LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR: MT. OLIVE TWP. SCHOOL DISTRICT
TINC ROAD ELEMENTARY SCHOOL

24 TINC ROAD
FLANDERS, NJ, 07836

ATTN: MR. THOMAS SCERBO
SUPERVISOR OF BUILDINGS & GROUNDS

PREPARED BY: CONCORD ENGINEERING GROUP
520 S. BURNT MILL ROAD
VOORHEES, NJ 08043
TELEPHONE: (856) 427-0200
FACSIMILE: (856) 427-6529
WWW.CEG-INC.NET

CEG CONTACT: ERSIN GERCEK, PE, CEM
LEAD MECHANICAL ENGINEER
EMAIL: EGERCEK@CEG-INC.NET

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I. EXECUTIVE SUMMARY

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

Mount Olive Township School District
Tinc Road Elementary School
24 Tinc Road,
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	$79,568
Natural Gas	$35,226
Total	$114,794

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. <u>Be aware that the ECM's and REM's are not additive because of the interrelation of some of the measures.</u> 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 and Gymnasium	$2,508	$946	2.6	466.0%
ECM #2	Lighting Upgrade - Building Exterior	$5,130	$1,167	4.4	241.2%
ECM #3	Lighting Occupancy Sensors / Daylight Sensors	$8,300	$1,462	5.7	164.3%
ECM #4	CRT Computer Monitors	$5,900	$1,077	5.5	173.9%
ECM #5	Replace MSI RTU's	$217,440	$5,848	37.2	-59.7%
ECM #6	Replace Rheem RTU	$34,815	$877	39.7	-62.2%
ECM #7	Air Conditioning Unit Upgrades	$13,018	$1,595	8.2	83.8%
ECM #8	Premium Efficiency Motors	$7,060	$261	27.1	-44.6%
ECM #9	Demand Controlled Ventilation	$30,000	$3,228	9.3	61.4%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solar PV Installation	$1,807,110	$127,495	14.2	5.8%

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

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

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Lighting Upgrade - Interior Spaces and Gymnasium	1.9	5,878	0
ECM #2	Lighting Upgrade - Building Exterior	1.6	7,247	0
ECM #3	Lighting Occupancy Sensors / Daylight Sensors	0	9,083	0
ECM #4	CRT Computer Monitors	0	6,691	0
ECM #5	Replace MSI RTU's	22.2	17,723	1,883
ECM #6	Replace Rheem RTU	4.3	3,478	199
ECM #7	Air Conditioning Unit Upgrades	3.4	11,687	0
ECM #8	Premium Efficiency Motors	0.3	1,017	0
ECM #9	Demand Controlled Ventilation	0.0	8,160	1,204
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	160.6	249,501	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 and Gymnasium
- **ECM #2** Lighting Upgrade - Building Exterior
- **ECM #3** Lighting Occupancy Sensors / Daylight Sensors
- **ECM #4** CRT Computer Monitor
- **ECM #7** Air Conditioning Unit Upgrades
- **ECM #9** Demand Controlled Ventilation

ECM #1 Lighting Upgrade - Interior Spaces and Gymnasium

The majority of the lighting in the Tinc Road Elementary School building was updated with modern fluorescent fixtures. There are very few spaces with older fluorescent fixtures with T12 lamps or incandescent bulbs. The gymnasium lighting is provided with probe start 400W metal halide fixtures. This type of metal halide fixtures use approximately 30% more energy than a T-5 HO fixture to provide the equivalent light. CEG recommends retrofitting remaining T12 fixtures, replacing any incandescent lamps with compact fluorescent lamps and replacing gymnasium metal halide fixtures with new T5HO fixtures. Overall savings for this ECM is approximately $946 per year and pays back in 2.6 years.

ECM #2 Lighting Upgrade - Building Exterior

The exterior of the Tinc Road Elementary School is illuminated with 250W Probe Start Metal Halide lights in "Shoe Box" fixtures. It is recommended to retrofit these fixtures with pulse start metal halide lamps and electronic ballasts. This ECM saves approximate $1,167 annually and has a simple payback of 4.4 years.

ECM #3: Lighting Occupancy Sensors / Daylight Sensors

Lighting controls provide a simple and effective solution to the problem of lights being unnecessarily left on. Occupancy sensors alone provide fast payback since there is no retrofit needed for the existing lighting. Daylight Sensors were included in this ECM to show the relative effect of daylight harvesting in addition to occupancy sensors. The combination of both options pays back in approximately 5.7 years and therefore it is recommended.

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 5.5 years saving over $1,000 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 #7 Air Conditioning Unit Upgrades

Teacher's room and a meeting room in the Elementary School building is heated and air conditioned with unit ventilators. These unit ventilators are equipped with electric heating coils for heating and coupled with older remote Carrier Split Air Conditioners for cooling. It is recommended to replace the condensing units of the unit ventilators with heat pumps. Heat pump technology is an efficient alternative to electric space heating. In addition, a server room is cooled with a Carrier mini split air conditioner. It is recommended to replace this split system with a new ductless split AC system. New split air conditioner condensers and heat pumps provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and R410a refrigerant. This ECM has a combined 8.2 years payback and saves approximately $1,600 per year.

ECM #9 Demand Controlled Ventilation

Carbon dioxide ventilation control or demand controlled ventilation (DCV) allows for the measurement and control of outside air ventilation levels to a target cfm/person ventilation rate in the space (i.e., 15 cfm/person) based on the number of people in the space. The basic premise behind DCV is monitoring indoor CO2 levels versus outdoor CO2 levels in order to provide proper ventilation to the spaces within the facility as well as saving costly dollars treating unconditioned ventilation air. HVAC-1 and HVAC-3 units are suitable candidates for DCV in this building. This ECM has a combined 9.3 years payback and saves approximately $3,230 per year.

Renewable Energy Analysis

Renewable Energy Measures (REMs) were also reviewed for implementation at the Tinc Road Elementary School. CEG utilized a parking lot canopy mounted solar array to house a substantial PV system. The recommended 200 kW PV system will produce approximately 250,000 kWh of electricity annually and will reduce the schools electrical consumption from the grid by 50%. The system's calculated simple payback of 14.2 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.

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 as little as 40% of the installation cost.

Conclusion

Based on the Energy Star rating of over 70, the Tinc Road Elementary School appears to be operating at a high efficiency level compared to other schools in the region. With the implementation of the above recommended measures the Mt. Olive BOE will realize further energy savings at the Tinc Road Elementary School.

II. INTRODUCTION

The comprehensive energy audit covers the 60,992 square feet Tinc Road Elementary School, which includes classrooms, library and media center, cafeteria, kitchen, gymnasium, music room, art room, boiler room, custodial spaces, storage spaces, administration offices and restrooms.

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

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

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

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

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

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

III. METHOD OF ANALYSIS

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

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

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

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

ECM Calculation Equations:

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

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

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

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

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

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

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	16.1¢ / kWh
Natural Gas	$1.59 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Jersey Central Power & Light (JCPL)
Rate: General Service Secondary 3 Phase
Meter No: G16655779
Customer ID No: 100001459872
Third Party Utility Provider: -
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION	DEMAND		TOTAL BILL
Sep-09	47,200	182.0		$7,700
Oct-09	30,800	176.4		$5,339
Nov-09	38,000	112.8		$5,905
Dec-09	48,000	136.8		$7,422
Jan-10	53,600	132.8		$8,162
Feb-10	48,000	125.6		$7,654
Mar-10	45,200	124.4		$6,965
Apr-10	36,400	108.4		$5,662
May-10	36,400	155.6		$5,967
Jun-10	43,200	168.8		$7,059
Jul-10	35,600	197.6		$6,223
Aug-10	31,600	173.6		$5,511
Totals	**494,000**	**197.6**	**Max**	**$79,568**

AVERAGE DEMAND **149.6 KW average**

AVERAGE RATE **$0.161** **$/kWh**

Figure 1
Electricity Usage Profile
Tinc Road Elementary School
July-09 through June-10

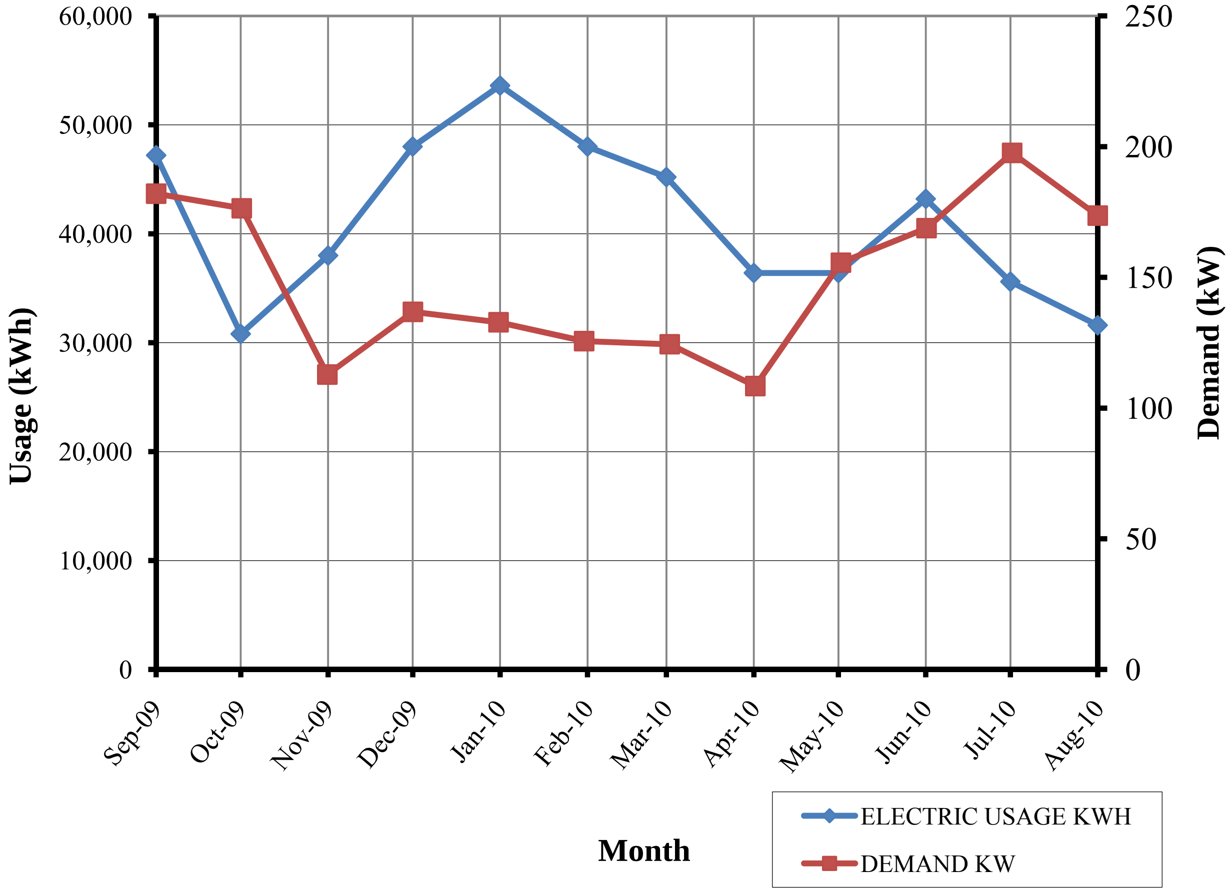
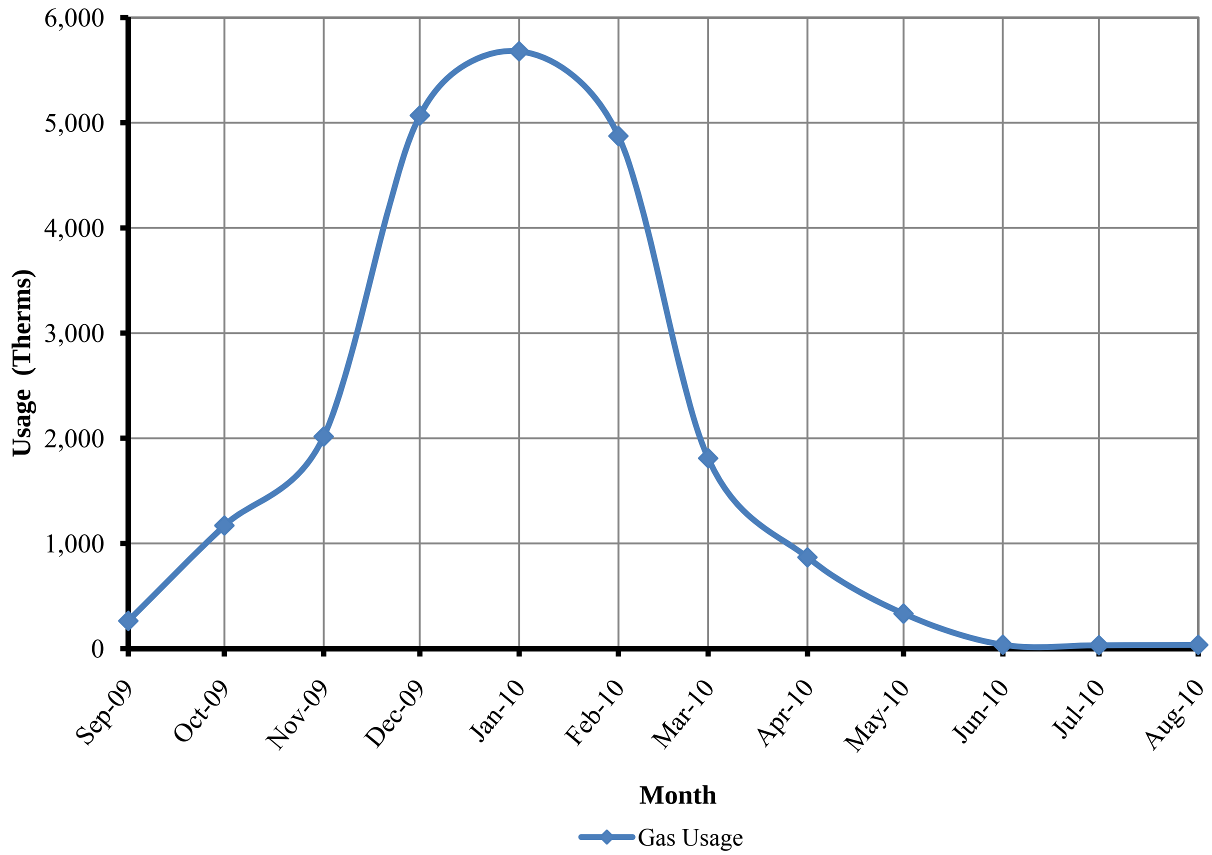


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	New Jersey Natural Gas	
Rate:	GSL	
Meter No:	00657911	
Point of Delivery ID:		
Third Party Utility Provider:	Pepco, HESS	
TPS Meter / Acct No:	081128137019, 446646/447321	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Sep-09	263.20	$852.73
Oct-09	1,169.62	$2,250.24
Nov-09	2,016.27	$3,418.58
Dec-09	5,069.95	$7,102.52
Jan-10	5,680.03	$7,903.84
Feb-10	4,874.12	$6,845.31
Mar-10	1,810.03	$2,848.55
Apr-10	867.65	$1,612.21
May-10	332.37	$910.44
Jun-10	35.82	$377.16
Jul-10	31.64	$597.64
Aug-10	34.85	$506.34
TOTALS	**22,185.55**	**$35,225.56**
AVERAGE RATE:	**$1.59**	**$/THERM**

Figure 2
Natural Gas Usage Profile
Tinc Road Elementary School
July-09 through June-10



B. Energy Use Index (EUI)

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

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

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

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

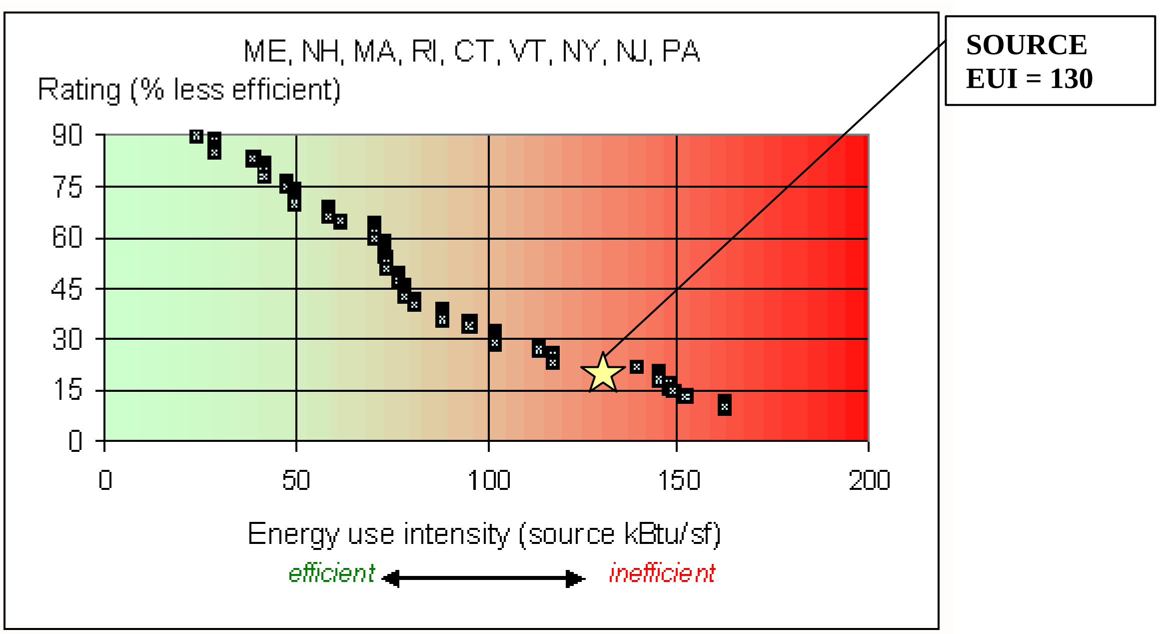
$$Building\ \ Source\ \ EUI = \frac{(Electric\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio + Gas\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio)}{Building\ \ Square\ \ Footage}$$

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	**BUILDING USE**			**SITE ENERGY**	**SITE-SOURCE RATIO**	**SOURCE ENERGY**
	kWh	**Therms**	**Gallons**	**kBtu**		**kBtu**
ELECTRIC	494,000			1,686,516	3.340	5,632,963
NATURAL GAS		22,186		2,218,555	1.047	2,322,827
TOTAL				3,905,071		7,955,791
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		60,992	SQUARE FEET			
BUILDING SITE EUI		*64*	kBtu/SF/YR			
BUILDING SOURCE EUI		*130*	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



C. EPA Energy Benchmarking System

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

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

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

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

User Name: 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
Tinc Road Elementary School	75	50

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

V. FACILITY DESCRIPTION

The 60,992 SF Elementary School is a single story facility comprised of classrooms, library, cafeteria, kitchen, gymnasium, music room, boiler room, custodial spaces, storage spaces, administration offices, restrooms, art room, and library & media center. The facility was built in 1974. The building didn't have any significant additions since original construction. The hours of operation for the school students and teachers are between 8:40 am and 3:40 pm on the weekdays. Majority of the facility is closed on weekends except for the cafeteria, which is used as a Chapel on Sundays between the hours of 8:00 AM and 1:00 PM. The student enrollment at Tinc Road Elementary School is approximately 510 students and 60 staff.

The building exterior is comprised of concrete block wall construction with brick façade. The amount of insulation within the wall structure is unknown. Based on the time period, the insulation would likely have been simply an air space or filled cores in the block walls.

The roof structure of the building is built up with spray foam and sand covering. The insulation value of the roof is not known. It is reported that the roof has leakage problems at various areas. The windows throughout the facility are in good condition. Typical windows throughout the facility are double pane, ¼" glazed glass with aluminum frames. Blinds are utilized through the facility per occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat in the summer.

The school houses a small commercial kitchen. The kitchen includes an electric cooking range, electric oven, a walk-in refrigerator and a freezer. The walk-in units appear to be in good condition. There are four (4) vending machines in the building. Two (2) of the machines are refrigerated soda machines, which operate year round.

HVAC Systems

The major source of heating for the perimeter spaces of the building consists of two (2) 1,750 MBH RBI Futura-II water tube boilers serving the building's perimeter hot water loop. The boiler water is circulated by two (2) floor mounted constant volume pumps made by Armstrong. The pumps are driven by two 5 HP standard efficiency electric motors. The pumps provide heating hot water for the unit ventilators and the hot water baseboard heaters on the perimeter spaces.

Heating and ventilation in the classrooms are provided with unit ventilators made by Magic Aire and Carrier. There are approximately 23 unit ventilators in the building. All of the units are equipped with hot water coils for heating and direct expansion refrigeration coils for cooling. The unit ventilators are connected to 4 Ton condensing units for mechanical cooling. Majority of the condensing units are located on the roof. The unit ventilators are installed below the windows in each classroom.

In addition to the classrooms, the air conditioning for the teachers' lounge and another meeting space are also provided with 4 Ton unit ventilators. These units are equipped with electric heating coils rather than hot water coils for heating.

The air conditioning for the administrative offices and the cafeteria are provided with two (2) 32 Ton Nesbitt rooftop air conditioning units made by MSI. The units are approximately 30 years old. The units appear to be in acceptable condition and they are maintained well. Each unit is equipped with a gas burner and heating coils with 500,000 BTU/Hr input capacity. The supply fan on each unit is driven by 15 HP premium efficiency motors.

The air conditioning for the music room and the art room is provided with a rooftop air conditioning unit made by Rheem. The Rheem unit is approximately 19 years old and beyond its useful service life. The unit is equipped with an airside economizer. The operation of the airside economizer could not be verified.

The air conditioning for the classrooms 104, 105 and 106 is provided with two relatively new 4-ton Carrier rooftop high efficiency air conditioning units. The units are equipped with 60,000 BTU/Hr gas heating coils for primary supply air preheating. Similarly, two additional 4-ton Carrier high efficiency rooftop air conditioners provide heating and air conditioning for the classrooms 190, 191 and 192. These units were installed in 1999.

Heating and ventilation for two main bathrooms in the building are provided with two (2) heating and ventilation (HV) units made by Reznor. The units provide 100% outside air to the bathrooms. The units are equipped with gas burners with a capacity of 90,000 BTU/Hr for the primary supply-air preheating. The bathroom fans are interlocked with the Reznor units. The Reznor units are approximately 11 years old.

Two other HV units provide heating and ventilation for the gymnasium. The units are equipped with hot water heating coils for the primary supply air heating. The air is exhausted from the gym via five (5) exhaust fans, which are interlocked with the HV units.

Exhaust System

Unit ventilators provide the minimum outside air intake in the majority of the classrooms. The air is exhausted from the classrooms and corridors via dedicated exhaust fans located on the roof. The toilet rooms have dedicated roof exhausters as well. The kitchen includes electric cooking ranges and a 4ft x 14ft commercial exhaust hood, which provides exhaust for cooking equipment. The kitchen hood is manually controlled with a wall switch.

HVAC System Controls

The building HVAC systems are controlled by JCI Metasys central building automation system. The Metasys control system is capable of operating the boilers, scheduling unit ventilators, rooftop A/C units and exhausters based on a time of day usage. The BAS system operates the heating water supply temperature based on outdoor air temperature. It is expected that the outside air dampers on each unit ventilator is intended to be controlled by this central system. The unit ventilators are scheduled to turn on and off based on student schedules. The system operates the outside air dampers on each unit ventilator such that the outside air dampers open during the occupied hours and shuts off when the unit is off. This should be checked and verified on a regular basis.

Domestic Hot Water

Domestic hot water for the restrooms and the faucets in the utility rooms is provided with three (3) 65 gallon, gas fired hot water heaters made by A.O. Smith. Two of the units were installed in 2009 while the 3rd unit was installed in 2003. The domestic hot water is circulated throughout a part of the building by a 1 HP hot water circulation pump. The circulation pump is controlled by aqua stat. The domestic hot water piping insulation appeared to be in good condition.

Lighting

Typical lighting throughout school building is modern fluorescent tube lay-in fixtures with T-8 lamps and magnetic ballasts. There are only a few fixtures in the building with older T12 lamps and magnetic ballasts. The gym lighting is provided with 400W metal halide fixtures. The building exterior is lit with 175W metal halide lights. The library is partially lit with sky lights.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade – Interior Spaces and Gymnasium

Description:

Interior Spaces

The lighting throughout the Tinc Road Elementary School building is provided with modern fixtures with T8 lamps and electronic ballasts. There are only a small number of interior spaces with inefficient lighting fixtures.

Gymnasium

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 draw-backs 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). The typical value 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.

Gymnasium Hours of Operation: 3,200 Hours/Yr

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:

T-12 Fixtures

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.

$$\text{SmartStart® Incentive} = (\#\text{ of } 1-4 \text{ lamp fixtures} \times \$10) = 2 \times \$10 = \$20$$

There is no significant replacement and Maintenance Savings generated by this retrofit.

Gymnasium Fixtures

NJ Smart Start® Program Incentives are calculated as follows:

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

For replacement of HID (400-999W) with new T-5 or T-8 fixtures = $100/Fixture

$$\text{Smart Start ® Incentive} = (\#\text{ of 400W Metal Halide Fixture Replaced} \times \$100)$$

$$\text{Smart Start ® Incentive} = (16 \times \$100) = \$1600$$

There is no significant replacement and Maintenance Savings generated by this replacement.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,128
NJ Smart Start Equipment Incentive ($):	$1,620
Net Installation Cost ($):	$2,508
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$946
Total Yearly Savings ($/Yr):	$946
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.6
Simple Lifetime ROI	466.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$14,196
Internal Rate of Return (IRR)	37%
Net Present Value (NPV)	$8,790.33

ECM #2: Lighting Upgrade – Building Exterior

Description:

The exterior of the Tinc Road Elementary School is illuminated with 250W Probe Start Metal Halide lights in “Shoe Box” fixtures. It is recommended to retrofit these fixtures with pulse start metal halide lamps and electronic ballasts. Pulse-start MH lamps have a high-voltage ignitor to start the lamp using a series of pulses instead of a starting probe electrode. Pulse start metal halide lamps typically have an increased lumen maintenance levels by up to 33%. This allows utilizing lower wattage lamps while maintaining the minimum lighting levels in the space.

This ECM retrofits existing probe start metal halide fixtures with pulse start metal halide fixtures. The bulb replacement cost for the new lamps compared to the existing lamps were found to be approximately equal and therefore not included in the savings calculations.

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 probe start metal halide with a pulse start system (with a minimum 12% wattage reduction) warrants the following incentive:

Pulse Start Metal Halide (for fixtures ≥ 150 watts) = $25 per fixture.

$$\text{SmartStart ® Incentive} = \text{\# of Probe Start Fixtures } \times \$25 = 27 \times \$25 = \$675$$

There isn’t any replacement and maintenance savings generated by this retrofit.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,805
NJ Smart Start Equipment Incentive ($):	$675
Net Installation Cost ($):	$5,130
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,167
Total Yearly Savings ($/Yr):	$1,167
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.4
Simple Lifetime ROI	241.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$17,501
Internal Rate of Return (IRR)	22%
Net Present Value (NPV)	$8,798.40

ECM #3: Lighting Occupancy Sensors / Daylight Sensors

Description:

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

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

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

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

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

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

Energy Savings Calculations:

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

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

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

Dual Technology Occupancy Sensor - Remote Mount	$160	per installation
2 Pole Power Pack w/Dual Tech. Occupancy Sensor	$225	per installation
Daylight Sensor	$160	per installation
Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	$125	per installation

Cost includes material and labor.

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

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

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

$$\text{Smart Start® Incentive} = \left(\#\text{ of wall mount} \times \$\,20\right) + (\#\text{of ceiling mount} \times 35)$$
$$\text{Smart Start® Incentive} = \left(0 \times \$\,20\right) + (49 \times \$35) = \$1{,}715$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$10,050
NJ Smart Start Equipment Incentive ($):	$1,750
Net Installation Cost ($):	$8,300
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,462
Total Yearly Savings ($/Yr):	$1,462
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.7
Simple Lifetime ROI	164.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$21,934
Internal Rate of Return (IRR)	16%
Net Present Value (NPV)	$9,156.67

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:	59
Run Time %:	90%
Weeks per Yr:	42
Hrs per Week:	60

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

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

COMPUTER MONITOR CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	CRT Monitors	LCD Monitor	
# of Computers	59	59	
Monitor Power Cons. (W)	75	25	
Run Time %	90%	90%	
Operating Hrs per Week	60	60	
Operating Weeks per Yr	42	42	
Elec Cost ($/kWh)	0.161	0.161	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Usage (kWh)	10,036	3,345	6,691
Energy Cost ($)	$1,616	$539	$1,077
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	59	$100	$5,900
Total	59		$5,900

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,900
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$5,900
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,077
Total Yearly Savings ($/Yr):	$1,077
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.5
Simple Lifetime ROI	173.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$16,158
Internal Rate of Return (IRR)	16%
Net Present Value (NPV)	$6,959.38

ECM #5: Replace Nesbitt Multi-zone Roof Units

Cafeteria and the administration 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 375 MBH net gas heating capacity. The units are approximately 30 years old and they air in 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:

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

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

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

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

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

ROOFTOP UNIT REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Nesbitt Units 32 Ton Cooling 375 MBH Net Heating	New Multizone Units 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	750	750	
Heating Efficiency (Gas)	70%	85%	
Heating Degree Days (65°F)	4,496	4,496	
Elec Cost ($/kWh)	$0.161	$0.161	
Natural Gas Cost ($/Therm)	$1.59	$1.59	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Cooling Energy Cnsmption, kWh	76,800	59,077	17,723
Cooling Demand, kW	96	73.8	22.2
Heating Energy (Therms)	10,672	8,789	1,883
Electric Energy Cost ($)	$12,365	$9,511	$2,853
Total Gas Cost ($)	$16,968	$13,974	$2,994
Total Cost ($)	$29,333	$23,485	$5,848
COMMENTS:	HDDS 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 (EER) at or above 9.5 for units with capacity between 30 Ton and 63 Tons. The incentives are as follows:

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

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):	$5,848
Total Yearly Savings ($/Yr):	$5,848
Estimated ECM Lifetime (Yr):	15
Simple Payback	37.2
Simple Lifetime ROI	-59.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$87,717
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($147,629.30)

ECM #6: Replace Rheem Rooftop HVAC Unit

Music and the art room areas are heated and cooled with an old rooftop unit made by Rheem. The Rheem RTU has 15 ton cooling capacity and 202.5 MBH net gas heating capacity. The unit is approximately 19 years old and in 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 Rheem unit. New high efficiency unit is based on new Energy Star complient Rheem roof top unit or equal rooftop air conditioning unit with air side economizer, premium efficiency motors, high efficiency scroll compressors with R410a refrigerant and high IPLV ratios and multiple stage gas burners with high turn down ratio.

Energy Savings Calculations:

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

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

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

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

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

ROOFTOP UNIT REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Rheem Rooftop HVAC Unit	New Rooftop HVAC Unit	
Number of Units	1	1	
Total Cooling Capacity, Tons	15	15	
Efficiency (EER)	9	11.5	
Annual Full Load Cooling Hours	800	800	
Total Heating Capacity, BTU/Hr	203	203	
Heating Efficiency (Gas)	75%	81%	
Heating Degree Days (65°F)	4,496	4,496	
Elec Cost ($/kWh)	$0.161	$0.161	
Natural Gas Cost ($/Therm)	$1.59	$1.59	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Cooling Energy Cnsmption, kWh	16,000	12,522	3,478
Cooling Demand, kW	20	15.7	4.3
Heating Energy (Therms)	2,689	2,490	199
Electric Energy Cost ($)	$2,576	$2,016	$560
Total Gas Cost ($)	$4,276	$3,959	$317
Total Cost ($)	$6,852	$5,975	$877
COMMENTS:	HDD estimated based on Newark,NJ.		

Cost and Incentives:

Estimated installed cost for the new unit is $36,000.

From the NJ Smart Start® Program appendix, the packaged unit's replacement falls under the category "Unitary HVAC Systems" and warrants an incentive based on efficiency (EER) at or above 11.5 for units with capacity between 11.25 Ton and 20 Tons. The incentives are as follows:

$$\text{SmartStart® Incentive} = (\text{AC Unit Tonnage} \times \$79/\text{Ton}) = (15 \times \$79) = \$1{,}185$$

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$36,000
NJ Smart Start Equipment Incentive ($):	$1,185
Net Installation Cost ($):	$34,815
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$877
Total Yearly Savings ($/Yr):	$877
Estimated ECM Lifetime (Yr):	15
Simple Payback	39.7
Simple Lifetime ROI	-62.2%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$13,151
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($24,348.54)

ECM #7: Air Conditioning Unit Upgrades

Description:

Teacher's room and a meeting room in the Elementary School building is heated and air conditioned with unit ventilators. These unit ventilators are equipped with electric heating coils for heating and coupled with older remote Carrier Split Air Conditioners for cooling. It is recommended to replace the condensing units of the unit ventilators with heat pumps. Heat pump technology is an efficient alternative to electric space heating. In addition, a server room is cooled with a Carrier mini split air conditioner. It is recommended to replace this split system with a new ductless split AC system.

New split air conditioner condensers and heat pumps provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and R410a refrigerant. Current cooling efficiencies for ductless split air conditioners are as high as SEER 18 for typical 2 to 4-Ton systems.

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

IMPLEMENTATION SUMMARY					
ECM INPUTS	**SERVICE FOR**	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
Carrier Split	Tech Room	1	24,000	2	New Ductless Split System
Carrier Split with 18kW Electric	Teachers Room	1	48,000	4	High SEER Heat Pump
Carrier Split with 18kW Electric	Meeting Room	1	30,000	2.5	High SEER Heat Pump
Total		**3**	**102,000**	**9**	

CU: Condensing Unit
UV: Unit Ventilator

The basis for the ductless split air conditioners is Fujitsu Halycon RLS Series Units and the basis for the split unit heat pumps is the Rheem Prestige Series heat pump units with R410a refrigerants or equivalent units. The unit ventilators need to be retrofitted with new higher pressure evaporator coils and controls to receive R410a refrigerant.

Energy Savings Calculations:

Cooling Energy Savings:

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

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

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

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

$$\text{Heating Energy} = \frac{\text{Heating Capacity} \times \text{HDD}_{65°\text{F}}}{\Delta\text{T}} \left(\frac{1}{\text{Eff}} - \frac{1}{\text{COP}_{\text{Heat Pump}}}\right)$$

Where:

Heating Capacity = Total heating capacity of the unit ventilator coils, kW
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)
COP = Coefficient of Process (3.5 for typical heat pump)

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

Energy savings calculations are summarized in the table below.

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the replacement of 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.

In addition, replacement of AC condensers with heat pumps falls under the category "Air-to-Air Heat Pumps" and warrants an incentive based on efficiency (SEER) at or above 14 and HSPF of at or above 7.8 for this type of systems.

The program incentives are calculated as follows:

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

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	2.0	$184
5.4 tons or less Heat Pumps	≥14 SEER	$92	6.5	$598
TOTAL				**$782**

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

COST & SAVINGS SUMMARY							
ECM INPUTS	**INSTALLED COST**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVING**	**PAY BACK YEARS**
Carrier Split	$3,800	1	$3,800	$184	$3,616	$1,093	3.3
Carrier Split with 18kW Electric Heat	$5,000	1	$5,000	$368	$4,632	$452	10.2
Carrier Split with 18kW Electric Heat	$5,000	1	$5,000	$230	$4,770	$336	14.2
Total		3	$13,800	$782	$13,018	$1,595	8.2

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

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$13,800
NJ Smart Start Equipment Incentive ($):	$782
Net Installation Cost ($):	$13,018
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,595
Total Yearly Savings ($/Yr):	$1,595
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.2
Simple Lifetime ROI	83.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$23,928
Internal Rate of Return (IRR)	9%
Net Present Value (NPV)	$6,025.02

ECM #8: 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 the MSI roof 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 one of the hot water pumps and program it to run as the primary pump throughout the year.

IMPLEMENTATION SUMMARY						
EQP TAG	FUNCTION	QTY	MOTOR HP	HOURS OF OPERATION	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY
HWP-1	Hot Water Pump motor	1	5	3600	87.5%	90.2%
SF-1	MSI Unit Supply Fan	2	15	3600	91.0%	92.4%

Energy Savings Calculations:

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

$\text{where, HP} = \text{Motor Nameplate Horsepower Rating}$

$\text{LF} = \text{Load Factor}$

$\text{Motor Efficiency} = \text{Motor Nameplate Efficiency}$

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

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

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

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
HWP-1	5	90%	87.5%	90.2%	0.11	413	$67
SF-1	15	90%	91.0%	92.4%	0.17	604	$97
TOTAL					**0.3**	**1,017**	**$164**

Cost and Incentives

SmartStart Building® incentives: 5 hp NEMA motor = $60/motor
15 hp NEMA motor = $115/motor

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

MOTOR REPLACEMENT SUMMARY							
MOTOR POWER HP	QTY	ENCL. TYPE	INSTALLED COST	SMART START INCENTIVE	TOTAL COST	TOTAL SAVINGS	SIMPLE PAYBACK
5	1	TEFC	$1,350	$60	$1,290	$67	19.4
15	2	TEFC	$6,000	$230	$5,770	$194	29.7
Totals:			**$7,350**	**$290**	**$7,060**	**$261**	**27.1**

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,350
NJ Smart Start Equipment Incentive ($):	$290
Net Installation Cost ($):	$7,060
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$261
Total Yearly Savings ($/Yr):	$261
Estimated ECM Lifetime (Yr):	15
Simple Payback	27.1
Simple Lifetime ROI	-44.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,914
Internal Rate of Return (IRR)	-7%
Net Present Value (NPV)	($3,944.92)

ECM #9: Demand Controlled Ventilation: Cafeteria, Music and Art Rooms

Demand Controlled Ventilation (DCV) is a means to provide active, zone level control of ventilation for spaces within a facility. The basic premise behind DCV is monitoring indoor CO2 levels versus outdoor CO2 levels in order to provide proper ventilation to the spaces within the facility as well as saving costly dollars treating unconditioned ventilation air. Carbon dioxide ventilation control or demand controlled ventilation (DCV) allows for the measurement and control of outside air ventilation levels to a target cfm/person ventilation rate in the space (i.e., 15 cfm/person) based on the number of people in the space. It is a direct measure of ventilation effectiveness and is a method whereby buildings can regain active and automatic zone level ventilation control, without having to open windows. The fixed ventilation approach depends on a set-it-and-forget-it methodology that is completely unresponsive to changes in the way spaces are utilized/occupied or how equipment is maintained. A DCV system utilizes various control algorithms to maintain a base ventilation rate. The system monitors space CO2 levels and the algorithm automatically adjusts the outdoor and return air dampers to provide the quantity of outdoor air to maintain the required CO2 level in the space. System designs are normally designed for maximum occupancy and the ventilation rates are designed for this (maximum) occupancy. In areas where occupancy swings are prevalent there is ample opportunity to reduce outdoor air quantity to satisfy the needs of the actual number of occupants present. By installing the DCV controls, energy savings are realized by the reduced quantities of outdoor air that do not require heating and cooling energy from the steam and chilled water plants.

HVAC-1 conditions two single zones in this building, which are the music and the art rooms. The unit is made by Rheem. In addition, HVAC-3 provides heating and air conditioning to the cafeteria area. The outside air is set to minimum damper positions at these spaces. When these units are on unoccupied mode, the outside air dampers shut. The outside air volume is typically based on the maximum occupancy of the space conditioned. When a given space is not fully occupied the outside air quantity delivered to the space is greater than the amount needed for adequate ventilation.

This ECM includes the installation of CO_2 sensors integrated into a demand control ventilation system, for the HVAC-1 and HVAC-3. This system allows the air handling unit to respond to changes in occupancy and therefore reduce the amount of outside air that has to be conditioned. Outside air accounts for a large portion of the energy consumption in the HVAC system, especially in high occupancy spaces. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Demand Control Ventilation - 10% - 15%.

Energy savings achieved through "Demand Control Ventilation" average 10%-15%. Savings resulting from the implementation of this ECM for energy management controls are estimated to be 15% of the total HVAC energy cost for this system.

The components included to install a demand control ventilation system include damper controllers, Variable Frequency Drives, CO2 sensors, wiring and programming. Each occupied zone would require minimum one CO_2 sensor installed to monitor occupancy levels.

IMPLEMENTATION SUMMARY					
INPUTS	**Service**	**Min # of CO2 SENSORS**	**HVAC Unit**	**Cooling Capaity, Tons**	**Heating Capacity, MBH**
DCV-1	Music Room	1	HVAC-1 (Rheem Unit)	10	203
	Art Room	1			
DCV-2	Cafeteria & Kitchen	3	HVAC -3 (MSI - Nesbitt Unit)	32	375
Total				**42**	**578**

Energy Savings Calculations:

$$\text{Cooling Energy Usage} = \frac{\text{Cooling}(\text{Tons}) \times 12{,}000\left(\frac{\text{Btu}}{\text{Ton hr}}\right) \times \text{Annual Full Load Cooling Hrs.}}{1000\left(\frac{\text{Wh}}{\text{kWh}}\right) \times \text{EER}\left(\frac{\text{Btu}}{\text{Wh}}\right)}$$

$$\text{Energy Savings} = \text{Cooling Energy}(\text{kwh}) \times 15\%$$

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

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

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

$$\text{Energy Savings} = \text{Heating Energy}(\text{Therms}) \times 15\%$$

DEMAND CONTROLLED VENTILATION		
ECM INPUTS	**DCV-1**	**DCV-2**
Equipment	HVAC-1 Rheem Unit	HVAC-3 Nesbitt Unit
Total Cooling Capacity, Tons	15	32
Efficiency (EER)	9	8
Annual Full Load Cooling Hours	800	800
Total Heating Capacity, BTU/Hr	203	375
Heating Efficiency (Gas)	75%	70%
Heating Degree Days (65°F)	4496	4,496
Heating Degree Days (65 - 40°F)	3,799	3,799
Heating Degree Days (40°F)	697	697
Energy Savings	15%	15%
Elec Cost ($/kWh)	$0.161	$0.161
Natural Gas Cost ($/Therm)	$1.59	$1.59
ENERGY SAVINGS		
ECM RESULTS	**DCV-1**	**DCV-2**
Cooling Energy Cnsmption, kWh	16,000	38,400
Heating Energy (Therms)	2,689	5,336
Cooling Energy Savings kWh	2,400	5,760
Heating Energy Savings (Therms)	403	800
Electric Energy Cost Savings ($)	$386	$927
Total Gas Cost Savings ($)	$641	$1,273
Total Cost Savings ($)	$1,028	$2,200
COMMENTS:	HDD estimated based on Newark,NJ.	

Cost and Incentives:

Estimated installed cost for demand controlled ventilation for the cafeteria area, music room and the art room is $30,000.

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

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$30,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$30,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$3,228
Total Yearly Savings ($/Yr):	$3,228
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.3
Simple Lifetime ROI	61.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$48,417
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	$8,532.94

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 parking lot area of the building being audited for the purposes of determining a potential for a canopy mounted photovoltaic system. A parking lot area of 14,250 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 200.8 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 249,500 KWh annually, reducing the overall utility bill by approximately 50% 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 parking lot space on the existing facility. Estimated solar array generation was then calculated based on the National Renewable Energy

Laboratory PVWatts Version 1.0 Calculator. In order to calculate the array generation an appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%), mismatch factor (98%), diodes and connections (100%), dc and ac wiring(98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age(new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 81%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the **Renewable/Distributed Energy Measures Calculation Appendix**.

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

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

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM		
PAYMENT TYPE	**SIMPLE PAYBACK**	**INTERNAL RATE OF RETURN**
Direct Purchase	14.2 Years	5.6%

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

Given the large amount of capital required by the Owner to invest in a solar system through a Direct Purchase CEG does not recommend the Owner pursue this route. It would be more advantageous for the Owner to solicit Power Purchase Agreement (PPA) Providers who will own, operate, and maintain the system for a period of 15 years. During this time the PPA

Provider would sell all of the electric generated by Solar Arrays to the Owner at a reduced rate compared to their existing electric rate.

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the facility. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. Based on CEG's review of the applicability of wind energy for the facility, it was determined that the average wind speed is not adequate, and the kilowatt demand for the building is below the threshold (200 kW) for purchase of a commercial wind turbine. Therefore, wind energy is not a viable option to implement.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The electricity usage profile demonstrates a typical cooling load profile for school facilities that have some occupancy during the summer months. Historical usage is relatively steady throughout the year with an average monthly usage of 41,167 kWh and an average monthly demand of 150kW. Largest consumption months were September, December, February, March and June.

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 f summer load. Third Party Supplier (TPS) electric commodity contracts that offer's a firm, fixed price for 100% of the facilities electric requirements and are lower than the JCP&L's BGS-FP default rate are recommended.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile. The summer months June – August have very little consumption. The average winter (Nov-Mar) consumption is 3,890 therms and the average summer (Apr-Oct) consumption is 391 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.

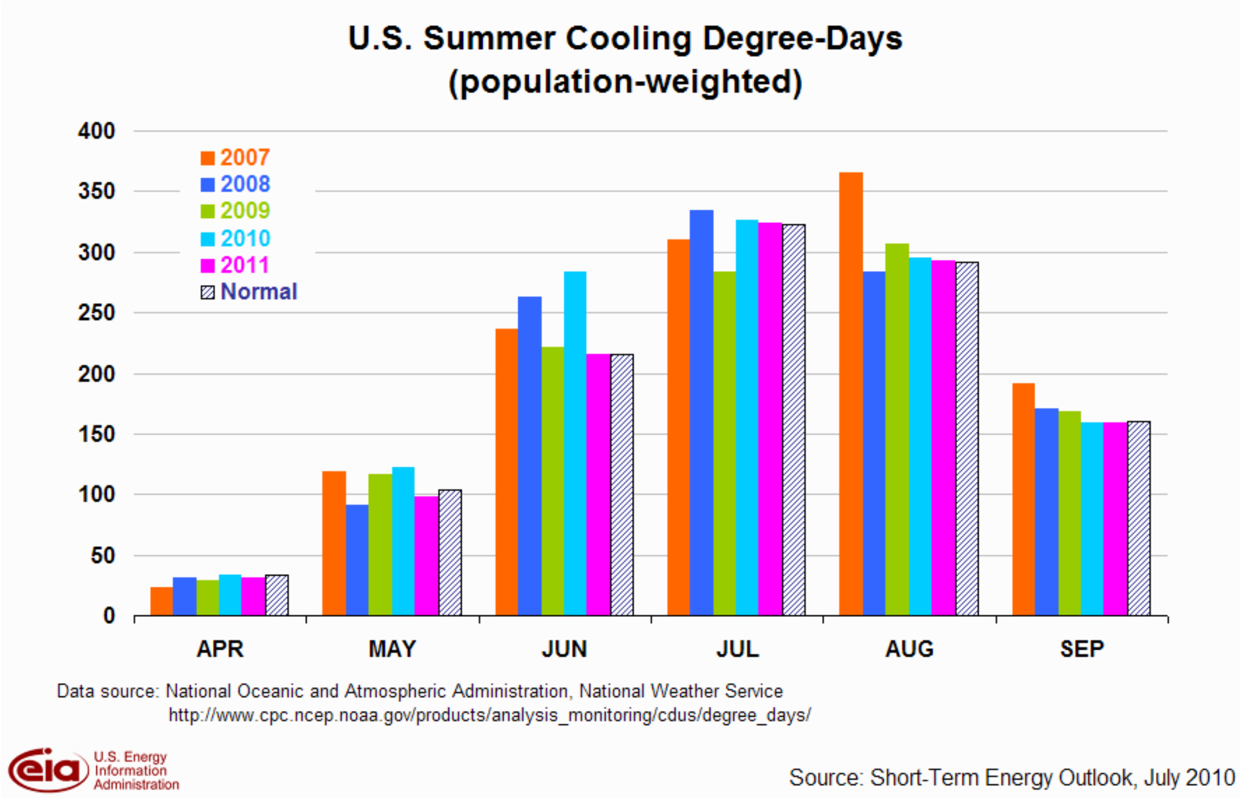
NJNG provides basic gas supply service (BGSS) to customers who choose not to shop from a Third Party Supplier (TPS) for natural gas commodity. The option is essential to protect the reliability of service to consumers as well as protecting consumers if a third party supplier defaults or fails to provide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

Tinc Road Elementary School

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - Interior Spaces and Gymnasium	$1,651	$2,477	$1,620	$2,508	$946	$0	$946	15	$14,196	$0	466.0%	2.6	37.42%	$8,790.33
ECM #2	Lighting Upgrade - Building Exterior	$2,322	$3,483	$675	$5,130	$1,167	$0	$1,167	15	$17,501	$0	241.2%	4.4	21.52%	$8,798.40
ECM #3	Lighting Occupancy Sensors / Daylight Sensors	$4,020	$6,030	$1,750	$8,300	$1,462	$0	$1,462	15	$21,934	$0	164.3%	5.7	15.62%	$9,156.67
ECM #4	CRT Computer Monitors	$5,900	$0	$0	$5,900	$1,077	$0	$1,077	15	$16,158	$0	173.9%	5.5	16.38%	$6,959.38
ECM #5	Replace MSI RTU's	$220,000	$0	$2,560	$217,440	$5,848	$0	$5,848	15	$87,717	$0	-59.7%	37.2	-9.67%	($147,629.30)
ECM #6	Replace Rheem RTU	$36,000	$0	$1,185	$34,815	$877	$0	$877	15	$13,151	$0	-62.2%	39.7	-10.26%	($24,348.54)
ECM #7	Air Conditioning Unit Upgrades	$13,800	$0	$782	$13,018	$1,595	$0	$1,595	15	$23,928	$0	83.8%	8.2	8.79%	$6,025.02
ECM #8	Premium Efficiency Motors	$7,350	$0	$290	$7,060	$261	$0	$261	15	$3,914	$0	-44.6%	27.1	-6.60%	($3,944.92)
ECM #9	Demand Controlled Ventilation	$30,000	$0	$0	$30,000	$3,228	$0	$3,228	15	$48,417	$0	61.4%	9.3	6.68%	$8,532.94
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solar PV Installation	$1,807,110	$0	$0	$1,807,110	$40,170	$87,325	$127,495	15	$1,912,425	$1,309,880	5.8%	14.2	0.72%	($285,082.83)

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

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of 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 $\geq$ 16 \$600 per ton, EER $\geq$ 18 \$750 per ton, EER $\geq$ 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
Tinc Road Elementary School

Building ID: 2404054
For 12-month Period Ending: July 31, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: October 01, 2010

Facility	**Facility Owner**	**Primary Contact for this Facility**
Tinc Road Elementary School 24 Tinc Road Flanders, NJ 07836	Public Schools of Mt. Olive 89 Route 46 Budd Lake, NH 07828	Thomas Scerbo 89 Route 46 Budd Lake, NJ 07828

Year Built: 1974
Gross Floor Area (ft²): 60,992

Energy Performance Rating[2] (1-100) 75

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	1,689,241
Natural Gas (kBtu)[4]	2,230,274
Total Energy (kBtu)	3,919,515
Energy Intensity[5]	
Site (kBtu/ft²/yr)	64
Source (kBtu/ft²/yr)	131
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	376
Electric Distribution Utility	
FirstEnergy - Jersey Central Power & Lt Co	
National Average Comparison	
National Average Site EUI	83
National Average Source EUI	168
% Difference from National Average Source EUI	-22%
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	Tinc Road Elementary School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	24 Tinc Road, 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	60,992 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	109	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	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	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 (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
06/18/2010	07/16/2010	35,600.00
05/21/2010	06/17/2010	43,200.00
04/21/2010	05/20/2010	36,400.00
03/20/2010	04/20/2010	36,400.00
02/19/2010	03/19/2010	45,200.00
01/21/2010	02/18/2010	48,000.00
12/21/2009	01/20/2010	53,600.00
11/19/2009	12/20/2009	48,000.00
10/21/2009	11/18/2009	38,000.00
09/19/2009	10/20/2009	30,800.00
08/19/2009	09/18/2009	47,200.00
Electric Consumption (kWh (thousand Watt-hours))		**462,400.00**
Electric Consumption (kBtu (thousand Btu))		**1,577,708.80**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,577,708.80**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
06/08/2010	06/28/2010	35.82
05/07/2010	06/07/2010	332.37
04/08/2010	05/06/2010	867.70
03/09/2010	04/07/2010	1,810.00
02/05/2010	03/08/2010	4,874.10
01/05/2010	02/04/2010	5,680.00
12/05/2009	01/04/2010	5,070.00
11/03/2009	12/04/2009	2,016.30
10/05/2009	11/02/2009	1,169.60
09/01/2009	10/04/2009	263.20
08/03/2009	08/31/2009	33.97

Gas Consumption (therms)	**22,153.06**
Gas Consumption (kBtu (thousand Btu))	**2,215,306.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**2,215,306.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

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

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

Certifying Professional

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

Name: ____ Date: _____________

Signature: ______________________________________

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Tinc Road Elementary School
24 Tinc Road
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

Tinc Road Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	60,992
Year Built	1974
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)	60,992
Open Weekends?	No
Number of PCs	109
Number of walk-in refrigeration/freezer units	2
Presence of cooking facilities	Yes
Percent Cooled	100
Percent Heated	100
Months°	9
High School?	No
School District°	Mt Olive

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 07/31/2010)	**Baseline** (Ending Date 07/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	75	75	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	64	64	65	N/A	83
Source (kBtu/ft^2)	131	131	131	N/A	168
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	376	376	378	N/A	483
$kgCO_2e/ft^2$/year	6	6	6	N/A	8

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

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

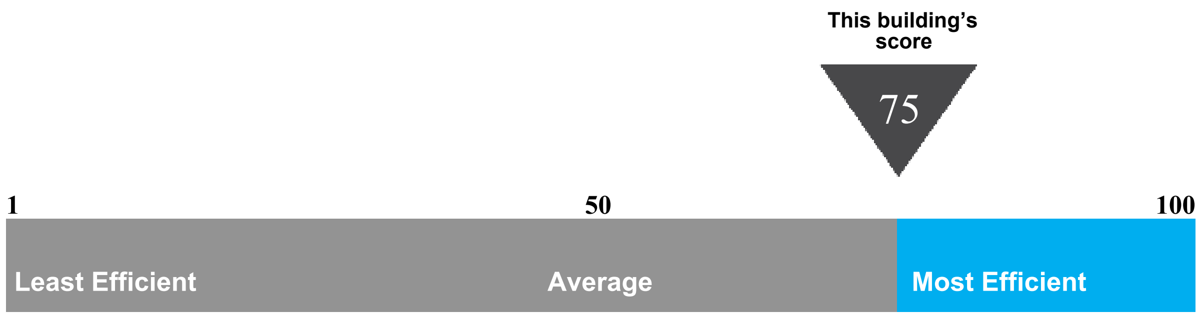
Statement of Energy Performance

2010

Tinc Road Elementary School
24 Tinc Road
Flanders, NJ 07836

Portfolio Manager Building ID: 2404054

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 131 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 BOE Tinc Road Elementary School

Unitary A/C Units

Tag	**Split CU**	**Split CU**	**Mini Split CU**
Unit Type	Air cooled condensing unit	Air cooled condensing unit	Air cooled condensing unit
Qty	23	1	1
Location	Roof	Roof	Roof
Area Served	Unit Ventilators	Teachers Room	Tech Room
Manufacturer	York	Carrier	Carrier
Model #	H1RA048S46A	38HDC048521	38QR024C331
Serial #	WEJP010770	-	-
Cooling Capacity (Tons)	4	4	2
Voltage / Phase	208/1	208-1	208-1
Efficiency (SEER)	9.7 EER 10.4 SEER	15	15
Indoor Unit	Unit Ventilators	Unit Ventilator with Electric Heat	Tech room wall hung
Capacity (Ton)	4	4	2
Approx Age	11	11	11
Ashrae Service Life	15	15	15
Remaining Life	4	4	4
Comments	-	-	-

CU = Condensing Unit

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Tinc Road Elementary School

Unitary A/C Units

Unitary A/C Units

Tag	Mini Split CU	Split CU	-
Unit Type	Air cooled condensing unit	Air cooled condensing unit	-
Qty	1	2	-
Location	Roof	Roof	-
Area Served	-	Various	-
Manufacturer	Carrier	York	-
Model #	38HDC030321	HABA - F018SG	-
Serial #	-	W0C5745445	-
Cooling Capacity (Tons)	2.5	1.5	-
Voltage / Phase	208-1	208-1	-
Efficiency (SEER)	15	11	-
Indoor Unit	Unit ventilator with Electric Heat	-	-
Capacity (Ton)	2.5	1.5	-
Approx Age	11	11	-
Ashrae Service Life	15	15	-
Remaining Life	4	4	-
Comments	-	-	-

CU = Condensing Unit

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Tinc Road Elementary School

Boilers

Tag	Boiler-1 & 2	-
Unit Type	Hot Water Finned Water Tube	-
Qty	2	-
Location	Boiler Room	-
Area Served	Building perimeter	-
Manufacturer	Ruscio Brothers LTD (RBI)	-
Model #	FWD 1750E-02	-
Serial #	050020863 050020864	-
Input Capacity	1,750 MBH	-
Rated Output Capacity (MBH)	~1480	-
Approx. Efficiency %	85%	-
Fuel	Natural Gas	-
Approx Age	10	-
Ashrae Service Life	30	-
Remaining Life	20	-
Burner	Built-in	-
Type	2-stage	-
Firing Rate	-	-
Comments	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Tinc Road Elementary School

Domestic Hot Water Heaters

Tag	HWH	HHW	HHW
Unit Type	Standard Gas Fired Hot Water Heater	Standard Gas Fired Hot Water Heater	Standard Gas Fired Hot Water Heater
Qty	1	2	1
Location	Utility Room	Utility Room	Utility Room
Area Served	Faucets, sinks etc.	Faucets, sinks etc.	Faucets, sinks etc.
Manufacturer	AO Smith	AO Smith	AO Smith
Model #	BT 65 110	BT 65 200	BT 65 100
Serial #	AM030032005	0811A026645, 0921A010739	AM030032005
Size (Gallons)	65	65	65
Input Capacity (MBH/KW)	65 MBH	65 MBH	65 MBH
Recovery (Gal/Hr)	60.4	67.4	60.4
Efficiency %	80%	80%	80%
Fuel	Natural Gas	Natural Gas	Natural Gas
Approx Age	7	1 - 2	3
Ashrae Service Life	12	12	12
Remaining Life	5	10	9
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Tinc Road Elementary School

Heating and Ventilation Units

Tag	HV	H&V 1-2	-
Unit Type	Heating and Ventilation	Heating and Ventilation	-
Qty	2	2	-
Location	Roof	Gym	-
Area Served	Bathrooms	Gym	-
Manufacturer	Reznor	-	-
Model #	-	-	-
Serial #	-	-	-
Fan HP	5 (est)	3	-
Cooling Type	None	None	-
Heating Type	Natural Ga	Hot Water	-
Heating Input (MBH)	90	-	-
Efficiency	~80%	-	-
Approx Age	30	30	-
Ashrae Service Life	15	15	-
Remaining Life	(15)	(15)	-
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Tinc Road Elementary School

Pumps

Tag	Hot Water Pump	Circulator	Circulator
Unit Type	Base Mounted - End Suction	Pipe mount, boiler bypass	Pipe mount, domestic HW Circulator
Qty	2 (1+Standby)	2	4 (est)
Location	Boiler Room	Boiler Room	Various
Area Served	Prımary Hot Water Loop UVs, radiators	Boilers	Domestic HW Circulator
Manufacturer	Armstrong	BG	BG
Model #	3x2 5x8 4030	-	-
Serial #	421356	-	-
Horse Power	5.0	~ 1 HP	~1/4 HP
Flow, GPM	220 Each	-	-
Pump Head, FT	60	-	-
Motor Info	Baldor	-	-
Electrical Power	460V, 3PH	-	-
RPM	1760	-	-
Motor Efficiency %	87.5%	-	-
Approx Age	10	10	10
Ashrae Service Life	20	15	15
Remaining Life	10	5	5
Comments	Constant speed. Standard efficiency motors	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Tinc Road Elementary School

Rooftop / AC Units

Tag	RTU	RTU
Unit Type	Packaged Rooftop Unit	Packaged Rooftop Unit
Qty	2	2
Location	Roof	Roof
Area Served	Rooms 104, 105 and 106	Rooms 190, 191 and 192
Manufacturer	Carrier	Carrier
Model #	Weathermaster 48GX-024060301--	Weathermaster 48HJF004ZS-631HE
Serial #	1100G11535, 1100G11537	3599G20357, 3399G20333
Cooling Type	DX	DX
Cooling Capacity (Tons)	4	4
Cooling Efficiency (SEER/EER)	13 SEER, 11 EER	13 SEER, 11 EER
Economizer	100 Outside Air	100 Outside Air
Supply Fan HP	-	-
Return Fan HP Motor Efficiency	-	-
Heating Type	Natural Gas	Natural Gas
Heating Input (MBH)	60	115
Heating Output (MBH)	48	93
Efficiency	81%	81%
Approx Age	~3	~3
Ashrae Service Life	15	15
Remaining Life	12	12
Comments	Units are in good condition	Units are in good condition

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Tinc Road Elementary School

Rooftop / AC Units

Tag	HVAC-1	HVAC 2 & 3
Unit Type	Packaged Rooftop Unit	Multizone
Qty	1	2
Location	Roof	Roof
Area Served	Music Room, Art Room	Administrative Offices and Cafeteria
Manufacturer	Rheem	MSI
Model #	PROF 2501000LR	RMA100NG5S2415HB01A4701 0ZBC11
Serial #	848298TRAD04991-1170	0901-0010, 0901-0011
Cooling Type	DX	DX
Cooling Capacity (Tons)	-	32
Cooling Efficiency (SEER/EER)	-	~8 EER
Economizer	100 Outside Air	100 Outside Air
Supply Fan HP	-	15 91%
Return Fan HP Motor Efficiency	-	3 HP 68.5%
Heating Type	Natural Gas	Natural Gas
Heating Input (MBH)	250	500
Heating Output (MBH)	203	375
Efficiency	81%	75%
Approx Age	19	30
Ashrae Service Life	15	15
Remaining Life	12	(15)
Comments	Unit is in fair condition	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Mt. Olive BOE Tinc Road Elementary School

Unit Ventilators

Tag	UV	UV	UV
Unit Type	Heating and Cooling	Celing type UV Heating and Cooling	-
Qty	23	2	-
Location	Classrooms	Faculty Rooms	-
Manufacturer	Magic Aire	Carrier	-
Model #	MA40UV150	40UV150	-
Serial #	W000541038	W000543306	-
Flow Capacity	-	-	-
Cooling Type	DX	DX	-
Cooling Capacity (Tons)	4	4	-
Estimated Cooling Efficiency (EER)	10	10	-
Heating Type	Hot Water Coil	Electric	-
Heating Input (MBH)	~50	63	-
Approx Age	11	11	-
Ashrae Service Life	15	15	-
Remaining Life	4	4	-
Comments	-	-	-

Investment Grade Lighting Audit

CEG Job #: 9C10050
Project: Tinc Road ES
Address: 24 Tinc Rd. Flanders, NJ, 07836
Building SF: 60,992

Tinc Road ES

KWH COST: $0.161

ECM #1 & 2: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
221.14	Elec. Room	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.23	603.2	$97.12	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
770	Gym	3200	16	1	400w MH, Prismatic Lens	465	7.44	23,808.0	$3,833.09	16	6	2x4 54w T5HO 6 Lamp w/Reflecter	354	5.66	18124.8	$2,918.09	$240.00	$3,840.00	1.78	5683.2	$915.00	4.20
331.11	Gym	4400	4	3	1x4, 3 Lamp, 54w T5HO Fixture	177	0.71	3,115.2	$501.55	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
200	Gym Storage	1200	1	2	1x2, 1 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.03	40.8	$6.57	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	164 Office	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
200	164A Closet	1200	1	2	1x2, 1 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.03	40.8	$6.57	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	165 Restroom	2600	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	78.0	$12.56	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
200	166 Closet	1200	1	2	1x2, 1 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.03	40.8	$6.57	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	PE Storage	1200	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	216.0	$34.78	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	123 Elec. Room	1200	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.23	278.4	$44.82	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Trailer #1	2600	16	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.93	2,412.8	$388.46	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Trailer #2	2600	16	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.93	2,412.8	$388.46	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Trailer #3	2600	16	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.93	2,412.8	$388.46	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Trailer #4	2600	16	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.93	2,412.8	$388.46	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	195B Storage	1200	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.12	139.2	$22.41	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Lobby	4400	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.23	1,020.8	$164.35	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
121.14	101 Elec. Closet	200	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., No Lens	78	0.16	31.2	$5.02	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	23.2	$3.74	$100.00	$200.00	0.04	8	$1.29	155.28
221.11	102 Faculty	3200	8	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.46	1,484.8	$239.05	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

221.11	Lounge	3200	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.29	928.0	$149.41	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	103 Guidance	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.23	603.2	$97.12	4	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	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.04	2,714.4	$437.02	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	105 Classroom	2600	10	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.58	1,508.0	$242.79	10	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	10	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.58	1,508.0	$242.79	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	124 Classroom	2600	16	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.48	1,248.0	$200.93	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	125 Classroom	2600	19	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.57	1,482.0	$238.60	19	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	120 Men's Restroom	1300	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	39.0	$6.28	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	121 Boy's Restroom	3200	3	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.09	288.0	$46.37	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	123A Custodial Closet	1200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.06	69.6	$11.21	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	126 Classroom	2600	14	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.42	1,092.0	$175.81	14	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	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	3200	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	192.0	$30.91	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	137 SGI	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	127 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$226.04	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	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	$226.04	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	129 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$226.04	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

211.11	129 Classroom	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	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	$226.04	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	131 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	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	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	133 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	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	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	96 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$226.04	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	97 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1,404.0	$226.04	18	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	98 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	99 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Men's Restroom	1300	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	156.0	$25.12	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Women's Restroom	1300	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	234.0	$37.67	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	146 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	147 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	148 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	149 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	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	3200	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	384.0	$61.82	4	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	3200	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	384.0	$61.82	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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211.11	156 Art	2600	36	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.08	2,808.0	$452.09	36	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	150 Music	2600	23	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.69	1,794.0	$288.83	23	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	Music Office	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.23	603.2	$97.12	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	Practice Room	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.23	603.2	$97.12	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	138 Work Room	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	140 A/V Room	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	139 Periodical Storage	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	141 Seminar	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	142 SGI	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Main Office	2800	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	504.0	$81.14	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	111 Copy Room	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.211	Principal Office	2600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.42	1,081.6	$174.14	4	3	Remove 1 Lamp - No Ballast Change Required	86	0.34	894.4	$144.00	$22.00	$88.00	0.07	187.2	$30.14	2.92
211.11	109 Helping Teacher	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	137 Librarian	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468.0	$75.35	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	Nurse	2600	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.35	904.8	$145.67	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41		2600	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.17	452.4	$72.84	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Girl's Restroom	3200	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.23	742.4	$119.53	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Boy's Restroom	3200	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.35	1,113.6	$179.29	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	196 Cafeteria	3200	56	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.68	5,376.0	$865.54	56	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	190 Classroom	2600	36	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	2.09	5,428.8	$874.04	36	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	191 Classroom	2600	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.70	1,809.6	$291.35	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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221.37	192 Classroom	2600	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.70	1,809.6	$291.35	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	187 Classroom	2600	29	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.87	2,262.0	$364.18	29	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	185 Classroom	2600	29	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.87	2,262.0	$364.18	29	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	182 Classroom	2600	29	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.87	2,262.0	$364.18	29	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	179 Service	3200	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.23	742.4	$119.53	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	174 Office	2600	5	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.15	390.0	$62.79	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	176 Sign Dept.	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312.0	$50.23	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.34	177 Boiler Room	4400	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.23	1,020.8	$164.35	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	112 Tech. Room	2600	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	156.0	$25.12	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Kitchen	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1,872.0	$301.39	24	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Corridors	4400	84	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	4.87	21,436.8	$3,451.32	84	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21		4400	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.23	1,020.8	$164.35	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
744	Exterior	4400	27	1	250w MH "Shoe Box" Area Light	295	7.97	35,046.0	$5,642.41	27	1	Retrofit; 200w MH Pulse Start Lamp and Ballast; Venture Lighting	234	6.32	27799.2	$4,475.67	$215.00	$5,805.00	1.65	7246.8	$1,166.73	4.98
767		4400	8	1	400w MH Flood	465	3.72	16,368.0	$2,635.25	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		1,166	132			62.44	199,597	$32,135	1,166	12			12.4	46,842	$7,541		$9,933	3.5	13,125	$2,113	4.70

Investment Grade Lighting Audit

CEG Job #: 9C10050
Project: Tinc Road ES
Address: 24 Tinc Rd. Flanders, NJ, 07836
Building SF: 60992

Tinc Road ES

KWH COST: $0.161

ECM #3: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
221.14	Elec. Room	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.232	603.2	$97.12	4	0	No Change	58	0.23	0%	603.2	$97.12	$0.00	$0.00	0.00	0	$0.00	0.00
770	Gym	3200	16	1	400w MH, Prismatic Lens	465	7.44	23808	$3,833.09	16	0	No Change	465	7.44	0%	23808	$3,833.09	$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	$501.55	4	0	No Change	177	0.71	0%	3115.2	$501.55	$0.00	$0.00	0.00	0	$0.00	0.00
200	Gym Storage	1200	1	2	1x2, 1 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.034	40.8	$6.57	1	0	No Change	34	0.03	0%	40.8	$6.57	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	164 Office	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
200	164A Closet	1200	1	2	1x2, 1 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.034	40.8	$6.57	1	0	No Change	34	0.03	0%	40.8	$6.57	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	165 Restroom	2600	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	78	$12.56	1	0	No Change	30	0.03	0%	78	$12.56	$0.00	$0.00	0.00	0	$0.00	0.00
200	166 Closet	1200	1	2	1x2, 1 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.034	40.8	$6.57	1	0	No Change	34	0.03	0%	40.8	$6.57	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	PE Storage	1200	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	216	$34.78	6	0	No Change	30	0.18	0%	216	$34.78	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	123 Elec. Room	1200	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.232	278.4	$44.82	4	0	No Change	58	0.23	0%	278.4	$44.82	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Trailer #1	2600	16	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.928	2412.8	$388.46	16	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.84	10%	2171.52	$349.61	$225.00	$225.00	0.09	241.28	$38.85	5.79
221.11	Trailer #2	2600	16	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.928	2412.8	$388.46	16	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.84	10%	2171.52	$349.61	$225.00	$225.00	0.09	241.28	$38.85	5.79
221.11	Trailer #3	2600	16	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.928	2412.8	$388.46	16	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.84	10%	2171.52	$349.61	$225.00	$225.00	0.09	241.28	$38.85	5.79
221.11	Trailer #4	2600	16	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.928	2412.8	$388.46	16	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.84	10%	2171.52	$349.61	$225.00	$225.00	0.09	241.28	$38.85	5.79
221.14	195B Storage	1200	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.116	139.2	$22.41	2	0	No Change	58	0.12	0%	139.2	$22.41	$0.00	$0.00	0.00	0	$0.00	0.00

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227.21	Lobby	4400	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.232	1020.8	$164.35	4	0	No Change	58	0.23	0%	1020.8	$164.35	$0.00	$0.00	0.00	0	$0.00	0.00
121.14	101 Elec. Closet	200	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., No Lens	78	0.156	31.2	$5.02	2	0	No Change	78	0.16	0%	31.2	$5.02	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	102 Faculty Lounge	3200	8	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.464	1484.8	$239.05	8	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.42	10%	1336.32	$215.15	$225.00	$225.00	0.05	148.48	$23.91	9.41
221.11		3200	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.29	928	$149.41	5	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	58	0.20	30%	649.6	$104.59	$125.00	$125.00	0.09	278.4	$44.82	2.79
221.11	103 Guidance	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.232	603.2	$97.12	4	0	No Change	58	0.23	0%	603.2	$97.12	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	104 Classroom	2600	18	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	1.044	2714.4	$437.02	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	0.94	10%	2442.96	$393.32	$225.00	$225.00	0.10	271.44	$43.70	5.15
221.11	105 Classroom	2600	10	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.58	1508	$242.79	10	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.52	10%	1357.2	$218.51	$160.00	$160.00	0.06	150.8	$24.28	6.59
221.11	106 Classroom	2600	10	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.58	1508	$242.79	10	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.52	10%	1357.2	$218.51	$160.00	$160.00	0.06	150.8	$24.28	6.59
211.11	124 Classroom	2600	16	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.48	1248	$200.93	16	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.43	10%	1123.2	$180.84	$225.00	$225.00	0.05	124.8	$20.09	11.20
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53
211.11	125 Classroom	2600	19	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.57	1482	$238.60	19	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.51	10%	1333.8	$214.74	$225.00	$225.00	0.06	148.2	$23.86	9.43
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53
211.11	120 Men's Restroom	1300	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	39	$6.28	1	0	No Change	30	0.03	0%	39	$6.28	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	121 Boy's Restroom	3200	3	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.09	288	$46.37	3	0	No Change	30	0.09	0%	288	$46.37	$0.00	$0.00	0.00	0	$0.00	0.00
221.14	123A Custodial Closet	1200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.058	69.6	$11.21	1	0	No Change	58	0.06	0%	69.6	$11.21	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	126 Classroom	2600	14	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.42	1092	$175.81	14	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.38	10%	982.8	$158.23	$225.00	$225.00	0.04	109.2	$17.58	12.80
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53
211.11	Girl's Restroom	3200	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	192	$30.91	2	0	No Change	30	0.06	0%	192	$30.91	$0.00	$0.00	0.00	0	$0.00	0.00

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211.11	137 SGI	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	127 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$226.04	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$203.44	$225.00	$225.00	0.05	140.4	$22.60	9.95
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53
211.11	128 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$226.04	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$203.44	$225.00	$225.00	0.05	140.4	$22.60	9.95
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53
211.11	129 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$226.04	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$203.44	$225.00	$225.00	0.05	140.4	$22.60	9.95
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53
211.11	130 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$226.04	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$203.44	$225.00	$225.00	0.05	140.4	$22.60	9.95
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53
211.11	131 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	132 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	133 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	134 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	96 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$226.04	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$203.44	$225.00	$225.00	0.05	140.4	$22.60	9.95
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53

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211.11	97 Classroom	2600	18	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.54	1404	$226.04	18	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.49	10%	1263.6	$203.44	$225.00	$225.00	0.05	140.4	$22.60	9.95
211.11		2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	1	Daylight Sensor Utilizing Power Pack Installed w/Occ Sensor	30	0.13	30%	327.6	$52.74	$125.00	$125.00	0.05	140.4	$22.60	5.53
211.11	98 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	99 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	Men's Restroom	1300	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	156	$25.12	4	0	No Change	30	0.12	0%	156	$25.12	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Women's Restroom	1300	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	234	$37.67	6	0	No Change	30	0.18	0%	234	$37.67	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	146 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	147 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	148 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	149 Classroom	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.65	10%	1684.8	$271.25	$225.00	$225.00	0.07	187.2	$30.14	7.47
211.11	Girl's Restroom	3200	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	384	$61.82	4	0	No Change	30	0.12	0%	384	$61.82	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Boy's Restroom	3200	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	384	$61.82	4	0	No Change	30	0.12	0%	384	$61.82	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	156 Art	2600	36	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.08	2808	$452.09	36	2	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.97	10%	2527.2	$406.88	$225.00	$450.00	0.11	280.8	$45.21	9.95
211.11	150 Music	2600	23	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.69	1794	$288.83	23	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.62	10%	1614.6	$259.95	$225.00	$225.00	0.07	179.4	$28.88	7.79
221.37	Music Office	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.232	603.2	$97.12	4	0	No Change	58	0.23	0%	603.2	$97.12	$0.00	$0.00	0.00	0	$0.00	0.00

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221.37	Practice Room	2600	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.232	603.2	$97.12	4	0	No Change	58	0.23	0%	603.2	$97.12	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	138 Work Room	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	140 A/V Room	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	139 Periodical Storage	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	141 Seminar	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	142 SGI	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Main Office	2800	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	504	$81.14	6	0	No Change	30	0.18	0%	504	$81.14	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	111 Copy Room	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
242.211	Principal Office	2600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.416	1081.6	$174.14	4	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	104	0.37	10%	973.44	$156.72	$160.00	$160.00	0.04	108.16	$17.41	9.19
211.11	109 Helping Teacher	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	137 Librarian	2600	6	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.18	468	$75.35	6	0	No Change	30	0.18	0%	468	$75.35	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	Nurse	2600	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.348	904.8	$145.67	6	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.31	10%	814.32	$131.11	$160.00	$160.00	0.03	90.48	$14.57	10.98
221.41		2600	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.174	452.4	$72.84	3	0	No Change	58	0.17	0%	452.4	$72.84	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Girl's Restroom	3200	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.232	742.4	$119.53	4	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.21	10%	668.16	$107.57	$160.00	$160.00	0.02	74.24	$11.95	13.39
221.11	Boy's Restroom	3200	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	58	0.348	1113.6	$179.29	6	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.31	10%	1002.24	$161.36	$160.00	$160.00	0.03	111.36	$17.93	8.92
211.11	196 Cafeteria	3200	56	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	1.68	5376	$865.54	56	0	No Change	30	1.68	0%	5376	$865.54	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	190 Classroom	2600	36	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	2.088	5428.8	$874.04	36	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	58	1.88	10%	4885.92	$786.63	$225.00	$225.00	0.21	542.88	$87.40	2.57
221.37	191 Classroom	2600	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.696	1809.6	$291.35	12	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.63	10%	1628.64	$262.21	$160.00	$160.00	0.07	180.96	$29.13	5.49
221.37	192 Classroom	2600	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.696	1809.6	$291.35	12	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.63	10%	1628.64	$262.21	$160.00	$160.00	0.07	180.96	$29.13	5.49
211.11	187 Classroom	2600	29	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.87	2262	$364.18	29	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.78	10%	2035.8	$327.76	$225.00	$225.00	0.09	226.2	$36.42	6.18

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211.11	185 Classroom	2600	29	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.87	2262	$364.18	29	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.78	10%	2035.8	$327.76	$225.00	$225.00	0.09	226.2	$36.42	6.18
211.11	182 Classroom	2600	29	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.87	2262	$364.18	29	1	2 Pole Power Pack w/Dual Tech. Occupancy Sensor (Sensorswitch or equal)	30	0.78	10%	2035.8	$327.76	$225.00	$225.00	0.09	226.2	$36.42	6.18
227.21	179 Service	3200	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.232	742.4	$119.53	4	1	Dual Technology Occupancy Sensor (Sensorswitch or equal)	58	0.21	10%	668.16	$107.57	$160.00	$160.00	0.02	74.24	$11.95	13.39
211.11	174 Office	2600	5	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.15	390	$62.79	5	0	No Change	30	0.15	0%	390	$62.79	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	176 Sign Dept.	2600	4	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.12	312	$50.23	4	0	No Change	30	0.12	0%	312	$50.23	$0.00	$0.00	0.00	0	$0.00	0.00
221.34	177 Boiler Room	4400	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.232	1020.8	$164.35	4	0	No Change	58	0.23	0%	1020.8	$164.35	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	112 Tech. Room	2600	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.06	156	$25.12	2	0	No Change	30	0.06	0%	156	$25.12	$0.00	$0.00	0.00	0	$0.00	0.00
211.11	Kitchen	2600	24	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.72	1872	$301.39	24	0	No Change	30	0.72	0%	1872	$301.39	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Corridors	4400	84	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	4.872	21436.8	$3,451.32	84	0	No Change	58	4.87	0%	21436.8	$3,451.32	$0.00	$0.00	0.00	0	$0.00	0.00
227.21		4400	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	58	0.232	1020.8	$164.35	4	1	Daylight Sensor (Sensorswitch PP-20 & CM-PC or equal)	58	0.17	25%	765.6	$123.26	$160.00	$160.00	0.06	255.2	$41.09	3.89
744	Exterior	4400	27	1	250w MH "Shoe Box" Area Light	295	7.965	35046	$5,642.41	27	0	No Change	295	7.97	0%	35046	$5,642.41	$0.00	$0.00	0.00	0	$0.00	0.00
767		4400	8	1	400w MH Flood	465	3.72	16368	$2,635.25	8	0	No Change	465	3.72	0%	16368	$2,635.25	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		1,166	132			62.4	199,596.6	$32,135	1,166	52			59.0		190,514.1	$30,672.77		$10,050	3.40	9,083	$1,462	6.87

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

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,807,110
Annual kWh Production	249,501
Annual Energy Cost Reduction	$40,170
Annual SREC Revenue	$87,325
First Cost Premium	**$1,807,110**
Simple Payback:	**14.17** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.161**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$1,807,110	0	0	0	$0	(1,807,110)	0
1	$0	249,501	$40,170	$0	$87,325	$127,495	($1,679,615)
2	$0	248,253	$41,375	$0	$86,889	$128,263	($1,551,352)
3	$0	247,012	$42,616	$0	$86,454	$129,070	($1,422,281)
4	$0	245,777	$43,894	$0	$86,022	$129,916	($1,292,365)
5	$0	244,548	$45,211	$2,519	$85,592	$128,284	($1,164,080)
6	$0	243,326	$46,568	$2,506	$85,164	$129,225	($1,034,855)
7	$0	242,109	$47,965	$2,494	$84,738	$130,209	($904,646)
8	$0	240,898	$49,404	$2,481	$84,314	$131,237	($773,409)
9	$0	239,694	$50,886	$2,469	$83,893	$132,310	($641,099)
10	$0	238,495	$52,412	$2,457	$83,473	$133,429	($507,670)
11	$0	237,303	$53,985	$2,444	$83,056	$134,596	($373,074)
12	$0	236,116	$55,604	$2,432	$82,641	$135,813	($237,261)
13	$0	234,936	$57,272	$2,420	$82,228	$137,080	($100,181)
14	$0	233,761	$58,991	$2,408	$81,816	$138,399	$38,218
15	$0	232,592	$60,760	$2,396	$81,407	$139,772	$177,990
16	$0	231,429	$62,583	$2,384	$81,000	$141,200	$319,190
17	$0	230,272	$64,461	$2,372	$80,595	$142,684	$461,874
18	$0	229,121	$66,394	$2,360	$80,192	$144,227	$606,100
19	$0	227,975	$68,386	$2,348	$79,791	$145,829	$751,930
20	$0	226,835	$70,438	$2,336	$79,392	$147,494	$899,424
21	$1	225,701	$72,551	$2,325	$78,995	$149,222	$1,048,645
22	$2	224,573	$74,727	$2,313	$78,600	$151,015	$1,199,660
23	$3	223,450	$76,969	$2,302	$78,207	$152,875	$1,352,535
24	$4	222,333	$79,278	$2,290	$77,816	$154,805	$1,507,340
25	$5	221,221	$81,657	$2,279	$77,427	$156,805	$1,664,145
	Totals:	5,877,233	$1,464,556	$50,333	$2,057,032	$3,471,255	($1,654,838)
				Net Present Value (NPV)		**$1,664,170**	
				Internal Rate of Return (IRR)		**5.6%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Tinc Road School	14250	Sunpower SPR230	873	14.7	12,837	200.79	249,501	28,809	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:	200.8 kW
DC to AC Derate Factor:	0.800
AC Rating:	160.6 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 ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.80	14160	22.80
2	3.53	16213	26.10
3	4.46	21954	35.35
4	5.28	24532	39.50
5	5.86	27648	44.51
6	6.10	26747	43.06
7	6.05	27125	43.67
8	5.60	25184	40.55
9	4.99	22078	35.55
10	3.97	18544	29.86
11	2.86	13402	21.58
12	2.43	11914	19.18
Year	4.50	249501	401.70

.= Proposed PV Layout

Notes:

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