LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR: **MT. OLIVE TWP. SCHOOL DISTRICT**
MOUNTAIN VIEW SCHOOL

118 CLOVERHILL DRIVE
FLANDERS, NJ, 07836

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I. EXECUTIVE SUMMARY

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

Mount Olive Township School District
Mountain View School
118 Cloverhill Drive,
Flanders, NJ, 07836

Facility 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	$127,831
Natural Gas	$56,775
Total	$184,606

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	$10,430	$1,855	5.6	166.7%
ECM #2	Lighting Upgrade - Gymnasium	$2,280	$1,277	1.8	740.3%
ECM #3	Lighting Controls Upgrade	$9,595	$2,480	3.9	287.7%
ECM #4	Replace CRT Monitors	$8,100	$1,525	5.3	182.4%
ECM #5	Replace Nesbitt Roof Units	$217,440	$5,674	38.3	-60.9%
ECM #6	Condensing Domestic HW Heaters	$11,500	$1,151	10.0	50.1%
ECM #7	Replace Older Mini Split Units	$11,748	$890	13.2	13.7%
ECM #8	Replace Windows	$487,500	$13,726	35.5	-57.8%
ECM #9	Premium Efficiency Motors	$2,679	$252	10.6	40.9%
ECM #10	Programmable Thermostats for Electric Baseboard	$2,000	$378	5.3	183.7%
ECM #11	ADD DX Cooling to Six Unit Ventilators	$22,896	$759	30.2	-50.3%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solar PV Installation	$1,119,870	$79,936	14.0	7.1%

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	3.9	10,760	0
ECM #2	Lighting Upgrade - Gymnasium	2.7	7,694	0
ECM #3	Lighting Controls Upgrade	0	14,939	0
ECM #4	Replace CRT Monitors	0	9,185	0
ECM #5	Replace Nesbitt Roof Units	22.2	17,723	1,687
ECM #6	Condensing Domestic HW Heaters	0	10,678	(384)
ECM #7	Replace Older Mini Split Units	2.1	5,364	0
ECM #8	Replace Windows	5.4	15,200	6,915
ECM #9	Premium Efficiency Motors	0.4	1,516	0
ECM #10	Programmable Thermostats for Electric Baseboard Heaters	0.0	2,278	0
ECM #11	ADD DX Cooling to Six Unit Ventilators	5.7	4,571	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	124.4	154616	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 #4** Replace CRT Monitors
- **ECM #6** Condensing Domestic HW Heaters
- **ECM #10** Programmable Thermostats for Electric Baseboard Heaters

ECM #1 – Lighting Upgrade - Interior Spaces

Some of the classrooms, corridors, cafeteria, kitchen, storage spaces, utility closets and bathrooms in the buildings still have a variety of older fixtures with T12 lamps with magnetic ballasts or incandescent 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 has a simple payback of 5.6 years.

ECM #2 - Lighting Upgrade - Gymnasium

The gymnasium utilizes older style, probe start metal halide fixtures. These fixtures have direct replacements that save considerable energy. The lighting retrofit includes new high bay T-5 high output fluorescent fixtures to replace the metal halide fixtures. Advantages include extended life, instant lamp start and superior light quality, making this ECM financially and aesthetically beneficial. 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. This ECM has a simple payback of 1.8 years making it highly recommended for the facility.

ECM #3 – Lighting Controls

Lighting controls provide a simple and effective solution to the problem of lights being unnecessarily left on. Occupancy sensors provide a fast payback since the installation costs are minimal per control device. This ECM includes installation of occupancy sensors for classrooms and offices with a simple payback of approximately 4 years.

ECM #4 – Computer Monitor Replacement

Many Cathode Ray Tube (CRT) monitors are used throughout the school district. These monitors use approximately three times more energy than a new flat panel LCD monitor. Since the majority of the computer monitors were noted to be on and in screen saver mode, it was

determined that the hours of operation for this plug in load are almost continuous. The energy savings from replacing the existing CRT monitors with LCD monitors will pay for the new monitors in approximately five (5) years saving over $1,500 annually. It is important to realize that these savings are comparing the energy savings based on the existing operating hours both before and after the retrofit, however even further savings could be seen if computers and monitors were turned off for all hours they are not in use.

ECM #6 Condensing Domestic HW Heaters

One of the domestic hot water heaters for the facility is a large 250 gallon electric hot water heater with a total 80kW heating capacity. This form of hot water heating is expensive due to the high cost of electricity. Condensing hot water heaters provide substantially improved operating costs over electric hot water heaters. This ECM includes installation of a new gas-fired, condensing hot water heater. This ECM has a 10 year simple payback and it is recommended for this facility.

ECM #10 Programmable Thermostats for Electric Baseboard Heaters

The perimeter heating for some of the spaces in the north building is achieved via electric baseboard heaters. The heaters are controlled with mechanical thermostats on the baseboard units. Currently, there is no night setback for the perimeter baseboard heating. It is recommended to install programmable digital thermostats to implement energy efficient control strategies such as night time setback for these heaters. This ECM has a simple payback of 5.3 years making it highly recommended for the facility.

Renewable Energy Analysis

Renewable Energy Measures (REMs) were also reviewed for implementation at the Mountain View Elementary School. CEG utilized a roof mounted solar array to house a substantial PV system. The recommended 124 kW PV system will produce approximately 154,500 kWh of electricity annually and will reduce the schools electrical consumption from the grid by 20%. The system's calculated simple payback of 14 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. Maintain insulation on the hot water pipes.
6. Check and confirm occupied and unoccupied temperature settings for each air conditioning unit and remove any overrides.
7. Confirm that outside air economizers on the packaged AC units and air handling 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. Moreover, the program currently has a 200 kW maximum demand limit for applicability. This demand limit is capable of being waived if the School District is able to receive a portion of their respective Township Local Government's American Recovery and Reinvestment Act (ARRA) funding towards energy efficiency improvements. Therefore, for facilities over the 200 kW maximum demand

limit, such as Mountain View Elementary School, the School District will need to coordinate Direct Install efforts with the Township's Local Government.

Conclusion

Overall, the Mountain View Elementary School appears to be operating at an efficiency level below average compared to other schools in the region. With the implementation of the above recommended measures the Mount Olive BOE will realize further energy savings at the Mountain View Elementary School.

II. INTRODUCTION

The comprehensive energy audit covers the 76,000 square foot Mountain View Elementary School, which includes classrooms, library, cafeteria, gymnasium, multi-purpose rooms, art room, music room, restrooms, kitchen, storage spaces, maintenance shop and administration offices.

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

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

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

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

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

The building site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs

provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

III. METHOD OF ANALYSIS

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

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

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

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

ECM Calculation Equations:

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

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

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

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

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

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

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. New Jersey Natural Gas (NJNG) provides natural gas to the facility under the General Service Large (GSL) transport service 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	16.6¢ / kWh
Natural Gas	$1.62 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Jersey Central Power and Lighting
Rate: General Service Secondary 3 Phase Space Heating Service
Meter No: G16650017, G16649685
Customer ID No: 100001260668, 100001260635
Third Party Utility Provider: -
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION	DEMAND	TOTAL BILL
Aug-09	49,600	291.2	$8,784
Sep-09	61,200	329.6	$10,474
Oct-09	64,800	290.8	$10,706
Nov-09	71,600	300.0	$11,691
Dec-09	82,400	266.4	$12,949
Jan-10	78,400	268.8	$12,424
Feb-10	71,200	255.6	$11,357
Mar-10	59,600	288.8	$9,991
Apr-10	59,600	287.6	$9,983
May-10	70,000	315.6	$11,784
Jun-10	60,000	319.2	$10,392
Jul-10	42,400	218.8	$7,296
Totals	**770,800**	**329.6 Max**	**$127,831**

AVERAGE DEMAND **286.0 KW average**
AVERAGE RATE **$0.166 $/kWh**

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

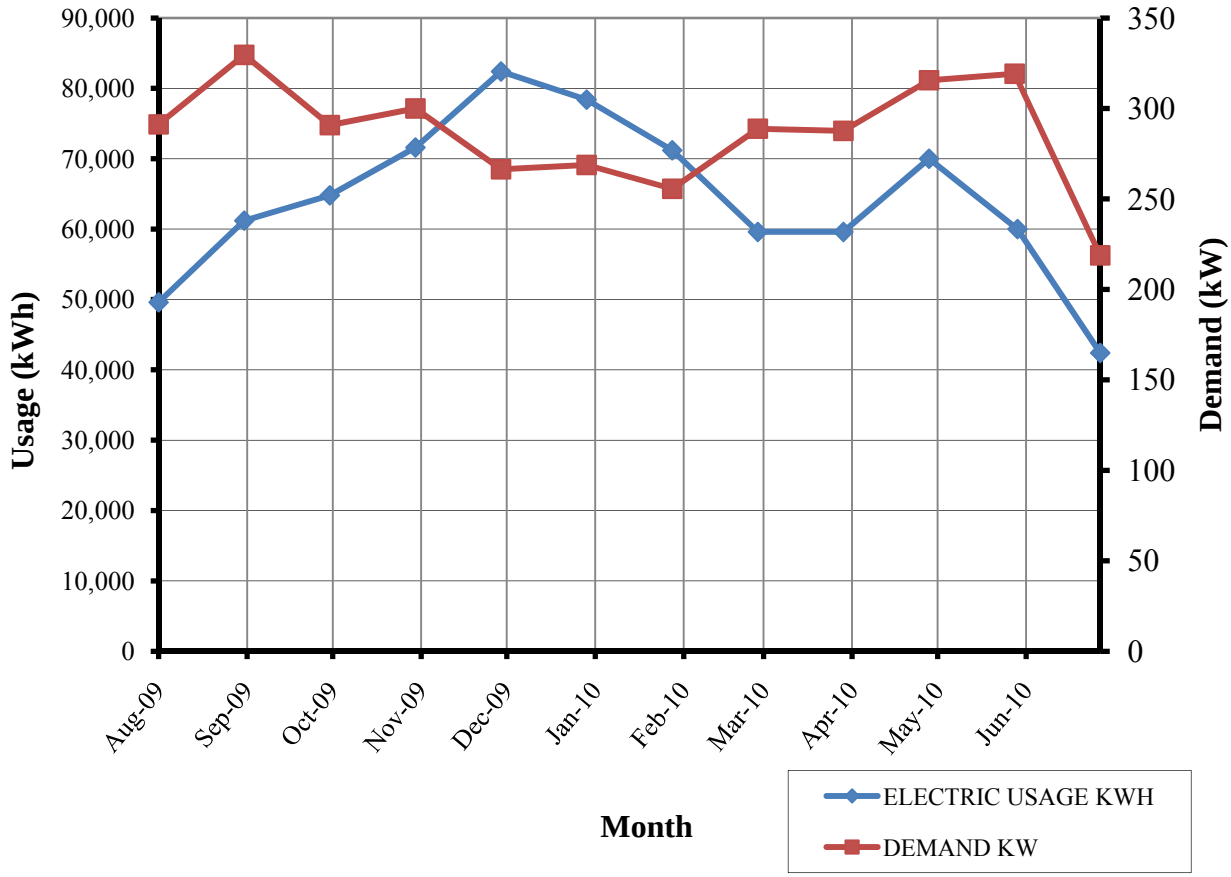


Table 4
Natural Gas Billing Data

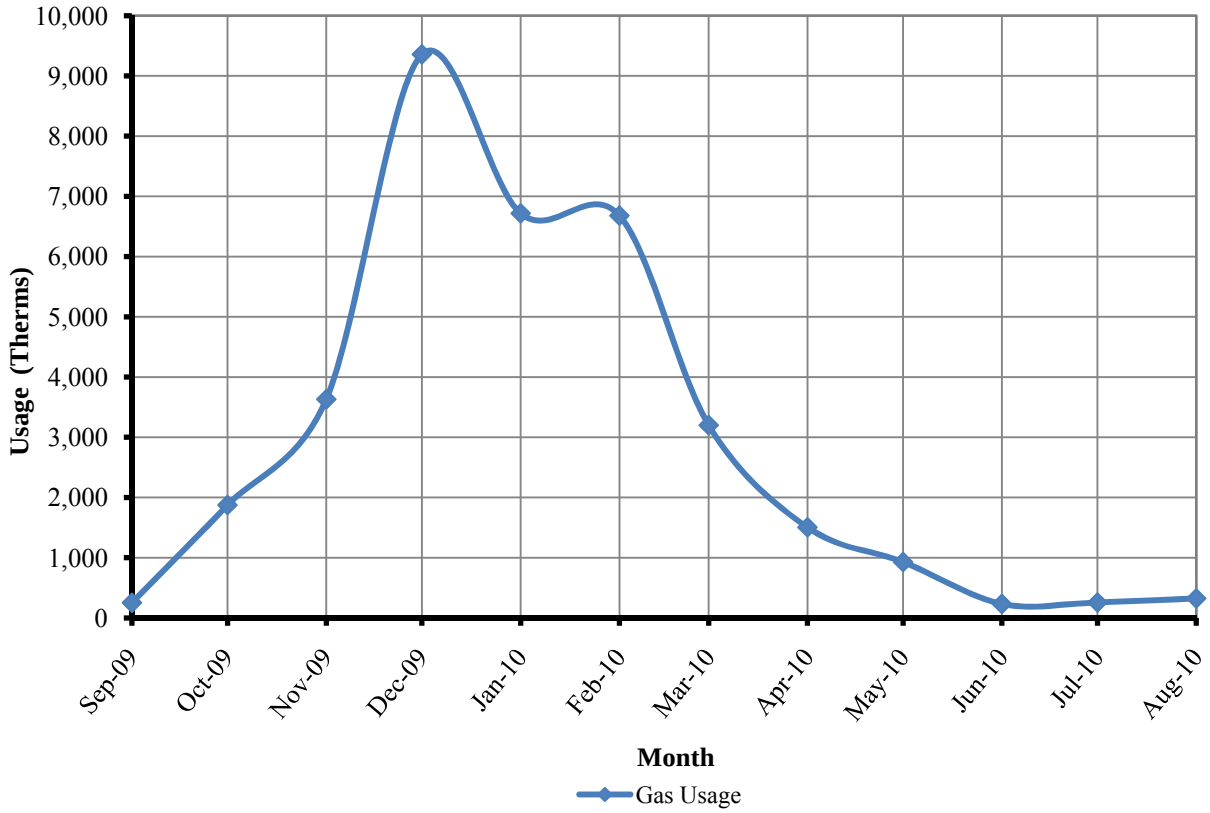
NATURAL GAS USAGE SUMMARY

Utility Provider: New Jersey Natural Gas
Rate: GSL
Meter No: 00871421, 00657789
Point of Delivery ID: -
Third Party Utility Provider: Pepco, Hess
TPS Account #: 071130000513, 220006642266, 446646/470145, 446646/447320

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Sep-09	253.31	$1,159.53
Oct-09	1,874.83	$3,662.65
Nov-09	3,631.51	$6,123.43
Dec-09	9,357.83	$13,208.85
Jan-10	6,716.67	$9,586.84
Feb-10	6,679.02	$9,537.40
Mar-10	3,200.98	$4,972.96
Apr-10	1,505.61	$2,748.64
May-10	928.74	$1,996.10
Jun-10	233.36	$1,077.06
Jul-10	258.53	$1,031.60
Aug-10	324.91	$1,670.01
TOTALS	**34,965.30**	**$56,775.07**

AVERAGE RATE: **$1.62** **$/THERM**

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



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:

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

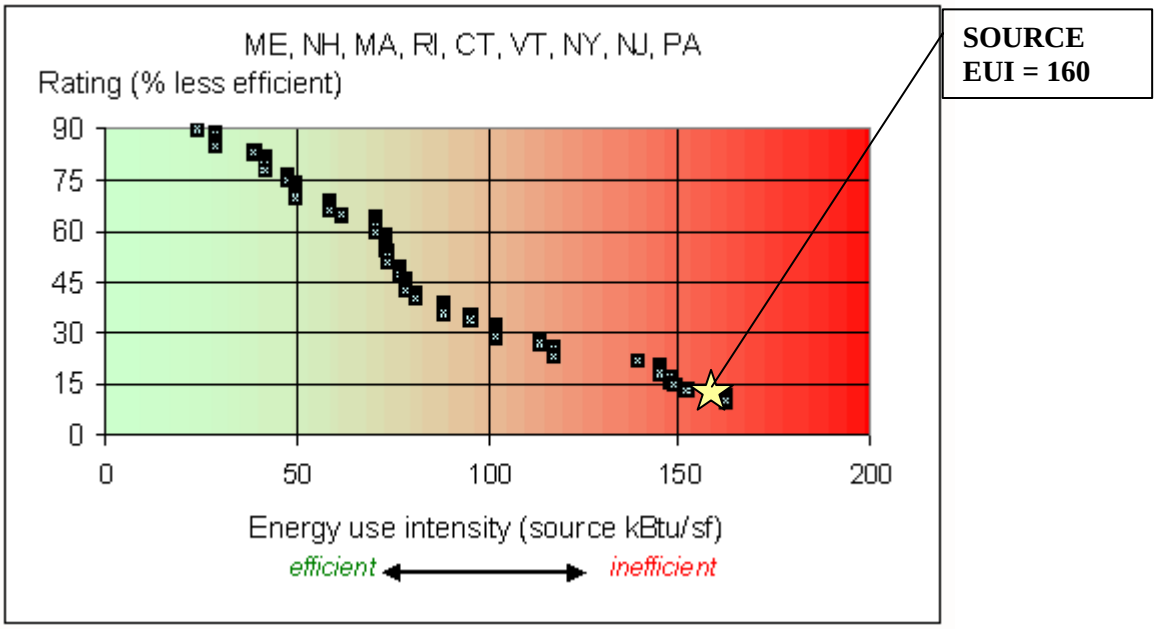
$$\text{Building Source EUI} = \frac{(\text{Electric Usage in kBtu X SS Ratio} + \text{Gas Usage in kBtu X SS Ratio})}{\text{Building Square Footage}}$$

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	770,800			2,631,511	3.340	8,789,247
NATURAL GAS		34,965		3,496,530	1.047	3,660,867
TOTAL				6,128,041		12,450,114
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		76,000	SQUARE FEET			
BUILDING SITE EUI		*81*	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



B. 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**
Mountain View Elementary School	30	50

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

V. FACILITY DESCRIPTION

The 76,000 SF Elementary School is a single story facility comprised of classrooms, library, kindergarten, cafeteria, gymnasium, multi-purpose rooms, art room, music room, restrooms, kitchen, storage spaces, maintenance shop and administration offices. The facility was built in 1969 and expanded in 1972 by building the North wing. Finally, the administration office area was built 2000.

The hours of operation for the school building are between 8:00 am and 4:00 pm on the weekdays. The facility is closed on weekends. The student enrollment at Mountain View Elementary School is approximately 650 students and 60 staff.

The building exterior is comprised of concrete block wall construction with face brick exterior. The amount of insulation within the wall structure is unknown. Based on the time period the insulation on the 1969 and 1972 structures would likely have been simply an air space or filled cores in the block walls. The roof structure of the north structure is built up with rubber membrane and loose gravel covering. The roof of the south structure is built up with rubber membrane and hardened sand covering. The insulation value of the roof is not unknown.

Window construction throughout the south building consists of a combination of single and double pane glasses with aluminum frames. Overall condition of the envelope is poor with respect to the building age. The north building has are newer, double pane windows with aluminum frames. The north building envelop is in good condition.

HVAC Systems

The South Building heating system consists of two (2) 1,950 MBH RBI Futura-II boilers that serve the south building's heating hot water loop. The boiler water is circulated by two pipe mounted pumps made by Armstrong. These pumps are constant volume and in good condition. The pumps provide heating hot water for the unit ventilators and the cafeteria hot water baseboard heaters.

Major heating equipment throughout the south building includes unit ventilators, heating and ventilation units and hot water baseboard heaters. There are total of 23 Magic Aire unit ventilators (UV) serving the classrooms in the south building. The unit ventilators include hot water coils fed from the boiler water loop. All of the unit ventilators are equipped with DX cooling coils. However, only four (4) of the UV's are actually connected to condensing units. DX cooling for these units are provided by four (4) 3-Ton condensing units made by Goodman. The unit ventilators are approximately 11 years old and overall in acceptable condition. There is little energy savings related with the replacement of these units since the heating system efficiency is based on the central boilers and hot water pumps.

In addition, there are two (2) heating and ventilation (HV) units serving the gymnasium, one (1) unit serving the bathrooms, three (3) other units serving the kitchen and the south building cafeteria and one (1) unit for the music rooms.The HV units are equipped with 1-2 HP fans and hot water heating coils. Similar to the Unit Ventilators, there is minimal savings associated to

replacement of these heating and ventilation units. The HV units provide 100% outside air to these spaces. They are controlled by a time of day schedule.

A portion of the South Building utilizes a total of six (6) Carrier rooftop air conditioning units with gas fired primary supply air pre-heat coils and 4 ton cooling coil. The rooftop units are fairly new units in good condition and they are maintained well.

In addition to the roof top units, there are three (3) ductless split air conditioners and six (6) window air conditioners providing cooling for various spaces in the building. 2-Ton ductless mini split air conditioning units are made by Carrier (one unit) and Sanyo (two units). The split system units and the window units provide supplemental cooling for utility rooms and various perimeter offices.

The North Building heating and air conditioning is provided with a variety of roof top air conditioners. These RTU's are approximately 11 years old and they are in good condition. The multipurpose room and the 1st grade areas are heated and cooled with two older multi-zone rooftop units made by MSI. Each MSI units is equipped with 32 Ton DX cooling and net 405 MBH gas heating capacity. The units are approximately 30 years old and they air in poor condition. Each unit is equipped with a 15 HP supply fans driven with standard efficiency motors. The heating and cooling for the library and the rooms 201 and 202 are provided with a 32-Ton Nesbitt rooftop unit. Nesbitt unit is approximately 10 years old and it is in good condition. The Nesbitt unit supply fan is driven with a 15HP high efficiency motor.

Perimeter heating for some of the spaces in the North building is provided with electric perimeter baseboard heaters. The baseboard heaters are controlled with local thermostats. There is currently no night time set back capability for the baseboard heaters.

The 2000 building addition includes a packaged rooftop unit made by Carrier with 25 Ton cooling capacity and 291 MBH gas heating coil capacity. The unit is equipped with a high efficiency motor and it appears to be in good condition. Terminal equipment includes VAV boxes and ceiling diffusers. The system includes spill dampers to relieve extra static pressure. The excess supply air is relieved into the return duct.

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.

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

HVAC System Controls

Currently, the building HVAC systems in the School building are controlled by two building automation systems. Two systems are JCI Metasys central building automation system (BAS) and Automated Logics BAS.

The Metasys control system currently handles the operation of the boilers, unit ventilators, MSI units and exhausters based on a time of day schedule. The Metasys system operates the heating water supply temperature of the boilers based on outdoor air temperature. The outside air dampers on each unit ventilator is controlled by this central system. It was reported that the outside air dampers function properly based on the building occupancy schedule. It is recommended to check this on a regular basis. It is expected that due to age that there is a potatioal for a portion of the existing outside air dampers to be mulfunctioning.

The older Automated Logics BAS controls less equipment than the Metasys system. The Automated Logics BAS controls the Reznor heating and ventilation units and the Carrier rooftop air handling units.

CEG strongly recommends operating the entire building through one single building automation system in order to accurately control the HVAC system in the building on a global level.

Domestic Hot Water

Domestic hot water for the restrooms and the faucets in the utility rooms is provided with a total of four (4) domestic hot water heaters. Two of the units are gas fired units while the remaining two are electric water heaters. It is recommended to replace electric hot water heaters with high efficiency gas fired units. The domestic hot water is circulated throughout the building by fractional horse power hot water circulation pumps. The circulation pumps are controlled by aqua stat. The domestic hot water piping insulation appeared to be in good condition.

Lighting

Typical lighting throughout 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 are 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 high pressure sodium light fixtures on the exterior walls.

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 Mountain View Elementary School building is provided with modern fixtures with T8 lamps and electronic ballasts. However, some of the classrooms, corridors, cafeteria, kitchen, 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.

$$\text{SmartStart® Incentive} = (\#\text{ of } 1-4 \text{ lamp fixtures} \times \$10) = 101 \times \$10 = \$1100$$

Replacement and Maintenance Savings are calculated as follows:

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

$$\text{Savings} = 9.78 \times (\$2 \text{ per lamp} + \$5 \text{ per lamp}) = \$68$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,540
NJ Smart Start Equipment Incentive ($):	$1,110
Net Installation Cost ($):	$10,430
Maintenance Savings ($/Yr):	$68
Energy Savings ($/Yr):	$1,786
Total Yearly Savings ($/Yr):	$1,855
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.6
Simple Lifetime ROI	166.7%
Simple Lifetime Maintenance Savings	$1,027
Simple Lifetime Savings	$27,820
Internal Rate of Return (IRR)	16%
Net Present Value (NPV)	$11,711.13

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 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: 2,800 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

$$\text{Smart Start ® Incentive} = (\#\ \text{of 250W Metal Halide Fixture Replaced} \times \$100)$$

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

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):	$1,277
Total Yearly Savings ($/Yr):	$1,277
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.8
Simple Lifetime ROI	740.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$19,159
Internal Rate of Return (IRR)	56%
Net Present Value (NPV)	$12,967.97

ECM #3: Lighting Controls Upgrade

Description:

Some of the lights in the school building 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.

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:

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

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

Cost and Incentives:

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

Dual Technology Occupancy Sensor	$160 per installation
2 Pole Power Pack w/Dual Tech. Occupancy Sensor	$225 per installation

Cost includes material and labor.

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

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

$$\text{Smart Start® Incentive} = (\#\text{ of wall mount} \times \$\,20) + (\#\text{ of ceiling mount} \times \$35)$$
$$\text{Smart Start® Incentive} = (0\text{ wall mount} \times \$\,20) + (57\text{ ceiling mount} \times \$35) = \$1{,}995$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,590
NJ Smart Start Equipment Incentive ($):	$1,995
Net Installation Cost ($):	$9,595
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,480
Total Yearly Savings ($/Yr):	$2,480
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.9
Simple Lifetime ROI	287.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$37,198
Internal Rate of Return (IRR)	25%
Net Present Value (NPV)	$20,009.73

ECM #4: Computer Monitor Replacement

Description:

A significant number of the computers in the classrooms and offices utilize CRT computer monitors. These computer monitors are outdated and have several disadvantages such as; significantly increased higher energy consumption, uses large amount of desk space, poor picture quality, distortions and flickering image, secular glare problems, and high weight, and electromagnetic emissions. Many of the drawbacks are difficult to quantify except for the energy use. CRT monitors use considerably more energy than an alternative flat panel LCD monitor. Replacement of the existing CRT monitors with LCD monitors saves considerable energy as well as provides other ergonomic benefits as well.

Based on the site survey it was noted that a number of the computers were left on and allowed to run 24 / 7. The majority of the monitors were left in screen saver mode, which is deceiving since this mode only saves the computer screen from image burn in, however it does not save on energy consumption. The average operating hours for all computers and monitors is estimated based on the site survey observations. Energy consumption of computer monitors are based on manufacture's specifications.

This ECM includes replacement of all existing CRT monitors with LCD flat panel monitors throughout the building. Installation costs were neglected for this ECM with the intention that the monitors would be replaced by the facility IT technicians. The calculations are based on the following operating assumptions:

Energy Savings Calculations:

# of Computers:	81
Run Time %:	90%
Weeks per Yr:	42
Hrs per Week:	60

$$\text{Electric Usage} = \frac{\#\text{of Computers} \times \text{Run Time \%} \times \text{Monitor Power (W)} \times \text{Operation (Hrs)}}{1000\left(\frac{\text{W}}{\text{KW}}\right)}$$

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

COMPUTER MONITOR CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	CRT Monitors	LCD Monitor	
# of Computers	81	81	
Monitor Power Cons. (W)	75	25	
Run Time %	90%	90%	
Operating Hrs per Week	60	60	
Operating Weeks per Yr	42	42	
Elec Cost ($/kWh)	0.166	0.166	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Usage (kWh)	13,778	4,593	9,185
Energy Cost ($)	$2,287	$762	$1,525
COMMENTS:			

Installation cost of new monitors is estimated based on current pricing for a 17" LCD monitor on the market today. No labor costs were included for replacing the existing monitors with the new monitors. No incentives are available for installation of computer monitors. Net cost per monitor was estimated to be $100. Cost of installation is summarized in the table below.

COST & SAVINGS SUMMARY			
ECM INPUT	**# OF UNITS**	**UNIT COST**	**TOTAL COST**
CRT MONITORS	81	$100	$8,100
Total	81		$8,100

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,100
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$8,100
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,525
Total Yearly Savings ($/Yr):	$1,525
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.3
Simple Lifetime ROI	182.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$22,872
Internal Rate of Return (IRR)	17%
Net Present Value (NPV)	$10,102.68

ECM #5: Replace Nesbitt Multi-zone Roof Units

Multipurpose room and the 1st grade areas are heated and cooled with two older multi-zone rooftop units made by MSI. Each MSI units is equipped with 32 Ton DX cooling and net 405 MBH net gas heating capacity. The units are approximately 30 years old and they air in very poor condition. Due to age, outdated parts and controls, the unit is inefficient compared to today's high efficiency standards.

This ECM includes installation of a new rooftop unit to replace the existing 2 Nesbitt roof units. New high efficiency units are based on new Nesbitt roof units or equal multi zone roof unit with air side economizer, premium efficiency motors, high efficiency scroll compressors, and multiple stage gas burners with high turn down ratio.

Energy Savings Calculations:

$$\text{EnergyUsage} = \frac{\text{Cooling(Tons)} \times 12{,}000 \left(\frac{\text{Btu}}{\text{Ton hr}} \right) \times \text{Seasonal Cooling Hrs.}}{1000 \left(\frac{\text{Wh}}{\text{kWh}} \right) \times \text{SEER} \left(\frac{\text{Btu}}{\text{Wh}} \right)}$$

$$\text{Demand} = \frac{\text{Cooling Capacity (Tons)} \times \left(\frac{12{,}000 \text{ BTU/Hr}}{1 \text{ Ton}} \right)}{\text{Cooling Efficiency (EER)} \times \left(\frac{1{,}000 \text{ Wh}}{\text{kWh}} \right)}$$

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

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

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

ROOFTOP UNIT REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Nesbitt Units 32 Ton Cooling 405 MBH Net Heating	New Multizone nits with equal capacity	
Number of Units	2	2	
Total Cooling Capacity, Tons	64	64	
Efficiency (EER)	8	10.4	
Annual Full Load Cooling Hours	800	800	
Total Heating Capacity, BTU/Hr	810	810	
Heating Efficiency (Gas)	70%	82%	
Heating Degree Days (65°F)	4,496	4,496	
Elec Cost ($/kWh)	$0.166	$0.166	
Natural Gas Cost ($/Therm)	$1.62	$1.62	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Cooling Energy Cnsmption, kWh	76,800	59,077	17,723
Cooling Demand, kW	96	73.8	22.2
Heating Energy (Therms)	11,526	9,839	1,687
Electric Energy Cost ($)	$12,749	$9,807	$2,942
Total Gas Cost ($)	$18,671	$15,939	$2,732
Total Cost ($)	$31,420	$25,746	$5,674
COMMENTS:	CDDs estimated based on Newark,NJ.		

Cost and Incentives:

Estimated installed cost for two new, multi-zone roof units is $220,000.

From the NJ Smart Start® Program appendix, the packaged unit's replacement falls under the category "Central DX AC Systems" and warrants an incentive based on efficiency at or above 9.5 EER for units with capacity between 30 Ton and 63 Tons. The incentives are as follows:

$$\text{Smart Start® Incentive} = (\text{AC Unit Tonnage} \times \$\,40/\text{Ton}) = (64 \times \$40) = \$2{,}560$$

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$220,000
NJ Smart Start Equipment Incentive ($):	$2,560
Net Installation Cost ($):	$217,440
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$5,674
Total Yearly Savings ($/Yr):	$5,674
Estimated ECM Lifetime (Yr):	15
Simple Payback	38.3
Simple Lifetime ROI	-60.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$85,117
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($149,698.97)

ECM #6: Condensing Domestic Hot Water Heater

Description:

One of the primary sources for domestic hot water for the facility is a large, 250 Gallon electric hot water heater with a total 80kW (273 MBH) heating elements. The heater provides hot water for the bathrooms, utility sinks and the cafeteria in the north building. This form of hot water heating is expensive due to the high cost of electricity. Condensing hot water heaters provide substantially improved operating costs over electric hot water heaters. The thermal efficiency of condensing hot water heaters is approximately 96%.

This ECM includes installation of a 100 Gallon, 250 MBH central tank type condensing hot water heater to replace the existing electric hot water heater. The basis for this ECM is the AO Smith condensing hot water heater model number BTH 250.

It must be noted that this ECM completely removes the existing 250 Gallon tank electric hot water heater with a 100 gallon condensing hot water heater with equivalent hot water recovery rate. It was reported that the existing hot water storage capacity is oversized for the current usage. Owner is recommended to retain a professional engineer to review current hot water usage and demand before implementing this ECM.

Energy Savings Calculations:

$$\text{Dom.HW Heat Consumption} = \left(\frac{\text{Gal}}{\text{Min}}\right) \times 8.33 \left(\frac{\text{lb}}{\text{Gal}}\right) \times \Delta\text{T}(^{\circ}\text{F}) \times \text{Time}(\text{Min}) \times \ldots$$

$$(\#\text{People}) \times \left(\frac{\text{Use}}{\text{Day/Person}}\right) \times 365 \left(\frac{\text{Days}}{\text{Yr}}\right)$$

$$\text{Dom. HW Elec Usage} = \frac{\text{Dom HW Heat Cons.}(\text{Btu})}{\text{Heating Eff.}(\%) \times \text{Fuel Heat Value}\left(\frac{\text{BTU}}{\text{kWh}}\right)}$$

$$\text{Dom. HW Gas Usage} = \frac{\text{Dom HW Heat Cons.}(\text{Btu})}{\text{Heating Eff.}(\%) \times \text{Fuel Heat Value}\left(\frac{\text{BTU}}{\text{Therm}}\right)}$$

$$\text{Elec Energy Cost} = \text{Heating Usage}(\text{kWh}) \times \text{Ave Fuel Cost}\left(\frac{\$}{\text{kWh}}\right)$$

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

CONDENSING DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Electric Hot Water Heater	High Efficiency Condensing HW Heater	
Number of People	300	300	
Lavatory Sink Time (Minutes)	0.25	0.25	
Sink Uses per Day per Person	2	2	
Faucet Gallons Per Minute (GPM)	2.5	2.5	
Domestic Water Temperature Change (°F)	70	70	
Days of operation per year	200	200	
Sink Usage (BTU)	43,732,500	43,732,500	
Heating Efficiency	100%	95%	
Total Usage (BTU)	43,732,500	43,732,500	
Electric Cost ($/kWh)	0.166	0.166	
Nat Gas Cost ($/Therm)	1.62	1.62	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Consumption (kWh)	12,814	0	12,814
Nat Gas Consumption (Therms)	0	460	(460)
Energy Cost ($)	$2,127	$746	$1,381
COMMENTS:	*Savings are based on LEED-NC Version 2.2 Reference Guide for faucet and shower flow rates. Usage per person is estimated.		

Cost, Rebates and Incentives

Typical installed cost for a condensing hot water heater is estimated to be $12,000.

From the NJ Smart Start® Program appendix, the hot water heater installation falls under the category "Gas Water Heating" and warrants an incentive as follows:

Smart Start ® Incentive: $2/MBH × Unit Capacity, MBH
(Water Heaters > 50 Gallons, up to 300 MBH)

Below is the summary table for the summary of costs and incentives for this ECM.

COST & SAVINGS SUMMARY					
ECM INPUT	**INSTALLED COST per UNIT**	**SMART START REBATES Per UNIT**	**TOTAL COST PER UNIT**	**# OF UNITS**	**TOTAL NET COST**
AO SMITH BTH 250	$12,000	$500	$11,500	1	$11,500
TOTAL			**$11,500**	**1**	**$11,500**

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$12,000
NJ Smart Start Equipment Incentive ($):	$500
Net Installation Cost ($):	$11,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,151
Total Yearly Savings ($/Yr):	$1,151
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.0
Simple Lifetime ROI	50.1%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$17,266
Internal Rate of Return (IRR)	6%
Net Present Value (NPV)	$2,241.44

ECM #7: Replace Mini Split Air Conditioners

Description:

Various spaces in the Mountain View Elementary School ar conditioned with ductless mini split AC systems made by Carrier and Sanyo. The existing units are standard efficiency and they are over 15 years old. New ductless mini split air conditioners provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants. Current efficiencies are as high as SEER 18 for typical 2-Ton units and SEER 15 for typical 3-Ton systems.

This ECM includes one-to-one replacement of the existing ductless split air conditioning units with newer high efficiency models. A summary of this ECM can be found in the table below:

IMPLEMENTATION SUMMARY			
ECM INPUTS	**Number of Units**	**Cooling Capacity**	**Total Capacity**
2-Ton Sanyo	1	12,000	1
2-Ton Carrier	1	24,000	2
3-Ton Carrier	1	36,000	3
Total	3		6

The basis for this ECM is Sanyo high efficiency cooling only units with Inverter motors or similar units with single wall mounted indoor units and ground or roof mounted outdoor units.

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
2-Ton Sanyo	12,000	2,500	11	18	1	1,061	0.4
2-Ton Carrier	24,000	2,500	11	18	1	2,121	0.8
3-Ton Carrier	36,000	2,500	11	15	1	2,182	0.9
Total					3	5,364	2.1

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:

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

DUCTLESS MINI SPLIT AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	UNIT EFFICIENCY	REBATE $/TON	PROPOSED CAPACITY TONS	TOTAL REBATE $
5.4 tons or less Unitary AC and Split System	≥14 SEER	$92	6	$552
TOTAL			**6**	**$552**

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
2-Ton Sanyo	$3,800	1	$3,800	$92	$3,708	$176	21.1
2-Ton Carrier	$3,800	1	$3,800	$184	$3,616	$352	10.3
3-Ton Carrier	$4,700	1	$4,700	$276	$4,424	$362	12.2
Total		3	$12,300	$552	$11,748	$890	13.2

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

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$12,300
NJ Smart Start Equipment Incentive ($):	$552
Net Installation Cost ($):	$11,748
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$890
Total Yearly Savings ($/Yr):	$890
Estimated ECM Lifetime (Yr):	15
Simple Payback	13.2
Simple Lifetime ROI	13.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$13,355
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	($1,118.90)

ECM #8: Window Replacement

Description:

The South 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:

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

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

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

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

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

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

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

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

WINDOW REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description:	Existing Windows (Single and double)	Double Pane Low-E Windows	
Original Bldg Area (SF)	76,000	76,000	
Average Ceiling Height (Ft)	9	9	
Window (SF)	6,500	6,500	
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	11400	5700	
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	800	800	
Average Cooling Efficiency, EER	9	9	
Gas Cost ($/Therm)	1.62	1.62	
Electric Cost ($/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)	815,100	407,550	407,550
Leakage Energy (Therms)	10,148	5,074	5,074
Conductive Energy (Therms)	4,208	2,367	1,841
Total Heating Energy (Therms)	14,357	7,441	6,915
Cooling Load (Ton)	29	14	14
Cooling Demand (kW)	10.8	5.4	5.4
Total Cooling Energy (kWh)	30,400	15,200	15,200
Gas Energy Cost ($)	$23,258	$12,055	$11,203
Electric Energy Cost ($)	$5,046	$2,523	$2,523
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 $487,500.

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$487,500
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$487,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$13,726
Total Yearly Savings ($/Yr):	$13,726
Estimated ECM Lifetime (Yr):	15
Simple Payback	35.5
Simple Lifetime ROI	-57.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$205,890
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($323,640.12)

ECM #9: 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 and the supply air fans in some of the air handling units 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 only one of the hot water pumps and program it to run as the primary pump most of the year.

IMPLEMENTATION SUMMARY						
EQMT TAG	**FUNCTION**	**QTY**	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
P-1	Hot Water Pump	1	7.5	3600	88.5%	91.0%
P-1	Carrier Supply Fan	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	7.5	90%	88.5%	91.0%	0.16	563	$93
P-1	10	90%	88.5%	91.7%	0.26	953	$158
TOTAL					**0.4**	**1,516**	**$252**

Cost and Incentives

SmartStart Building® incentives:

7.5 hp NEMA motor = $81/motor
10 hp NEMA motor = $90/motor

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

MOTOR REPLACEMENT PLAN							
MOTOR POWER HP	**QTY**	**ENCL. TYPE**	**INSTALLED COST**	**SMART START INCENTIVE**	**TOTAL COST**	**TOTAL SAVINGS**	**SIMPLE PAYBACK**
7.5	1	ODP	$1,350	$81	$1,269	$93	13.6
10	1	TEFC	$1,500	$90	$1,410	$158	8.9
Totals:			**$2,850**	**$171**	**$2,679**	**$252**	**10.6**

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,850
NJ Smart Start Equipment Incentive ($):	$171
Net Installation Cost ($):	$2,679
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$252
Total Yearly Savings ($/Yr):	$252
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.6
Simple Lifetime ROI	40.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,774
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$324.84

ECM #10: Programmable Thermostats for Electric Perimeter Heaters

Description:

The perimeter heating for some of the spaces in the north building is achieved via electric baseboard heaters. The system is controlled with mechanical thermostats on the baseboard units. Currently, there is no night setback for the perimeter baseboard heating.

Energy consumption of the perimeter baseboard heating can be reduced by installing programmable baseboard heater thermostats. Programmable thermostats customized for electric baseboard heaters are available to utilize time-of-day schedules for occupied and unoccupied times and set-backs.

This energy conservation measure will install programmable thermostats to control the electric baseboard heaters. The recommended thermostat set points for heating in the offices are as follows:

Occupied Heating =	70° F
Unoccupied Heating =	65° F

Energy Savings Calculations:

Energy savings calculations are derived based on industry average perimeter zone heating density and heating degree days.

Total heating capacity is calculated with the equation below.

$$\text{Heating Capacity}, \frac{\text{BTU}}{\text{Hr}} = \text{Total baseboard heater length, ft} \times \text{Heat Density}, \frac{\text{BTU}}{\text{ft}}$$

$$\text{Heating Energy Used} = \frac{\text{Heating Capacity}}{\Delta\text{T} \times \text{Eff} \times \text{V}} \left(\text{HDD}_{65°\text{F}} \times \text{Non}_{\text{Setback}}\text{Hrs} + \text{HDD}_{60°F} \times \text{Setback Hrs}\right)$$

Where:

HDD = number of Heating Degree Days as Specified Base Temperature
ΔT= Design temperature difference, º F (Warm Air = 65 º F)
Eff = Efficiency of Energy Utilization (100%, Electric Heat)
V = Heating value of fuel, BTU/kWh (3,413 Btu = 1 kWh)

Estimated total cost of heating = Energy Consumption (kWh) x Cost of Electric ($/kWh)

Energy savings calculations are summarized in the table below.

PROGRAMMABLE THERMOSTATS for ELECTRIC BASEBOARD HEATERS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Standard on-board thermostat controls	Programmable Thermostats	
Total baseboard heater length, ft	100	100	
Baseboard heating density, BTU/ft	400	400	
Total Heating Capacity, BTU/Hr	40,000	40,000	
Heating Efficiency (Electric)	100%	100%	
Heating Degree Days (65°F)	4,496	4,496	
Heating Degree Days (60°F)	3,443	3,443	
Hours of setback	0	12	
Elec Cost ($/kWh)	$0.166	$0.166	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Heating Energy,kWh (non setback)	19,456	9,728	
Heating Energy, kWh (setback)	0	7,450	
Heating Energy Consumption, kWh	19,456	17,177	2,278
Electric Energy Cost ($)	$3,230	$2,851	$378
COMMENTS:	HDDs estimated based on Newark,NJ.		

Cost

Installed cost of programmable thermostats is $400/Unit. It is reported that there are five (5) separate spaces with electric baseboard heaters.

Total cost of implementation of this ECM is $2,000.

Note

An alternative tool available in this facility to implement time of day schedule controls over the baseboard heaters is the Energy Management System. The baseboard heaters can be tied into the Energy Management System for a more robust supervisory control over the space temperatures and controls. Incremental cost for this application is approximately $2,000 with no added energy saving benefits provided that the thermostats settings will not be tampered with.

Energy Savings Summary:

ECM #10 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$378
Total Yearly Savings ($/Yr):	$378
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.3
Simple Lifetime ROI	183.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$5,673
Internal Rate of Return (IRR)	17%
Net Present Value (NPV)	$2,514.99

ECM #11: High Efficiency DX Condensing Units for UVs

Description:

Air conditioning for six (6) classrooms is provided via a total of six (6) 2-ton window air conditioning units. The window A/C units are standard efficiency units. In addition, some of these units are attached to the windows in a permanent fashion such that they cannot be easily removed from the windows during winter months. This causes infiltration of unconditioned cold air into the spaces in the heating season. These spaces are already provided with unit ventilators, which can be coupled with a condensing unit to provide cooling.

It is recommended to remove window air conditioners in these spaces and connect high efficiency air cooled condensing units for the unit ventilators utilizing 410a refrigerant.

This ECM includes removing window air conditioning units and installing high efficiency condensing units to provide cooling through the unit ventilators. The existing DX coils in the unit ventilators should be replaced with new coils in order to operate with 410a refrigerant.

IMPLEMENTATION SUMMARY			
ECM INPUTS	**Number of Units**	**Cooling Capacity**	**Total Capacity**
Single Zone 2-Ton Unit	6	24,000	12
Total	4		12

The basis for this ECM is Rheem Prestige Series condensing units with SEER 14 combined efficiency. The owner should have a professional engineer verify configuration, heating and cooling loads prior to moving forward with this ECM.

Energy Savings Calculations:

Cooling Energy Savings:

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

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

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

SPLIT AC UNIT SAVINGS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**SEER WINDOW UNITS**	**SEER SPLIT UNITS**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
Single Zone 2-Ton Unit	24,000	800	9	14	6	4,571	6
Total					6	4,571	6

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

Project Cost and Incentives

Estimated installed cost for six (6) high efficiency condensing unit including installation new DX coils compatible with high pressure 410a refrigerant is $24,000.

From the NJ Smart Start® Program appendix, installation of high efficiency condensing units fall 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:

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

DUCTLESS MINI SPLIT AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
5.4 tons or less Unitary AC and Split System	≥14 SEER	$92	12	$1,104
TOTAL			**12**	**$1,104**

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

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

COST SAVINGS SUMMARY						
ECM INPUTS	**INSTALLED COST**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVING**
2-Ton Unit	$4,000	6	$24,000	$1,104	$22,896	$759
Total		6	$24,000	$1,104	$22,896	$759

Energy Savings Summary:

ECM #11 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$24,000
NJ Smart Start Equipment Incentive ($):	$1,104
Net Installation Cost ($):	$22,896
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$759
Total Yearly Savings ($/Yr):	$759
Estimated ECM Lifetime (Yr):	15
Simple Payback	30.2
Simple Lifetime ROI	-50.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$11,383
Internal Rate of Return (IRR)	-8%
Net Present Value (NPV)	($13,836.81)

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 and the parking lot of the building being audited for the purposes of determining a potential for a roof mounted or parking lot canopy style photovoltaic systems. A combination of roof and parking lot spaces with a total area of 8,825 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 124 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 154,616 KWh annually, reducing the overall utility bill by approximately 20% 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 and parking lot spaces 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 customer 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 Years	5.7%

*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 customer to invest in a solar system through a Direct Purchase CEG does not recommend the customer pursue this route. It would be more

advantageous for the Mt. View School 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 School 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 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 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 64,233 kWh and an average monthly demand of 286kW. Largest consumption months were November – February.

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 have little consumption. The average winter (Nov-Mar) consumption is 5,917 therms and the average summer (Apr-Oct) consumption is 768 therms. The largest consumption month is December at 9,358 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 New Jersey Natural Gas (NJNG) on rate schedule GSL (General Service - Large) and has contracted a Third Party Supplier (TPS) to provide natural gas commodity service.

NJNG 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

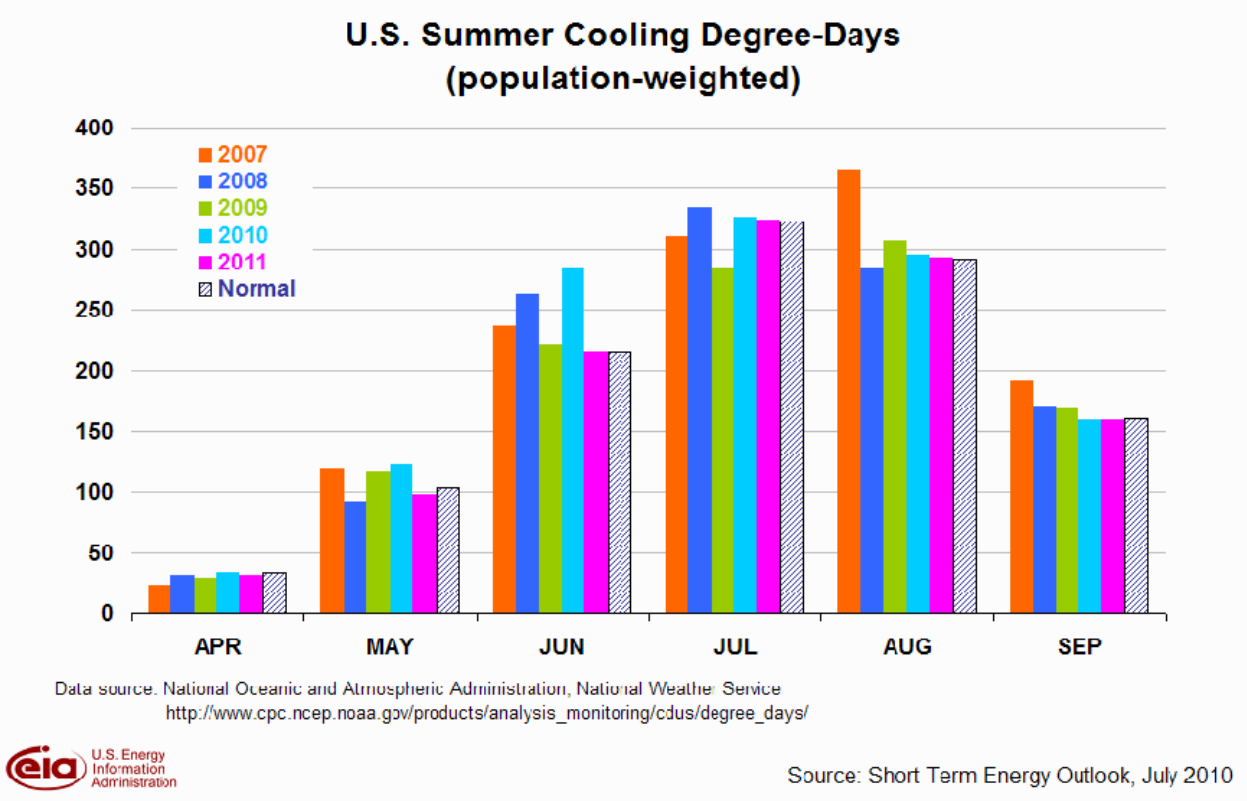
defaults or fails to provide commodity service. Please refer to the link below for a recap of natural gas BGSS charges from New Jersey Natural Gas for rate schedule GSL. http://www.njng.com/pdf/Oct2010LargeCommercialPriceTable.pdf

The utility, NJNG 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. New Jersey Natural's delivery service rate includes the following charges: Customer Service Charge, Demand Charge and Delivery 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. Maintain insulation on hot water pipes

F. Check and confirm occupied/unoccupied temperature setpoints for each HVAC system

G. 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

Mt. Olive BOE - Mountain View 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	$6,924	$4,616	$1,110	$10,430	$1,786	$68	$1,855	15	$27,820	$1,027	166.7%	5.6	15.82%	$11,711.13
ECM #2	Lighting Upgrade - Gymnasium	$1,152	$1,728	$600	$2,280	$1,277	$0	$1,277	15	$19,159	$0	740.3%	1.8	55.95%	$12,967.97
ECM #3	Lighting Controls Upgrade	$4,636	$6,954	$1,995	$9,595	$2,480	$0	$2,480	15	$37,198	$0	287.7%	3.9	24.93%	$20,009.73
ECM #4	Replace CRT Monitors	$8,100	$0	$0	$8,100	$1,525	$0	$1,525	15	$22,872	$0	182.4%	5.3	17.05%	$10,102.68
ECM #5	Replace Nesbitt Roof Units	$220,000	$0	$2,560	$217,440	$5,674	$0	$5,674	15	$85,117	$0	-60.9%	38.3	-9.94%	($149,698.97)
ECM #6	Condensing Domestic HW Heaters	$7,200	$4,800	$500	$11,500	$1,151	$0	$1,151	15	$17,266	$0	50.1%	10.0	5.57%	$2,241.44
ECM #7	Replace Older Mini Split Units	$7,380	$4,920	$552	$11,748	$890	$0	$890	15	$13,355	$0	13.7%	13.2	1.65%	($1,118.90)
ECM #8	Replace Windows	$487,500	$0	$0	$487,500	$13,726	$0	$13,726	15	$205,890	$0	-57.8%	35.5	-9.24%	($323,640.12)
ECM #9	Premium Efficiency Motors	$1,853	$998	$171	$2,679	$252	$0	$252	15	$3,774	$0	40.9%	10.6	4.63%	$324.84
ECM #10	Programmable Thermostats for Electric Baseboard Heaters	$2,000	$0	$0	$2,000	$378	$0	$378	15	$5,673	$0	183.7%	5.3	17.15%	$2,514.99
ECM #11	ADD DX Cooling to Six Unit Ventilators	$24,000	$0	$1,104	$22,896	$759	$0	$759	15	$11,383	$0	-50.3%	30.2	-7.69%	($13,836.81)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solar PV Installation	$1,119,870	$0	$0	$1,119,870	$25,821	$54,116	$79,936	15	$1,199,047	$811,734	7.1%	14.0	0.87%	($165,593.59)

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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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%

STATEMENT OF ENERGY PERFORMANCE
Mt. View Elementary School

Building ID: 2404059
For 12-month Period Ending: July 31, 2010[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 01, 2010

Facility
Mt. View Elementary School
118 Cloverhill Drive
Flanders, NJ 07836

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: 1969
Gross Floor Area (ft²): 76,000

Energy Performance Rating[2] (1-100) 30

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	2,627,416
Natural Gas (kBtu)[4]	3,481,721
Total Energy (kBtu)	6,109,137

Energy Intensity[5]

Site (kBtu/ft²/yr)	80
Source (kBtu/ft²/yr)	163

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	585

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	68
National Average Source EUI	138
% Difference from National Average Source EUI	19%
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	Mt. View 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	118 Cloverhill Drive , Flanders, NJ 07836	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		☐
School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	76,000 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	125	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 - North (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
06/15/2010	07/14/2010	42,000.00
05/15/2010	06/14/2010	42,800.00
04/17/2010	05/14/2010	33,200.00
03/17/2010	04/15/2010	20,800.00
02/17/2010	03/15/2010	45,200.00
01/17/2010	02/15/2010	49,600.00
12/17/2009	01/15/2010	52,800.00
11/17/2009	12/15/2009	42,000.00
10/17/2009	11/15/2009	36,800.00
09/17/2009	10/15/2009	35,600.00
08/17/2009	09/15/2009	30,000.00
Electric Meter - North Consumption (kWh (thousand Watt-hours))		**430,800.00**
Electric Meter - North Consumption (kBtu (thousand Btu))		**1,469,889.60**
Meter: Electric Meter - South (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
06/15/2010	07/14/2010	18,000.00
05/15/2010	06/14/2010	27,200.00
04/17/2010	05/14/2010	26,400.00
03/17/2010	04/15/2010	38,800.00
02/17/2010	03/15/2010	26,000.00
01/17/2010	02/15/2010	28,800.00
12/17/2009	01/15/2010	29,600.00
11/17/2009	12/15/2009	29,600.00
10/17/2009	11/15/2009	28,000.00
09/17/2009	10/15/2009	25,600.00
08/17/2009	09/15/2009	19,600.00
Electric Meter - South Consumption (kWh (thousand Watt-hours))		**297,600.00**
Electric Meter - South Consumption (kBtu (thousand Btu))		**1,015,411.20**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**2,485,300.80**

Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?	☐

Fuel Type: Natural Gas

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

Start Date	End Date	Energy Use (therms)
06/04/2010	07/03/2010	203.25
05/06/2010	06/03/2010	630.38
04/06/2010	05/05/2010	1,453.27
03/06/2010	04/05/2010	3,200.98
02/04/2010	03/05/2010	6,679.02
01/06/2010	02/03/2010	6,716.67
12/01/2009	01/05/2010	8,127.70
10/31/2009	11/30/2009	2,745.81
09/30/2009	10/30/2009	1,278.08
08/29/2009	09/29/2009	219.84
Natural Gas - North Consumption (therms)		**31,255.00**
Natural Gas - North Consumption (kBtu (thousand Btu))		**3,125,500.00**

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

Start Date	End Date	Energy Use (therms)
06/04/2010	07/03/2010	30.11
05/06/2010	06/03/2010	298.36
04/06/2010	05/05/2010	52.34
03/06/2010	04/05/2010	0.00
02/04/2010	03/05/2010	0.00
01/06/2010	02/03/2010	0.00
12/01/2009	01/05/2010	1,230.13
10/31/2009	11/30/2009	885.70
09/30/2009	10/30/2009	596.75
08/29/2009	09/29/2009	33.47
Natural Gas - South Consumption (therms)		**3,126.86**
Natural Gas - South Consumption (kBtu (thousand Btu))		**312,686.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**3,438,186.00**
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 SAF.)

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
Mt. View Elementary School
118 Cloverhill Drive
Flanders, NJ 07836

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

Mt. View Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	76,000
Year Built	1969
For 12-month Evaluation Period Ending Date:	July 31, 2010

Facility Space Use Summary

School	
Space Type	K-12 School
Gross Floor Area(ft^2)	76,000
Open Weekends?	No
Number of PCs	125
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 06/30/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	30	31	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	80	80	53	N/A	68
Source (kBtu/ft^2)	163	161	107	N/A	138
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/$ft^2$/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	585	578	385	N/A	492
$kgCO_2e/ft^2$/year	8	8	5	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.

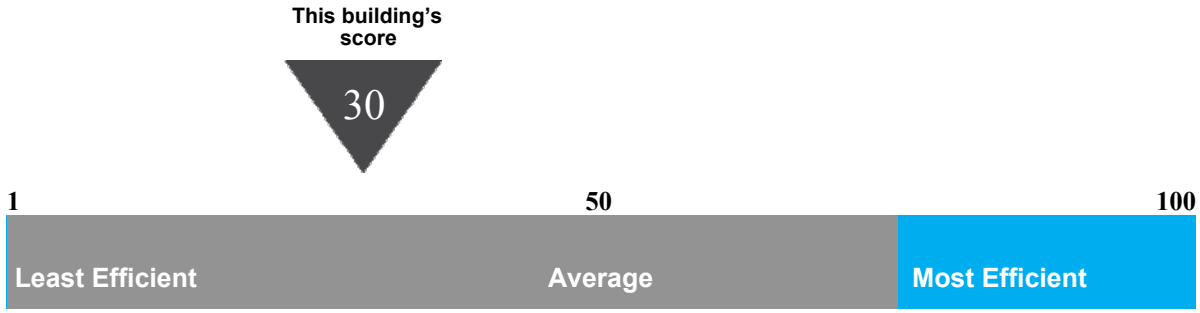
Statement of Energy Performance

2010

Mt. View Elementary School
118 Cloverhill Drive
Flanders, NJ 07836

Portfolio Manager Building ID: 2404059

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 163 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: 10/01/2010

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive - Mountain View 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	1	1	1
Location	Roof	Roof	Roof
Area Served	Various	Various	Various
Manufacturer	Carrier	Carrier	Sanyo
Model #	38QR024C331	38HDC036321	CL2412
Serial #	2800X79131	-	0023103
Cooling Capacity (Tons)	2	3	2
Voltage / Phase	208-1	208-1	208-1
Efficiency (SEER)	11	11	11
Indoor Unit	Ceiling Hung Air Handler	Ceiling Hung Air Handler	Wall Hung
Capacity (Ton)	2	3	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 - Mountain View Elementary School

Unitary A/C Units

Tag	Window Unit	Split CU	-
Unit Type	Air cooled condensing unit	Air cooled condensing unit	-
Qty	6	3	-
Location	Perimeter Offices	Ground	-
Area Served	Perimeter Offices	Unit Ventilators	-
Manufacturer	Freidrich, --	Goodman	-
Model #	KL25J30A	GSD4303661A	-
Serial #	LBFR12508	602689041	-
Cooling Capacity (Tons)	2	3 Ton	-
Voltage / Phase	208 - 1	208/1	-
Efficiency (SEER)	9 EER	13	-
Indoor Unit	-	-	-
Capacity (Ton)	2	-	-
Approx Age	10	5	-
Ashrae Service Life	15	15	-
Remaining Life	5	10	-
Comments	-	-	-

CU = Condensing Unit

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive - Mountain View Elementary School

Boilers

Tag	**Boiler-1 & 2**	-	-
Unit Type	Hot Water Finned Water Tube	-	-
Qty	2	-	-
Location	South Building Boiler Room	-	-
Area Served	South Building	-	-
Manufacturer	Ruscio Brothers LTD (RBI)	-	-
Model #	FWD 1950E-02	-	-
Serial #	050020986 050020951	-	-
Input Capacity	1,950 MBH	-	-
Rated Output Capacity (MBH)	-	-	-
Approx. Efficiency %	85%	-	-
Fuel	Natural Gas	-	-
Approx Age	11	-	-
Ashrae Service Life	30	-	-
Remaining Life	19	-	-
Burner	Built-in	-	-
Type	2-stage	-	-
Firing Rate	-	-	-
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive - Mountain View Elementary School

Domestic Hot Water Heaters

Tag	HWH-1	HWH-2	HWH-3
Unit Type	Gas Fired Condensing Hot Water Heater	Electric Hot Water Heater	Gas Fired Condensing Hot Water Heater
Qty	1	1	1
Location	South Bldg Boiler room	North Building Utility Room	Utility Room
Area Served	Faucets, sinks etc.	Faucets, sinks etc.	Faucets, sinks etc. in the office area
Manufacturer	AO Smith	Patterson Kelley	State
Model #	Cyclone Series BTH 150	PKW 80V 4/V	SBT75 75 NE1
Serial #	MA00-0896289-966	197624	F994752213
Size (Gallons)	100	~200	75
Input Capacity (MBH/KW)	150 MBH	80 kW	75 MBH
Recovery (Gal/Hr)	171 GPH at 100°F	-	68.3
Efficiency %	96%	100%	80.00%
Fuel	Natural Gas	Electric	Natural Gas
Approx Age	5	42	14
Ashrae Service Life	12	12	12
Remaining Life	7	(30)	(2)
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive - Mountain View Elementary School

Heating and Ventilation Units

Tag	HV	HV	HV
Unit Type	Makeup air unit for bathrooms	Heating and Ventilation	Heating and Ventilation
Qty	1	2	2
Location	Roof	Over gym	Cafeteria
Area Served	Bathrooms	Gym	Cafeteria
Manufacturer	Reznor	-	-
Model #	-	-	-
Serial #	-	-	-
Fan HP	-	2	2
Cooling Type	None	None	None
Heating Type	Natural Gas	Hot Water	Hot Water
Heating Input (MBH)	75	-	-
Efficiency	~80%	-	-
Approx Age	15	30	30
Ashrae Service Life	15	15	15
Remaining Life	0	(15)	(15)
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive - Mountain View Elementary School

Heating and Ventilation Units

Tag	HV	HV	-
Unit Type	Heating and Ventilation	Heating and Ventilation	-
Qty	2	1	-
Location	Kitchen	Music Room	-
Area Served	Kitchen	Music Room	-
Manufacturer	-	-	-
Model #	-	-	-
Serial #	-	-	-
Fan HP	1	1	-
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 - Mountain View Elementary School

Pumps

Tag	Hot Water Pump	Boiler By-pass	-
Unit Type	Base Mounted - End Suction	Pipe mounted	-
Qty	2	1	-
Location	South Building Boiler Room	South Building Boiler Room	-
Area Served	Prımary Hot Water Loop UVs , radiators	Boilers	-
Manufacturer	Armstrong	US Motors	-
Model #	4x3x10	G152A	-
Serial #	-		-
Horse Power	7.5	1.5	-
Flow, GPM	330	-	-
Pump Head, FT	60	-	-
Motor Info	Marathon Electric	US Electric	-
Electrical Power	460V, 3PH	208-1	-
RPM	1760	1725	-
Motor Efficiency %	88.5%	-	-
Approx Age	11	11	-
Ashrae Service Life	20	10	-
Remaining Life	9	(1)	-
Comments	Constant speed. High efficiency motors	Constant speed	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive - Mountain View Elementary School

Rooftop / AC Units

Tag	HVAC	HVAC 2	RTU-1 - 12
Unit Type	Multizone	Multizone	Packaged Rooftop Unit
Qty	2	1	12
Location	Roof	Roof	Roof
Area Served	1st Grade Multi Purpose Rm.	Library, 201, 202	Various Spaces
Manufacturer	MSI	MSI	Carrier
Model #	DTH - 600	RMA100NG4S2415HB 07A470100BD01	48HJE004-S-631HE
Serial #	1990-0002	N0412100	2000G20159
Cooling Type	DX	DX	DX
Cooling Capacity (Tons)	32	32	4
Cooling Efficiency (SEER/EER)	~ 8 EER	11 EER	11.2 EER / 13 SEER
Supply Fan HP **Motor Efficiency**	15 85.6%	15 91%	~3 HP -
Heating Type	Natural Gas	Natural Gas	Natural Gas
Heating Input (MBH)	540	400	72
Heating Output (MBH)	405	320	59
Efficiency	75%	80%	82%
Approx Age	30	10	2
Ashrae Service Life	15	15	15
Remaining Life	(15)	5	13
Comments	Units are in poor condition	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive - Mountain View Elementary School

Rooftop / AC Units

Tag	**RTU**	-	-
Unit Type	Packaged Rooftop Unit	-	-
Qty	1	-	-
Location	Roof of Office Extension	-	-
Area Served	Office Area	-	-
Manufacturer	Carrier	-	-
Model #	48TJF028Z	-	-
Serial #	4398F78728	-	-
Cooling Type	DX	-	-
Cooling Capacity (Tons)	25	-	-
Cooling Efficiency (SEER/EER)	8.5 EER	-	-
Supply Fan Motor HP	10	-	-
Heating Type	Natural Gas	-	-
Heating Input (MBH)	360	-	-
Heating Output (MBH)	291	-	-
Efficiency	81%	-	-
Approx Age	10	-	-
Ashrae Service Life	15	-	-
Remaining Life	5	-	-
Comments	Low EER Unit	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive - Mountain View Elementary School

Unit Ventilators

Tag	**UV**	-	-
Unit Type	Heating and Cooling	-	-
Qty	23	-	-
Location	Classrooms Floor or Ceiling	-	-
Manufacturer	Magic Aire	-	-
Model #	MA40UV125	-	-
Serial #	W000541010	-	-
Flow Capacity	-	-	-
Cooling Type	DX	-	-
Cooling Capacity (Tons)	~4	-	-
Estimated Cooling Efficiency (EER)	10	-	-
Heating Type	Hot Water Coil	-	-
Heating Input (MBH)	~50	-	-
Approx Age	11	-	-
Ashrae Service Life	15	-	-
Remaining Life	4	-	-
Comments	-	-	-

Investment Grade Lighting Audit

CEG Job #: 9C10050
Project: Mountain View ES
Address: 118 Cloverhill Dr. Flanders, NJ, 07836

Mountain View ES

KWH COST: $0.166

Bldg. Sq. Ft. 76,000

ECM #3: Lighting Controls

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
222.21	201 Classroom	2600	24	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	1.39	3,619.2	$600.79	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Classroom	2600	8	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.24	624.0	$103.58	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	208 Speech	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$77.69	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	206 Speech	2600	9	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.27	702.0	$116.53	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Men's Restroom	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.12	301.6	$50.07	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Women's Restroom	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.12	301.6	$50.07	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Teacher's Lounge	2600	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.12	301.6	$50.07	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Elect. Closet	1200	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.06	69.6	$11.55	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	203 Classroom	2600	15	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.87	2,262.0	$375.49	15	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	205 Classroom	2600	39	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	2.26	5,881.2	$976.28	39	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	205 restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	75.4	$12.52	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Elect. Closet	1200	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.16	187.2	$31.08	1	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.09	103.2	$17.13	$100.00	$100.00	0.07	84	$13.94	7.17
221.11	207 Classroom	2600	33	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.91	4,976.4	$826.08	33	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	207 Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	75.4	$12.52	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	OT/PT	2600	15	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.87	2,262.0	$375.49	15	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	OT/PT Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	75.4	$12.52	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	210 Classroom	2600	15	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.87	2,262.0	$375.49	15	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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221.41	210 Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	75.4	$12.52	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Reading Rescue	2600	4	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.23	603.2	$100.13	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Girl's Restroom	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	150.8	$25.03	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Boy's Restroom	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	150.8	$25.03	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Cafeteria	3200	36	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	3.10	9,907.2	$1,644.60	36	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
551		3200	20	1	Recessed Down Light, 100w R40 Lamp	100	2.00	6,400.0	$1,062.40	20	1	26w CFL Lamp	26	0.52	1664	$276.22	$20.00	$400.00	1.48	4736	$786.18	0.51
222.21	Custodial Closet	1200	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.12	139.2	$23.11	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Kitchen - 200 Wing	2600	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.26	670.8	$111.35	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
617		800	2	1	Hood Light w/Globe & Cage, 100w A19 Lamp	100	0.20	160.0	$26.56	2	1	(1) 26w CFL Lamp	26	0.05	41.6	$6.91	$20.00	$40.00	0.15	118.4	$19.65	2.04
232.21	Custodian Office	2600	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.26	670.8	$111.35	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Custodial Closet	1200	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.06	69.6	$11.55	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Library	2800	37	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	2.15	6,008.8	$997.46	37	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Computer Room	2600	10	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.58	1,508.0	$250.33	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	219 Classroom	2600	8	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.46	1,206.4	$200.26	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	218 Classroom	2600	8	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.46	1,206.4	$200.26	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	217 Elec. Closet	1200	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.12	139.2	$23.11	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	216 Classroom	2600	9	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.52	1,357.2	$225.30	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	215 Classroom	2600	9	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.52	1,357.2	$225.30	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	213 Classroom	2600	9	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.52	1,357.2	$225.30	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	212 Classroom	2600	8	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.46	1,206.4	$200.26	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	211 Classroom	2600	9	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.52	1,357.2	$225.30	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	200 Corridor	4200	37	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	2.15	9,013.2	$1,496.19	37	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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222.21	Corridor to 200 Area	4200	8	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.46	1,948.8	$323.50	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	316 Nurse	2600	10	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.58	1,508.0	$250.33	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	Main Office Hall	2800	12	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	1.10	3,091.2	$513.14	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Custodial Closet	1200	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.06	69.6	$11.55	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Men's Restroom	1300	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.17	226.2	$37.55	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Women's Restroom	1300	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.17	226.2	$37.55	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	Copy/ Mail Room	2800	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.55	1,545.6	$256.57	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	Reception	2800	18	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	1.66	4,636.8	$769.71	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	301 Principal's Office	2600	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.55	1,435.2	$238.24	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	302 Confrenece Room	2600	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.55	1,435.2	$238.24	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	303 Office	2600	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.55	1,435.2	$238.24	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	304 Office	2600	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.55	1,435.2	$238.24	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	305 Tech/ Storage Room	2600	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.10	270.4	$44.89	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Vestibule	4400	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.06	255.2	$42.36	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Corridor 2100T	4400	18	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	1.04	4,593.6	$762.54	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21		4400	4	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.23	1,020.8	$169.45	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Break Room	2600	5	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.29	754.0	$125.16	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	112 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.04	2,714.4	$450.59	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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221.41	112 Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	75.4	$12.52	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	110 Classroom	2600	29	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.68	4,373.2	$725.95	29	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	110 Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	75.4	$12.52	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	108 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Acrylic Lens	58	1.22	3,166.8	$525.69	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	106 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.22	3,166.8	$525.69	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	104 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.22	3,166.8	$525.69	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	102 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.22	3,166.8	$525.69	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	101 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.22	3,166.8	$525.69	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	103 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.22	3,166.8	$525.69	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	105 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.40	3,650.4	$605.97	18	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	1.04	2714.4	$450.59	$100.00	$1,800.00	0.36	936	$155.38	11.58
121.11	107 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.40	3,650.4	$605.97	18	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	1.04	2714.4	$450.59	$100.00	$1,800.00	0.36	936	$155.38	11.58
121.11	109 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.40	3,650.4	$605.97	18	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	1.04	2714.4	$450.59	$100.00	$1,800.00	0.36	936	$155.38	11.58
121.11	111 Classroom	2600	12	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.94	2,433.6	$403.98	12	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.70	1809.6	$300.39	$100.00	$1,200.00	0.24	624	$103.58	11.58
221.41	111 Restroom	1300	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.12	150.8	$25.03	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.14	Custodial Closet	1200	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	36.0	$5.98	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Women's Restroom	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	150.8	$25.03	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Corridor 2100T	4400	16	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.93	4,083.2	$677.81	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	114 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.04	2,714.4	$450.59	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	116 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.04	2,714.4	$450.59	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Supply Room	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	75.4	$12.52	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	Elect. Closet	1200	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.35	417.6	$69.32	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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221.11	118 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.04	2,714.4	$450.59	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	115 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.04	2,714.4	$450.59	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	124 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.40	3,650.4	$605.97	18	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	1.04	2714.4	$450.59	$100.00	$1,800.00	0.36	936	$155.38	11.58
221.11	117 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.04	2,714.4	$450.59	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Women's Restroom	1300	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.12	150.8	$25.03	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Men's Restroom	1300	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.12	150.8	$25.03	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Men's Restroom	1300	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.12	150.8	$25.03	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Women's Restroom	1300	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.12	150.8	$25.03	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	126 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.40	3,650.4	$605.97	18	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	1.04	2714.4	$450.59	$100.00	$1,800.00	0.36	936	$155.38	11.58
121.21	ESL	2600	4	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.31	811.2	$134.66	4	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.23	603.2	$100.13	$100.00	$400.00	0.08	208	$34.53	11.58
227.21	Lobby	4400	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.23	1,020.8	$169.45	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Corridor 2800T	4400	21	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	1.22	5,359.2	$889.63	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Office	2600	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.70	1,809.6	$300.39	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Reading Room	2600	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.12	301.6	$50.07	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Men's Faculty Restroom	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$33.66	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$25.03	$100.00	$100.00	0.02	52	$8.63	11.58
121.11	Women's Faculty Restroom	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$33.66	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$25.03	$100.00	$100.00	0.02	52	$8.63	11.58
221.11	Faculty Lounge	2600	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.70	1,809.6	$300.39	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Book Room	2600	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.35	904.8	$150.20	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Restroom	2600	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.06	150.8	$25.03	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Sprinkler room Entrance	2600	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.16	405.6	$67.33	1	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.09	223.6	$37.12	$100.00	$100.00	0.07	182	$30.21	3.31
121.21	Custodial Storage	1200	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.08	93.6	$15.54	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	69.6	$11.55	$100.00	$100.00	0.02	24	$3.98	25.10

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222.21	Supply Room	2600	4	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.23	603.2	$100.13	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.34	Boiler Room	4400	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.17	765.6	$127.09	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	Storage	1200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.06	69.6	$11.55	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Office	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.12	301.6	$50.07	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Kitchen	2600	24	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.39	3,619.2	$600.79	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Cafeteria	2600	56	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.68	4,368.0	$725.09	56	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.34	Master Control Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.06	150.8	$25.03	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
770	Gym	2800	12	1	400w MH, Prismatic Lens	465	5.58	15,624.0	$2,593.58	12	4	2x4 54w T5HO 4 Lamp w/Reflective Lens, Wire Cage	236	2.83	7929.6	$1,316.31	$240.00	$2,880.00	2.75	7694.4	$1,277.27	2.25
331.11		4400	4	3	1x4, 3 Lamp, 54w T5HO Fixture	177	0.71	3,115.2	$517.12	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Gym Storage	1200	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.12	139.2	$23.11	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Gym Office	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.23	603.2	$100.13	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Custodial Closet	1200	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	36.0	$5.98	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Boy's Restroom	2600	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	156.0	$25.90	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Girl's Restroom	2600	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	156.0	$25.90	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Art	2600	30	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.90	2,340.0	$388.44	30	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	119 Classroom	2600	181	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	5.43	14,118.0	$2,343.59	181	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	121 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$233.06	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	123 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$233.06	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	134 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$233.06	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	132 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$233.06	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	130 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$233.06	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	128 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$233.06	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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221.11	Music	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.04	2,714.4	$450.59	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Music Office	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.06	150.8	$25.03	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Practice Rooms	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.12	301.6	$50.07	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
725	Exterior	4400	18	1	150w HPS Wallpack	188	3.38	14,889.6	$2,471.67	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
712		4400	12	1	100w HPS Recessed, 18" Square, Fresnel Lens	125	1.50	6,600.0	$1,095.60	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		1,465	248			88.72	253,379	$42,061	1,465	32			9.9	26,318	$4,369		$14,420	6.7	18,455	$3,063	4.71

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

Investment Grade Lighting Audit

CEG Job #: 9C10050
Project: Mountain View ES
Address: 118 Cloverhill Dr. Flanders, NJ, 07836

Mountain View ES

KWH COST: $0.166

Building SF: 76,000

ECM #3: Lighting Controls

EXISTING LIGHTINC										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
222.21	201 Classroom	2600	24	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	1.392	3619.2	$600.79	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.25	10%	3257.28	$540.71	$225.00	$225.00	0.14	361.92	$60.08	3.75
211.11	Classroom	2600	8	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.24	624	$103.58	8	0	No Change	30	0.24	0%	624	$103.58	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	208 Speech	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$77.69	6	0	No Change	30	0.18	0%	468	$77.69	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	206 Speech	2600	9	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.27	702	$116.53	9	0	No Change	30	0.27	0%	702	$116.53	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Men's Restroom	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.116	301.6	$50.07	2	0	No Change	58	0.12	0%	301.6	$50.07	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Women's Restroom	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.116	301.6	$50.07	2	0	No Change	58	0.12	0%	301.6	$50.07	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Teacher's Lounge	2600	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.116	301.6	$50.07	2	0	No Change	58	0.12	0%	301.6	$50.07	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Elect. Closet	1200	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.058	69.6	$11.55	1	0	No Change	58	0.06	0%	69.6	$11.55	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	203 Classroom	2600	15	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.87	2262	$375.49	15	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.78	10%	2035.8	$337.94	$225.00	$225.00	0.09	226.2	$37.55	5.99
221.11	205 Classroom	2600	39	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	2.262	5881.2	$976.28	39	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	2.04	10%	5293.08	$878.65	$225.00	$225.00	0.23	588.12	$97.63	2.30
221.41	205 restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	75.4	$12.52	1	0	No Change	58	0.06	0%	75.4	$12.52	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Elect. Closet	1200	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.156	187.2	$31.08	1	0	No Change	156	0.16	0%	187.2	$31.08	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	207 Classroom	2600	33	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.914	4976.4	$826.08	33	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.72	10%	4478.76	$743.47	$225.00	$225.00	0.19	497.64	$82.61	2.72
221.41	207 Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	75.4	$12.52	1	0	No Change	58	0.06	0%	75.4	$12.52	$0.00	$0.00	0.00	0	$0.00	0.00

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221.11	OT/PT	2600	15	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.87	2262	$375.49	15	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.78	10%	2035.8	$337.94	$225.00	$225.00	0.09	226.2	$37.55	5.99
221.41	OT/PT Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	75.4	$12.52	1	0	No Change	58	0.06	0%	75.4	$12.52	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	210 Classroom	2600	15	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.87	2262	$375.49	15	0	No Change	58	0.87	0%	2262	$375.49	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	210 Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	75.4	$12.52	1	0	No Change	58	0.06	0%	75.4	$12.52	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Reading Rescue	2600	4	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.232	603.2	$100.13	4	0	No Change	58	0.23	0%	603.2	$100.13	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Girl's Restroom	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	150.8	$25.03	1	0	No Change	58	0.06	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Boy's Restroom	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	150.8	$25.03	1	0	No Change	58	0.06	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Cafeteria	3200	36	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	3.096	9907.2	$1,644.60	36	0	No Change	86	3.10	0%	9907.2	$1,644.60	$0.00	$0.00	0.00	0	$0.00	0.00
551		3200	20	1	Recessed Down Light, 100w R40 Lamp	100	2	6400	$1,062.40	20	0	No Change	100	2.00	0%	6400	$1,062.40	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Custodial Closet	1200	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.116	139.2	$23.11	2	0	No Change	58	0.12	0%	139.2	$23.11	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Kitchen - 200 Wing	2600	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.258	670.8	$111.35	3	0	No Change	86	0.26	0%	670.8	$111.35	$0.00	$0.00	0.00	0	$0.00	0.00
617		800	2	1	Hood Light w/Globe & Cage, 100w A19 Lamp	100	0.2	160	$26.56	2	0	No Change	100	0.20	0%	160	$26.56	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Custodian Office	2600	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.258	670.8	$111.35	3	0	No Change	86	0.26	0%	670.8	$111.35	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Custodial Closet	1200	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.058	69.6	$11.55	1	0	No Change	58	0.06	0%	69.6	$11.55	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Library	2800	37	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	2.146	6008.8	$997.46	37	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.93	10%	5407.92	$897.71	$225.00	$225.00	0.21	600.88	$99.75	2.26
222.21	Computer Room	2600	10	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.58	1508	$250.33	10	0	No Change	58	0.58	0%	1508	$250.33	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	219 Classroom	2600	8	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.464	1206.4	$200.26	8	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.42	10%	1085.76	$180.24	$160.00	$160.00	0.05	120.64	$20.03	7.99
222.21	218 Classroom	2600	8	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.464	1206.4	$200.26	8	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.42	10%	1085.76	$180.24	$160.00	$160.00	0.05	120.64	$20.03	7.99
222.21	217 Elec. Closet	1200	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.116	139.2	$23.11	2	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.10	10%	125.28	$20.80	$160.00	$160.00	0.01	13.92	$2.31	69.24
222.21	216 Classroom	2600	9	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.522	1357.2	$225.30	9	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.47	10%	1221.48	$202.77	$160.00	$160.00	0.05	135.72	$22.53	7.10

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222.21	215 Classroom	2600	9	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.522	1357.2	$225.30	9	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.47	10%	1221.48	$202.77	$160.00	$160.00	0.05	135.72	$22.53	7.10
222.21	213 Classroom	2600	9	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.522	1357.2	$225.30	9	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.47	10%	1221.48	$202.77	$160.00	$160.00	0.05	135.72	$22.53	7.10
222.21	212 Classroom	2600	8	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.464	1206.4	$200.26	8	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.42	10%	1085.76	$180.24	$160.00	$160.00	0.05	120.64	$20.03	7.99
222.21	211 Classroom	2600	9	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.522	1357.2	$225.30	9	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.47	10%	1221.48	$202.77	$160.00	$160.00	0.05	135.72	$22.53	7.10
221.11	200 Corridor	4200	37	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	2.146	9013.2	$1,496.19	37	0	No Change	58	2.15	0%	9013.2	$1,496.19	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Corridor to 200 Area	4200	8	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.464	1948.8	$323.50	8	0	No Change	58	0.46	0%	1948.8	$323.50	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	316 Nurse	2600	10	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.58	1508	$250.33	10	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.52	10%	1357.2	$225.30	$160.00	$160.00	0.06	150.8	$25.03	6.39
237.21	Main Office Hall	2800	12	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	1.104	3091.2	$513.14	12	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	92	0.99	10%	2782.08	$461.83	$160.00	$160.00	0.11	309.12	$51.31	3.12
222.21	Custodial Closet	1200	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.058	69.6	$11.55	1	0	No Change	58	0.06	0%	69.6	$11.55	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Men's Restroom	1300	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.174	226.2	$37.55	3	0	No Change	58	0.17	0%	226.2	$37.55	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Women's Restroom	1300	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.174	226.2	$37.55	3	0	No Change	58	0.17	0%	226.2	$37.55	$0.00	$0.00	0.00	0	$0.00	0.00
237.21	Copy/ Mail Room	2800	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.552	1545.6	$256.57	6	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	92	0.50	10%	1391.04	$230.91	$160.00	$160.00	0.06	154.56	$25.66	6.24
237.21	Reception	2800	18	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	1.656	4636.8	$769.71	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	92	1.49	10%	4173.12	$692.74	$225.00	$225.00	0.17	463.68	$76.97	2.92
237.21	301 Principal's Office	2600	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.552	1435.2	$238.24	6	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	92	0.50	10%	1291.68	$214.42	$160.00	$160.00	0.06	143.52	$23.82	6.72
237.21	302 Confrenece Room	2600	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.552	1435.2	$238.24	6	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	92	0.50	10%	1291.68	$214.42	$160.00	$160.00	0.06	143.52	$23.82	6.72
237.21	303 Office	2600	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.552	1435.2	$238.24	6	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	92	0.50	10%	1291.68	$214.42	$160.00	$160.00	0.06	143.52	$23.82	6.72
237.21	304 Office	2600	6	3	2x2, 3 Lamp, 31w T8 Ulamp, Elect. Ballast, Recessed Mnt., Prismatic Lens	92	0.552	1435.2	$238.24	6	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	92	0.50	10%	1291.68	$214.42	$160.00	$160.00	0.06	143.52	$23.82	6.72
242.21	305 Tech/ Storage Room	2600	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.104	270.4	$44.89	1	0	No Change	104	0.10	0%	270.4	$44.89	$0.00	$0.00	0.00	0	$0.00	0.00

222.21	Vestibule	4400	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.058	255.2	$42.36	1	0	No Change	58	0.06	0%	255.2	$42.36	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Corridor 2100T	4400	18	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	1.044	4593.6	$762.54	18	0	No Change	58	1.04	0%	4593.6	$762.54	$0.00	$0.00	0.00	0	$0.00	0.00
222.21		4400	4	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.232	1020.8	$169.45	4	0	No Change	58	0.23	0%	1020.8	$169.45	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Break Room	2600	5	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.29	754	$125.16	5	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.26	10%	678.6	$112.65	$160.00	$160.00	0.03	75.4	$12.52	12.78
221.11	112 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.044	2714.4	$450.59	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.94	10%	2442.96	$405.53	$225.00	$225.00	0.10	271.44	$45.06	4.99
221.41	112 Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	75.4	$12.52	1	0	No Change	58	0.06	0%	75.4	$12.52	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	110 Classroom	2600	29	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.682	4373.2	$725.95	29	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.51	10%	3935.88	$653.36	$225.00	$225.00	0.17	437.32	$72.60	3.10
221.41	110 Restroom	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	75.4	$12.52	1	0	No Change	58	0.06	0%	75.4	$12.52	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	108 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Acrylic Lens	58	1.218	3166.8	$525.69	21	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.10	10%	2850.12	$473.12	$225.00	$225.00	0.12	316.68	$52.57	4.28
221.11	106 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.218	3166.8	$525.69	21	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.10	10%	2850.12	$473.12	$225.00	$225.00	0.12	316.68	$52.57	4.28
221.11	104 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.218	3166.8	$525.69	21	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.10	10%	2850.12	$473.12	$225.00	$225.00	0.12	316.68	$52.57	4.28
221.11	102 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.218	3166.8	$525.69	21	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.10	10%	2850.12	$473.12	$225.00	$225.00	0.12	316.68	$52.57	4.28
221.11	101 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.218	3166.8	$525.69	21	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.10	10%	2850.12	$473.12	$225.00	$225.00	0.12	316.68	$52.57	4.28
221.11	103 Classroom	2600	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.218	3166.8	$525.69	21	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.10	10%	2850.12	$473.12	$225.00	$225.00	0.12	316.68	$52.57	4.28
121.11	105 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.404	3650.4	$605.97	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	78	1.26	10%	3285.36	$545.37	$225.00	$225.00	0.14	365.04	$60.60	3.71

121.11	107 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.404	3650.4	$605.97	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	78	1.26	10%	3285.36	$545.37	$225.00	$225.00	0.14	365.04	$60.60	3.71
121.11	109 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.404	3650.4	$605.97	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	78	1.26	10%	3285.36	$545.37	$225.00	$225.00	0.14	365.04	$60.60	3.71
121.11	111 Classroom	2600	12	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.936	2433.6	$403.98	12	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	78	0.84	10%	2190.24	$363.58	$225.00	$225.00	0.09	243.36	$40.40	5.57
221.41	111 Restroom	1300	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.116	150.8	$25.03	2	0	No Change	58	0.12	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
211.14	Custodial Closet	1200	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	36	$5.98	1	0	No Change	30	0.03	0%	36	$5.98	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Women's Restroom	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	150.8	$25.03	1	0	No Change	58	0.06	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Corridor 2100T	4400	16	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.928	4083.2	$677.81	16	0	No Change	58	0.93	0%	4083.2	$677.81	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	114 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.044	2714.4	$450.59	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.94	10%	2442.96	$405.53	$225.00	$225.00	0.10	271.44	$45.06	4.99
221.11	116 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.044	2714.4	$450.59	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.94	10%	2442.96	$405.53	$225.00	$225.00	0.10	271.44	$45.06	4.99
221.11	Supply Room	1300	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	75.4	$12.52	1	0	No Change	58	0.06	0%	75.4	$12.52	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	Elect. Closet	1200	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.348	417.6	$69.32	6	0	No Change	58	0.35	0%	417.6	$69.32	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	118 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.044	2714.4	$450.59	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.94	10%	2442.96	$405.53	$225.00	$225.00	0.10	271.44	$45.06	4.99
221.11	115 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.044	2714.4	$450.59	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.94	10%	2442.96	$405.53	$225.00	$225.00	0.10	271.44	$45.06	4.99
121.11	124 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.404	3650.4	$605.97	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	78	1.26	10%	3285.36	$545.37	$225.00	$225.00	0.14	365.04	$60.60	3.71
221.11	117 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.044	2714.4	$450.59	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.94	10%	2442.96	$405.53	$225.00	$225.00	0.10	271.44	$45.06	4.99

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221.11	Women's Restroom	1300	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.116	150.8	$25.03	2	0	No Change	58	0.12	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Men's Restroom	1300	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.116	150.8	$25.03	2	0	No Change	58	0.12	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Men's Restroom	1300	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.116	150.8	$25.03	2	0	No Change	58	0.12	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Women's Restroom	1300	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.116	150.8	$25.03	2	0	No Change	58	0.12	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	126 Classroom	2600	18	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.404	3650.4	$605.97	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	78	1.26	10%	3285.36	$545.37	$225.00	$225.00	0.14	365.04	$60.60	3.71
121.21	ESL	2600	4	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.312	811.2	$134.66	4	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	78	0.28	10%	730.08	$121.19	$160.00	$160.00	0.03	81.12	$13.47	11.88
227.21	Lobby	4400	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.232	1020.8	$169.45	4	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.21	10%	918.72	$152.51	$160.00	$160.00	0.02	102.08	$16.95	9.44
227.21	Corridor 2800T	4400	21	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	1.218	5359.2	$889.63	21	0	No Change	58	1.22	0%	5359.2	$889.63	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Office	2600	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.696	1809.6	$300.39	12	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.63	10%	1628.64	$270.35	$225.00	$225.00	0.07	180.96	$30.04	7.49
222.21	Reading Room	2600	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.116	301.6	$50.07	2	0	No Change	58	0.12	0%	301.6	$50.07	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Men's Faculty Restroom	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$33.66	1	0	No Change	78	0.08	0%	202.8	$33.66	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Women's Faculty Restroom	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$33.66	1	0	No Change	78	0.08	0%	202.8	$33.66	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Faculty Lounge	2600	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.696	1809.6	$300.39	12	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.63	10%	1628.64	$270.35	$225.00	$225.00	0.07	180.96	$30.04	7.49
221.11	Book Room	2600	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.348	904.8	$150.20	6	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.31	10%	814.32	$135.18	$160.00	$160.00	0.03	90.48	$15.02	10.65
222.21	Restroom	2600	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.058	150.8	$25.03	1	0	No Change	58	0.06	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Sprinkler room Entrance	2600	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.156	405.6	$67.33	1	0	No Change	156	0.16	0%	405.6	$67.33	$0.00	$0.00	0.00	0	$0.00	0.00
121.21	Custodial Storage	1200	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.078	93.6	$15.54	1	0	No Change	78	0.08	0%	93.6	$15.54	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Supply Room	2600	4	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.232	603.2	$100.13	4	0	No Change	58	0.23	0%	603.2	$100.13	$0.00	$0.00	0.00	0	$0.00	0.00
221.34	Boiler Room	4400	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.174	765.6	$127.09	3	0	No Change	58	0.17	0%	765.6	$127.09	$0.00	$0.00	0.00	0	$0.00	0.00

221.14	Storage	1200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.058	69.6	$11.55	1	0	No Change	58	0.06	0%	69.6	$11.55	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Office	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.116	301.6	$50.07	2	0	No Change	58	0.12	0%	301.6	$50.07	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Kitchen	2600	24	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.392	3619.2	$600.79	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.25	10%	3257.28	$540.71	$225.00	$225.00	0.14	361.92	$60.08	3.75
211.11	Cafeteria	2600	56	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.68	4368	$725.09	56	0	No Change	30	1.68	0%	4368	$725.09	$0.00	$0.00	0.00	0	$0.00	0.00
221.34	Master Control Room	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.058	150.8	$25.03	1	0	No Change	58	0.06	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
770	Gym	2800	12	1	400w MH, Prismatic Lens	465	5.58	15624	$2,593.58	12	0	No Change	465	5.58	0%	15624	$2,593.58	$0.00	$0.00	0.00	0	$0.00	0.00
331.11		4400	4	3	1x4, 3 Lamp, 54w T5HO Fixture	177	0.708	3115.2	$517.12	4	0	No Change	177	0.71	0%	3115.2	$517.12	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Gym Storage	1200	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.116	139.2	$23.11	2	0	No Change	58	0.12	0%	139.2	$23.11	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Gym Office	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.232	603.2	$100.13	4	0	No Change	58	0.23	0%	603.2	$100.13	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Custodial Closet	1200	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	36	$5.98	1	0	No Change	30	0.03	0%	36	$5.98	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Boy's Restroom	2600	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	156	$25.90	2	0	No Change	30	0.06	0%	156	$25.90	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Girl's Restroom	2600	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	156	$25.90	2	0	No Change	30	0.06	0%	156	$25.90	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Art	2600	30	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.9	2340	$388.44	30	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.81	10%	2106	$349.60	$225.00	$225.00	0.09	234	$38.84	5.79
211.11	119 Classroom	2600	181	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	5.43	14118	$2,343.59	181	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	4.89	10%	12706.2	$2,109.23	$225.00	$225.00	0.54	1411.8	$234.36	0.96
211.11	121 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$233.06	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$209.76	$225.00	$225.00	0.05	140.4	$23.31	9.65
211.11	123 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$233.06	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$209.76	$225.00	$225.00	0.05	140.4	$23.31	9.65
211.11	134 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$233.06	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$209.76	$225.00	$225.00	0.05	140.4	$23.31	9.65

Investment Grade Lighting Audit

211.11	132 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$233.06	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$209.76	$225.00	$225.00	0.05	140.4	$23.31	9.65
211.11	130 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$233.06	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$209.76	$225.00	$225.00	0.05	140.4	$23.31	9.65
211.11	128 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$233.06	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$209.76	$225.00	$225.00	0.05	140.4	$23.31	9.65
221.11	Music	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.044	2714.4	$450.59	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.94	10%	2442.96	$405.53	$225.00	$225.00	0.10	271.44	$45.06	4.99
221.11	Music Office	2600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.058	150.8	$25.03	1	0	No Change	58	0.06	0%	150.8	$25.03	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Practice Rooms	2600	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.116	301.6	$50.07	2	0	No Change	58	0.12	0%	301.6	$50.07	$0.00	$0.00	0.00	0	$0.00	0.00
725	Exterior	4400	18	1	150w HPS Wallpack	188	3.384	14889.6	$2,471.67	18	0	No Change	188	3.38	0%	14889.6	$2,471.67	$0.00	$0.00	0.00	0	$0.00	0.00
712		4400	12	1	100w HPS Recessed, 18" Square, Fresnel Lens	125	1.5	6600	$1,095.60	12	0	No Change	125	1.50	0%	6600	$1,095.60	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		1,465	248			88.7	253,379.0	$42,061	1,465	57			83.0		238,439.9	$39,581.03		$11,590	5.69	14,939	$2,480	4.67

Project Name: LGEA Solar PV Project - Mountain View School
Location: Flanders, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

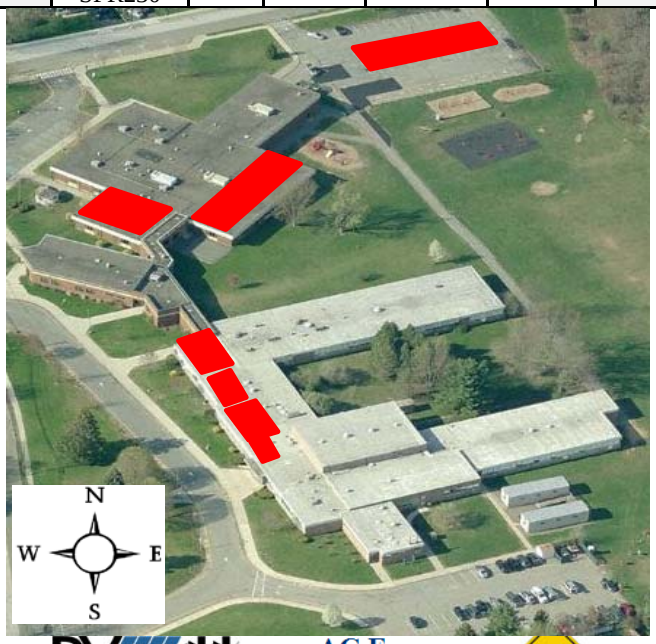
	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,119,870
Annual kWh Production	154,616
Annual Energy Cost Reduction	$25,821
Annual SREC Revenue	$54,116
First Cost Premium	**$1,119,870**
Simple Payback:	**14.01** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.167**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$1,119,870	0	0	0	$0	(1,119,870)	0
1	$0	154,616	$25,821	$0	$54,116	$79,936	($1,039,934)
2	$0	153,843	$26,595	$0	$53,845	$80,441	($959,493)
3	$0	153,074	$27,393	$0	$53,576	$80,969	($878,524)
4	$0	152,308	$28,215	$0	$53,308	$81,523	($797,001)
5	$0	151,547	$29,062	$1,561	$53,041	$80,542	($716,459)
6	$0	150,789	$29,933	$1,553	$52,776	$81,157	($635,302)
7	$0	150,035	$30,831	$1,545	$52,512	$81,798	($553,504)
8	$0	149,285	$31,756	$1,538	$52,250	$82,469	($471,035)
9	$0	148,539	$32,709	$1,530	$51,988	$83,168	($387,868)
10	$0	147,796	$33,690	$1,522	$51,729	$83,897	($303,971)
11	$0	147,057	$34,701	$1,515	$51,470	$84,656	($219,315)
12	$0	146,322	$35,742	$1,507	$51,213	$85,448	($133,867)
13	$0	145,590	$36,814	$1,500	$50,956	$86,271	($47,596)
14	$0	144,862	$37,919	$1,492	$50,702	$87,128	$39,533
15	$0	144,138	$39,056	$1,485	$50,448	$88,020	$127,553
16	$0	143,417	$40,228	$1,477	$50,196	$88,947	$216,499
17	$0	142,700	$41,435	$1,470	$49,945	$89,910	$306,409
18	$0	141,986	$42,678	$1,462	$49,695	$90,911	$397,320
19	$0	141,276	$43,958	$1,455	$49,447	$91,950	$489,270
20	$0	140,570	$45,277	$1,448	$49,200	$93,029	$582,299
21	$1	139,867	$46,635	$1,441	$48,954	$94,148	$676,447
22	$2	139,168	$48,034	$1,433	$48,709	$95,310	$771,757
23	$3	138,472	$49,475	$1,426	$48,465	$96,514	$868,271
24	$4	137,780	$50,960	$1,419	$48,223	$97,763	$966,035
25	$5	137,091	$52,489	$1,412	$47,982	$99,058	$1,065,093
	Totals:	3,642,127	$941,410	$31,191	$1,274,744	$2,184,963	($637,381)
				Net Present Value (NPV)		**$1,065,118**	
				Internal Rate of Return (IRR)		**5.7%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Mountain View School	8825	Sunpower SPR230	541	14.7	7,955	124.43	154,616	17,853	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:	124.4 kW
DC to AC Derate Factor:	0.800
AC Rating:	99.5 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	8775	14.65
2	3.53	10047	16.78
3	4.46	13605	22.72
4	5.28	15203	25.39
5	5.86	17133	28.61
6	6.10	16575	27.68
7	6.05	16809	28.07
8	5.60	15607	26.06
9	4.99	13682	22.85
10	3.97	11492	19.19
11	2.86	8305	13.87
12	2.43	7383	12.33
Year	4.50	154616	258.21

.= Proposed PV Layout

Notes:

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