper F-Bay	229	4.58	17175	$2,421.68	$400.00	$8,000.00	4.52	16950	$2,389.95	3.35
35	Staff Dining	3750	6	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.35	1,305.0	$184.01	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
36	Kitchen	3750	4	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.23	870.0	$122.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
37		3750	23	2	1' x 4', 2-Lamp, T8 32W, Surface Ballast, Surface Mount, Prismatic Lens	58	1.33	5,002.5	$705.35	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
38	Kitchen Office	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
39	Kitchen Locker Room	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
40	Kitchen Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
41	Music	3750	16	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.74	6,540.0	$922.14	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
42	Music Small Instruction	3750	3	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.17	652.5	$92.00	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
43	Music Office	3750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$230.54	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
44	Stage	3750	8	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.87	3,270.0	$461.07	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
45		3750	14	1	High-hat, 1-Lamp, Recessed Mount	13	0.18	682.5	$96.23	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

46	Stage Storage	3750	4	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.23	870.0	$122.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
47	Corridor E	3750	22	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	1.28	4,785.0	$674.69	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
48	Corridor E	3750	5	6	4' x 4', 6-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	167	0.84	3,131.3	$441.51	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
49	Custodian Office	3750	3	3	2' x 4', 3-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	82	0.25	922.5	$130.07	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
50	Electrical Room	3750	7	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Pendant Mount, Prismatic Lens	58	0.41	1,522.5	$214.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
51	121	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
52	119	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
53	119 Sink area	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
54	119 Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
55	117	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
56	117 Sink area	3750	1	3	2' x 4', 3-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	82	0.08	307.5	$43.36	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
57	117 Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
58	115	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
59	Corridor D	3750	25	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	1.45	5,437.5	$766.69	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
60	113	3750	12	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.31	4,905.0	$691.61	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
61	113 Sink area	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

62	113 Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
63	113 Chalkboard	3750	7	2	4' Chalkboard Light, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount	58	0.41	1,522.5	$214.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
64	Women's Bathroom	3750	4	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.23	870.0	$122.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
65	Janitor Closet	3750	1	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
66	Men's Bathroom	3750	4	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.23	870.0	$122.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
67	114	3750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$230.54	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
68	112	3750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$230.54	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
69	111	3750	12	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.31	4,905.0	$691.61	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
70	111 Sink area	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
71	111 Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
72	109	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
73	110	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
74	108	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
75	107	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
76	106	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
77	105	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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78	104	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
79	103	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
80	102	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
81	101	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
82	Corridor B Electrical Room	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$57.63	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
83	146	3750	6	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.65	2,452.5	$345.80	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
84	116 Computer Lab	3750	16	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.74	6,540.0	$922.14	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
85	Computer Lab Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
86	118	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
87	120	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
88	Main Office	3750	10	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.58	2,175.0	$306.68	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
89		3750	25	2	1' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	1.45	5,437.5	$766.69	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
90	Main Office Copy Room	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$115.27	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
91	Main Office Storage	3750	2	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.12	435.0	$61.34	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
92	Principal Office	3750	4	3	2' x 4', 3-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Parabolic Lens	82	0.33	1,230.0	$173.43	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
93	Principal Conference Room	3750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	817.5	$115.27	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

94	Vice President Office	3750	2	3	2' x 4', 3-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Parabolic Lens	82	0.16	615.0	$86.72	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
95	Nurse	3750	4	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.23	870.0	$122.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
96	Nurse Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
97	Nurse Exam Room	3750	3	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.17	652.5	$92.00	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
98	Nurse Patient Room	3750	5	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.29	1,087.5	$153.34	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
99	Corridor	3750	1	2	2' x 2', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
100	Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
101	Main Office Corridor	3750	5	1	High-hat, 1-Lamp, Compact Fluorescent 13W, Electronic Ballast, Recessed Mount	13	0.07	243.8	$34.37	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
102	122	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
103	124	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
104	126	3750	15	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.64	6,131.3	$864.51	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
105	126 Storage	3750	1	2	2' x 4', 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
106	126 Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Surface Mount	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
107	Paper Storage	3750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	408.8	$57.63	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
108	128	3750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$230.54	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
109	129	3750	12	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	1.31	4,905.0	$691.61	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

110	129 Bathroom	3750	1	2	4' Vanity, 2-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	58	0.06	217.5	$30.67	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
111	130	3750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,635.0	$230.54	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
112	131	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
113	132	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
114	133	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
115	134	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
116	135	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
117	136	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
118	137	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
119	138	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
120	139	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121	140	3750	9	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.98	3,678.8	$518.70	0	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		695	286			72.89	273,326.3	$38,539.00	44	2			10.076	37785	$5,327.69		$17,600.00	9.94	37290.0	$5,257.89	3.35

Lighting Controls Applicable

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

Simple Payback Analysis

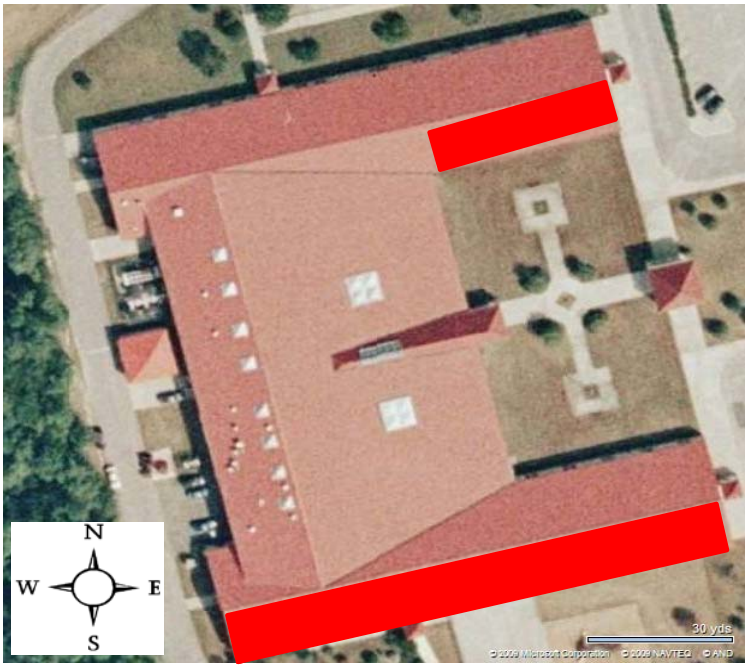
	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,952,010
Annual kWh Production	285,747
Annual Energy Cost Reduction	$40,290
Annual SREC Revenue	$100,011
First Cost Premium	**$1,952,010**
Simple Payback:	**13.9** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.141**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$1,952,010	0	0	0	$0	(1,952,010)	0
1	$0	285,747	$40,290	$0	$100,011	$140,302	($1,811,708)
2	$0	284,318	$41,499	$0	$99,511	$141,010	($1,670,698)
3	$0	282,897	$42,744	$0	$99,014	$141,758	($1,528,940)
4	$0	281,482	$44,026	$0	$98,519	$142,545	($1,386,395)
5	$0	280,075	$45,347	$2,885	$98,026	$140,489	($1,245,906)
6	$0	278,674	$46,708	$2,870	$97,536	$141,373	($1,104,533)
7	$0	277,281	$48,109	$2,856	$97,048	$142,301	($962,232)
8	$0	275,895	$49,552	$2,842	$96,563	$143,273	($818,959)
9	$0	274,515	$51,039	$2,828	$96,080	$144,291	($674,667)
10	$0	273,143	$52,570	$2,813	$95,600	$145,356	($529,311)
11	$0	271,777	$54,147	$2,799	$95,122	$146,469	($382,841)
12	$0	270,418	$55,771	$2,785	$94,646	$147,632	($235,209)
13	$0	269,066	$57,444	$2,771	$94,173	$148,846	($86,363)
14	$0	267,721	$59,168	$2,758	$93,702	$150,112	$63,749
15	$0	266,382	$60,943	$2,744	$93,234	$151,433	$215,182
16	$0	265,050	$62,771	$2,730	$92,768	$152,809	$367,990
17	$0	263,725	$64,654	$2,716	$92,304	$154,241	$522,232
18	$0	262,406	$66,594	$2,703	$91,842	$155,733	$677,965
19	$0	261,094	$68,592	$2,689	$91,383	$157,285	$835,250
20	$0	259,789	$70,649	$2,676	$90,926	$158,900	$994,150
21	$1	258,490	$72,769	$2,662	$90,471	$160,578	$1,154,728
22	$2	257,197	$74,952	$2,649	$90,019	$162,322	$1,317,049
23	$3	255,911	$77,200	$2,636	$89,569	$164,134	$1,481,183
24	$4	254,632	$79,516	$2,623	$89,121	$166,015	$1,647,198
25	$5	253,359	$81,902	$2,610	$88,676	$167,968	$1,815,166
	Totals:	5,451,454	$1,082,616	$44,465	$1,908,009	$3,767,176	$2,946,160
				Net Present Value (NPV)			**$1,815,191**
				Internal Rate of Return (IRR)			**5.6%**

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
Silver Run School	15400	Sunpower SPR230	943	14.7	13,866	216.9	285,747	31,119	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:	216.9 kW
DC to AC Derate Factor:	0.810
AC Rating:	175.7 kW
Array Type:	Fixed Tilt
Array Tilt:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	14.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.61	20443	2882.46
2	4.20	21284	3001.04
3	4.78	25679	3620.74
4	5.23	26373	3718.59
5	5.44	27684	3903.44
6	5.48	25913	3653.73
7	5.55	26791	3777.53
8	5.41	26397	3721.98
9	5.23	25264	3562.22
10	4.60	23626	3331.27
11	3.59	18770	2646.57
12	3.17	17523	2470.74
Year	4.69	285747	40290.33

.= Proposed PV Layout

Notes:

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