LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR:

MT. OLIVE TWP. SCHOOL DISTRICT
SANDSHORE ELEMENTARY SCHOOL

498 SANDSHORE RD.
BUDD LAKE, NJ, 07828

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I. EXECUTIVE SUMMARY

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

Mount Olive Township School District
Sandshore Elementary School
498 Sandshore Road,
Budd Lake, NJ, 07828

Municipal Contact Person: Mr. Thomas Scerbo

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	$65,214
Natural Gas	$46,286
Total	$111,500

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's are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade - Interior Spaces	$6,350	$794	8.0	87.5%
ECM #2	Lighting Upgrade - Gymnasium	$2,280	$1,294	1.8	751.5%
ECM #3	Lighting Controls Upgrade	$10,775	$2,099	5.1	192.2%
ECM #4	Install Condensing Hot Water Boilers	$220,000	$9,985	22.0	-31.9%
ECM #5	Premium Efficiency Motors	$1,410	$158	8.9	68.3%
ECM #6	Replace windows	$427,500	$8,772	48.7	-69.2%
ECM #7	Air Conditioning Unit Upgrades	$33,306	$2,670	12.5	20.2%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solar PV installation	$1,724,310	$120,701	14.3	5.0%

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

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

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
ECM #1	Lighting Upgrade - Interior Spaces	1.9	4,807	0
ECM #2	Lighting Upgrade - Gymnasium	2.7	8,244	0
ECM #3	Lighting Controls Upgrade	0	13,370	0
ECM #4	Install Condensing Hot Water Boilers	0	0	7,862
ECM #5	Premium Efficiency Motors	0.3	953	0
ECM #6	Replace windows	3.7	7,800	5,086
ECM #7	Air Conditioning Unit Upgrades	8.7	17,004	0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	Solar PV installation	153.3	238,069	0

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

- **ECM #1** Lighting Upgrade - Interior Spaces
- **ECM #2** Lighting Upgrade - Gymnasium
- **ECM #3** Lighting Controls Upgrade
- **ECM #5** Premium Efficiency Motors

ECM #1 Lighting Upgrade – Interior Spaces

The majority of the lighting in the Sandshore Elementary School building was updated with modern fluorescent fixtures. However, there are still older fluorescent fixtures with T12 lamps and incandescent bulbs in a number of the areas such as some of the classrooms, offices, storage spaces, utility closets and bathrooms. T8 lamps with electronic ballasts use less energy while providing longer equipment life. In addition, compact fluorescent lamps provide a simple and easy way to reduce electrical energy incandescent lamps use. CEG recommends retrofitting remaining T12 fixtures with T8 lamps and electronic ballasts and replacing all of the incandescent lamps with compact fluorescent lamps. This ECM has a simple payback of 8 years.

ECM #2 Lighting Upgrade – Gymnasium

The existing metal halide fixtures in the gymnasium provide adequate light for the space, however with a few drawbacks that should be considered. In addition to the color, and operability drawbacks, the metal halide fixtures use approximately 30% more energy than a T-5 HO fixture to provide the equivalent light. Overall savings for this ECM is approximately $1,300 per year and pays back in 1.8 years.

ECM #3 Lighting Occupancy Sensors / Daylight Sensors

Lighting controls provide a simple and effective solution to the problem of lights being unnecessarily left on. Occupancy sensors alone provide fast payback since there is no retrofit needed for the existing lighting. Daylight Sensors were included in this ECM to show the relative effect of daylight harvesting in addition to occupancy sensors. The combination of both options still pays back in approximately 5 years and therefore it is recommended.

ECM #5 Premium Efficiency Motors

The existing electric motors driving the primary hot water pumps are good candidates for replacing with premium efficiency motors. These standard efficiency motors are old and run considerable amount of time over a year. NEMA Premium® is the most efficient motor designation in the marketplace today.

Other Energy Conservation Measures

ECM #7 does not provide a payback less than 10 years. However, CEG recommends the board to review the list of air conditioners mentioned in this ECM and when the existing units fail, replace them with the recommended high efficiency units listed in the ECM #7.

Renewable Energy Analysis

Renewable Energy Measures (REMs) were also reviewed for implementation at the Sandshore Elementary School. CEG utilized a roof mounted solar array to house a substantial PV system. The recommended 192 kW PV system will produce approximately 238,000 kWh of electricity annually and will reduce the schools electrical consumption from the grid by 57%. The system's calculated simple payback of 14.3 years is past the standard 10 year simple payback threshold; however, with alternative funding this payback could be lessened. CEG recommends the Owner review all funding options before deciding to not implement this renewable energy measure.

Operation and Maintenance Considerations

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.
5. 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.

Retro-Commissioning

In addition to the above recommendations, based on the review of the facility's energy bills 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.

Other Recommendations

To provide assistance to small public entities in the effort to implement valuable ECMs, the NJ Clean Energy program in combination with the BPU has initiated the "Direct Install Program". This program provides extremely large incentives to facilities such as the Chester M. Stephens Elementary School building, to jump start energy projects. The direct install program offers incentives up to 60% of the installation costs through the services of pre-approved contractors. The program is directed towards one for one replacement projects that save energy and provide valuable upgrades for the facility for only 40% of the installation cost.

Conclusion

Overall, the Sandshore Elementary School appears to be operating at a lower efficiency level compared to other schools in the region. With the implementation of the above recommended measures the Mt. Olive BOE will realize further energy savings at the Sandshore Elementary School.

II. INTRODUCTION

The comprehensive energy audit covers the 52,000 square foot Sandshore Elementary School, which includes classrooms, library and media center, cafeteria, kitchen, gymnasium, music room, art room, boiler room, custodial spaces, storage spaces, administration offices and restrooms.

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:

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

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

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

$$\text{Lifetime Maintnance Savings} = \left(\text{Yearly Maintenance Savings} \times \text{ECM Lifetime} \right)$$

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

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

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. Jersey Central Power and Light (JCP&L) provides electricity to the facility under their General Service Secondary Three-Phase 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. Elizabethtown Gas Company provides natural gas to the facility under the General Delivery Service (GDS) rate structure. 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 was responsible for providing the supply of gas to the building. The facility switched to a HESS as the new commodity provider starting from July 2010. Commodity (Supply) 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 for the campus is as follows:

Description	Average
Electricity	15.7¢ / kWh
Natural Gas	$1.27 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Jersey Central Power and Lighting
Rate: General Service Secondary
Meter No: L86728160
Customer ID No: 100000654572
Third Party Utility Provider: -
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Sep-09	36,160	117.9	$5,694
Oct-09	40,800	114.3	$6,199
Nov-09	36,000	114.3	$5,642
Dec-09	41,920	117.9	$6,472
Jan-10	38,560	109.0	$5,960
Feb-10	35,920	109.0	$5,600
Mar-10	40,960	111.7	$6,305
Apr-10	33,120	112.3	$5,240
May-10	35,920	121.3	$5,737
Jun-10	34,480	131.8	$5,614
Jul-10	21,680	121.8	$3,409
Aug-10	20,800	73.2	$3,342
Totals	**416,320**	**131.8 Max**	**$65,214**

AVERAGE DEMAND 112.9 KW average
AVERAGE RATE $0.157 $/kWh

Figure 1
Electricity Usage Profile
Sandshore Elementary School
Sep-09 through Aug-10

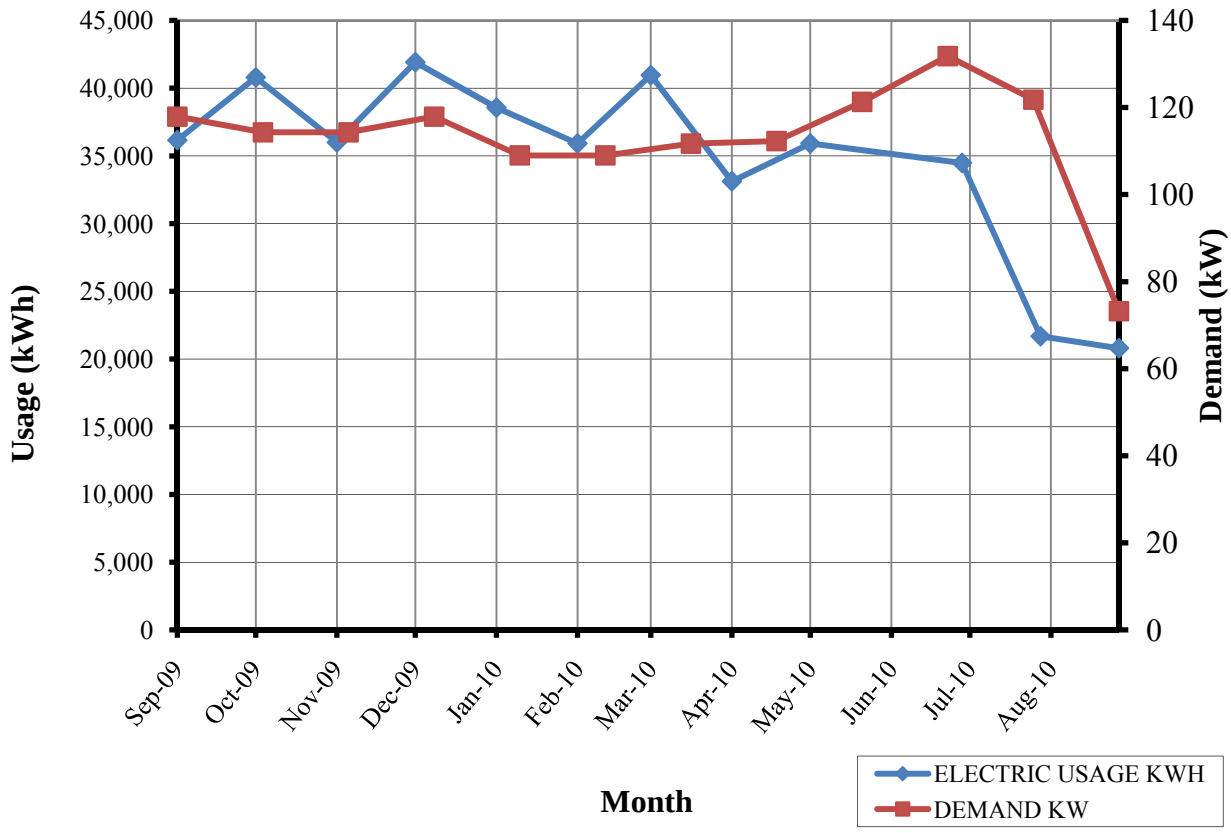
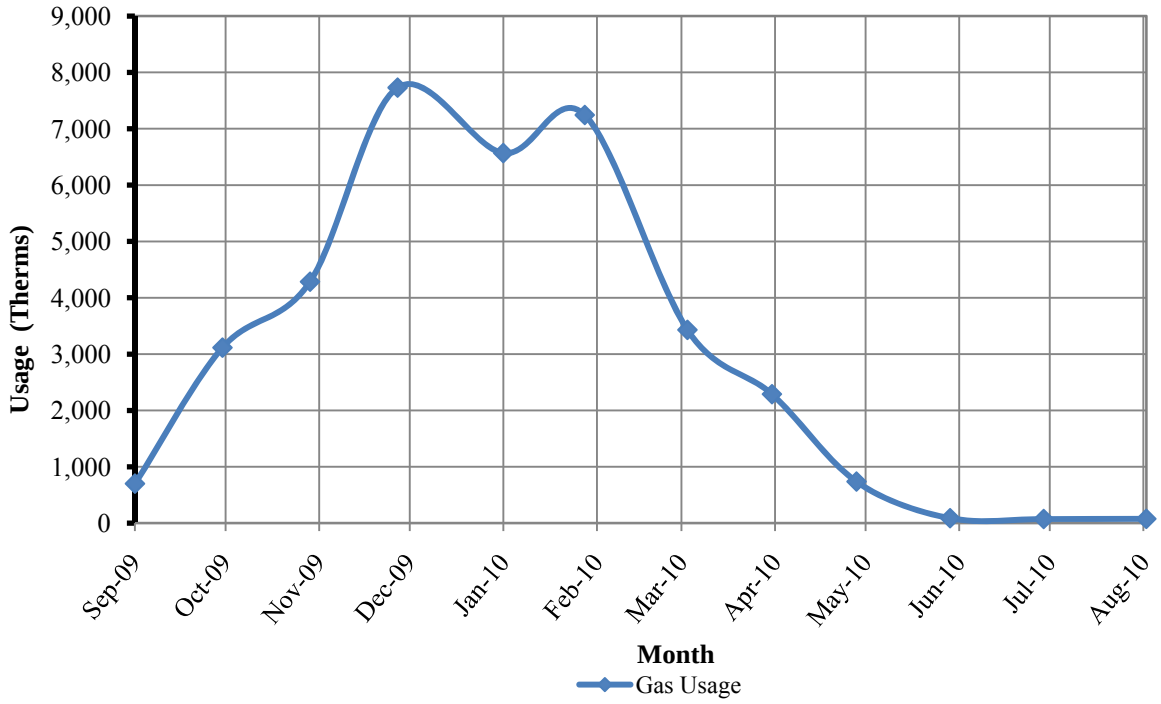


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	Elizabethtown Gas	
Rate:	General Delivery Service	
Meter No:	00037826	
Account Number	1047034561	
Third Party Utility Provider:	Pepco, HESS	
TPS Account #:	1047034561, 446646/565191	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Sep-09	701.70	$1,312.30
Oct-09	3,116.10	$4,441.12
Nov-09	4,285.90	$5,427.36
Dec-09	7,730.10	$9,417.81
Jan-10	6,567.60	$8,040.23
Feb-10	7,243.40	$8,832.11
Mar-10	3,430.00	$4,351.06
Apr-10	2,290.30	$2,988.99
May-10	738.60	$1,197.18
Jun-10	89.10	$103.23
Jul-10	74.00	$86.03
Aug-10	77.80	$88.87
TOTALS	**36,344.60**	**$46,286.29**
AVERAGE RATE:	**$1.27**	**$/THERM**

Figure 2
Natural Gas Usage Profile
Sandshore Elementary School
Sep-09 through Aug-10



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:

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

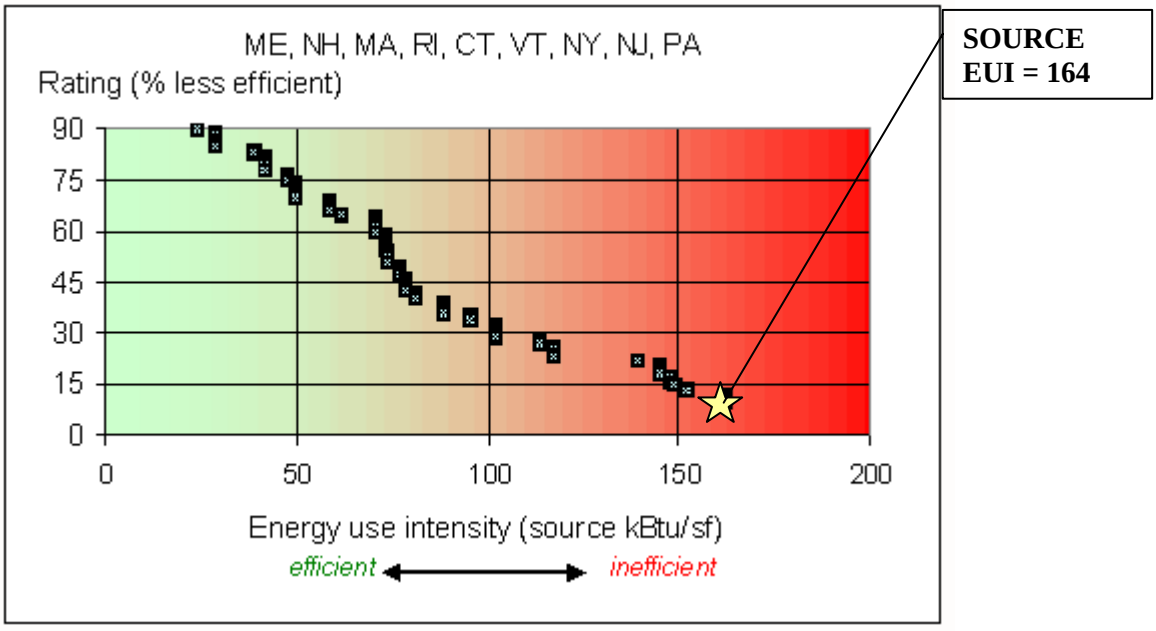
$$\text{Building Source EUI} = \frac{(\text{Electric Usage in kBtu X SS Ratio} + \text{Gas Usage in kBtu X SS Ratio})}{\text{Building Square Footage}}$$

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	416,320			1,421,316	3.340	4,747,197
NATURAL GAS		36,345		3,634,460	1.047	3,805,280
TOTAL				5,055,776		8,552,477
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		52,000	SQUARE FEET			
BUILDING SITE EUI		*97*	kBtu/SF/YR			
BUILDING SOURCE EUI		*164*	kBtu/SF/YR			

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

Figure 3
Source Energy Use Intensity Distributions: Elementary School



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: mtoliveschools
Password: lgeaceg2010

Security Question: What city were you born in?
Security Answer: Mount Olive

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**
Sandshore Elementary School	39	50

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

V. FACILITY DESCRIPTION

The 52,000 SF Elementary School is a single story facility comprised of classrooms, library, cafeteria, kitchen, gymnasium, music room, boiler room, custodial spaces, storage spaces, administration offices, restrooms, art room, and library & media center. The facility was built in 1972. The hours of operation for the school students and teachers are between 8:45 am and 3:30 pm on the weekdays. The facility is closed on weekends. The student enrollment at Sandshore Elementary School is approximately 500 students and 50 staff.

The building exterior is comprised of concrete block wall construction with brick façade. The amount of insulation within the wall structure is unknown. The roof structure of the north structure is built up with spray foam and sand covering. The insulation value of the roof is not known. Window construction consists of a combination of single pane glasses with aluminum frames. Overall condition of the windows throughout the building is fair. It is recommended to replace the windows with double or triple pane insulated windows. Blinds are utilized throughout the perimeter spaces. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat in the summer.

HVAC Systems

The Building heating system consists of two (2) 5,000 MBH Cleaver Brooks hot water boilers, which serve the building's heating hot water loop. The hot water is circulated by two (2) floor mounted constant volume pumps made by Armstrong. The pumps are driven by standard efficiency motors. The pumps provide heating hot water for the unit ventilators, hot water baseboard heaters and preheat and reheat coils on heating and ventilation (HV) units and some of the roof top air conditioning units.

Heating and ventilation in the classrooms and library are provided with unit ventilators. There are approximately twenty-nine (29) unit ventilators in the building. Twelve (12) of the units are connected to condensing units of various sizes for mechanical cooling. Majority of the condensing units are located on the roof. The unit ventilators are installed either below the windows or on the ceiling in the classrooms. Six (6) of the unit ventilators are installed on the ceiling. These units are made by Carrier and they are connected to 2 ton Carrier condensing units. The remaining unit ventilators are made by Herman Nelson. Six (6) of these unit ventilators are connected to condensing units made by York (4) and Sanyo (2). In addition, there are two (2) heating and ventilation (HV) units serving the gymnasium, two (2) HV units serving the cafeteria, one (1) unit for the band room and one (1) more HV unit for the kitchen. The HV units are approximately 28 years old and original to the building. However, there is minimal energy savings associated with replacement of these heating and ventilation units.

Special education department utilizes (2) Carrier rooftop air conditioning units with 3 and 5 ton cooling capacities. The units were installed 2000 and in good condition. The heating for the special education department is provided with fin-tube hot water radiators. In addition, there are two (2) 2-Ton window air conditioners feeding two classrooms in the building. These units are in good condition.

Recently, two (2) Fujitsu high efficiency ductless split air conditioning units were installed for the faculty room. Each unit has 18,000 BTU/Hr cooling capacity.

The school houses a small commercial kitchen. The kitchen includes an electric cooking range, electric oven, a walk-in refrigerator and a freezer. The walk-in units appear to be in good condition. The walk-in refrigerator is approximately 30 years old while the walk-in freezer is 15 years old. There are two (2) refrigerated vending machines that operate year round in this building.

Exhaust System

Unit ventilators provide the minimum outside air intake and exhaust in the majority of the classrooms. Some of the classrooms and the office spaces have dedicated exhaust fans located on the roof. The toilet rooms have dedicated roof exhausters as well.

The kitchen includes electric cooking ranges and a 4ft x 14ft commercial exhaust hood, which provides exhaust for cooking equipment. The kitchen hood is equipped with variable speed fan speed controls and it is manually controlled with a wall switch.

HVAC System Controls

The building HVAC systems are controlled by two separate building automation systems, which are Johnson Controls Incorporated (JCI) Metasys System and Automated Logics System.

The Metasys control system is capable of operating the hot water boilers, hot water pumps, hot water supply temperatures based on outside air temperature and also time of day scheduling. In addition, the Metasys system controls two (2) unit ventilators in the library. The unit ventilators are scheduled to turn on and off based on student schedules. The system operates the outside air dampers on each unit ventilator such that the outside air dampers open during the occupied hours and shuts off when the unit is off.

The Automated Logics building automation system controls the remaining unit ventilators. The system controls the hot water valves on the coils, outside air dampers and condensing units. The Carrier Rooftop Units are scheduled through the Automated Logics system as well.

Domestic Hot Water

Domestic hot water for the restrooms and the faucets in the utility rooms is provided with a 120 gallon, gas fired hot water heater made by A.O. Smith. The unit is installed in 2009. The domestic hot water is circulated throughout the building by a hot water re-circ pumps. The circulation pump is controlled by aqua stat. The domestic hot water piping insulation appeared to be in good condition.

Lighting

Typical lighting throughout school building is fluorescent tube lay-in fixtures with T-8 lamps and magnetic ballasts. There are small amount of fixtures in the building with older T12 lamps and magnetic ballasts. Some of the storage rooms and closets lit with a mixture of incandescent

lamps and compact fluorescent lamps. The gym lighting is provided with 400W metal halide fixtures. The building exterior is lit with 175W metal halide flood lights.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade – Interior Spaces

Description:

The majority of the lighting throughout the Sandshore Elementary School building is provided with modern fixtures with T8 lamps and electronic ballasts. However, some of the classrooms, offices, storage spaces, utility closets and bathrooms in the buildings still have a variety of older fixtures with T12 lamps with magnetic ballasts, incandescent lamps and compact fluorescent lamps. It is recommended to replace all of the T12 fixtures and the incandescent lights in these areas with higher efficiency fluorescent T8 fixtures with electronic ballasts or compact fluorescent lamps.

This ECM includes retrofit of all T12 fixtures with T8 fixtures with electronic ballasts in the building. The new, energy efficient T8 fixtures will provide adequate lighting and will save on electrical costs due to better performance of the lamp and ballasts. This ECM also includes maintenance savings through the reduced number of lamps replaced per year. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which is approximately 20,000 burn-hours. The facility will need approximately 33% less lamps replaced per year for each one for one fixture replaced.

The ECM also includes replacement of any incandescent lamps with compact fluorescent lamps. Compact fluorescent lamps (CFL's) were designed to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 26-Watt CFL for a 100-Watt incandescent lamp. The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures. Where the existing fixture is controlled by a dimmer switch, the CFL bulb must be compatible with a dimmer switch. In some locations the bulb replacement will need to be tested to make sure the larger base of the CFL will fit into the existing fixture. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours. However, the maintenance savings due to reduced lamp replacement is offset by the higher cost of the CFL's compared to the incandescent lamps.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building.

Rebates and Incentives:

There are incentives available from NJ Smart Start® Program for the retrofits in this ECM. Incentives are calculated as follows:

From the Smart Start Incentive appendix, the retrofit of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-4 lamp) = $10 per fixture.

$$\text{Smart Start® Incentive} = (\#\text{ of } 1-4 \text{ lamp fixtures} \times \$10) = 67 \times \$10 = \$670$$

Replacement and Maintenance Savings are calculated as follows:

$$\text{Savings} = (\text{reduction in lamps replaced per year}) \times (\text{repacment \$ per lamp} + \text{Labor \$ per lamp})$$

$$\text{Savings} = 5.6 \times (\$2 \text{ per lamp} + \$5 \text{ per lamp}) = \$39$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,020
NJ Smart Start Equipment Incentive ($):	$670
Net Installation Cost ($):	$6,350
Maintenance Savings ($/Yr):	$39
Energy Savings ($/Yr):	$755
Total Yearly Savings ($/Yr):	$794
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.0
Simple Lifetime ROI	87.5%
Simple Lifetime Maintenance Savings	$585
Simple Lifetime Savings	$11,905
Internal Rate of Return (IRR)	9%
Net Present Value (NPV)	$3,124.91

ECM #2: Lighting Upgrade - Gymnasium

Description:

The gymnasium at the Elementary School utilizes 400W metal halide fixtures for its lighting. Metal halide bulbs provide a reasonably efficient option for bay lighting however a few drawbacks that are common. Metal halide fixtures often have poor overall efficacy which limits the amount of light actually leaving the fixture. Also metal halide bulbs require a significant warm-up period and even longer cool down period eliminating the potential for occupancy sensors frequent switching. This symptom encourages the gymnasium lighting to be left on continuously during the day. Another drawback is the reduced lumen output (Lumen Maintenance) of the metal halide bulb over its life time. Average bulb output or "mean lumens," is approximately 25% less than the bulb's initial lumens for typical metal halide lamps. In addition the most rapid rate of light output decline is during the beginning of its life, approximately 15-20% light loss within the first 20% of its rated life. It is important to note that the light loss has no savings in energy used; therefore the overall light efficiency is continuously decreasing with age. The final drawback is the light quality or Color Rendering Index (CRI). Typical values for metal halide bulbs is 65, which is a measure of how close the light is to true "full spectrum" light produced by sunlight or incandescent lighting. Metal halide bulbs also show noticeable color shifting when the bulb is reaching the end of its life.

Utilizing fluorescent fixtures in low and high bay spaces is a superior option over metal halide fixtures in all areas described above. Although metal halide fixtures provide light very efficiently at the start of the bulb life, the average efficiency over the life is below that of fluorescent fixtures.

This ECM includes replacement of each of the existing gymnasium high bay metal halide light fixtures with 4-lamp T5HO fixtures with reflective lenses. The retrofit for the metal halide fixtures includes a one for one fixture replacement. The fluorescent fixtures selected will provide equivalent light compared to the average light output of the existing metal halide fixtures. The bulb replacement cost for T-5 HO lamps compared to the existing metal halide lamps were found to be approximately equal and therefore not included in the savings calculations.

Hours of Operation

Gymnasium: 3,000 Hours/Yr

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, the following incentives are warranted:

For replacement of HID (250-399W) with new T-5 or T-8 fixtures = $50/Fixture

$$\text{Smart Start ® Incentive} = (\#\ \text{of 250W Metal Halide Fixture Replaced} \times \$50)$$

$$\text{Smart Start ® Incentive} = (12 \times \$50) = \$600$$

There is no significant replacement or maintenance savings generated with this ECM.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,880
NJ Smart Start Equipment Incentive ($):	$600
Net Installation Cost ($):	$2,280
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,294
Total Yearly Savings ($/Yr):	$1,294
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.8
Simple Lifetime ROI	751.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$19,415
Internal Rate of Return (IRR)	57%
Net Present Value (NPV)	$13,171.36

ECM #3: Lighting Occupancy Sensors / Daylight Sensors

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 off when a room is left or on when a room is first occupied. This is common in 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 expected to be 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.

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:

- Occupancy Sensors for Lighting Control 20% - 28% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total light energy controlled by occupancy sensors and daylight sensors (The majority of the savings is expected to be after school hours when rooms are left with lights on)

This ECM includes installation of ceiling type sensors for individual offices, classrooms, large bathrooms, and libraries. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

$$\text{Energy Savings} = (\%\ \text{Savings} \times \text{Controlled Light Energy}\ (\text{kWh/Yr}))$$

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

Installation cost per dual-technology sensors (Basis: Sensor switch or equivalent) are as follows:

Dual Technology Occupancy Sensor & Day Light Sensor	$360	per installation
2 Pole Power Pack w/Dual Tech. Occupancy Sensor	$225	per installation
Dual Technology Occupancy Sensor - Remote Mount	$160	per installation
Dual Technology Occupancy Sensor - Switch Mount	$75	per installation
Daylight Sensor	$160	per installation

Cost includes material and labor.

See the **Investment Grade Lighting Audit Appendix** for details.

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Occupancy Sensor Wall Mounted (existing facility only) = $20 per sensor.
Occupancy Sensor Remote Mounted (existing facility only) = $35 per sensor

$$\text{Smart Start® Incentive} = (\#\ \text{of wall mount} \times \$\ 20) + (\#\ \text{of ceiling mount} \times 35)$$
$$\text{Smart Start® Incentive} = (14 \times \$\ 20) + (36 \times \$35) = \$1{,}540$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$12,315
NJ Smart Start Equipment Incentive ($):	$1,540
Net Installation Cost ($):	$10,775
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,099
Total Yearly Savings ($/Yr):	$2,099
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.1
Simple Lifetime ROI	192.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$31,486
Internal Rate of Return (IRR)	18%
Net Present Value (NPV)	$14,283.13

ECM #4: Condensing Boiler Installation

Description:
Heating for the Sandshore Elementary School is provided via two (2) standard efficiency 5,230 MBH gas fired boilers made by Cleaver Brooks. The boilers are approximately 39 years old, which is beyond their expected useful service life of thirty-five (35) years per ASHRAE. It is reported that a single boiler can satisfy the load throughout the year. This means boilers often run at partial load conditions. Typically, standard (non-condensing) boilers provide lower nominal efficiency compared to condensing boilers. Standard boilers suffer further efficiency losses at part load operating conditions mainly due to limitations in the reduction of the flue gas temperature. Current average combustion efficiency of each boiler is estimated to be 70% due to limited turn down ratio, cycling losses, age of the equipment, rusting and sediment build-up on the heat transfer surfaces and outdated design and controls. A new condensing boiler could substantially improve the operating efficiency of the heating system of the building. Condensing boiler's peak efficiency tops out at 99% depending on return water temperature.
CEG recommends replacing one of the two boilers with a set of two condensing hot water boilers to provide building with heating throughout the year. The annual average operating efficiency of the proposed boiler set is expected to be 90%, which gives the heating system a 20% increase in efficiency. This ECM is based on variable supply water temperature adjusted based on outdoor temperature.

This ECM includes installation of two (2) new condensing gas fired boilers to replace one of the existing Cleaver Brooks boilers. The basis for this ECM is Aerco Benchmark 2.5. New boiler shall be setup and programmed to provide heating for the building during entire year. The remaining Cleaver Brooks boiler shall be kept as a spare system.

Energy Savings Calculations:

Summary of annual gas consumption can be found in the table below:

ANNUAL GAS USAGE				
MONTH	TOTAL USAGE	DOMESTIC HW USAGE	HEATING ONLY	COST
Sep-09	702	80	621	$1,312
Oct-09	3,116	80	3,036	$4,441
Nov-09	4,286	80	4,206	$5,427
Dec-09	7,730	80	7,650	$9,418
Jan-10	6,568	80	6,487	$8,040
Feb-10	7,243	80	7,163	$8,832
Mar-10	3,430	80	3,350	$4,351
Apr-10	2,290	80	2,210	$2,989
May-10	739	80	658	$1,197
Jun-10	89	80	0	$103
Jul-10	74	80	0	$86
Aug-10	78	80	0	$89
TOTAL	**36,345**		**35,381**	**$46,286**

Baseline Domestic Hot Water Gas Use: 80 Therms (Average from June - August Gas Use)

Existing Natural Gas Use for Heating: 36,345 Therms – (80 Therms x 12 Months)
35,381 Therms

$$\text{Bldg Heat Required} = \text{Heating Nat. Gas (Therm)} \times \text{Heating Eff (\%)} \times \text{Fuel Heat Value } (\frac{\text{BTU}}{\text{Therm}})$$

$$\text{Proposed Heating Gas Usage} = \frac{\text{Bldg. Heat Required (BTU)}}{\text{New Heating Eff (\%)} \times \text{Fuel Heat Value } (\frac{\text{BTU}}{\text{Therm}})}$$

$$\text{Energy Cost} = \text{Heating Gas Usage (Therms)} \times \text{Ave Fuel Cost } (\frac{\$}{\text{Therm}})$$

CONDENSING BOILER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing AO Smith HW Boiler	New Condensing Boilers	-
Existing Nat Gas (Therms)	35,381	-	-
Boiler Efficiency (%)	70%	90%	20%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	0
Equivalent Building Heat Usage (MMBTUs)	2,477	2,477	0
Gas Cost ($/Therm)	1.27	1.27	0.00
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	35,381	27,519	7,862
Energy Cost ($)	$44,934	$34,949	$9,985
COMMENTS:			

Project Cost, Incentives and Maintenance Savings

Estimated cost for removing one of the existing boilers and installing two condensing hot water boilers with advanced controls is $225,000.

From the **New Jersey Smart Start® Program Incentives Appendix**, installation of a high efficiency hot water boiler falls under the category "Gas Heating" and warrants an incentive based on efficiency at or above 84% for this type of equipment. The program incentives are calculated as follows:

GAS FIRED BOILER REBATE SUMMARY					
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/MBH**	**PROPOSED CAPACITY, MBH**	**NUMBER OF UNITS**	**TOTAL REBATE, $**
>1500 - ≤ 4000 MBH	84% AFUE for Hot Water boilers	$1	2500	2	$5,000
TOTAL					**$5,000**

There isn't any significant maintenance savings associated with this ECM.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$225,000
NJ Smart Start Equipment Incentive ($):	$5,000
Net Installation Cost ($):	$220,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$9,985
Total Yearly Savings ($/Yr):	$9,985
Estimated ECM Lifetime (Yr):	15
Simple Payback	22.0
Simple Lifetime ROI	-31.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$149,780
Internal Rate of Return (IRR)	-4%
Net Present Value (NPV)	($100,796.08)

ECM #5: Install NEMA Premium® Efficiency Motors

Description:

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 continuously 24 hours a day, even small increases in efficiency can yield substantial energy and dollar savings.

The existing electric motors driving the primary hot water pumps are good candidates for replacing with premium efficiency motors. These standard efficiency motors run considerable amount of time over a year.

This energy conservation measure replaces existing electric motors over 5 HP or more with NEMA Premium® efficiency motors. NEMA Premium® is the most efficient motor designation in the marketplace today. It is recommended to replace one of the hot water pumps and program it to run as the primary pump for the heating system.

IMPLEMENTATION SUMMARY						
EQMT TAG	**FUNCTION**	**QTY**	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
P-1	Hot Water Pump	1	10	3600	88.5% *	91.7%
* Estimated						

Energy Savings Calculations:

$$\text{Electric usage, kWh} = \frac{\text{HP} \times \text{LF} \times 0.746 \times \text{Hours of Operation}}{\text{Motor Efficiency}}$$

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor

Motor Efficiency = Motor Nameplate Efficiency

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric cost savings} = \text{Electric Usage Savings} \times \text{Electric Rate} \left(\frac{\$}{\text{kWh}}\right)$$

The calculations were carried out and the results are tabulated in the table below:

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQP TAG	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWH	COST SAVINGS
P-1	10	90%	88.5%	91.7%	0.26	953	$158
TOTAL					**0.3**	**953**	**$158**

Cost and Incentives

SmartStart Building® incentives:

10 hp NEMA motor = $90/motor

The following table outlines the summary of motor replacement costs and incentives:

MOTOR REPLACEMENT SUMMARY							
MOTOR POWER HP	QTY	ENCL. TYPE	INSTALLED COST	SMART START INCENTIVE	TOTAL COST	TOTAL SAVINGS	SIMPLE PAYBACK
10	1	TEFC	$1,500	$90	$1,410	$158	8.9
Totals:			**$1,500**	**$90**	**$1,410**	**$158**	**8.9**

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,500
NJ Smart Start Equipment Incentive ($):	$90
Net Installation Cost ($):	$1,410
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$158
Total Yearly Savings ($/Yr):	$158
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.9
Simple Lifetime ROI	68.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,373
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	$478.68

ECM #6: Window Replacement

Description:

The building envelope consists of a combination of double and single pane operable windows with aluminum frames throughout the building. The single pane windows are original to the building. Single and double pane windows were installed as the original windows failed, cracked or broke. The windows account for significant energy use through leakage heat loss and conductive heat loss. The age and condition of the windows contribute to the leakage rate of the building. The single pane construction allows higher thermal (conductive) energy loss. These factors lead to increased energy use in the heating season. The heating loss due to single pane glass is combined with heat loss due to poor seals at each operable window.

New double pane windows with low E glazing offer a substantial improvement in thermal performance in the summer months. The Elementary School is closed during the peak cooling season. As a result, the energy savings due to the improved cooling performance is minimal. Although the energy savings is minimal the occupant comfort will be enhanced.

This ECM includes the replacement of all existing windows in the building with double pane windows and low emissivity glass. The proposed windows include reduced outside air leakage. In addition the double pane structure will significantly increase the insulation value compared to the existing single pane window structure. The basis for this ECM is Anderson Windows at $75 per SF of window installed.

Energy Savings Calculations:

$$\text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min.}}\right)=\frac{\text{Area}\left(\text{Ft}^2\right)\times\text{Ave Height}\left(\text{Ft}\right)\times\text{AirChanges Per Hour}\left(\frac{1}{\text{Hr.}}\right)}{60\left(\frac{\text{Min}}{\text{Hr.}}\right)}$$

$$\text{Heat Load}\left(\frac{\text{Btu}}{\text{Hr.}}\right)=1.1\times\text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min}}\right)\times\text{Design Temperature Difference}\left(^{\circ}\text{F}\right)$$

$$\text{Cooling Load}\left(\text{Ton}\right)=\text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min}}\right)\times\frac{1\,\text{Ton Cooling}}{400\left(\frac{\text{Ft}^3}{\text{Min}}\right)}$$

$$\text{Heating Leakage Energy (Therms)} = \frac{\text{Heat Load}\left(\frac{\text{Btu}}{\text{Hr.}}\right) \times \text{HDD(Day °F)} \times 24\left(\frac{\text{Hr.}}{\text{Day}}\right) \times (0.60)}{65(\text{°F}) \times \text{Fuel Heat Value}\left(\frac{\text{Btu}}{\text{Therms}}\right) \times \text{Heating Efficiency (\%)}}$$

$$\text{Cooling Leakage Energy (kWh)} = \frac{\text{Cooling Load(Ton)} \times \left(\frac{12{,}000\,\text{Btu}}{\text{Ton Hr.}}\right) \times \text{Full Load Cooling Hours}}{\frac{1000\,\text{W.h}}{\text{kWh}} \times \text{Cooling Efficiency (EER)}}$$

$$\text{Conductive Energy (Therms)} = \frac{\text{U} - \text{Value} \times \text{Area}(\text{Ft}^2) \times \text{HDD(Day °F)} \times 24\left(\frac{\text{Hr.}}{\text{Day}}\right) \times (0.60)}{65(\text{°F}) \times \text{Fuel Heat Value}\left(\frac{\text{Btu}}{\text{Therms}}\right) \times \text{Heating Efficiency (\%)}}$$

$$\text{Heating Energy Cost} = \text{Total Heating Energy(Therms)} \times \text{Ave Fuel Cost}\left(\frac{\$}{\text{Therms}}\right)$$

$$\text{Cooling Energy Cost} = \text{Total Cooling Energy(kWh)} \times \text{Ave Fuel Cost}\left(\frac{\$}{\text{kWh}}\right)$$

WINDOW REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description:	Existing Windows (Single and double)	Double Pane Low-E Windows	-
Original Bldg Area (SF)	52,000	52,000	-
Average Ceiling Height (Ft)	9	9	-
Window (SF)	5,700	5,700	-
U-Value (BTU/HR/SF*°F)	0.8	0.45	0.35
Average Leakage Rate (Air Changes per Hr)	1.0	0.5	0.5
Infiltration, CFM	7800	3900	3,900
Heating System Efficiency (%)	80%	80%	-
Heating Degree Days (HDD)	4,496	4,496	-
Design Day Temp Diff (°F)	65	65	-
Heating Hrs Per Day (Hrs)	24	24	-
Full Load Cooling Hours	600	600	-
Average Cooling Efficiency, EER	9	9	-
Gas Cost ($/Therm)	1.47	1.47	-
Electric Cost ($/kWh)	0.166	0.166	-
Gas Heat Value (BTU/Therm)	100,000	100,000	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Heat Load (BTU/Hr)	557,700	278,850	278,850
Leakage Energy (Therms)	6,944	3,472	3,472
Conductive Energy (Therms)	3,690	2,076	1,615
Total Heating Energy (Therms)	10,634	5,548	5,086
Cooling Load (Ton)	20	10	10
Cooling Demand (kW)	7.4	3.7	3.7
Total Cooling Energy (kWh)	15,600	7,800	7,800
Gas Energy Cost ($)	$15,632	$8,155	$7,477
Electric Energy Cost ($)	$2,590	$1,295	$1,295
Comments:	1. Proposed window U-value Based on ASHRAE 90.1 - 2007		

Estimated cost for replacing all the windows at the Elementary School building is $427,500.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$427,500
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$427,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$8,772
Total Yearly Savings ($/Yr):	$8,772
Estimated ECM Lifetime (Yr):	15
Simple Payback	48.7
Simple Lifetime ROI	-69.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$131,575
Internal Rate of Return (IRR)	-12%
Net Present Value (NPV)	($322,784.05)

ECM #7: Air Conditioning Unit Upgrades

Description:

Various spaces in the Elementary School are conditioned with older split AC systems made by Carrier, Sanyo and York. In addition there are two (2) 2-ton window AC units in two classrooms. These units are older and inefficient units compared to today's split systems. New split air conditioner condensers provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants. Current efficiencies for ductless split air conditioners are as high as SEER 25 for typical 1-Ton units, SEER 18 for typical 2-Ton to 3-Ton systems.

This ECM includes one-to-one replacement of the older air conditioning units with new higher efficiency systems. A summary of this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	**SERVICE FOR**	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
Carrier Mini Split	Various spaces	6	24,000	12	New Ductless Split Units
York CU	Classroom UVs	1	42,000	3.5	New High SEER CU
Sanyo CU	Classroom UVs	2	24,000	4	New High SEER CU
Window AC Units	Classrooms	2	24,000	4	Install DX Cooling for UV
Total		**11**	**114,000**	**19.5**	

CU: Condensing Unit
UV: Unit Ventilator

The basis for the ductless split air conditioners is Fujitsu Halycon RLS Series Units and the basis for the split unit condenser is Rheem Prestige Series condensing units with R410a refrigerants. The evaporator in the existing unit ventilators need to be replaced to receive new higher efficiency refrigerant.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

$$\text{Energy Savings, kWh} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right) \times \frac{\text{Operation Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity}, \left(\frac{\$}{\text{kWh}}\right)$$

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS SEER**	**SPLIT UNITS SEER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
Carrier Mini Split	24,000	2,500	11	18	6	12,727	5.1
York CU	42,000	1,200	10	18	1	2,240	1.9
Sanyo CU	24,000	1,200	11	18	2	2,036	1.7
Window AC Units	24,000	1,200	11	18	2	2,036	1.7
Total					9	17,004	8.7

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the replacement of window AC units with ductless mini split AC units falls under the category "Unitary HVAC Split System" and warrants an incentive based on efficiency (SEER) at or above 14 for this type of systems. The program incentives are calculated as follows:

$$\text{Smart Start® Incentive} = (\text{Cooling Tons} \times \$/\text{Ton Incentive})$$

DUCTLESS MINI SPLIT AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
5.4 tons or less Unitary	≥14 SEER	$92	19.5	$1,794
TOTAL			**19.5**	**$1,794**

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	**INSTALLED COST**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVING**	**PAY BACK YEARS**
Carrier Mini Split	$3,800	6	$22,800	$1,104	$21,696	$1,998	10.9
York CU	$4,700	1	$4,700	$322	$4,378	$352	12.4
Sanyo CU	$3,800	2	$7,600	$368	$7,232	$320	22.6
Window AC Units	$3,800	2	$7,600	$368	$7,232	$320	22.6
Total		9	$35,100	$1,794	$33,306	$2,670	12.5

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$35,100
NJ Smart Start Equipment Incentive ($):	$1,794
Net Installation Cost ($):	$33,306
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,670
Total Yearly Savings ($/Yr):	$2,670
Estimated ECM Lifetime (Yr):	15
Simple Payback	12.5
Simple Lifetime ROI	20.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$40,044
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	($1,436.84)

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 measures (REM) for the municipality utilizing renewable technologies and concluded that there is potential for solar energy generation. The solar photovoltaic system calculation summary will be concluded as **REM#1** within this report.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will 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). 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 existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 13,600 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in **Renewable / Distributed Energy Measures Calculation Appendix**. Using this square footage it was determined that a system size of 192 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 238,000 KWh annually, reducing the overall utility bill by approximately 57% percent. A detailed financial analysis can be found in the **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.

The array system capacity was sized on available roof space on the existing facility. 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 owner 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:

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM		
PAYMENT TYPE	**SIMPLE PAYBACK**	**INTERNAL RATE OF RETURN**
Direct Purchase	14.3 Years	5.5%

*The solar energy measure is shown for reference in the executive summary Renewable Energy Measure (REM) table

Given the large amount of capital required by the Owner to invest in a solar system through a Direct Purchase CEG does not recommend the Owner pursue this route. It would be more advantageous for the Owner 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 Owner 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. Based on CEG's review of the applicability of wind energy for the facility, it was determined that the average wind speed is not adequate, and the kilowatt demand for the building is below the threshold (200 kW) for purchase of a commercial wind turbine. Therefore, wind energy is not a viable option to implement.

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:

The electricity usage profile demonstrates a typical cooling load profile for school facilities that have occupancy during the summer months. Historical usage is relatively steady throughout the year with an average monthly usage of 34,693 kWh and an average monthly demand of 113kW. Largest consumption months were October, December and March.

The historical usage profile is beneficial and will allow for more competitive energy prices when shopping for alternative suppliers mainly due to the relatively flat load profile and reduction of summer load. Third Party Supplier (TPS) electric commodity contracts that offer's a firm, fixed price for 100% of the facilities electric requirements and are lower than the JCP&L's BGS-FP default rate are recommended.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile. The summer months June - August have very little consumption. The average winter (Nov-Mar) consumption is 5,851 therms and the average summer (Apr-Oct) consumption is 1,013 therms.

This load profile will yield less favorable natural gas pricing when shopping for alternative suppliers. This is because the higher winter month consumption will yield higher pricing which will not be offset by the summer month consumption. Nymex commodity pricing is generally higher in the winter months of November – March and lower in the summer months of April – October. Obtaining a flat load profile, (usage is similar each month), will yield optimum natural gas pricing when shopping for alternative suppliers. Third Party Supplier (TPS) natural gas commodity contracts that offer product structures that include either a firm, fixed price or market based rate with basis lock in for 100% of the facilities natural gas requirements are recommended due to current low market pricing.

Tariff Analysis:

Electricity:

This facility receives electrical service through Jersey Central Power & Light (JCP&L) on a GS-Sec (General Service Secondary) rate. Service classification GS-Sec is available for general service purposes on secondary voltages not included under Service Classifications RS, RT, RGT or GST. This facility's rate is a single or three phase service at secondary voltages. This facility has not contracted a Third Party Supplier (TPS) to provide electric commodity service. For electric supply (generation) service, the client has a choice to either use JCP&L's default service rate BGS-FP or contract with a Third Party Supplier (TPS) to supply electric.

Each year since 2002, the four New Jersey Electric Distribution Companies (EDCs) - Public Service Gas & Electric Company (PSE&G), Atlantic City Electric Company (ACE), Jersey Central Power & Light Company (JCP&L), and Rockland Electric Company (RECO) - have procured several billion dollars of electric supply to serve their Basic Generation Service (BGS) customers through a statewide auction process held in February.

BGS refers to the service of customers who are not served by a third party supplier or competitive retailer. This service is sometimes known as Standard Offer Service, Default Service, or Provider of Last Resort Service.

The Auction Process has consisted of two auctions that are held concurrently, one for larger customers on an hourly price plan (BGS-CIEP) and one for smaller commercial and residential customers on a fixed-price plan (BGS-FP). This facility's rate structure is based on the fixed-price plan (BGS-FP).

The facility's current BGS-FP average price to compare for GS-Sec rate is $0.1180/kWh.

The utility, JCP&L will continue to be responsible for maintaining the existing network of wires, pipes and poles that make up the delivery system, which will serve all consumers, regardless of whom they choose to purchase their electricity or natural gas from.

JCP&L's Delivery Service rate includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI.

Natural Gas:

This facility currently receives natural gas distribution service through Elizabethtown Gas (ETown) on rate schedule GDS (General Delivery Service) and has contracted a Third Party Supplier (TPS) to provide natural gas commodity service.

ETown provides basic gas supply service (BGSS) to customers who choose not to shop from a Third Party Supplier (TPS) for natural gas commodity. The option is essential to protect the reliability of service to consumers as well as protecting consumers if a third party supplier

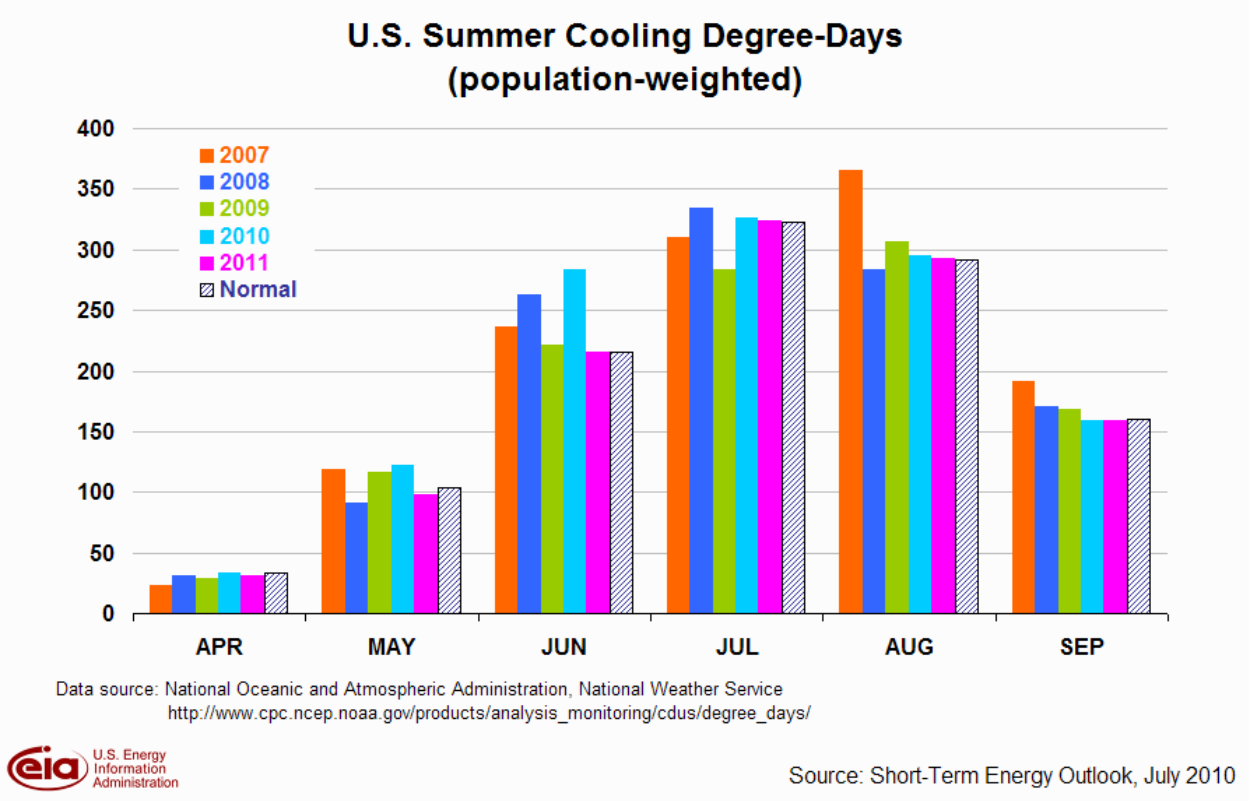
defaults or fails to provide commodity service. Please refer to the link below for a recap of natural gas BGSS charges from Elizabethtown Gas for rate schedule GDS. http://www.elizabethtowngas.com/Universal/RatesandTariff/BGSSRateHistory.aspx

The utility, ETown is responsible for maintaining the existing network of pipes that make up the delivery system, which will serve all consumers, regardless of whom they choose to purchase their electricity or natural gas from. ETown's delivery service rate includes the following charges: Customer Service Charge, Demand Charge and Distribution Charge.

Electric and Natural Gas Commodities Market Overview:

Current electricity and natural gas market pricing has remained relatively stable over the last year. Commodity pricing in 2008 marked historical highs in both natural gas and electricity commodity. Commodity pricing commencing spring of 2009 continuing through 2010, has decreased dramatically over 2008 historic highs and continues to be favorable for locking in long term (2-5 year) contracts with 3rd Party Supplier's for both natural gas and electricity supply requirements.

It is important to note that both natural gas and electric commodity market prices are moved by supply and demand, political conditions, market technicals and trader sentiment. This market is continuously changing Energy commodity pricing is also correlated to weather forecasts. Because weather forecasts are dependable only in the short-term, prolonged temperature extremes can really cause extreme price swings.



Short Term Energy Outlook - US Energy Information Administration (10/13/2010):

U.S. Natural Gas Prices. *The Henry Hub spot price averaged $3.89 per MMBtu in September, $0.43 per MMBtu lower than the average spot price in August. Prices are expected to remain below $4 per MMBtu in October but rise to $4.68 per MMBtu by January as space-heating demand increases this winter. EIA has revised its projections for natural gas prices downward through 2011. Expectations are now for a price of $4.16 per MMBtu for the last quarter of 2010, $0.27 per MMBtu (6 percent) lower than last month's Outlook, based on several weeks of strong inventory builds. Price expectations for 2011 are $4.58 per MMBtu, which is $0.18 per MMBtu (4 percent) lower than last month's forecast, primarily due to a stronger domestic production forecast.*

Uncertainty over future natural gas prices is lower this year compared with last year at this time. Natural gas futures for December 2010 delivery for the 5-day period ending October 7 averaged $4.07 per MMBtu, and the average implied volatility over the same period was 39 percent. This produced lower and upper bounds for the 95-percent confidence interval of $3.09 per MMBtu and $5.37 per MMBtu, respectively. At this time last year, the natural gas December 2009 futures contract averaged $5.59 per MMBtu and implied volatility averaged 56 percent. The corresponding lower and upper limits of the 95-percent confidence interval were $3.70 per MMBtu and $8.50 per MMBtu.

U.S. Electricity Retail Prices. *Although the average U.S. residential retail price of electricity fell by nearly 1 percent during the first half of 2010 compared with the same period last year, prices are expected to increase by 1.5 percent year-over-year during the second half of 2010. Higher generation fuel costs this year are expected to be passed through to retail consumers during 2011, pushing up residential prices by 1.4 percent next year*

Recommendations:

CEG recommends an aggregated approach for 3rd party commodity supply procurement strategies for electric supply service. Aggregating all school facilities for electricity supply service would allow this facility to achieve a reduction in electric supply costs. Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. This facility could realize up to a 20% reduction in electricity supply costs, if it were to aggregate usage with the other school facilities and take advantage of these current market prices quickly, before energy increases.

Overall, after review of the utility consumption, billing, and current commodity pricing outlook, CEG recommends that the facility in conjunction with the other school facilities utilize the advisement of 3rd party unbiased Energy Consulting Firm experienced in the aggregation of facilities and procurement of retail electricity commodity. The Energy Consulting Firm should incorporate a rational, defensible strategy for purchasing commodity in volatile markets based upon the following:

- Budgets that reflect sound market intelligence
- An understanding of historical prices and trends
- Awareness of seasonal opportunities (e.g. shoulder months)
- Negotiation of fair contractual terms
- An aggressive, market based price

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 that were audited as part of the NJ Clean Energy's Local Government Energy Audit Program. 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%.

v. *Direct Install Program* – The New Jersey Clean Energy's Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 200 kW. This turnkey program is aimed at providing owners a seamless, comprehensive process for analysis, equipment replacement and financial incentives to reduce consumption, lower utility costs and improve profitability. The program covers up to 60% of the cost for eligible upgrades including lighting, lighting controls, refrigeration, HVAC, motors, variable speed drives, natural gas and food service. Participating contractors (refer to www.njcleanenergy.com) conduct energy assessments in addition to your standard local government energy audit and install the cost-effective measures.

vi. *Energy Efficiency and Conservation Block Grants* – The EECGB rebate provides supplemental funding up to $20,000 for counties and local government entities to implement energy conservation measures. The EECGB funding is provided through the American Recovery and Reinvestment Act (ARRA). The local

government must be among the eligible local government entities listed on the NJ Clean Energy website as follows - http://njcleanenergy.com/commercial-industrial/programs/eecbg-eligible-entities. This program is limited to municipalities and counties that have not already received grants directly through the US department of Energy.

This incentive is provided in addition to the other NJ Clean Energy program funding. This program's incentive is considered the entity's capital and therefore can be applied to the LGEA program's requirements to implement the recommended energy conservation measures totaling at least 25% of the energy audit cost. Additional requirements of this program are as follows:

1. The entity must utilize additional funding through one or more of the NJ Clean Energy programs such as Smart Start, Direct Install, and Pay for Performance.

2. The EECBG funding in combination with other NJ Clean Energy programs may not exceed the total cost of the energy conservation measures being implemented.

3. Envelope measures are applicable only if recommended by the LGEA energy audit and if the energy audit was completed within the past 12 months.

4. New construction and previously installed measures are not eligible for the EECBG rebate.

5. Energy conservation measures eligible for the EECBG must fall within the list of approved energy conservation measures. The complete list of eligible measures and other program requirements are included in the "EECBG Complete Application Package." The application package is available on the NJ Clean Energy website - http://njcleanenergy.com/commercial-industrial/programs/energy-efficiency-and-conservation-block-grants.

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.

XII. ENERGY AUDIT ASSUMPTIONS

The assumptions utilized in this energy audit include but are not limited to following:

A. Cost Estimates noted within this report are based on industry accepted costing data such as RS Means™ Cost Data, contractor pricing and engineering estimates. All cost estimates for this level of auditing are +/- 20%. Prevailing wage rates for the specified region has been utilized to calculate installation costs. The cost estimates indicated within this audit should be utilized by the owner for prioritizing further project development post the energy audit. Project development would include investment grade auditing and detailed engineering.
B. Energy savings noted within this audit are calculated utilizing industry standard procedures and accepted engineering assumptions. For this level of auditing, energy savings are not guaranteed.
C. Information gathering for each facility is strongly based on interviews with operations personnel. Information dependent on verbal feedback is used for calculation assumptions including but not limited to the following:
    a. operating hours
    b. equipment type
    c. control strategies
    d. scheduling
D. Information contained within the major equipment list is based on the existing owner documentation where available (drawings, O&M manuals, etc.). If existing owner documentation is not available, catalog information is utilized to populate the required information.
E. Equipment incentives and energy credits are based on current pricing and status of rebate programs. Rebate availability is dependent on the individual program funding and applicability.
F. Equipment (HVAC, Plumbing, Electrical, & Lighting) noted within an ECM recommendation is strictly noted as a **basis for calculation** of energy savings. The owner should use this equipment information as a benchmark when pursuing further investment grade project development and detailed engineering for specific energy conservation measures.
G. Utility bill annual averages are utilized for calculation of all energy costs unless otherwise noted. Accuracy of the utility energy usage and costs are based on the information provided. Utility information including usage and costs is estimated where incomplete data is provided.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Sandshore Elementary School

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - Interior Spaces	$2,808	$4,212	$670	$6,350	$755	$39	$794	15	$11,905	$585	87.5%	8.0	9.13%	$3,124.91
ECM #2	Lighting Upgrade - Gymnasium	$2,880	$0	$600	$2,280	$1,294	$0	$1,294	15	$19,415	$0	751.5%	1.8	56.70%	$13,171.36
ECM #3	Lighting Controls Upgrade	$4,926	$7,389	$1,540	$10,775	$2,099	$0	$2,099	15	$31,486	$0	192.2%	5.1	17.81%	$14,283.13
ECM #4	Install Condensing Hot Water Boilers	$100,000	$125,000	$5,000	$220,000	$9,985	$0	$9,985	15	$149,780	$0	-31.9%	22.0	-4.46%	($100,796.08)
ECM #5	Premium Efficiency Motors	$1,500	$0	$90	$1,410	$158	$0	$158	15	$2,373	$0	68.3%	8.9	7.35%	$478.68
ECM #6	Replace windows	$427,500	$0	$0	$427,500	$8,772	$0	$8,772	15	$131,575	$0	-69.2%	48.7	-12.07%	($322,784.05)
ECM #7	Air Conditioning Unit Upgrades	$35,100	$0	$1,794	$33,306	$2,670	$0	$2,670	15	$40,044	$0	20.2%	12.5	2.40%	($1,436.84)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solar PV installation	$1,724,310	$0	$0	$1,724,310	$37,377	$83,324	$120,701	25	$3,017,525	$2,083,104	75.0%	14.3	4.87%	$377,474.04

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* .

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FAX: (856) 427-6508

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February, 2010:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2004

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
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2004

Ground Source Heat Pumps

Closed Loop & Open Loop	$450 per ton, EER ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2004

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, AFUE ≥ 92%

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
Gas Fired Tankless Water Heaters	$300 per unit

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$25 per fixture (1-2 lamps) $30 per fixture (3-4 lamps)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	$7 per bulb
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
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
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$42 per 5 foot $65 per 6 foot

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
Daylight Dimming - office	$50 per fixture controlled

Premium Motors

Three-Phase Motors	$45 - $700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	$40 per electronic communicated motor

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
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Sandshore Road Elementary School

Building ID: 2404057
For 12-month Period Ending: July 31, 2010[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 22, 2010

Facility
Sandshore Road Elementary School
Sandshore Rd.
Budd Lake, NJ 07828

Facility Owner
Public Schools of Mt. Olive
89 Route 46
Budd Lake, NH 07828

Primary Contact for this Facility
Thomas Scerbo
89 Route 46
Budd Lake, NJ 07828

Year Built: 1972
Gross Floor Area (ft²): 52,000

Energy Performance Rating[2] (1-100) 39

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,430,037
Natural Gas (kBtu)[4]	3,726,800
Total Energy (kBtu)	5,156,837

Energy Intensity[5]

Site (kBtu/ft²/yr)	99
Source (kBtu/ft²/yr)	167

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	416

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	91
National Average Source EUI	152
% Difference from National Average Source EUI	10%
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
Michael Fischette
520 S. Burnt Mill Rd.
Voorhees, NJ 08043

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) or a Registered Architect (RA) 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 or RA 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	Sandshore Road Elementary 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	Sandshore Rd., Budd Lake, NJ 07828	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		☐
Elementary School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	52,000 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	91 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	2	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	50 %	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	9(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: FirstEnergy - Jersey Central Power & Lt 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))
06/29/2010	07/28/2010	21,680.00
06/02/2010	06/28/2010	34,480.00
05/01/2010	06/01/2010	35,920.00
04/02/2010	04/30/2010	33,120.00
03/03/2010	04/01/2010	40,960.00
02/02/2010	03/02/2010	35,920.00
01/05/2010	02/01/2010	38,560.00
12/04/2009	01/04/2010	41,920.00
11/03/2009	12/03/2009	36,000.00
10/02/2009	11/02/2009	40,800.00
09/01/2009	10/01/2009	36,160.00
08/01/2009	08/31/2009	21,520.00
Electric Meter Consumption (kWh (thousand Watt-hours))		**417,040.00**
Electric Meter Consumption (kBtu (thousand Btu))		**1,422,940.48**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,422,940.48**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

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

Start Date	End Date	Energy Use (therms)
06/04/2010	07/06/2010	89.10
05/05/2010	06/03/2010	738.60
04/07/2010	05/04/2010	2,290.30
03/10/2010	04/06/2010	3,430.00
02/04/2010	03/09/2010	7,243.40
01/08/2010	02/03/2010	6,567.60
12/04/2009	01/07/2010	7,730.10
11/05/2009	12/03/2009	4,285.90
10/07/2009	11/04/2009	3,116.10
09/08/2009	10/06/2009	701.70

08/10/2009	09/08/2009	94.60
Gas Meter Consumption (therms)		**36,287.40**
Gas Meter Consumption (kBtu (thousand Btu))		**3,628,740.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**3,628,740.00**
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 PE or RA 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
Sandshore Road Elementary School
Sandshore Rd.
Budd Lake, NJ 07828

Facility Owner
Public Schools of Mt. Olive
89 Route 46
Budd Lake, NH 07828

Primary Contact for this Facility
Thomas Scerbo
89 Route 46
Budd Lake, NJ 07828

General Information

Sandshore Road Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	52,000
Year Built	1972
For 12-month Evaluation Period Ending Date:	July 31, 2010

Facility Space Use Summary

Elementary School	
Space Type	K-12 School
Gross Floor Area(ft^2)	52,000
Open Weekends?	No
Number of PCs[d]	91
Number of walk-in refrigeration/freezer units	2
Presence of cooking facilities	Yes
Percent Cooled	50
Percent Heated	100
Months[o]	9
High School?	No
School District[o]	Mt Olive

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 07/31/2010)	**Baseline** (Ending Date 07/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	39	39	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	99	99	71	N/A	91
Source (kBtu/ft^2)	167	167	119	N/A	152
Energy Cost					
$/year	$ 78,785.65	$ 78,785.65	$ 56,231.20	N/A	$ 71,905.71
$/$ft^2$/year	$ 1.52	$ 1.52	$ 1.08	N/A	$ 1.39
Greenhouse Gas Emissions					
$MtCO_2e$/year	416	416	297	N/A	380
$kgCO_2e/ft^2$/year	8	8	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.

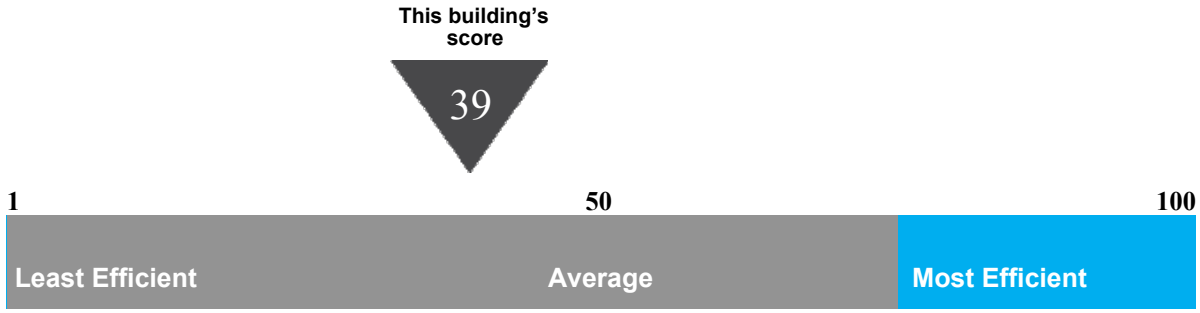
Statement of Energy Performance

2010

Sandshore Road Elementary School
Sandshore Rd.
Budd Lake, NJ 07828

Portfolio Manager Building ID: 2404057

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 167 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending July 2010

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: 10/22/2010

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Unitary A/C Units

Tag	Mini Split CU	Mini Split CU	Mini Split CU
Unit Type	Air cooled condensing unit	Air cooled condensing unit	Air cooled condensing unit
Qty	6	2	2
Location	Roof	Roof	Roof
Area Served	Various	Various	Various
Manufacturer	Carrier	Payne	Sanyo
Model #	38QR024C331, 38HDC030331, --	PA10JA018	C2422
Serial #	-	2605X92010	0056973
Cooling Capacity (Tons)	1.5, 2, 2.5	1.5	2
Voltage / Phase	208-1	208-1	208-1
Efficiency (SEER)	11	11	11
Indoor Unit	Ceiling Hung Air Handler	Unit ventilator	Unit ventilator
Capacity (Ton)	2 to 2.5	1.5	2
Approx Age	10	10	10
Ashrae Service Life	15	15	15
Remaining Life	5	5	5
Comments	-	-	-

CU = Condensing Unit

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Unitary A/C Units

Tag	Window Unit	Split CU	Split CU
Unit Type	Window AC Unit	Air cooled condensing unit	Air cooled condensing unit
Qty	2	1	1
Location	Classrooms	Roof	Roof
Area Served	Classrooms	Unit Ventilators	Unit Ventilators
Manufacturer	Freidrich	York	York
Model #	SL24J30	H1RA042S06D	HABA-T-042SG
Serial #	JGCS13397	WAMM038943	W0D5968349
Cooling Capacity (Tons)	2	3.5	3.5
Voltage / Phase	208 - 1	208/1	208/1
Efficiency (SEER)	9.2 EER	11	11
Indoor Unit	-	Unit Ventilators	Unit Ventilators
Capacity (Ton)	2	3.5	3.5
Approx Age	10	10	5
Ashrae Service Life	15	15	15
Remaining Life	5	5	5
Comments	-	-	-

CU = Condensing Unit

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Air Compressor

Tag	Air Compressor	-	-
Unit Type	Duplex Reciprocating, Air Cooled	-	-
Qty	1	-	-
Location	Boiler Room	-	-
Area Served	Pneumatic System	-	-
Manufacturer	Quincy Compressor	-	-
Model #	-	-	-
Serial #	-	-	-
Tank Capacity	100	-	-
Voltage / Phase	208/1	-	-
Motor HP	2 x 5 HP	-	-
Approx Age	1	-	-
Ashrae Service Life	20	-	-
Remaining Life	19	-	-
Comments	New unit	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Boilers

Tag	**HW Boiler #1 & 2**	-
Unit Type	Firetube Standard Efficiency Water Boilers	-
Qty	2	-
Location	Boiler Room	-
Area Served	Unit ventilators, hot water coils	-
Manufacturer	Cleaver Brooks	-
Model #	CB-810-125	-
Serial #	L52643, L52644	-
Input Capacity (MBH)	5,230,000	-
Rated Output Capacity (MBH)	4,184,000	-
Approx. Efficiency %	80%	-
Fuel	Natural Gas	-
Approx Age	39	-
Ashrae Service Life	35	-
Remaining Life	(4)	-
Burner	CB	-
Model #	-	-
Serial #	-	-
Type	Single Speed	-
Firing Rate (MBH)	-	-
Comments	The boilers are past their useful life.	

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Domestic Water Heaters

Tag	**HWH**	-	-
Unit Type	Standard Gas Fired Hot Water Heater	-	-
Qty	1	-	-
Location	Boiler room	-	-
Area Served	Faucets, sinks etc.	-	-
Manufacturer	AO Smith	-	-
Model #	Masterfit BTR 250A 118	-	-
Serial #	0919M000943	-	-
Size (Gallons)	100	-	-
Input Capacity (MBH/KW)	250 MBH	-	-
Recovery (Gal/Hr)	242.4 GPH	-	-
Efficiency %	80%	-	-
Fuel	Natural Gas	-	-
Approx Age	1	-	-
Ashrae Service Life	12	-	-
Remaining Life	11	-	-
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Heating and Ventilation Units

Tag	HV	HV	-
Unit Type	Heating and Ventilation	Heating and Ventilation	-
Qty	2	2	-
Location	Cafeteria	Gym	-
Area Served	Cafeteria	Gym	-
Manufacturer	-	-	-
Model #	-	-	-
Serial #	-	-	-
Fan HP	2	3	-
Cooling Type	None	None	-
Heating Type	Hot Water	Hot Water	-
Heating Input (MBH)	-	-	-
Efficiency	-	-	-
Approx Age	30	30	-
Ashrae Service Life	15	15	-
Remaining Life	(15)	(15)	-
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Pumps

Tag	Hot Water Pump	Circulator	-
Unit Type	Base Mounted - End Suction	Domestic HW Circulator	-
Qty	2 (1+Standby)	1	-
Location	Boiler Room	Boiler Room	-
Area Served	Prımary Hot Water Loop UVs, radiators	Domestic HW Circulator	-
Manufacturer	Armstrong	BG	-
Model #	SG 54	-	-
Serial #	-	-	-
Horse Power	10.0	~ 1/2 HP	-
Flow, GPM	325 each	-	-
Pump Head, FT	70	-	-
Motor Info	Marathon Electric	-	-
Electrical Power	460V, 3PH	-	-
RPM	1760	-	-
Motor Efficiency %	88.5% (Est)	-	-
Approx Age	11	10	-
Ashrae Service Life	20	15	-
Remaining Life	9	5	-
Comments	Constant speed. High efficiency motors	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Rooftop / AC Units

Tag	RTU	RTU	-
Unit Type	Packaged Rooftop Unit	Packaged Rooftop Unit	-
Qty	1	1	-
Location	Roof	Roof	-
Area Served	Special Education	Special Education	-
Manufacturer	Carrier	Carrier	-
Model #	Weathermaster 50HJ-006-S-63338-1	Weathermaster 50HJ-004-S-63338-1	-
Serial #	2600G21245	2600G21317	-
Cooling Type	DX		-
Cooling Capacity (Tons)	5	3	-
Cooling Efficiency (SEER/EER)	13 SEER, 11 EER	13 SEER, 11.2 EER	-
Economizer	100 Outside Air	100 Outside Air	-
Heating Type	-	-	-
Approx Age	~3	~3	-
Ashrae Service Life	15	15	-
Remaining Life	12	12	-
Comments	Units are in good condition	Units are in good condition	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Sandshore Elementary School

Unit Ventilators

Tag	UV	UV	UV
Unit Type	Heating and Cooling	Heating and Cooling	Celing type UV Heating and Cooling
Qty	17	6	6
Location	Classrooms Floor or Ceiling	Classrooms Floor or Ceiling	Various
Manufacturer	AAF - Herman Nelson	AAF - Herman Nelson	Carrier
Model #	-	-	-
Serial #	-	-	-
Flow Capacity	6	6	2
Cooling Type	None	DX	DX
Cooling Capacity (Tons)	None	~4	2
Estimated Cooling Efficiency (EER)	None	10	9
Heating Type	Hot Water Coil	Hot Water Coil	Hot Water Coil
Heating Input (MBH)	~120	~120	~70
Approx Age	Over 15	Over 15	~10
Ashrae Service Life	15	15	15
Remaining Life	0	0	5
Comments	-	-	-

Investment Grade Lighting Audit

CEG Job #: 9C10050

Project: Sandshore ES

Sandshore ES

KWH COST: $0.157

Address: 498 Sandshore Ave. Budd Lake, NJ, 07828

Building SF: 52,000

ECM #1&2: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	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
221.11	Tech Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	150.8	$23.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Stage	2600	6	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.35	904.8	$142.05	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Cafeteria	3000	56	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.68	5,040.0	$791.28	56	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Women's Rest Room	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$31.84	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$23.68	$100.00	$100.00	0.02	52	$8.16	12.25
121.11	Men's Rest Room	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$31.84	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$23.68	$100.00	$100.00	0.02	52	$8.16	12.25
121.11	Faculty Room Entrance	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$31.84	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$23.68	$100.00	$100.00	0.02	52	$8.16	12.25
121.11	Room off of Nurses's Office	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$31.84	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$23.68	$100.00	$100.00	0.02	52	$8.16	12.25
7	Rest Room off of Kitchen	2600	1	1	1x2, 1 Lamp, 17w T8, Elect. Ballast, Wall Mnt., Prismatic Lens	18	0.02	46.8	$7.35	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Kitchen Storage Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	150.8	$23.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Kitchen	2600	25	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.75	1,950.0	$306.15	25	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
7	Rest Room near Boiler Office	2600	1	1	1x2, 1 Lamp, 17w T8, Elect. Ballast, Wall Mnt., Prismatic Lens	18	0.02	46.8	$7.35	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	Boiler Room	4400	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.52	2,296.8	$360.60	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	Storage Room near Boiler	1200	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.12	139.2	$21.85	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Nurse	2600	11	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.64	1,658.8	$260.43	11	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Elec. Closet	2600	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	78.0	$12.25	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Hall	4400	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	132.0	$20.72	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Office near Bolier Room	4400	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	264.0	$41.45	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Corridors	4400	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	264.0	$41.45	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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227.21	Corridors	4400	56	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	3.25	14,291.2	$2,243.72	56	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Faculty Room	2600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.42	1,081.6	$169.81	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Principal's Office	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$73.48	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Work Room	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312.0	$48.98	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Copy Room	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312.0	$48.98	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Main Office	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$73.48	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Helping Teacher	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312.0	$48.98	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Main Lobby	4400	8	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.46	2,041.6	$320.53	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Library Storage	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312.0	$48.98	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.21	Guidance Office	2600	4	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.31	811.2	$127.36	4	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.23	603.2	$94.70	$100.00	$400.00	0.08	208	$32.66	12.25
211.11	Library Office	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312.0	$48.98	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Library & Media Center	2600	45	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.35	3,510.0	$551.07	45	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #166	2600	30	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.90	2,340.0	$367.38	30	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #169	2600	30	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.90	2,340.0	$367.38	30	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #172	2600	30	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.90	2,340.0	$367.38	30	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Classroom #179	2600	25	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.45	3,770.0	$591.89	25	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	SGI	2600	10	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.58	1,508.0	$236.76	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #183	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Girls' Rest Room	3200	8	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Acrylic Lens	58	0.46	1,484.8	$233.11	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Boys' Rest Room	3200	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Acrylic Lens	58	0.35	1,113.6	$174.84	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #190	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #192	2600	18	1	1x4, 1 Lamp, 32w T8, Elect.	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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211.11	Classroom #194	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #196	2600	18	1	1x4, 1 Lamp, 32w T8, Elect.	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #198	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #197	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #195	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #193	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #191	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Classroom #189	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.40	3,650.4	$573.11	18	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	1.04	2714.4	$426.16	$100.00	$1,800.00	0.36	936	$146.95	12.25
221.11	Classroom #184	2600	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.52	1,357.2	$213.08	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	SGI	2600	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.52	1,357.2	$213.08	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	Child Study Team Offices	2600	25	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	2.30	5,980.0	$938.86	25	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Store Room	1200	3	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.23	280.8	$44.09	3	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.17	208.8	$32.78	$100.00	$300.00	0.06	72	$11.30	26.54
221.11	Tech Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	150.8	$23.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Tech Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	150.8	$23.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Art Room Storage	1200	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.16	187.2	$29.39	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	139.2	$21.85	$100.00	$200.00	0.04	48	$7.54	26.54
121.11	Art Room	2600	36	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	2.81	7,300.8	$1,146.23	36	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	2.09	5428.8	$852.32	$100.00	$3,600.00	0.72	1872	$293.90	12.25
211.11	Teachers' Rest Room	1200	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	36.0	$5.65	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Tech. Room	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Acrylic Lens	58	0.12	301.6	$47.35	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3520	Rest Room	2600	1	2	15" Round White Globe, 2 60w A Lamps	120	0.12	312.0	$48.98	1	2	13w CFL Lamp	26	0.03	67.6	$10.61	$20.00	$20.00	0.09	244.4	$38.37	0.52
3520	Mech. Closet	1200	1	2	15" Round White Globe, 2 60w A Lamps	120	0.12	144.0	$22.61	1	2	13w CFL Lamp	26	0.03	31.2	$4.90	$20.00	$20.00	0.09	112.8	$17.71	1.13
3520	Storage Closet	1200	1	2	15" Round White Globe, 2 60w A Lamps	120	0.12	144.0	$22.61	1	2	13w CFL Lamp	26	0.03	31.2	$4.90	$20.00	$20.00	0.09	112.8	$17.71	1.13

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211.11	PE Office	2600	7	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.21	546.0	$85.72	7	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	PE Storage	1200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	69.6	$10.93	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
766	Gymnasium	3000	12	1	400w MH, 2x2, Recessed Mnt., Prismatic Lens	465	5.58	16,740.0	$2,628.18	12	4	2x4 54w T5HO 4 Lamp w/Reflective Lens, Wire Cage	236	2.83	8496	$1,333.87	$240.00	$2,880.00	2.75	8244	$1,294.31	2.23
331.11		3000	4	3	1x4, 3 Lamp, 54w T5HO Fixture	177	0.71	2,124.0	$333.47	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Storage	1200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	69.6	$10.93	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	OT/PT	2600	10	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.30	780.0	$122.46	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3520	Closet	1200	1	2	15" Round White Globe, 2 60w A Lamps	120	0.12	144.0	$22.61	1	2	13w CFL Lamp	26	0.03	31.2	$4.90	$20.00	$20.00	0.09	112.8	$17.71	1.13
211.11	SGI	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$73.48	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	SGI	2600	9	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.27	702.0	$110.21	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #106	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #104	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt.,	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #102	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt.,	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #100	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #99	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #101	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #103	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom #105	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$220.43	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Storage	1200	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	72.0	$11.30	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Girls' Rest Room	3200	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.29	928.0	$145.70	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Men's Rest Room	1200	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.29	348.0	$54.64	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Music Room	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.22	3,166.8	$497.19	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
738	Exterior	4400	8	1	175w MH Flood	210	1.68	7,392.0	$1,160.54	8	1	150w MH Energy Master Lamp; Venture Lighting	185	1.48	6512	$1,022.38	$30.00	$240.00	0.20	880	$138.16	1.74
765		4400	1	1	400w HPS Flood	465	0.47	2,046.0	$321.22	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		938	126			46.77	135,283	$21,239	938	31			8.3	24,867	$3,904		$9,900	4.7	13,051	$2,049	4.83

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

2. Lamp totals only include T-12 tube replacement calculations

CEG Job #: 9C10050
Project: Sandshore ES
Address: 498 Sandshore Ave. Budd Lake, NJ, 07828
Building SF: 52000

Sandshore ES

KWH COST: $0.157

ECM #3: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
221.11	Tech Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	150.8	$23.68	1	0	No Change	58	0.06	0%	150.8	$23.68	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Stage	2600	6	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.348	904.8	$142.05	6	0	No Change	58	0.35	0%	904.8	$142.05	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Cafeteria	3000	56	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.68	5040	$791.28	56	2	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	1.51	10%	4536	$712.15	$225.00	$450.00	0.17	504	$79.13	5.69
121.11	Women's Rest Room	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$31.84	1	0	No Change	78	0.08	0%	202.8	$31.84	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Men's Rest Room	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$31.84	1	0	No Change	78	0.08	0%	202.8	$31.84	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Faculty Room Entrance	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$31.84	1	0	No Change	78	0.08	0%	202.8	$31.84	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Room off of Nurses's Office	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$31.84	1	0	No Change	78	0.08	0%	202.8	$31.84	$0.00	$0.00	0.00	0	$0.00	0.00
7	Rest Room off of Kitchen	2600	1	1	1x2, 1 Lamp, 17w T8, Elect. Ballast, Wall Mnt., Prismatic Lens	18	0.018	46.8	$7.35	1	0	No Change	18	0.02	0%	46.8	$7.35	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Kitchen Storage Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	150.8	$23.68	1	0	No Change	58	0.06	0%	150.8	$23.68	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Kitchen	2600	25	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.75	1950	$306.15	25	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.68	10%	1755	$275.54	$225.00	$225.00	0.08	195	$30.62	7.35
7	Rest Room near Boiler Office	2600	1	1	1x2, 1 Lamp, 17w T8, Elect. Ballast, Wall Mnt., Prismatic Lens	18	0.018	46.8	$7.35	1	0	No Change	18	0.02	0%	46.8	$7.35	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	Boiler Room	4400	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.522	2296.8	$360.60	9	0	No Change	58	0.52	0%	2296.8	$360.60	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	Storage Room near Boiler	1200	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.116	139.2	$21.85	2	0	No Change	58	0.12	0%	139.2	$21.85	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Nurse	2600	11	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.638	1658.8	$260.43	11	0	No Change	58	0.64	0%	1658.8	$260.43	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Elec. Closet	2600	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	78	$12.25	1	0	No Change	30	0.03	0%	78	$12.25	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Hall	4400	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	132	$20.72	1	0	No Change	30	0.03	0%	132	$20.72	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Office near Bolier Room	4400	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	264	$41.45	2	0	No Change	30	0.06	0%	264	$41.45	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Corridors	4400	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	264	$41.45	2	1	Daylight Sensor (Sensorswitch PP-20 & CM-PC or equal)	30	0.05	20%	211.2	$33.16	$160.00	$160.00	0.01	52.8	$8.29	19.30
227.21		4400	56	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	3.248	14291.2	$2,243.72	56	0	No Change	58	3.25	0%	14291.2	$2,243.72	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Faculty Room	2600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.416	1081.6	$169.81	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	104	0.37	10%	973.44	$152.83	$75.00	$75.00	0.04	108.16	$16.98	4.42

211.11	Principal's Office	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$73.48	6	1	Dual Technology Occupancy Sensor - Switch Mnt.	30	0.16	10%	421.2	$66.13	$75.00	$75.00	0.02	46.8	$7.35	10.21
211.11	Work Room	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312	$48.98	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	30	0.11	10%	280.8	$44.09	$75.00	$75.00	0.01	31.2	$4.90	15.31
211.11	Copy Room	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312	$48.98	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	30	0.11	10%	280.8	$44.09	$75.00	$75.00	0.01	31.2	$4.90	15.31
211.11	Main Office	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$73.48	6	0	No Change	30	0.18	0%	468	$73.48	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Helping Teacher	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312	$48.98	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	30	0.11	10%	280.8	$44.09	$75.00	$75.00	0.01	31.2	$4.90	15.31
227.21	Main Lobby	4400	8	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.464	2041.6	$320.53	8	0	No Change	58	0.46	0%	2041.6	$320.53	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Library Storage	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312	$48.98	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	30	0.11	10%	280.8	$44.09	$75.00	$75.00	0.01	31.2	$4.90	15.31
121.21	Guidance Office	2600	4	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.312	811.2	$127.36	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	78	0.28	10%	730.08	$114.62	$75.00	$75.00	0.03	81.12	$12.74	5.89
211.11	Library Office	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312	$48.98	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	30	0.11	10%	280.8	$44.09	$75.00	$75.00	0.01	31.2	$4.90	15.31
211.11	Library & Media Center	2600	45	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.35	3510	$551.07	45	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	1.01	25%	2632.5	$413.30	$360.00	$360.00	0.34	877.5	$137.77	2.61
211.11	Classroom #166	2600	30	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.9	2340	$367.38	30	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.81	10%	2106	$330.64	$225.00	$225.00	0.09	234	$36.74	6.12
211.11	Classroom #169	2600	30	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.9	2340	$367.38	30	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.81	10%	2106	$330.64	$225.00	$225.00	0.09	234	$36.74	6.12
211.11	Classroom #172	2600	30	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.9	2340	$367.38	30	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.81	10%	2106	$330.64	$225.00	$225.00	0.09	234	$36.74	6.12
221.11	Classroom #179	2600	25	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.45	3770	$591.89	25	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	58	1.09	25%	2827.5	$443.92	$360.00	$360.00	0.36	942.5	$147.97	2.43
221.11	SGI	2600	10	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.58	1508	$236.76	10	1	Dual Technology Occupancy Sensor - Switch Mnt.	58	0.52	10%	1357.2	$213.08	$75.00	$75.00	0.06	150.8	$23.68	3.17
211.11	Classroom #183	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
221.21	Girls' Rest Room	3200	8	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Acrylic Lens	58	0.464	1484.8	$233.11	8	1	Dual Technology Occupancy Sensor - Remote Mnt.	58	0.42	10%	1336.32	$209.80	$160.00	$160.00	0.05	148.48	$23.31	6.86
221.21	Boys' Rest Room	3200	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Acrylic Lens	58	0.348	1113.6	$174.84	6	1	Dual Technology Occupancy Sensor - Remote Mnt.	58	0.31	10%	1002.24	$157.35	$160.00	$160.00	0.03	111.36	$17.48	9.15
211.11	Classroom #190	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53

211.11	Classroom #192	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #194	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #196	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #198	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #197	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #195	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #193	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #191	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
121.11	Classroom #189	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.404	3650.4	$573.11	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	78	1.05	25%	2737.8	$429.83	$360.00	$360.00	0.35	912.6	$143.28	2.51
221.11	Classroom #184	2600	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.522	1357.2	$213.08	9	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	58	0.39	25%	1017.9	$159.81	$360.00	$360.00	0.13	339.3	$53.27	6.76
221.11	SGI	2600	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.522	1357.2	$213.08	9	1	Dual Technology Occupancy Sensor - Remote Mnt.	58	0.47	10%	1221.48	$191.77	$160.00	$160.00	0.05	135.72	$21.31	7.51
237.21	Child Study Team Offices	2600	25	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	2.3	5980	$938.86	25	0	No Change	92	2.30	0%	5980	$938.86	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Store Room	1200	3	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.234	280.8	$44.09	3	1	Dual Technology Occupancy Sensor - Switch Mnt.	78	0.21	10%	252.72	$39.68	$75.00	$75.00	0.02	28.08	$4.41	17.01
221.11	Tech Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	150.8	$23.68	1	0	No Change	58	0.06	0%	150.8	$23.68	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Tech Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	150.8	$23.68	1	0	No Change	58	0.06	0%	150.8	$23.68	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Art Room Storage	1200	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.156	187.2	$29.39	2	0	No Change	78	0.16	0%	187.2	$29.39	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Art Room	2600	36	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	2.808	7300.8	$1,146.23	36	2	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	78	2.53	10%	6570.72	$1,031.60	$225.00	$450.00	0.28	730.08	$114.62	3.93

211.11	Teachers' Rest Room	1200	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	36	$5.65	1	0	No Change	30	0.03	0%	36	$5.65	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Tech. Room	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Acrylic Lens	58	0.116	301.6	$47.35	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	58	0.10	10%	271.44	$42.62	$75.00	$75.00	0.01	30.16	$4.74	15.84
3520	Rest Room	2600	1	2	15" Round White Globe, 2 60w A Lamps	120	0.12	312	$48.98	1	0	No Change	120	0.12	0%	312	$48.98	$0.00	$0.00	0.00	0	$0.00	0.00
3520	Mech. Closet	1200	1	2	15" Round White Globe, 2 60w A Lamps	120	0.12	144	$22.61	1	0	No Change	120	0.12	0%	144	$22.61	$0.00	$0.00	0.00	0	$0.00	0.00
3520	Storage Closet	1200	1	2	15" Round White Globe, 2 60w A Lamps	120	0.12	144	$22.61	1	0	No Change	120	0.12	0%	144	$22.61	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	PE Office	2600	7	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.21	546	$85.72	7	1	Dual Technology Occupancy Sensor - Switch Mnt.	30	0.19	10%	491.4	$77.15	$75.00	$75.00	0.02	54.6	$8.57	8.75
221.11	PE Storage	1200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	69.6	$10.93	1	0	No Change	58	0.06	0%	69.6	$10.93	$0.00	$0.00	0.00	0	$0.00	0.00
766	Gymnasium	3000	12	1	400w MH, 2x2, Recessed Mnt., Prismatic Lens	465	5.58	16740	$2,628.18	12	0	No Change	465	5.58	0%	16740	$2,628.18	$0.00	$0.00	0.00	0	$0.00	0.00
331.11		3000	4	3	1x4, 3 Lamp, 54w T5HO Fixture	177	0.708	2124	$333.47	4	0	No Change	177	0.71	0%	2124	$333.47	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Storage	1200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	69.6	$10.93	1	0	No Change	58	0.06	0%	69.6	$10.93	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	OT/PT	2600	10	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.3	780	$122.46	10	1	Dual Technology Occupancy Sensor - Remote Mnt.	30	0.27	10%	702	$110.21	$160.00	$160.00	0.03	78	$12.25	13.07
3520	Closet	1200	1	2	15" Round White Globe, 2 60w A Lamps	120	0.12	144	$22.61	1	0	No Change	120	0.12	0%	144	$22.61	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	SGI	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$73.48	6	1	Dual Technology Occupancy Sensor - Switch Mnt.	30	0.16	10%	421.2	$66.13	$75.00	$75.00	0.02	46.8	$7.35	10.21
211.11	SGI	2600	9	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.27	702	$110.21	9	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.20	25%	526.5	$82.66	$360.00	$360.00	0.07	175.5	$27.55	13.07
211.11	Classroom #106	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #104	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #102	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #100	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #99	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #101	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Classroom #103	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53

211.11	Classroom #105	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$220.43	18	1	Dual Technology Occupancy Sensor & Day Light Sensor - (Sensor Switch CM-PC, PP-20, CM-PDT)	30	0.41	25%	1053	$165.32	$360.00	$360.00	0.14	351	$55.11	6.53
211.11	Storage	1200	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	72	$11.30	2	0	No Change	30	0.06	0%	72	$11.30	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Girls' Rest Room	3200	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.29	928	$145.70	5	1	Dual Technology Occupancy Sensor - Remote Mnt.	58	0.26	10%	835.2	$131.13	$160.00	$160.00	0.03	92.8	$14.57	10.98
221.11	Men's Rest Room	1200	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.29	348	$54.64	5	1	Dual Technology Occupancy Sensor - Switch Mnt.	58	0.26	10%	313.2	$49.17	$75.00	$75.00	0.03	34.8	$5.46	13.73
221.11	Music Room	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.218	3166.8	$497.19	21	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.10	10%	2850.12	$447.47	$225.00	$225.00	0.12	316.68	$49.72	4.53
738	Exterior	4400	8	1	175w MH Flood	210	1.68	7392	$1,160.54	8	0	No Change	210	1.68	0%	7392	$1,160.54	$0.00	$0.00	0.00	0	$0.00	0.00
765		4400	1	1	400w HPS Flood	465	0.465	2046	$321.22	1	0	No Change	465	0.47	0%	2046	$321.22	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		**938**	**126**			**46.8**	**135,283**	**$21,239**	**938**	**52**			**41.7**		**121,913**	**$19,140**		**$12,315**	**5.11**	**13,370**	**$2,099**	**5.87**

Project Name: LGEA Solar PV Project - Sandshore School
Location: Budd Lake, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,724,310
Annual kWh Production	238,069
Annual Energy Cost Reduction	$37,377
Annual SREC Revenue	$83,324
First Cost Premium	**$1,724,310**
Simple Payback:	**14.29** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.157**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$1,724,310	0	0	0	$0	(1,724,310)	0
1	$0	238,069	$37,377	$0	$83,324	$120,701	($1,603,609)
2	$0	236,879	$38,498	$0	$82,908	$121,406	($1,482,203)
3	$0	235,694	$39,653	$0	$82,493	$122,146	($1,360,057)
4	$0	234,516	$40,843	$0	$82,081	$122,923	($1,237,134)
5	$0	233,343	$42,068	$2,403	$81,670	$121,335	($1,115,799)
6	$0	232,176	$43,330	$2,391	$81,262	$122,200	($993,599)
7	$0	231,016	$44,630	$2,379	$80,855	$123,106	($870,493)
8	$0	229,861	$45,969	$2,368	$80,451	$124,052	($746,441)
9	$0	228,711	$47,348	$2,356	$80,049	$125,041	($621,400)
10	$0	227,568	$48,768	$2,344	$79,649	$126,073	($495,327)
11	$0	226,430	$50,231	$2,332	$79,250	$127,150	($368,177)
12	$0	225,298	$51,738	$2,321	$78,854	$128,272	($239,905)
13	$0	224,171	$53,290	$2,309	$78,460	$129,441	($110,464)
14	$0	223,050	$54,889	$2,297	$78,068	$130,659	$20,195
15	$0	221,935	$56,536	$2,286	$77,677	$131,927	$152,123
16	$0	220,825	$58,232	$2,275	$77,289	$133,246	$285,369
17	$0	219,721	$59,979	$2,263	$76,902	$134,618	$419,987
18	$0	218,623	$61,778	$2,252	$76,518	$136,044	$556,031
19	$0	217,530	$63,632	$2,241	$76,135	$137,526	$693,558
20	$0	216,442	$65,541	$2,229	$75,755	$139,066	$832,624
21	$1	215,360	$67,507	$2,218	$75,376	$140,664	$973,288
22	$2	214,283	$69,532	$2,207	$74,999	$142,324	$1,115,612
23	$3	213,211	$71,618	$2,196	$74,624	$144,046	$1,259,658
24	$4	212,145	$73,766	$2,185	$74,251	$145,832	$1,405,490
25	$5	211,085	$75,979	$2,174	$73,880	$147,685	$1,553,175
	Totals:	5,607,942	$1,362,732	$48,027	$1,962,780	$3,277,485	($1,977,499)
				Net Present Value (NPV)			**$1,553,200**
				Internal Rate of Return (IRR)			**5.5%**

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
Sandshore School	13600	Sunpower SPR230	833	14.7	12,249	191.59	238,069	27,489	15.64

PVWatts

AC Energy & Cost Savings

Cautions for Interpreting the Results

(Type comments here to appear on printout; maximum 1 row of 80 characters.)

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	191.6 kW
DC to AC Derate Factor:	0.800
AC Rating:	153.3 kW
Array Type:	Fixed Tilt
Array Tilt:	15.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	0.2 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	2.80	13512	21.21
2	3.53	15470	24.29
3	4.46	20948	32.89
4	5.28	23408	36.75
5	5.86	26381	41.42
6	6.10	25521	40.07
7	6.05	25882	40.63
8	5.60	24030	37.73
9	4.99	21067	33.08
10	3.97	17694	27.78
11	2.86	12788	20.08
12	2.43	11368	17.85
Year	4.50	238069	373.77

.= Proposed PV Layout

Notes:

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