ENERGY AUDIT – FINAL REPORT

SCHOOL DISTRICT OF THE CHATHAMS
SOUTHERN BOULEVARD SCHOOL

192 SOUTHERN BOULEVARD
CHATHAM, NJ 07928

ATTN: RALPH GOODWIN
SCHOOL BUSINESS ADMINISTRATOR BOARD SECRETARY

CEG PROJECT NO. 9C09078

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I. EXECUTIVE SUMMARY

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

Southern Boulevard School
192 Southern Boulevard
Chatham, NJ 07928

Facility Contact Person: John Cataldo
Municipal Contact Person: Ralph Goodwin

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, 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	$68,813
Natural Gas	$56,600
Total	$125,413

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that the ECM's are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade - General	$2,050	$469	4.4	471.4%
ECM #2	Lighting Controls	$10,080	$1,545	6.5	130.0%
ECM #3	LED EXIT SIGNS	$414	$464	0.9	2703.3%
ECM #4	Lighting Upgrade - Gym	$4,500	$427	10.5	137.3%
ECM #5	Boiler Replacement – High Efficiency Upgrade	$185,250	$5,795	32.0	9.5%
ECM #6	Domestic Water Heater Replacement	$22,420	$351	63.9	-81.2%
ECM #7	High-Efficiency Split System Units	$21,103	$217	97.4	-84.6%
ECM #8	DDC System	$247,628	$9,631	25.7	-41.7%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solar PV Project	$1,374,480	$98,046	14.0	78.3%

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

The estimated demand and energy savings for each ECM and REM is shown below in Table 2. The information in this table corresponds to the ECM's and REM 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 - General	1.4	2,844.9	0.0
ECM #2	Lighting Controls	0.0	9,366.4	0.0
ECM #3	LED EXIT SIGNS	0.2	2,049.8	0.0
ECM #4	Lighting Upgrade - Gym	1.2	2,545.9	0.0
ECM #5	Boiler Replacement – High Efficiency Upgrade	0.0	0.0	3,775
ECM #6	Domestic Water Heater Replacement	0.0	0.0	230.9
ECM #7	High-Efficiency Split System Units	0.0	1,313.0	0.0
ECM #8	DDC System	0.0	31,431.0	42,820.0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	Solar PV Project	152.7	190,380	0.0

Recommendation:

Concord Engineering Group (CEG) strongly recommends 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 Southern Boulevard School:

- **ECM #1:** Lighting Upgrade
- **ECM #2:** Install Lighting Controls
- **ECM #3:** LED Exit Signs
- **ECM #4:** Install T-5 Lighting in Gym

ECM #5 provides a payback within its lifetime. This system is past the ASHRAE recommended useful service life and will need to be replaced. The boiler can be replaced with more efficient equipment that will provide some energy savings and improve the schools carbon foot print.

Systems that have past their useful service life should be replaced such as the systems described in ECM#6 and 7. Although these ECMs will do not have a payback, they are systems that should be replaced and will save energy as summarized in Table 2 on page 5.

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.

Efficient HVAC equipment replacements are difficult to justify with the energy savings alone. The replacement of HVAC equipment such as the heating and ventilation units at Southern Boulevard School is typically initiated when the equipment stops working, surpasses the life expectancy, or maintenance requirements grow beyond the ability to continue to support it. When replacing the equipment becomes necessary, the additional cost to install high efficiency systems becomes a great value for the investment.

The existing facility does not qualify for the Pay for Performance Program because the average operating demand is below 200 KW.

II. INTRODUCTION

The Southern Boulevard School is a 61,907 square foot facility that includes classrooms, offices, Library/Media center, gymnasium, cafeteria, music rooms, Electric room and boiler rooms.

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 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 SmartStart 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 costs and savings are applied and a simple payback and simple return on investment (ROI) is calculated. The simple payback is based on the years that it takes for the savings to pay back the net installation cost (Net Installation divided by Net Savings.) A simple return on investment is calculated as the percentage of the net installation cost that is saved in one year (Net Savings divided by Net Installation.)

A simple life-time calculation is shown for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The energy savings is extrapolated throughout the life-time of the ECM and the total energy savings is calculated as the total life-time savings.

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.

There are two electric services for the facility. The primary service is located at the Electric room room. The secondary service is located at the boiler room in the 1988 addition. The electric usage profile (below) represents the combined total actual electrical usage for the facility. Jersey Central Power and Light (JCP&L) provides electricity to the facility under their General Service Three-Phase rate structure, 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. Public Service Electric and Gas (PSE&G) provides natural gas to the facility under the Basic General Supply Service- Large Volume Gas (LVG) rate structure. Hess Corporation is a third party supplier. 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 overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provide, the average cost for utilities at this facility is as follows:

Description	Average
Electricity	16.5¢ / kWh
Natural Gas	$1.521 / Therm

Table 3
Electricity Billing Data

Electric Usage Summary

Utility Provider: JCP&L, General Service Secondary 3 phase
Meter: G28743023 Customer Number: 0801577897 0000554411
Meter: G16589718 Customer Number: 0801577897 0006106040

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Aug-08	33,760	159.2	$6,411
Sep-08	32,200	122.2	$5,168
Oct-08	35,480	118.6	$5,615
Nov-08	41,360	111.9	$6,554
Dec-08	37,720	115.7	$6,206
Jan-09	23,920	119.9	$4,248
Feb-09	39,240	117.2	$6,360
Mar-09	29,920	116.2	$4,980
Apr-09	36,120	145.7	$5,920
May-09	37,480	138.0	$6,107
Jun-09	37,400	138.5	$6,056
Jul-09	33,200	157.4	$5,188
Totals	**417,800**	**159.2 Max**	**$68,813**

AVERAGE DEMAND 130.0 KW average
AVERAGE RATE $0.165 $/kWh

Figure 1
Electricity Usage Profile

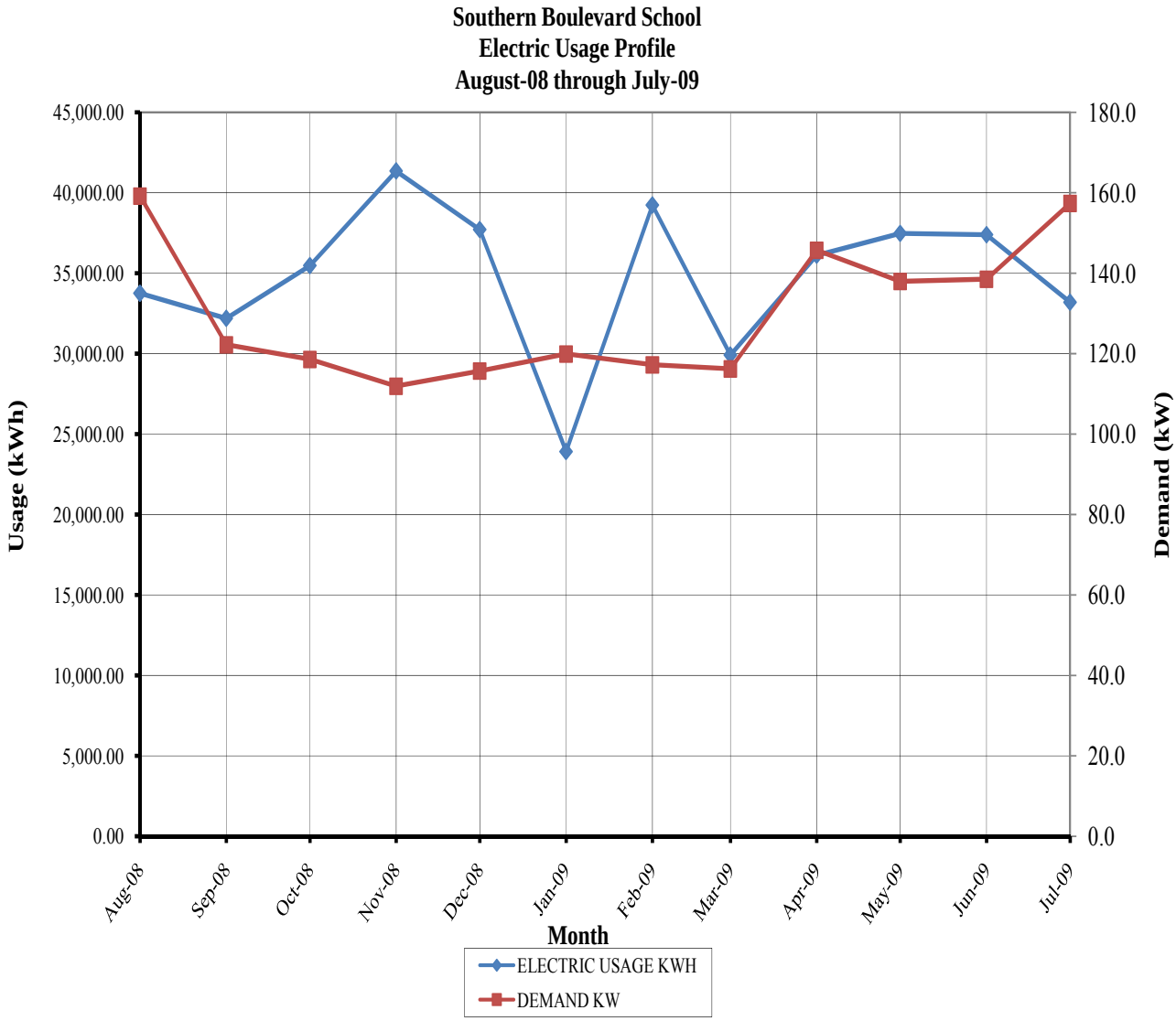
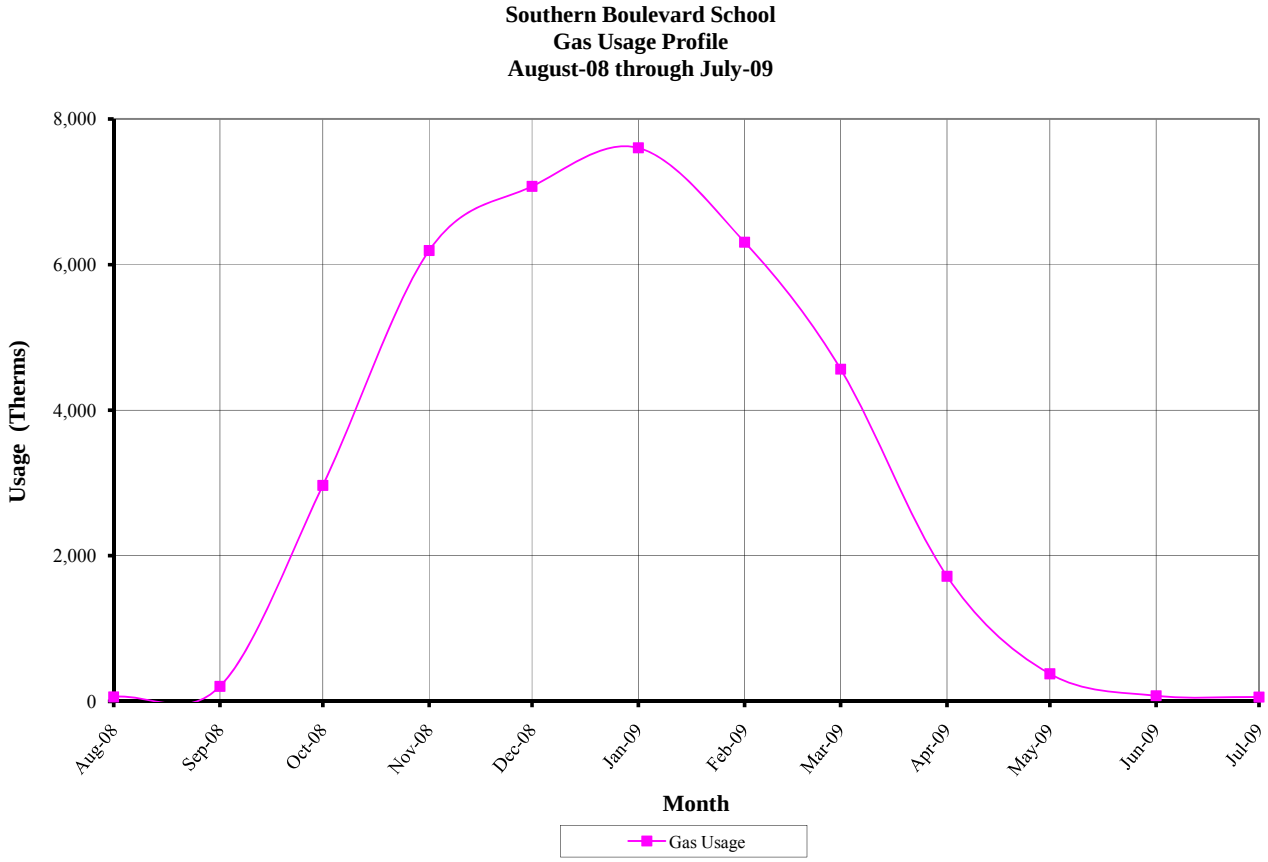


Table 4
Natural Gas Billing Data

Natural Gas Usage Summary		
Utility Provider: PSE&G	Combined (1874132, 1810551)	
PoD ID:	PG00001165 0698104556	
Third Party Utility Provider: HESS		
HESS Meters:	394872 / 394902, 394872 / 404582	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Aug-08	64.94	$181.76
Sep-08	207.19	$368.93
Oct-08	2,968.93	$5,112.68
Nov-08	6,195.02	$9,562.44
Dec-08	7,074.66	$10,832.63
Jan-09	7,603.17	$11,599.91
Feb-09	6,307.56	$9,804.56
Mar-09	4,563.15	$6,004.71
Apr-09	1,719.89	$2,335.55
May-09	380.09	$593.24
Jun-09	78.18	$102.85
Jul-09	60.46	$100.92
TOTALS	**37,223.23**	**$56,600.18**
AVERAGE RATE:	**$1.521**	**$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

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

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

The site and source EUI for this facility is calculated as follows. (See Table 5 for details):

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

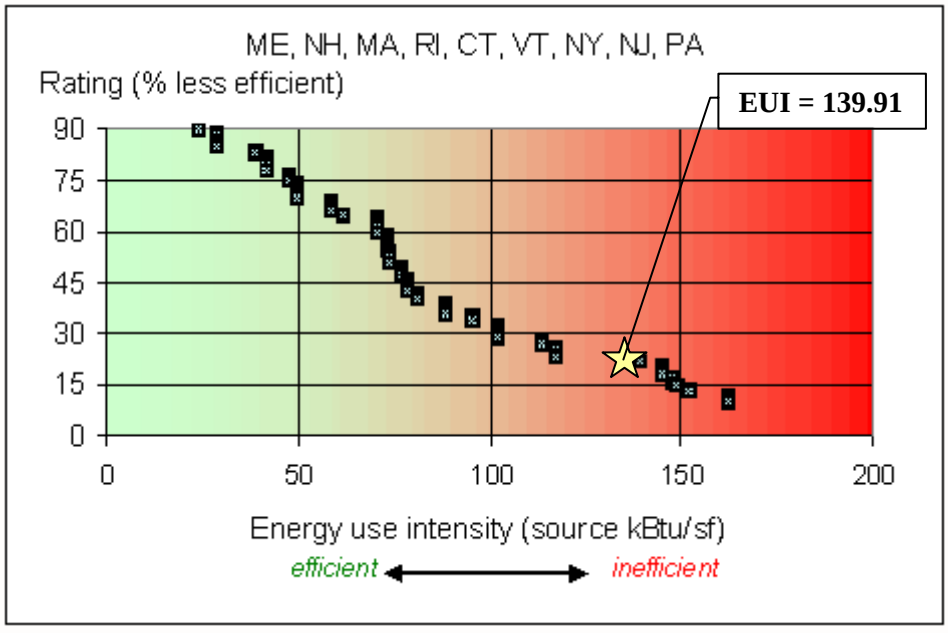
$$Building\ \ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ \ x\ SS\ \ Ratio + Gas\ Usage\ in\ kBtu\ \ x\ SS\ \ Ratio)}{Building\ \ Square\ \ Footage}$$

Table 5
Lafayette School EUI Calculations

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	417,800.0			1,426,369	3.340	4,764,073
NATURAL GAS		37,223.2		3,722,323	1.047	3,897,272
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				5,148,692		8,661,345
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		61,907	SQUARE FEET			
BUILDING SITE EUI		*83.17*	kBtu/SF/YR			
BUILDING SOURCE EUI		*139.91*	kBtu/SF/YR			

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

Figure 3
Source Energy Use Intensity Distributions: Elementary Schools



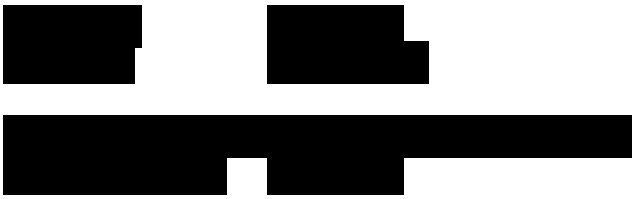
C. EPA Energy Benchmarking System

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 following is the user name and password for this account:

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



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

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Southern Boulevard School	36	50

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

V. FACILITY DESCRIPTION

The original Southern Boulevard School building was built in 1955 and is a two-story with a basement, concrete with brick faced building. An addition of similar construction was built in 1964 making a total of approximately 54,320 square feet at that time. A gym addition was built in 1988 and boiler room built in 2001 that added approximately 7,587 square feet, bringing the building total to 61,907 square feet.

The facility currently houses the boiler rooms, electric room, cafeteria, offices, classrooms, gymnasium, restrooms, Library/Media center and music rooms. The building operates for 40 hours during a typical week. There is a built up roof on the original building. The 1988 addition has an EPDM roof membrane on 1.5" rigid insulation on 1.5" steel deck on steel beams. The windows are tempered, insulated glass with aluminum frame.

Heating System

There are two (2) boiler plants providing hot water for heating for this facility. The boiler plant in the original building consists of two (2) H.B. Smith, Mills 450-W-13 water boilers, each rated for 2,640,000 BTU/hr gross output and 2,295,700 BTU/hr net water output. Each boiler has a Power Flame model C2-GO-20B Natural Gas/oil burner with a maximum natural gas input rating of 3,080,000 BTU/hr. The boilers are 78.3% thermal efficient, operating in a lead/lag configuration. These pumps are approximately 8 years old and in good to fair condition.

The 2001 addition added a boiler plant and serves the 1988 addition. The boiler is a HB Smith model Series 28A-10 cast iron boiler, 3172 maximum MBH natural gas input and is 78.8% efficient. The boiler is eight years old and in good condition. There are two (2) 1.5 hp system pumps piped in parallel located in the 2001 addition boiler room and operating in a lead/lag configuration. The pumps are eight years old and are in fair condition.

There is one (1) heat and ventilation unit in the Basement Custodial room serving the Cafeteria. It appears (could not verify scheduled data) to be the original Nesbitt unit Type G, Size 1012L, 3600 CFM, 1.5 hp fan motor, 180 MBH hot water coil built in 1964 and is in poor condition.

The heating hot water serves twenty five (25) unit ventilators, nine (9) unit heaters and twenty nine (29) fin tube radiators in the original building and 1964 addition. The heating hot water serves three (3) cabinet unit heaters, two (2) heat and ventilation units, one (1) unit ventilator and two (2) fin tube radiators in the 1988 gym addition. The unit ventilators and unit heaters have fractional horse power fan motors and are in fair to poor condition. The two (2) heat and ventilation units serving the gym have a 1 hp and a 1.5 hp fan motor and are in fair condition.

Domestic Hot Water

There is an A.O. Smith model BT-80-112, 74 gallon capacity tank, natural gas, domestic water heater provides hot water for the original building. This unit has an natural gas input of 75,100 Btu/h, and a recovery rate of 72.82 gallons per hour, is 80% thermal efficient. The water heater was manufactured in 2005 and is in good condition.

There is a Rheem-Ruud Universal model G75-125, natural gas, domestic water heater provides hot water for the 1988 addition. This unit has an input of 125,000 Btu/h, 75 gallon tank and a recovery rate of 121.2 gallons per hour, is 80% thermal efficient. The water heater was manufactured in 2000 and is in fair condition.

There is a Ruud-Monel size 80-80, natural gas, domestic water heater provides hot water for the original building. This unit has an input of 95,200 Btu/h, 67 gallon tank and a recovery rate of 80 gallons per hour, is 80% thermal efficient. The water heater was manufactured in 1955 and is in poor condition.

Cooling System

The facility is cooled via four (4) split system air conditioning systems and forty two (42) window air conditioners. All cooling units are air cooled, direct expansion cooling. The split systems range from 3.5 to 7.5 nominal tons. The split systems range from eight (8) to fourteen (14) years old and range from good to fair condition. The window air conditioners range from one (1) to eight (8) years old and are in good condition.

Controls System

There are Johnson Controls pneumatic controls serving the original boiler room and original school building. A Quincy air compressor, approximately 3 years old, with (2) 2hp motors provides air to the controls system. The system operates on a hot water reset schedule as follows: 0°F Outside air temperature (OA): 200°F Leaving Water Temperature (LWT), 15°F Outside air temperature (OA): 175°F Leaving Water Temperature (LWT), 30°F Outside air temperature (OA): 150°F Leaving Water Temperature (LWT), 45°F Outside air temperature (OA): 125°F Leaving Water Temperature (LWT), 60°F Outside air temperature (OA): 100°F Leaving Water Temperature (LWT). The system appears to be operational but is antiquated.

Exhaust System

There are approximately twenty three (23) exhaust fans exhausting the toilet rooms, basement and gym. They are all fractional horse power fan.

Lighting

The building is lit by varying types and sizes of light bulb types. The types used include the use of T-12 fluorescent, T-8 fluorescent, incandescent and halogen. The lamp wattages range from 31 watts to 200 watts with the majority being fluorescent T8 light fixtures with 32 Watt lamps. The incandescent lamps range from 75 watts to 100 watts and the Halogen are 200 watts. There are twenty nine (29) LED exit signs and nine (9) incandescent lamp exit signs.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade - General

Description: General

The lighting in the Southern Boulevard School is primarily made up of fluorescent fixtures with T-12 lamps and magnetic ballasts, T-8 lamps with electronic ballasts, incandescent lamps and halogen lamps. There is a closet, faculty room and a stairwell with incandescent lighting.

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

This ECM also includes replacement of all incandescent lamps to compact fluorescent lamps. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours.

Energy Savings Calculations:

The **Grade Lighting Audit ECM#1- General Appendix** outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = $25 per fixture; T-5 or T-8 (3-4 lamp) = $30 per fixture.

$$\text{Smart Start®}\ \textit{Incentive} = (\#\ of\ 1-2\ lamp\ \ fixtures \times\ \$\ 25) + (\#\ of\ 3-4\ lamp\ \ fixtures \times\ \$\ 30)$$
$$\text{Smart Start®}\ \textit{Incentive} = (11 \times\ \$\ 25) = \underline{\$275}$$

Replacement and Maintenance Savings are calculated as follows:

96T12: 11 fixtures x 2 lamps x ($4.30/lamp+ $5 labor/lamp) x 25 years x 2080 hrs/yr / 20,000 hours/lamp = $531.96 lifetime cost

59T8: 22 lamps x ($9.50/lamp+ $5 labor/lamp) x 25 years x 2080 hrs/yr / 30,000 hours/lamp = $552.93

Savings = T12 cost – T8 cost = $531.96 - $552.93 = (-$20.97) lifetime maintenance and cost savings (loss)

From the Smart Start Incentive appendix, there is no incentive for replacing incandescent lamps with compact fluorescent lamps. The incentive is only available if the entire light fixture is replaced. In most cases, the existing fixtures can be re-lamped by the facility's staff to obtain the energy savings without the expense of a new fixture and the involvement of an electrician to install a new fixture.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,325
NJ Smart Start Equipment Incentive ($):	$275
Net Installation Cost ($):	$2,050
Maintenance Savings ($/Yr):	($1)
Energy Savings ($/Yr):	$469
Total Yearly Savings ($/Yr):	$469
Estimated ECM Lifetime (Yr):	25
Simple Payback	4.4
Simple Lifetime ROI	471.4%
Simple Lifetime Maintenance Savings	($21)
Simple Lifetime Savings	$11,714
Internal Rate of Return (IRR)	23%
Net Present Value (NPV)	$6,109.36

* ECM#1 Calculations DO NOT include lighting control changes implemented in ECM#2. If ECM#1 and #2 are implemented together the savings will be relatively lower than shown above.

ECM #2: Install Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. There has been a belief that it is better to keep the lights on rather than to continuously switch them on and off. This on/off dilemma was studied, and it was determined that the best option is to turn the lights off whenever possible. Although this practice reduces the lamp life, the energy savings far outweigh the lamp replacement costs.

Lighting controls are available in many forms. Lighting controls can be as simplistic as an additional switch. Timeclocks are often used which allow the user to set an on/off schedule. Timeclocks range from a dial clock with on/off indicators to a small box the size of a thermostat with user programs for on/off schedule in digital format. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in all classrooms, private offices, conference rooms, restrooms, lunch rooms, lounges, file rooms, etc.

Energy Savings Calculations:

The **Investment Grade Lighting Audit ECM#2- Lighting Controls Appendix** outlines the proposed retrofits, costs, savings, and payback periods. The hallways of the building is a 24/7 facility while the majority of the building is only occupied 40 hours a week and other areas are only a few hours a day. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors and was calculated to be 9,366.4 kWh/year and $1,545/year.

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is $160/unit including material and labor. The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $140/unit. Total number of rooms to be retrofitted is 72. Total cost to install sensors is $140/ceiling unit x 72 units = $10,080.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,520
NJ Smart Start Equipment Incentive ($):	$1,440
Net Installation Cost ($):	$10,080
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,545
Total Yearly Savings ($/Yr):	$1,545
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.5
Simple Lifetime ROI	130.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$23,182
Internal Rate of Return (IRR)	13%
Net Present Value (NPV)	$8,369.60

ECM #3: Install LED Exit Signs

Description:

LED is an acronym for light-emitting-diode. LED's are small light sources that are readily associated with electronic equipment. LED exit signs have been manufactured in a variety of shapes and sizes. There are also retrofit kits that allow for simply modification of existing exit signs to accommodate LED technology. The benefits of LED technology are substantial. LED exit signs will last for 20-30 years without maintenance. This results in tremendous maintenance savings considering that incandescent or fluorescent lamps need to be replaced at a rate of 1-5 times per year. Lamp costs ($2-$7 each) and labor costs ($4-$10 per lamp) add up rapidly. Additionally, LED exit lights only uses 4 Watts. In comparison, conventional exit signs use 10-40 Watts. It is recommended that samples of the products be installed to confirm that they are compatible with the existing electrical system.

This EM replaces all exit signs with incandescent lamps with new exit signs containing LED technology.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in **Investment Grade Lighting Audit Appendix – ECM#3** that outlines the proposed retrofits, costs, savings, and payback periods.

(30 watts-4 watts) x 1 kW/1000 watts x 8760 hrs/yr x 9 fixtures = 2,049.84 kWh/yr. saved

2,049.84 kWh/yr x $0.165/kWh = $338.22 / yr. saved

Maintenance savings = 9 fixtures x 2 bulbs/fixture x ($3/bulb + $4/bulb installation) = $126/yr

NJ Smart Start® Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, $20/LED Exit sign (≤75kW facility connected load) and $10/LED Exit sign (≥75kW facility connected load).

9 LED Exit signs x $10/ LED Exit sign = $90

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$504
NJ Smart Start Equipment Incentive ($):	$90
Net Installation Cost ($):	$414
Maintenance Savings ($/Yr):	$126
Energy Savings ($/Yr):	$338
Total Yearly Savings ($/Yr):	$464
Estimated ECM Lifetime (Yr):	25
Simple Payback	0.9
Simple Lifetime ROI	2703.3%
Simple Lifetime Maintenance Savings	$3,150
Simple Lifetime Savings	$11,606
Internal Rate of Return (IRR)	112%
Net Present Value (NPV)	$7,669.53

ECM #4: Install T-5 Lighting System in Gym

Description:

The Gym is currently lit via eighteen (18) HID, 250 W Metal Halide fixtures that are mounted approximately 20'-0" above the finished floor. The lighting system is antiquated and the space would be better served with a more efficient, fluorescent lighting system. Studies have shown that metal halide lighting systems have a steep lumen depreciation rate (rate at which light is produced from fixture) which equates to approximately a 26% to 35% reduction in lighting output at 40% of the rated lamp life. In addition, the new fluorescent system will provide a better quality of light and save the Owner many dollars on replacement of the highly expensive metal halide lamps.

CEG recommends upgrading the lighting within the Gym to an energy-efficient T-5 lighting system that includes new lighting fixtures with high efficiency, electronic ballasts and T-5 high output (HO) lamps. The T-5 HO lamps are rated for 20,000 hours versus the 10,000 hours for the 250W Metal Halide lamps so there would be a savings in replacement cost and labor. In addition to the standard lighting features of the T-5 fixtures; a day-lighting option could be selected for the outside rows of light to take advantage of the natural daylight that provides light to the room during the day via the clerestory.

This measure replaces all the HID, 250 W Metal Halide fixtures in the Gym with a well-designed T-5 lighting system. Approximately twenty (18), 3-lamp T5HO high bay fixtures with reflectors and high-efficiency, electronic ballasts will be required in order to meet the mandated 50 foot-candle average within the Gym.

Energy Savings Calculations:

A detailed **Grade Lighting Audit ECM#4- T-5 Lighting System in Gym Appendix** that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, the replacement of a 250 W HID fixture to a T-5 or T-8 fixture warrants the following incentive: $50 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ fixtures \times\ \$50) = (18 \times \$50) = \underline{\$900}$$

Maintenance savings are calculated based on the facility operational hours as indicated by the Owner. For the Gym, the estimated operational hours are 2,080 hours per year. Based on the lamp life comparison, there will be five (5) complete lamp replacements required for the metal halide system at the time when two (2) complete lamp replacement would be required for the fluorescent lighting system. Based on industry pricing, the lamp cost for a 250W metal halide lamp is approximately ±$25 per lamp and a T-5 54HO fluorescent lamp is approximately ±$5 per lamp. Therefore, the maintenance savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ MH\ \ lamps \times\ \ \$25\ \ per\ lamp) - (\#\ of\ \ T5HO\ lamps \times \$5\ \ per\ lamp)$$

$$Maintenance\ Savings = (18\ lamps \times\ \ \$25\ \ per\ lamp) - (54\ lamps \times \$5\ \ per\ lamp) = \underline{\$180}$$
$$= \$180 / 25 \text{ years} = \$7.20/\text{year average maintenance savings}$$

It is pertinent to note, that installation labor was not included in the maintenance savings.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,400
NJ Smart Start Equipment Incentive ($):	$900
Net Installation Cost ($):	$4,500
Maintenance Savings ($/Yr):	$7
Energy Savings ($/Yr):	$420
Total Yearly Savings ($/Yr):	$427
Estimated ECM Lifetime (Yr):	25
Simple Payback	10.5
Simple Lifetime ROI	137.3%
Simple Lifetime Maintenance Savings	$180
Simple Lifetime Savings	$10,680
Internal Rate of Return (IRR)	8%
Net Present Value (NPV)	$2,938.90

ECM #5: Boiler Replacement – High Efficiency Upgrade

Description:

Heating is provided to the facility by two heating plants. The original basement heating plant, built in 1965 is outdated and can be more efficient. The newer heating plant, built in 2001 is adequately efficient and should remain in service.

In regards to the original plant, there are two (2) two H.B. Smith, Mills 450 series boiler, model 450-W-13, 3,370 MBH Natural Gas input each, natural gas burner water boilers, which have a combustion efficiency of 78.3% when new. These boilers are 9 years past its ASHRAE useful service life.

This energy conservation measure will replace the gas fired boilers serving the original facility. The calculation is based on the following equipment: Aerco, Benchmark BMK-3.0LN-2 condensing boiler or equivalent. The existing units will be replaced with high energy efficient units with capacities typical of the existing units.

Energy Savings Calculations:

Existing 2,640 MBH Gas Fired Boiler:

Rated Capacity = 5,280 MBh Input, 4,591.4 MBh Output (Natural Gas)

Combustion Efficiency = 78.3%
Age & Radiation Losses = 5%
Thermal Efficiency = 73.3%

Natural Gas Equipment List - Estimated Annual Usage per unit

Concord Engineering Group

Southern Boulevard

Manufacturer	Qty.	Model #	Serial #	Input (MBh)	% of Total Input	Estimated Annual Therms
H.B. SMITH	1	MILLS 450-W-13	41992H	3370	**33.02%**	**12,289.47**
H.B. SMITH	1	MILLS 450-W-13	781163 HI	3370	**33.02%**	**12,289.47**
H.B. SMITH	1	Series 28A-10	N2001-350	3172	**31.08%**	11,567.42
A.O. Smith	1	BT-80-112	L05M002900	75	**0.74%**	273.87
Rheem-Ruud	1	G75-125	URNG 1100G03000	125	**1.22%**	455.84
Ruud-Monel	1	Size 80-80		95.2	**0.93%**	347.17
			Total Input MBH	**10,207**	**1.00**	**37,223.23**
			Total Input Therms	102.1		
		Total Gas Consumption Therms / yr.		37223.23		

Replacement Gas Fired Boiler:

High-Efficiency Gas Fired Boiler

Rated Capacity = 6,000 MBh Input, 11,124 MBh maximum Output (Natural Gas)

Combustion Efficiency = 87.1%
Radiation Losses = 0.5%
Thermal Efficiency = 86.6%

Operating Data:

Heating Season Fuel Consumption = 24,579 Therms of natural (based on natural gas billing data and the square footage of the facility).

$$Heating\ Energy\ Savings = Fuel\ Consumption \times (New\ Furnace\ Efficiency - Old\ Furnace\ Efficiency)$$

Heating Energy Savings = 24,579 Therms x ((86.6% - 73.3%) / (86.6%)) = 3,775 Therms

Total Heating Cost savings

Heating Energy Cost Savings = Annual Energy Savings x $/Therm

Heating Energy Cost Savings = (3,775 Therms) x $1.521/Therm = $5,742/ yr.

Installed cost of two (2) new BMK3.0 LN 460/4, IRI 3000MBH input gas fired boilers with one (1) BMS II sequencing panel, sensor kit and installation is $195,750.

Equipment Incentives:

Heating Smart Start Equipment Incentive = ($1.75/MBh) = (6,000 MBh) x $1.75 = $10,500

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$195,750
NJ Smart Start Equipment Incentive ($):	$10,500
Net Installation Cost ($):	$185,250
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$5,795
Total Yearly Savings ($/Yr):	$5,795
Estimated ECM Lifetime (Yr):	35
Simple Payback	32.0
Simple Lifetime ROI	9.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$202,825
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	($60,731.56)

ECM #6: Domestic Water Heater Replacement

Description:

There are three (3) existing domestic water heaters. The existing (WH-1) Ruud-Monel size 80-80 with a 67 gallon tank, 95,200 BTUH input natural gas heater with 80% thermal efficiency and a nameplate recovery rate of 80 gallon per hour. The existing domestic water heater (WH-2) is a Rheem-Ruud model G75-125 with a 75 gallon tank, 125,000 BTUH input natural gas heater with 80% thermal efficiency and a nameplate recovery rate of 121.2 gallon/hr. The other domestic water heater (WH-3) is an A.O Smith model BT-80-112 with a 74 gallon tank and 75,000 BTUH input natural gas heater with an 80% thermal efficiency and a nameplate recovery rate of 72.82 gallons per hour.

This energy conservation measure will replace each of the three (3) existing water heaters with a 96% thermal efficient Bradford White model EF-60T-125E-3N gas fired domestic hot water heater having 125 MBH input and 60-gallon storage capacity or equivalent.

Energy Savings Calculations:

Existing Natural Gas DW Heater (WH1)
Rated Capacity = 95.2 MBH input; 67 gallons storage
Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Existing Natural Gas DW Heater (WH2)
Rated Capacity = 125 MBH input; 75 gallons storage
Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Existing Natural Gas DW Heater (WH2)
Rated Capacity = 75 MBH input; 74 gallons storage
Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Proposed Natural Gas-Fired, High-Efficiency DW Heater (WH1), (WH2), and (WH3)
Rated Capacity = 125 MBH input; 60 gallons storage
Thermal Efficiency = 96%
Radiation Losses = 0.5%
Net Efficiency = 95.5%

Natural Gas Equipment List - Estimated Annual Usage per unit

Concord Engineering Group

Southern Boulevard

Manufacturer	Qty.	Model #	Serial #	Input (MBh)	% of Total Input	Estimated Annual Therms
H.B. SMITH	1	MILLS 450-W-13	41992H	3370	**33.02%**	12,289.47
H.B. SMITH	1	MILLS 450-W-13	781163 HI	3370	**33.02%**	12,289.47
H.B. SMITH	1	Series 28A-10	N2001-350	3172	**31.08%**	11,567.42
A.O. Smith	1	BT-80-112	L05M002900	75	**0.74%**	**273.87**
Rheem-Ruud	1	G75-125	URNG 1100G03000	125	**1.22%**	**455.84**
Ruud-Monel	1	Size 80-80		95.2	**0.93%**	**347.17**
			Total Input MBH	**10,207**	**1.00**	**37,223.23**
			Total Input Therms	102.1		
			Total Gas Consumption Therms / yr.	37223.23		

Operating Data for Domestic Water Heater

$$\text{Estimated Consumption(WH1)} = \frac{95.2 MBH input}{10{,}207 MBH bldg input} \; x 37{,}223.23 Therms / year = 347.2 Therms / year$$

$$\text{Estimated Consumption(WH2)} = \frac{125 MBH input}{10{,}207 MBH bldg input} \; x 37{,}223.23 Therms / year = 455.8 Therms / year$$

$$\text{Estimated Consumption(WH3)} = \frac{75 MBH input}{10{,}207 MBH bldg input} \; x 37{,}223.23 Therms / year = 273.9 Therms / year$$

Energy Savings = Old Water Heater Energy Input x ((New Water Heater Efficiency – Old Water Heater) / New Water Heater Efficiency))

Energy Savings (WH1) = 347.2 Therms x (95.5% - 75%) = 74.2 Therms
(95.5%)

Energy Savings (WH2) = 455.8 Therms x (95.5% - 75%) = 97.9 Therms
(95.5%)

Energy Savings (WH3) = 273.9 Therms x (95.5% - 75%) = 58.8 Therms
(95.5%)

Total Energy Savings = (WH1) +(WH2) + (WH3)
= 74.2 Therms + 97.9 Therms + 58.8 Therms
= 230.9 Therms

Average Cost of Natural Gas = $1.521/Therm

Yearly Savings = 230.9 Therm x $1.521/ Therm = $351/year

Cost of (3) two Commercial Domestic Water Heater and Installation = $23,010

Simple Payback = $23,010 / $351 = 65.6 years

Smart Start Incentive = $2.00/MBh x (95.2+125+75) /installed MBh = $590.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$23,010
NJ Smart Start Equipment Incentive ($):	$590
Net Installation Cost ($):	$22,420
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$351
Total Yearly Savings ($/Yr):	$351
Estimated ECM Lifetime (Yr):	12
Simple Payback	63.9
Simple Lifetime ROI	-81.2%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$4,212
Internal Rate of Return (IRR)	-19%
Net Present Value (NPV)	($18,926.14)

ECM #7: High-Efficiency Split System Units

Description:

There is one (1) indoor air handling unit and one (1) outdoor condensing unit that is near the end of it's expected service life of fifteen (15) years as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. This split system was built in 1995 and is in fair condition. Due to escalating owning and maintenance costs, this unit can be replaced. The unit is 3,000 CFM (cubic feet per minute) capacity, 7.6 tons cooling.

This measure would replace the air handling and condensing unit with energy-efficient variable air volume air handler with DX cooling and hot water heating coil, variable air volume zone control dampers and an energy efficient condensing unit, by Trane or approved equivalent.

Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}} \right) \times Avg.LoadFactor \times Hrs.ofCooling$$

Existing Trane 7.5-Ton CU

Rated Capacity = 7.5 Tons per unit
Condenser Section Efficiency = 10.3 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.165/kWh

Proposed High-Efficiency 7.5-Ton Condensing Unit

Rated Capacity = 7.5 Tons per Unit
New Cooling Unit Efficiency = 11.5 EER

$$EnergySavings = \frac{[7.5Tons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{10.3} - \frac{1}{11.5} \right) \times 0.8 \times 1800 = 1{,}313\,kWh/yr \text{ per unit}$$

Total Energy Cost Savings = (1,313) kWh/yr. x $0.165/kWh = $216.64 per year per unit

Installation costs for the 7.5 nominal Ton split system Air handling unit and condensing unit replacements with matching capacity are estimated at $21,900. It is pertinent to note that this estimate includes the demolition of the existing units.

NJ Smart Start® Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, the rooftop unit replacement falls under the category "Unitary HVAC" and warrants an incentive based on efficiency (EER) at a certain cooling tonnage.

$$\text{Smart Start®}\ Incentive\ (UnitaryHVAC / SplitSystems : 5.4 - 11.25\ Tons) = (Cooling\ Tons \times \ Incentive)$$
$$= 1 unit(7.5\ Tons \times \$73 / Ton) = \$547$$

$$\text{Smart Start®}\ Incentive\ DualEnthalpyEconomizerControls = \$250\ \text{x 1 units} = \$250$$

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$21,900
NJ Smart Start Equipment Incentive ($):	$797
Net Installation Cost ($):	$21,103
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$217
Total Yearly Savings ($/Yr):	$217
Estimated ECM Lifetime (Yr):	15
Simple Payback	97.4
Simple Lifetime ROI	-84.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,250
Internal Rate of Return (IRR)	-18%
Net Present Value (NPV)	($18,516.77)

ECM #8: DDC System – Southern Boulevard School

Description:

There is a Johnson Controls pneumatic controls system serving the original boiler room and original school building at the Southern Boulevard School. It appears to be original to the 1965 building. A Quincy air compressor, approximately 3 years old, with (2) 2hp motors provides air to the controls system. The system operates on a hot water reset schedule 0°F Outside air temperature (OA): 200°F Leaving Water Temperature (LWT), 15°F Outside air temperature (OA): 175°F Leaving Water Temperature (LWT), 30°F Outside air temperature (OA): 150°F Leaving Water Temperature (LWT), 45°F Outside air temperature (OA): 125°F Leaving Water Temperature (LWT), 60°F Outside air temperature (OA): 100°F Leaving Water Temperature (LWT). The system appears to be operational but is antiquated.

During initial discussions with the Owner it was noted that the hours of operation of the facility are generally 40 hours per week. Occasionally, there is additional after-hours usage during weeknights and weekends and thermostat adjustments are made by the person currently occupying the space instead on one general setpoint. This is a means for a cycling amongst different HVAC systems attempting to meet various setpoints throughout the year, independent of heating or cooling season. Therefore, a DDC system providing the Owner with full control over the HVAC equipment within the building appears to be an energy saving opportunity.

This ECM includes installing a Building Automation system with Direct Digital Controls (DDC) wired through an Ethernet backbone and front end controller within the Southern Boulevard School only. The system will include new thermostat controllers for all indoor air-handling systems and the rooftop units, in addition to each piece of equipment being wired back to a front end controller and computer interface. With the communication between the devices and the front end computer interface, the Owner will be able to take advantage of equipment scheduling for occupied and unoccupied periods based on the actual occupancy of the facility. Due to the fact that the Southern Boulevard School has diverse hours of occupancy, including evening and weekend hours, having supervisory control over all of the equipment makes sense. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours.

The new DDC system has the potential to provide substantial savings by controlling the HVAC systems as a whole and provide operating schedules and features such as space averaging, night set-back, temperature override control, etc. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings 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 referenced report:

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

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total energy cost for the facility.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $4.00 per SF in accordance with recent Contractor pricing for systems of this magnitude. Savings from the implementation of this ECM will be from the reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Cost of complete DDC System = ($4.00/SF x 61,907 SF) = $247,628

Heating Season Heating Degree Days = 4,996 HDD
Average Cost of Gas = $1.521 / Therm

Cooling Season Full Load Cooling Hrs. = 1,129 hrs / yr
Average Cost of Electricity = $0.165/ kWh

Note: Degree Days and Full Load Hours referenced from ASHRAE Weather Data for Newark, NJ.

Energy Savings Calculations:

10% Savings on Heating Calculations

$$Heat\ Load = \frac{Heat\ Loss\left(\frac{Btu}{Hr\ SF}\right) \times Area\ (SF)}{1000\left(\frac{Btu}{kBtu}\right)}$$

$$Heat\ Load = \frac{50\left(\frac{Btu}{Hr\ SF}\right) \times 61{,}907\ (SF)}{1000\left(\frac{Btu}{kBtu}\right)} = 3095.3\left(\frac{kBtu}{Hr}\right)$$

$$Est\ Heat\ Cons. = \frac{Heat\ Load\left(\frac{kBtu}{Hr}\right) \times Heat\ Deg\ Days \times 24\ Hrs \times Correction\ Factor}{Design\ Temp\ Difference(^{\circ}F) \times Efficiency(\%) \times Fuel\ Heat\ Value\left(\frac{kBtu}{Therm}\right)}$$

$$Est\ Heat\ Cons. = \frac{3{,}095\left(\frac{kBtu}{Hr}\right) \times 4{,}996\ (HDD) \times 24\ Hrs \times 0.6}{65\ (^{\circ}F) \times 80\% \times 100\left(\frac{kBtu}{Therm}\right)} = 42{,}820(Therms)$$

$$Savings. = Heat\ Cons.(Therms) \times 10\%\ Savings \times Ave\ Gas\ Cost\left(\frac{\$}{Therm}\right)$$

$$Savings. = 42{,}820\ (Therms) \times 10\% \times 1.521\left(\frac{\$}{Therm}\right) = \underline{\$6{,}513}$$

10% Savings on Cooling Calculations**:**

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

$$Est\ Cool\ Cons. = \frac{23.2\ (Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times 1{,}129\ Hrs.}{10.0\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)} = 31{,}431(kWh)$$

$$Savings. = Cool\ Cons.(kWh) \times 10\%\ Savings \times Ave\ Elec\ Cost\left(\frac{\$}{kWh}\right)$$

$$Savings. = 31{,}431\ (kWh) \times 10\% \times 0.165\left(\frac{\$}{kWh}\right) = \underline{\$518}$$

Total Annual Energy Savings = $6,513 + $518 = $7,031 per year

It is pertinent to note that electric demand savings were unable to be estimated. Also, incentives for the installation of the DDC system are not currently available and maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Estimated Maintenance Savings:

As stated before, a Johnson Controls electronic control system was installed in the 1995 addition but has since been ripped out and is now controlled manually. This ECM would eliminate the need to manually control this equipment and the savings is estimated as follows:

Maintenance Savings = 0.5 hrs/day x 5 days/week x 52 weeks/year x $20/hour = $2,600

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$247,628
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$247,628
Maintenance Savings ($/Yr):	$2,600
Energy Savings ($/Yr):	$7,031
Total Yearly Savings ($/Yr):	$9,631
Estimated ECM Lifetime (Yr):	15
Simple Payback	25.7
Simple Lifetime ROI	-41.7%
Simple Lifetime Maintenance Savings	$39,000
Simple Lifetime Savings	$144,465
Internal Rate of Return (IRR)	-6%
Net Present Value (NPV)	($132,653.75)

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy technologies for Southern Boulevard School, and concluded that there is potential for solar energy generation.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 9,755 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 152.72 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 190,380 KWh annually, reducing the overall utility bill by approximately 45.5% percent. A detailed financial analysis can be found in the **Renewable / Distributed Energy Measures Calculation Appendix**. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The proposed photovoltaic array layout is designed based on the specifications for the Sun Power SPR-230 panel. This panel has a "DC" rated full load output of 230 watts, and has a total panel conversion efficiency of 18%. Although panels rated at higher wattages are available through Sun Power and other various manufacturers, in general most manufacturers who produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the public entity if they wish to pursue the proposed solar recommendation without losing significant system capacity.

The array system capacity was sized on available roof space on the existing facility. Estimated solar array generation was then calculated based on the National Renewable Energy Laboratory PVWatts Version 1.0 Calculator. In order to calculate the array generation an appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%),

mismatch factor (98%), diodes and connections (100%), dc and ac wiring(98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age(new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 81%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the **Renewable/Distributed Energy Measures Calculation Appendix**.

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

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM			
PAYMENT TYPE	**SIMPLE PAYBACK**	**SIMPLE ROI**	**INTERNAL RATE OF RETURN**
Self-Finance	14 Years	78.3%	3.7%
Direct Purchase	14 Years	78.3%	5.7%

*The solar energy measure is shown for reference in the executive summary REM table

The resultant Internal Rate of Return indicates that if the Owner was able to "Direct Purchase" the solar project, the project would be slightly more beneficial to the Owner.

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 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 Electric Usage Profile demonstrates a fairly flat load profile throughout the year, with the exception of a sharp drop-off in January 2009. But for this exception the balance of the year is quite steady in consumption. The steady load in the summer suggests activities and use of the building during this time. Again, this is a multi-function facility with boiler rooms, electric room, cafeteria, offices classrooms, gymnasium, restrooms, library/media center, and music rooms. The steady summer time consumption is suggestive of cooling (air conditioner) load. In this facility air-conditioning is provided via (4) four split systems and (42) forty two window units. The split systems range from 3.5 – 7.5 nominal tons of capacity. This is unusual for a school, because typically schools are closed in the summer. However the steady and elevated summer load profile (March – October), with a unique peak in November, is supported by the amount of multi-use rooms in this facility. Currently this facility's electric supply is provided by JCP&L (Jersey Central Power and Light). CEG will provide options for this under the Recommendations section. A flatter load profile of this type, will allow for more competitive energy prices when shopping for alternative energy suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical heating load profile. An increase in consumption is observed September through March during the standard heating season. Heating for this facility is provided by (2) two boiler plants which provide hot water for heating. The boiler plant consists of (2) two H.B. Smith Mills hot water boilers serviced by natural gas. The 2001 addition has a H.B Smith boiler that serves the 1988 building. There is (1) one heat and ventilation unit in the custodial room serving the cafeteria. The heating hot water serves (25) twenty five unit ventilators, (9) nine unit heaters and (29) twenty nine fin tube radiators in the original building. The heating hot water serves (3) three cabinet unit heaters, (2) two heat and ventilation units, (1) one unit ventilator and (2) two fin tube radiators in the 1988 gym addition.

Domestic Hot Water: The original building has a 75 gallon natural gas fired A.O. Smith hot water heater. The 1988 addition has a Rheem Ruud 75 gallon natural gas fired water heater. The original building has a Ruud Monel, 67 gallon natural gas fired hot water heater.

Natural gas Delivery-service is provided by Public Service Electric and Gas Company (PSE&G) on an LVG rate schedule. Commodity service is supplied by the Hess Corporation, the Third Party

Supplier. This consistent load profile is beneficial when looking at supply options with a new Third Party Supplier.

Tariff:

Electricity:

This facility receives electrical service through Jersey Central Power & Light (JCP&L) on a GSS (General Service Secondary – 3 Phase) rate. Service classification GS 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 three phase service at secondary voltages. For electric supply (generation), the customer uses the service of a JCP&L. This facility uses the Delivery Service of the utility (JCP&L). The Delivery Service 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. The Generation Service is provided by JCP&L under BGS (Basic Generation Service). BGS Energy and Reconciliation Charges are provided in Rider BGS-FP (fixed pricing) or BGS-CIEP (Commercial Industrial Energy Pricing). BGS also has a Transmission component to its charge.

Natural Gas:

This facility receives utility service through Public Service Electric and Gas Company (PSE&G). This facility utilizes the Delivery Service from PSE&G while receiving Commodity service from a Third Party Supplier (TPS), Hess Corporation.

LVG Rate: This utility tariff is for "firm" delivery service for general purposes. This rate schedule has a Delivery Charge, Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS). Note: Should the TPS not deliver, the customer may receive service from PSE&G under Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service.

"Firm" delivery service defines the reliability of the transportation segment of the pricing. Much like the telecom industry, natural gas pipelines were un-bundled in the late 1990's and the space was divided up and marketed into reliability of service. Firm Service is said to be the most reliable and last in the pecking order for interruption. This service should not be interrupted.

Commodity Charges: Customer may choose to receive gas supply from either: A TPS or PSE&G through its Basic Gas Supply Service default service. PSE&G may also supply Emergency Sales Service in certain instances. This is at a much higher than normal rate. It should be perceived as a penalty.

This facility utilizes the services of a Third Party Supplier, The Hess Corporation. The contract is administered by The Alliance for Competitive Service (ACES). ACES is the energy aggregation program of the New Jersey School Boards Association of School Administrator's. The process was reviewed and approved by the New Jersey Department of Community Affairs.

Please see CEG recommendations below.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities. Good potential savings can be seen equally in the electric costs and the natural gas costs. The average price per kWh (kilowatt hour) for the High School based on a historical 1-year weighted average fixed price from the utility JCP&L is $.1415 / kWh (this is the fixed "price to compare" when shopping for energy procurement alternatives). The fixed weighted average price per decatherm for natural gas service in the High School, provided by the Hess Corporation (TPS) is $ 12.08 / dth (dth, is the common unit of measure). The natural gas prices are also the "prices to compare".

The "price to compare" is the netted cost of the energy (including other costs), that the customer will use to compare to Third Party Supply sources when shopping for alternative suppliers. For electricity this cost would not include the utility transmission and distribution chargers. For natural gas the cost would not include the utility distribution charges and is said to be delivered to the utilities city-gate.

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Chatham School District could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before energy prices increase. Based on electric supply from JCP&L and utilizing the historical consumption data provided (August 2008 through July 2009) and current electric rates, the school(s) could see an improvement in its electric costs of up to 25 % annually. (Note: Savings were calculated using Average Annual Consumption and a variance to a Fixed Average One-Year commodity contract). CEG recommends aggregating the entire electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".
CEG's second recommendation coincides with the natural gas costs. Based on the current alternative market pricing supplied by the Hess Corporation (ACES Agreement), CEG feels that School District could see an improvement of up to 33 % in its natural gas costs. CEG has experience with the mechanism for schools to buy energy in New Jersey. It is through the ACES Agreement (The Alliance for Competitive Energy Services) which is an energy aggregation program. From our experience, the basis price is the reason that the overall average price per dekatherm is ($12.08/dth). Therefore the average pricing formula supplied by Hess is 25 % above today's competitive market pricing. CEG recommends the school receive further advisement on these prices through an energy advisor. They should also consider procuring energy (natural gas) through an alternative supply source.

CEG also recommends scheduling a meeting with the current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), the municipality can learn more about the competitive supply process. The county can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. They should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the information for ongoing demand-side management projects. Furthermore, special attention should be given to credit mechanisms, imbalances, balancing charges and commodity charges when

meeting with the utility representative. The School District should ask the utility representative about alternative billing options, such as consolidated billing when utilizing the service of a Third Party Supplier. Finally, if the supplier for energy (natural gas) is changed, closely monitor balancing, particularly when the contract is close to termination. This could be performed with the aid of an "energy advisor".

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the Owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and par for the costs using the value of energy savings that result from the improvements. The "Energy Savings Improvement Program (ESIP)" law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.

ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.

iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as "power purchase agreements." These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party's work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

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

Total incentive is capped at 50% of the project cost. The program savings is broken down into three benchmarks; Energy Reduction Plan, Project Implementation, and Measurement and Verification. Each step provides additional incentives as the energy reduction project continues. The benchmark incentives are as follows:

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

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

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

CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

XI. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

A. Chemically clean the condenser and evaporator coils in the window AC units periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%. The 3-step process includes cleaning of the coils, rinsing and a micro biocide treatment. Thoroughly cleaned coils are not as susceptible to re-fouling so they stay clean longer, reducing the cleaning cycle frequency

B. Maintain all weather stripping on windows and doors.

C. Repair/replace damaged or missing ductwork insulation in the ceiling spaces.

D. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.

E. Recalibrate existing zone thermostats.

F. Clean all fixtures to maximize light output.

G. Feel for air drafts around electrical outlets. Inexpensive pads are available, as are plugs for unused sockets.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Southern Boulevard 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.	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 - General	$2,325	$0	$275	$2,050	$469	($1)	$469	25	$11,714	-$21	471.4%	4.4	22.72%	$6,109.36
ECM #2	Lighting Controls	$11,520	$0	$1,440	$10,080	$1,545	$0	$1,545	15	$23,182	$0	130.0%	6.5	12.82%	$8,369.60
ECM #3	LED EXIT SIGNS	$504	$0	$90	$414	$338	$126	$464	25	$11,606	$3,150	2703.3%	0.9	112.13%	$7,669.53
ECM #4	Lighting Upgrade - Gym	$5,400	$0	$900	$4,500	$420	$7	$427	25	$10,680	$180	137.3%	10.5	8.16%	$2,938.90
ECM #5	Boiler Replacement – High Efficiency Upgrade	$195,750	$0	$10,500	$185,250	$5,795	$0	$5,795	35	$202,825	$0	9.5%	32.0	0.51%	($60,731.56)
ECM #6	Domestic Water Heater Replacement	$23,010	$0	$590	$22,420	$351	$0	$351	12	$4,212	$0	-81.2%	63.9	-19.46%	($18,926.14)
ECM #7	High-Efficiency Split System Units	$21,900	$0	$797	$21,103	$217	$0	$217	15	$3,250	$0	-84.6%	97.4	-17.56%	($18,516.77)
ECM #8	DDC System	$247,628	$0	$0	$247,628	$7,031	$2,600	$9,631	15	$144,465	$39,000	-41.7%	25.7	-6.09%	($132,653.75)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solar PV Project	$1,374,480	$0	$0	$1,374,480	$31,413	$66,633	$98,046	25	$2,451,150	$1,665,825	78.3%	14.0	5.05%	$332,809.48

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.

2) The variable DR in the NPV equation stands for Discount Rate

3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period*.

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SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

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

Gas Cooling

Gas Absorption Chillers	$185 - $400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per hp
Compressors	$5,250 to $12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters >50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 - $30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive

MAJOR EQUIPMENT LIST

Concord Engineering Group

Southern Boulevard School

Boiler

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Orig., 1988 Add.	H.B. SMITH	1	MILLS 450-W-13	41992H	3370	2640	78.3%	Natural Gas	44	35	(-9)	
Basement	Orig., 1988 Add.	H.B. SMITH	1	MILLS 450-W-13	781163 HI	3370	2640	78.3%	Natural Gas	44	35	(-9)	
2001 Addition	2001 Addition	H.B. SMITH	1	Series 28A-10	N2001-350	3172	2498	78.8%	Natural Gas	8	35	27	

Boiler - Burner

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Orig., 1988 Add.	Power Flame	1	C2-GO-20B	78130449	3080	78.3	NG/ Oil	31	20	(-11)	
Basement	Orig., 1988 Add.	Power Flame	1	C2-GO-20B		3080	78.3	NG/ Oil	31	20	(-11)	
2001 Addition	Smith Series 28A		1	HG-35-S-2	40446-1		78.8%	NG	8	20	12	

Boiler - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Frame Size	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	
Basement	Orig., 1988 Add.	Weinman Pump Co.	2	2K B 2G	152662-1	7.5	1750	156	55	215T	208-220/240		44	20	(-24)	Base mounted
Basement	Orig., 1988 Add.	Armstrong	2	H-54BF	8906	0.75							10	10	0	in-line
2001 Boiler Rm	Smith Series 28A	Taco	2	1619C3N3U									8	10	2	in-line

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basemant	Orig., 1988 Add.	Ruud-Monel	1	Size 80-80		95.2	80	67	80	NG	54	12	(-42)	
Basemant	Orig., 1988 Add.	Rheem-Ruud	1	G75-125	URNG 1100G03000	125	121.2	75	80	NG	9	12	3	
Basemant	Orig., 1988 Add.	A.O. Smith	1	BT-80-112	L05M002900	75	72.82	74	80	NG	4	12	8	

DHW - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	Volts	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Orig., 1988 Add.	TACO	1	007-BF5		1/25			2000	10	1	ciculator

Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity (MBH)	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Music Room	Am. Std. Trane	1	TWE090300BV		DX R-22	10.3	92000						208-2320	3		1995	15	1	Mates with outdoor CU at Grade.

Split Systems and AC Condensers

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity Btu/h	Eff.	Refrigerant	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Rooftop		Fedders	2	C1048BBD3V	AS298427006X			R-22	208/230	3		2004			
Rooftop		Lennox	1	HS29-060-94	5801D31759			R-22	208/230	1					
Rooftop		Lennox	1	HS29-042-94	5801E 40263			R-22	208/230	3					
Rooftop		Heat Controller	1	SMA18SA-1		18000		R-410A	208/230	1					
Grade	Music Room/Basement	Am. Std. Trane	1	TT090A300CB	K2945P1AH	90000	10.3	R-22	208-230	3		1995	15	1	

Window AC Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity Btu/h	Eff.	Refrigerant	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Classrooms		Airtemp	1	CSM12E25	LZ177856 3138	12500		R-22	115	1	12				
Classrooms		Friedrich	3	KS15J10-A	LDFR20065	14500	10.8	R-22	115	1	12	2004			
Classrooms		Airtemp	1	B3D18E7A	KH192168 2906	18000/17500		R-22	230/208	1	7.9/8.5				
Classrooms		Air Exchanger	1	ASM12E25	KZ138371-2998	12500		R-22	115	1	12				
Classrooms		Airtemp	1	CSL19E75	MZ 265839 3438	18500		R-22	230/208	1	11/11.5				
Classrooms		Friedrich	8	KM18L30-C	LHM2001301	17800/17600	10	R-22	230/208	1	8.1/8.8	2008			
Classrooms		Friedrich	1	KM18J30C-A	LDDR04574	18000/17700		R-22	230/208	1	8.3/9.2	2004			
Classrooms		White-Westinghouse	2	WAS185F2A1	JK70312501	18000/17600		R-22	230/208	1	8.5/9				
Classrooms		Fridgidaire Gallery	3	FAS22512A2	JK10900033	22000		R-22	208/230	1		2001			
Classrooms		Fridgidaire Gallery	1	FAL125J1A3	JK0157099	12000	9.5	R-22	115	1		2000			
		Quasar	1	HQ2102GH	1409500310	10000	9.5	R-22	115	1					
		Emerson Quiet Cool	1	12DD40		18000/17500	10		208/230	1					
Classrooms		Friedrich	3	KM18L30-A	LEERG2601	17800/17600		R-22	230/208	1		2005			
		Friedrich	1	KS15L10-B	LGAR02392	14500	10.8	R-22	115	1	12	2007			
		Friedrich	1	KM18L30-B	LGER00206	17800/17600	10	R-22	208/230	1		2007			

Air Compressor

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	Pressure	Capacity	Volts	Phase	FLA	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Original Bldg	Quincy	1			(2) 2 hp motor			200	3					

Heating and Ventilation Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Heating Coil	Cooling Capacity (Btu/h)	Fan HP	Fan RPM	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Classrooms	Classrooms	AAF	2	U.AZO.4.024.C.G.65.Z.19.AL.22.G.W.B.1	280202000	HW, 1 Row	24,000 BTU	0.33		208	1		7			DX Cooling

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Southern Blvd School

Building ID: 1830643
For 12-month Period Ending: July 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 15, 2009

Facility
Southern Blvd School
192 Southern Blvd
Chatham, NJ 07928

Facility Owner
School District of the Chathams
58 Meyersville Road
Chatham, NJ 07928

Primary Contact for this Facility
Ralph Goodwin
58 Meyersville Road
Chatham, NJ 07928

Year Built: 1955
Gross Floor Area (ft²): 61,907

Energy Performance Rating[2] (1-100) 36

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,425,534
Natural Gas (kBtu)[4]	3,722,324
Total Energy (kBtu)	5,147,858

Energy Intensity[5]

Site (kBtu/ft²/yr)	83
Source (kBtu/ft²/yr)	140

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	415

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	73
National Average Source EUI	124
% Difference from National Average Source EUI	13%
Building Type	K-12 School

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Raymond Johnson
520 South Burnt Mill Road
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) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Southern Blvd 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	192 Southern Blvd, Chatham, NJ 07928	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		☐
Southern Blvd School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	61,907 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	108	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	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	60 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	90 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	10 (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: Jersey Central Power & Lt Co

Fuel Type: Electricity		
Meter: G28743023 JCP&L (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
07/01/2009	07/31/2009	18,800.00
06/01/2009	06/30/2009	21,920.00
05/01/2009	05/31/2009	23,320.00
04/01/2009	04/30/2009	24,720.00
03/01/2009	03/31/2009	18,880.00
02/01/2009	02/28/2009	26,400.00
01/01/2009	01/31/2009	16,240.00
12/01/2008	12/31/2008	24,400.00
11/01/2008	11/30/2008	27,440.00
10/01/2008	10/31/2008	21,920.00
09/01/2008	09/30/2008	20,560.00
08/01/2008	08/31/2008	19,840.00
G28743023 JCP&L Consumption (kWh (thousand Watt-hours))		**264,440.00**
G28743023 JCP&L Consumption (kBtu (thousand Btu))		**902,269.28**
Meter: G16589718 JCP&L (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
07/01/2009	07/31/2009	14,400.00
06/01/2009	06/30/2009	15,480.00
05/01/2009	05/31/2009	14,160.00
04/01/2009	04/30/2009	11,400.00
03/01/2009	03/31/2009	11,040.00
02/01/2009	02/28/2009	12,840.00
01/01/2009	01/31/2009	7,680.00
12/01/2008	12/31/2008	13,320.00
11/01/2008	11/30/2008	13,920.00
10/01/2008	10/31/2008	13,560.00
09/01/2008	09/30/2008	11,640.00
08/01/2008	08/31/2008	13,920.00
G16589718 JCP&L Consumption (kWh (thousand Watt-hours))		**153,360.00**

G16589718 JCP&L Consumption (kBtu (thousand Btu))	**523,264.32**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))	**1,425,533.60**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?	☐

Fuel Type: Natural Gas

Meter: 1874132, 1810551 PSE&G (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
07/01/2009	07/31/2009	60.46
06/01/2009	06/30/2009	78.18
05/01/2009	05/31/2009	380.09
04/01/2009	04/30/2009	1,719.89
03/01/2009	03/31/2009	4,563.15
02/01/2009	02/28/2009	6,307.56
01/01/2009	01/31/2009	7,603.17
12/01/2008	12/31/2008	7,074.66
11/01/2008	11/30/2008	6,195.02
10/01/2008	10/31/2008	2,968.93
09/01/2008	09/30/2008	207.19
08/01/2008	08/31/2008	64.94

1874132, 1810551 PSE&G Consumption (therms)	**37,223.24**
1874132, 1810551 PSE&G Consumption (kBtu (thousand Btu))	**3,722,324.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**3,722,324.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

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

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

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Southern Blvd School
192 Southern Blvd
Chatham, NJ 07928

Facility Owner
School District of the Chathams
58 Meyersville Road
Chatham, NJ 07928

Primary Contact for this Facility
Ralph Goodwin
58 Meyersville Road
Chatham, NJ 07928

General Information

Southern Blvd School	
Gross Floor Area Excluding Parking: (ft^2)	61,907
Year Built	1955
For 12-month Evaluation Period Ending Date:	July 31, 2009

Facility Space Use Summary

Southern Blvd School	
Space Type	K-12 School
Gross Floor Area(ft^2)	61,907
Open Weekends?	No
Number of PCs	108
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	60
Percent Heated	90
Months°	10
High School?	No
School District°	Chatham

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 07/31/2009)	**Baseline** (Ending Date 07/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	36	36	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	83	83	57	N/A	73
Source ($kBtu/ft^2$)	140	140	97	N/A	124
Energy Cost					
$/year	$ 80,971.99	$ 80,971.99	$ 55,945.17	N/A	$ 71,545.55
$/$ft^2$/year	$ 1.31	$ 1.31	$ 0.91	N/A	$ 1.16
Greenhouse Gas Emissions					
$MtCO_2e$/year	415	415	287	N/A	367
$kgCO_2e/ft^2$/year	7	7	5	N/A	6

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

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

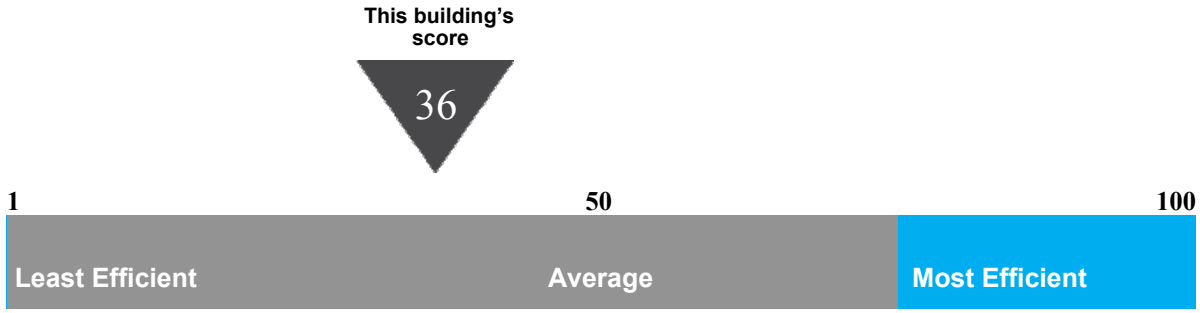
Statement of Energy Performance

2009

Southern Blvd School
192 Southern Blvd
Chatham, NJ 07928

Portfolio Manager Building ID: 1830643

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 140 kBtu per square foot per year.*

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

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

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

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 10/15/2009

CEG Job #: 9C09078
Project: School District of the Chathams — **Southern Boulevard School** — **KWH COST** **$0.165**
Address: 192 Southern Blvd
Chatham, NJ
Building SF: 61,907

ECM #1: 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
10	Closet	260	3	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.17	45.2	$7.46	3	2	No Change	58	0.17	45.24	$7.46	$0.00	$0.00	0.00	0	$0.00	0.00
20	122	2080	14	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	58	0.81	1,689.0	$278.68	14	2	No Change	58	0.81	1688.96	$278.68	$0.00	$0.00	0.00	0	$0.00	0.00
12	122	2080	5	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	82	0.41	852.8	$140.71	5	3	No Change	82	0.41	852.8	$140.71	$0.00	$0.00	0.00	0	$0.00	0.00
8	125	2080	3	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	108	0.32	673.9	$111.20	3	3	No Change	108	0.32	673.92	$111.20	$0.00	$0.00	0.00	0	$0.00	0.00
12	125	2080	14	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	82	1.15	2,387.8	$393.99	14	3	No Change	82	1.15	2387.84	$393.99	$0.00	$0.00	0.00	0	$0.00	0.00
10	125	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.12	241.3	$39.81	2	2	No Change	58	0.12	241.28	$39.81	$0.00	$0.00	0.00	0	$0.00	0.00
17	Gym	2080	18	1	Halogen 1 Lamp Magnetic Ballast Surface Mounting	200	3.60	7,488.0	$1,235.52	18	1	No Change	200	3.60	7488	$1,235.52	$0.00	$0.00	0.00	0	$0.00	0.00
1	106	2080	20	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.56	1,164.8	$192.19	20	1	No Change	28	0.56	1164.8	$192.19	$0.00	$0.00	0.00	0	$0.00	0.00
7	106	2080	2	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.15	303.7	$50.11	2	2	No Change	73	0.15	303.68	$50.11	$0.00	$0.00	0.00	0	$0.00	0.00
1	105	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	No Change	28	0.50	1048.32	$172.97	$0.00	$0.00	0.00	0	$0.00	0.00
1	104	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	No Change	28	0.50	1048.32	$172.97	$0.00	$0.00	0.00	0	$0.00	0.00
1	103	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	No Change	28	0.50	1048.32	$172.97	$0.00	$0.00	0.00	0	$0.00	0.00
1	102	2080	14	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.39	815.4	$134.53	14	1	No Change	28	0.39	815.36	$134.53	$0.00	$0.00	0.00	0	$0.00	0.00
1	101	2080	14	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.39	815.4	$134.53	14	1	No Change	28	0.39	815.36	$134.53	$0.00	$0.00	0.00	0	$0.00	0.00

10	Faculty Rm	2080	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.23	482.6	$79.62	4	2	No Change	58	0.23	482.56	$79.62	$0.00	$0.00	0.00	0	$0.00	0.00
23	Faculty Rm	2080	1	1	Incadescent 100 watt	100	0.10	208.0	$34.32	1	0	Eiko-30w mini sprial	30	0.03	62.4	$10.30	$6.00	$6.00	0.07	145.6	$24.02	0.25
2	Faculty Rm	2080	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.06	120.6	$19.91	1	2	No Change	58	0.06	120.64	$19.91	$0.00	$0.00	0.00	0	$0.00	0.00
3	Faculty Rm	2080	4	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Parabolic Lens	58	0.23	482.6	$79.62	4	2	No Change	58	0.23	482.56	$79.62	$0.00	$0.00	0.00	0	$0.00	0.00
10	Nurse	2080	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.46	965.1	$159.24	8	2	No Change	58	0.46	965.12	$159.24	$0.00	$0.00	0.00	0	$0.00	0.00
2	Nurse	2080	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.06	120.6	$19.91	1	2	No Change	58	0.06	120.64	$19.91	$0.00	$0.00	0.00	0	$0.00	0.00
7	Nurse	2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.07	151.8	$25.05	1	2	No Change	73	0.07	151.84	$25.05	$0.00	$0.00	0.00	0	$0.00	0.00
14	Bathroom	2080	1	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.11	226.7	$37.41	1	4	No Change	109	0.11	226.72	$37.41	$0.00	$0.00	0.00	0	$0.00	0.00
10	Closet	260	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.06	15.1	$2.49	1	2	No Change	58	0.06	15.08	$2.49	$0.00	$0.00	0.00	0	$0.00	0.00
23	Closet	260	1	1	Incadescent 100 watt	100	0.10	26.0	$4.29	1	0	Eiko-30w mini sprial	30	0.03	7.8	$1.29	$6.00	$6.00	0.07	18.2	$3.00	2.00
15	100	2080	12	6	T8 2x4 6 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	167	2.00	4,168.3	$687.77	12	6	No Change	167	2.00	4168.32	$687.77	$0.00	$0.00	0.00	0	$0.00	0.00
10	Office	2080	3	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.17	361.9	$59.72	3	2	No Change	58	0.17	361.92	$59.72	$0.00	$0.00	0.00	0	$0.00	0.00
3	Office	2080	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Parabolic Lens	58	0.06	120.6	$19.91	1	2	No Change	58	0.06	120.64	$19.91	$0.00	$0.00	0.00	0	$0.00	0.00
14	Bathroom	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	No Change	109	0.22	453.44	$74.82	$0.00	$0.00	0.00	0	$0.00	0.00
13	Bathroom	2080	1	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.08	170.6	$28.14	1	3	No Change	82	0.08	170.56	$28.14	$0.00	$0.00	0.00	0	$0.00	0.00
13	208	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
14	Bathroom	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	No Change	109	0.22	453.44	$74.82	$0.00	$0.00	0.00	0	$0.00	0.00

13	Art Room	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
11	Art Room	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Surface Mouted Prismatic Lens	58	0.06	120.6	$19.91	1	2	No Change	58	0.06	120.64	$19.91	$0.00	$0.00	0.00	0	$0.00	0.00
13	201	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
13	202	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
14	203	2080	12	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	1.31	2,720.6	$448.91	12	4	No Change	109	1.31	2720.64	$448.91	$0.00	$0.00	0.00	0	$0.00	0.00
13	204	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
22	Stairwell	2080	1	1	Incadescent 75 watt	75	0.08	156.0	$25.74	1	0	Eiko-25w mini sprial	25	0.03	52	$8.58	$5.75	$5.75	0.05	104	$17.16	0.34
2	Stairwell	2080	5	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.29	603.2	$99.53	5	2	No Change	58	0.29	603.2	$99.53	$0.00	$0.00	0.00	0	$0.00	0.00
13	Hallway	2080	8	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.66	1,364.5	$225.14	8	3	No Change	82	0.66	1364.48	$225.14	$0.00	$0.00	0.00	0	$0.00	0.00
10	Hallway	2080	6	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.35	723.8	$119.43	6	2	No Change	58	0.35	723.84	$119.43	$0.00	$0.00	0.00	0	$0.00	0.00
2	Stairwell	2080	5	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.29	603.2	$99.53	5	2	No Change	58	0.29	603.2	$99.53	$0.00	$0.00	0.00	0	$0.00	0.00
10	45	2080	7	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.41	844.5	$139.34	7	2	No Change	58	0.41	844.48	$139.34	$0.00	$0.00	0.00	0	$0.00	0.00
14	Hallway	2080	19	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	2.07	4,307.7	$710.77	19	4	No Change	109	2.07	4307.68	$710.77	$0.00	$0.00	0.00	0	$0.00	0.00
16	Hallway	2080	2	6	T8 4x4 6 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	164	0.33	682.2	$112.57	2	6	No Change	164	0.33	682.24	$112.57	$0.00	$0.00	0.00	0	$0.00	0.00
8	Hallway	2080	5	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	108	0.54	1,123.2	$185.33	5	3	No Change	108	0.54	1123.2	$185.33	$0.00	$0.00	0.00	0	$0.00	0.00
4	Cafeteria	2080	36	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Parabolic Lens	58	2.09	4,343.0	$716.60	36	2	No Change	58	2.09	4343.04	$716.60	$0.00	$0.00	0.00	0	$0.00	0.00
6	Cafeteria	2080	6	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting No Lens	58	0.35	723.8	$119.43	6	2	No Change	58	0.35	723.84	$119.43	$0.00	$0.00	0.00	0	$0.00	0.00

5	Cafeteria	2080	6	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	58	0.35	723.8	$119.43	6	2	No Change	58	0.35	723.84	$119.43	$0.00	$0.00	0.00	0	$0.00	0.00
18	Electric Rm	2080	1	2	T12 1x8 2 Lamps Magnetic Ballast Pendant Mouting No Lens	210	0.21	436.8	$72.07	1	2	8' 2-Lamp T-8 Cooper Metalux, Electronic Ballast M/N 8TDIM-232-UNV-EB81-U	118	0.12	245.44	$40.50	$207.00	$207.00	0.09	191.36	$31.57	6.56
22	Electric Rm	2080	4	1	Incadescent 75 watt	75	0.30	624.0	$102.96	4	0	Eiko-25w mini sprial	25	0.10	208	$34.32	$5.75	$23.00	0.20	416	$68.64	0.34
14	Music Rm	2080	17	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	1.85	3,854.2	$635.95	17	4	No Change	109	1.85	3854.24	$635.95	$0.00	$0.00	0.00	0	$0.00	0.00
14	Basement Rms	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	No Change	109	0.22	453.44	$74.82	$0.00	$0.00	0.00	0	$0.00	0.00
14	Basement Rms	2080	10	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	1.09	2,267.2	$374.09	10	4	No Change	109	1.09	2267.2	$374.09	$0.00	$0.00	0.00	0	$0.00	0.00
26	Basement Rms	2080	6	2	T8 1x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.35	723.8	$119.43	6	2	No Change	58	0.35	723.84	$119.43	$0.00	$0.00	0.00	0	$0.00	0.00
10	Basement Rms	2080	7	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.41	844.5	$139.34	7	2	No Change	58	0.41	844.48	$139.34	$0.00	$0.00	0.00	0	$0.00	0.00
21	Basement Rms	2080	1	1	Incadescent 40 watt	40	0.04	83.2	$13.73	1	0	Eiko-13w mini sprial	13	0.01	27.04	$4.46	$7.19	$7.19	0.03	56.16	$9.27	0.78
10	Bathroom	2080	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.23	482.6	$79.62	4	2	No Change	58	0.23	482.56	$79.62	$0.00	$0.00	0.00	0	$0.00	0.00
10	Exit Stairs	2080	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.23	482.6	$79.62	4	2	No Change	58	0.23	482.56	$79.62	$0.00	$0.00	0.00	0	$0.00	0.00
9	Library	2080	41	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Parabolic Lens	108	4.43	9,210.2	$1,519.69	41	3	No Change	108	4.43	9210.24	$1,519.69	$0.00	$0.00	0.00	0	$0.00	0.00
20	Library	2080	16	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	58	0.93	1,930.2	$318.49	16	2	No Change	58	0.93	1930.24	$318.49	$0.00	$0.00	0.00	0	$0.00	0.00
12	Library	2080	3	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	82	0.25	511.7	$84.43	3	3	No Change	82	0.25	511.68	$84.43	$0.00	$0.00	0.00	0	$0.00	0.00
12	124	2080	14	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	82	1.15	2,387.8	$393.99	14	3	No Change	82	1.15	2387.84	$393.99	$0.00	$0.00	0.00	0	$0.00	0.00
9	124	2080	4	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Parabolic Lens	108	0.43	898.6	$148.26	4	3	No Change	108	0.43	898.56	$148.26	$0.00	$0.00	0.00	0	$0.00	0.00
10	Storage	260	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.06	15.1	$2.49	1	2	No Change	58	0.06	15.08	$2.49	$0.00	$0.00	0.00	0	$0.00	0.00

10	Bathroom	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.06	120.6	$19.91	1	2	No Change	58	0.06	120.64	$19.91	$0.00	$0.00	0.00	0	$0.00	0.00
14	Boys Room	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	No Change	109	0.22	453.44	$74.82	$0.00	$0.00	0.00	0	$0.00	0.00
7	Boys Room	2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.07	151.8	$25.05	1	2	No Change	73	0.07	151.84	$25.05	$0.00	$0.00	0.00	0	$0.00	0.00
14	Girls Room	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	No Change	109	0.22	453.44	$74.82	$0.00	$0.00	0.00	0	$0.00	0.00
7	Girls Room	2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.07	151.8	$25.05	1	2	No Change	73	0.07	151.84	$25.05	$0.00	$0.00	0.00	0	$0.00	0.00
1	107	2080	20	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.56	1,164.8	$192.19	20	1	No Change	28	0.56	1164.8	$192.19	$0.00	$0.00	0.00	0	$0.00	0.00
7	107	2080	2	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.15	303.7	$50.11	2	2	No Change	73	0.15	303.68	$50.11	$0.00	$0.00	0.00	0	$0.00	0.00
1	108	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	No Change	28	0.50	1048.32	$172.97	$0.00	$0.00	0.00	0	$0.00	0.00
1	108	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	No Change	28	0.50	1048.32	$172.97	$0.00	$0.00	0.00	0	$0.00	0.00
2	Boys Room	2080	2	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.12	241.3	$39.81	2	2	No Change	58	0.12	241.28	$39.81	$0.00	$0.00	0.00	0	$0.00	0.00
1	109	2080	14	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.39	815.4	$134.53	14	1	No Change	28	0.39	815.36	$134.53	$0.00	$0.00	0.00	0	$0.00	0.00
1	110	2080	14	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.39	815.4	$134.53	14	1	No Change	28	0.39	815.36	$134.53	$0.00	$0.00	0.00	0	$0.00	0.00
13	111	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
13	112	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
13	206	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
13	207	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
10	Boys Room	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.12	241.3	$39.81	2	2	No Change	58	0.12	241.28	$39.81	$0.00	$0.00	0.00	0	$0.00	0.00

13	205	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	No Change	82	0.98	2046.72	$337.71	$0.00	$0.00	0.00	0	$0.00	0.00
2	Stairwell	2080	5	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.29	603.2	$99.53	5	2	No Change	58	0.29	603.2	$99.53	$0.00	$0.00	0.00	0	$0.00	0.00
2	Stairwell	2080	5	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.29	603.2	$99.53	5	2	No Change	58	0.29	603.2	$99.53	$0.00	$0.00	0.00	0	$0.00	0.00
9	Staff Bathroom	2080	1	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Parabolic Lens	108	0.11	224.6	$37.07	1	3	No Change	108	0.11	224.64	$37.07	$0.00	$0.00	0.00	0	$0.00	0.00
13	Staff Bathroom	2080	2	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.16	341.1	$56.28	2	3	No Change	82	0.16	341.12	$56.28	$0.00	$0.00	0.00	0	$0.00	0.00
18	Gym Office	2080	8	2	T12 1x8 2 Lamps Magnetic Ballast Pendant Mouting No Lens	210	1.68	3,494.4	$576.58	8	2	8' 2-Lamp T-8 Cooper Metalux, Electronic Ballast M/N 8TDIM-232-UNV-EB81-U	118	0.94	1963.52	$323.98	$207.00	$1,656.00	0.74	1530.88	$252.60	6.56
19	Storage	2080	2	2	T12 1x8 2 Lamps Magnetic Ballast Surface Mounting Prismatic Lens	210	0.42	873.6	$144.14	2	2	8' 2-Lamp T-8 Cooper Metalux, Electronic Ballast M/N 8TDIM-232-UNV-EB81-U	118	0.24	490.88	$81.00	$207.00	$414.00	0.18	382.72	$63.15	6.56
	Totals		701	211			51.31	106,012.9	$17,492.13	701	206			49.88	103168	$17,022.72		$2,324.94	1.43	2844.9	$469.41	4.95

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

CEG Job #: 9C09078
Project: School District of the Chathams
Address: 192 Southern Blvd
Chatham, NJ
Building SF: 61,907

Southern Boulevard School

KWH COST: $0.165

ECM #2: 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. Lamps	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
10	Closet	260	3	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.17	45.2	$7.46	3	2	None	58	0.17	0%	45.24	$7.46	$0.00	$0.00	0.00	0	$0.00	0.00
20	122	2080	14	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	58	0.81	1,689.0	$278.68	14	2	Dual Technology Occupancy Sensor	58	0.81	10%	1520.064	$250.81	$160.00	$160.00	0.00	168.896	$27.87	5.74
12	122	2080	5	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	82	0.41	852.8	$140.71	5	3	Dual Technology Occupancy Sensor	82	0.41	10%	767.52	$126.64	$160.00	$160.00	0.00	85.28	$14.07	11.37
8	125	2080	3	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	108	0.32	673.9	$111.20	3	3	Dual Technology Occupancy Sensor	108	0.32	10%	606.528	$100.08	$160.00	$160.00	0.00	67.392	$11.12	14.39
12	125	2080	14	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	82	1.15	2,387.8	$393.99	14	3	Dual Technology Occupancy Sensor	82	1.15	10%	2149.056	$354.59	$160.00	$160.00	0.00	238.784	$39.40	4.06
10	125	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.12	241.3	$39.81	2	2	Dual Technology Occupancy Sensor	58	0.12	10%	217.152	$35.83	$160.00	$160.00	0.00	24.128	$3.98	40.19
17	Gym	2080	18	1	Halogen 1 Lamp Magnetic Ballast Surface Mounting	200	3.60	7,488.0	$1,235.52	18	1	Dual Technology Occupancy Sensor	200	3.60	10%	6739.2	$1,111.97	$160.00	$160.00	0.00	748.8	$123.55	1.30
1	106	2080	20	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.56	1,164.8	$192.19	20	1	Dual Technology Occupancy Sensor	28	0.56	10%	1048.32	$172.97	$160.00	$160.00	0.00	116.48	$19.22	8.33
7	106	2080	2	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.15	303.7	$50.11	2	2	Dual Technology Occupancy Sensor	73	0.15	10%	273.312	$45.10	$160.00	$160.00	0.00	30.368	$5.01	31.93
1	105	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	Dual Technology Occupancy Sensor	28	0.50	10%	943.488	$155.68	$160.00	$160.00	0.00	104.832	$17.30	9.25
1	104	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	Dual Technology Occupancy Sensor	28	0.50	10%	943.488	$155.68	$160.00	$160.00	0.00	104.832	$17.30	9.25
1	103	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	Dual Technology Occupancy Sensor	28	0.50	10%	943.488	$155.68	$160.00	$160.00	0.00	104.832	$17.30	9.25
1	102	2080	14	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.39	815.4	$134.53	14	1	Dual Technology Occupancy Sensor	28	0.39	10%	733.824	$121.08	$160.00	$160.00	0.00	81.536	$13.45	11.89
1	101	2080	14	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.39	815.4	$134.53	14	1	Dual Technology Occupancy Sensor	28	0.39	10%	733.824	$121.08	$160.00	$160.00	0.00	81.536	$13.45	11.89

10	Faculty Rm	2080	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.23	482.6	$79.62	4	2	Dual Technology Occupancy Sensor	58	0.23	10%	434.304	$71.66	$160.00	$160.00	0.00	48.256	$7.96	20.09
23	Faculty Rm	2080	1	1	Incadescent 100 watt	100	0.10	208.0	$34.32	1	0	Dual Technology Occupancy Sensor	100	0.10	10%	187.2	$30.89	$160.00	$160.00	0.00	20.8	$3.43	46.62
2	Faculty Rm	2080	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.06	120.6	$19.91	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$17.92	$160.00	$160.00	0.00	12.064	$1.99	80.38
3	Faculty Rm	2080	4	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Parabolic Lens	58	0.23	482.6	$79.62	4	2	Dual Technology Occupancy Sensor	58	0.23	10%	434.304	$71.66	$160.00	$160.00	0.00	48.256	$7.96	20.09
10	Nurse	2080	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.46	965.1	$159.24	8	2	Dual Technology Occupancy Sensor	58	0.46	10%	868.608	$143.32	$160.00	$160.00	0.00	96.512	$15.92	10.05
2	Nurse	2080	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.06	120.6	$19.91	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$17.92	$160.00	$160.00	0.00	12.064	$1.99	80.38
7	Nurse	2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.07	151.8	$25.05	1	2	Dual Technology Occupancy Sensor	73	0.07	10%	136.656	$22.55	$160.00	$160.00	0.00	15.184	$2.51	63.86
14	Bathroom	2080	1	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.11	226.7	$37.41	1	4	Dual Technology Occupancy Sensor	109	0.11	10%	204.048	$33.67	$160.00	$160.00	0.00	22.672	$3.74	42.77
10	Closet	260	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.06	15.1	$2.49	1	2	None	58	0.06	0%	15.08	$2.49	$0.00	$0.00	0.00	0	$0.00	0.00
23	Closet	260	1	1	Incadescent 100 watt	100	0.10	26.0	$4.29	1	0	None	100	0.10	0%	26	$4.29	$0.00	$0.00	0.00	0	$0.00	0.00
15	100	2080	12	6	T8 2x4 6 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	167	2.00	4,168.3	$687.77	12	6	Dual Technology Occupancy Sensor	167	2.00	10%	3751.488	$619.00	$160.00	$160.00	0.00	416.832	$68.78	2.33
10	Office	2080	3	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.17	361.9	$59.72	3	2	Dual Technology Occupancy Sensor	58	0.17	10%	325.728	$53.75	$160.00	$160.00	0.00	36.192	$5.97	26.79
3	Office	2080	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Parabolic Lens	58	0.06	120.6	$19.91	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$17.92	$160.00	$160.00	0.00	12.064	$1.99	80.38
14	Bathroom	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	Dual Technology Occupancy Sensor	109	0.22	10%	408.096	$67.34	$160.00	$160.00	0.00	45.344	$7.48	21.39
13	Bathroom	2080	1	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.08	170.6	$28.14	1	3	Dual Technology Occupancy Sensor	82	0.08	10%	153.504	$25.33	$160.00	$160.00	0.00	17.056	$2.81	56.85
13	208	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
14	Bathroom	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	Dual Technology Occupancy Sensor	109	0.22	10%	408.096	$67.34	$160.00	$160.00	0.00	45.344	$7.48	21.39
13	Art Room	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74

11	Art Room	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Surface Mouted Prismatic Lens	58	0.06	120.6	$19.91	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$17.92	$160.00	$160.00	0.00	12.064	$1.99	80.38
13	201	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
13	202	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
14	203	2080	12	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	1.31	2,720.6	$448.91	12	4	Dual Technology Occupancy Sensor	109	1.31	10%	2448.576	$404.02	$160.00	$160.00	0.00	272.064	$44.89	3.56
13	204	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
22	Stairwell	2080	1	1	Incadescent 75 watt	75	0.08	156.0	$25.74	1	0	None	75	0.08	0%	156	$25.74	$0.00	$0.00	0.00	0	$0.00	0.00
2	Stairwell	2080	5	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.29	603.2	$99.53	5	2	None	58	0.29	0%	603.2	$99.53	$0.00	$0.00	0.00	0	$0.00	0.00
13	Hallway	2080	8	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.66	1,364.5	$225.14	8	3	None	82	0.66	0%	1364.48	$225.14	$0.00	$0.00	0.00	0	$0.00	0.00
10	Hallway	2080	6	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.35	723.8	$119.43	6	2	None	58	0.35	0%	723.84	$119.43	$0.00	$0.00	0.00	0	$0.00	0.00
2	Stairwell	2080	5	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.29	603.2	$99.53	5	2	None	58	0.29	0%	603.2	$99.53	$0.00	$0.00	0.00	0	$0.00	0.00
10	45	2080	7	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.41	844.5	$139.34	7	2	Dual Technology Occupancy Sensor	58	0.41	10%	760.032	$125.41	$160.00	$160.00	0.00	84.448	$13.93	11.48
14	Hallway	2080	19	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	2.07	4,307.7	$710.77	19	4	None	109	2.07	0%	4307.68	$710.77	$0.00	$0.00	0.00	0	$0.00	0.00
16	Hallway	2080	2	6	T8 4x4 6 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	164	0.33	682.2	$112.57	2	6	None	164	0.33	0%	682.24	$112.57	$0.00	$0.00	0.00	0	$0.00	0.00
8	Hallway	2080	5	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	108	0.54	1,123.2	$185.33	5	3	None	108	0.54	0%	1123.2	$185.33	$0.00	$0.00	0.00	0	$0.00	0.00
4	Cafeteria	2080	36	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Parabolic Lens	58	2.09	4,343.0	$716.60	36	2	Dual Technology Occupancy Sensor	58	2.09	10%	3908.736	$644.94	$160.00	$160.00	0.00	434.304	$71.66	2.23
6	Cafeteria	2080	6	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting No Lens	58	0.35	723.8	$119.43	6	2	Dual Technology Occupancy Sensor	58	0.35	10%	651.456	$107.49	$160.00	$160.00	0.00	72.384	$11.94	13.40
5	Cafeteria	2080	6	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	58	0.35	723.8	$119.43	6	2	Dual Technology Occupancy Sensor	58	0.35	10%	651.456	$107.49	$160.00	$160.00	0.00	72.384	$11.94	13.40
18	Electric Rm	2080	1	2	T12 1x8 2 Lamps Magnetic Ballast Pendant Mouting No Lens	210	0.21	436.8	$72.07	1	2	Dual Technology Occupancy Sensor	210	0.21	10%	393.12	$64.86	$160.00	$160.00	0.00	43.68	$7.21	22.20

22	Electric Rm	2080	4	1	Incadescent 75 watt	75	0.30	624.0	$102.96	4	0	Dual Technology Occupancy Sensor	75	0.30	10%	561.6	$92.66	$160.00	$160.00	0.00	62.4	$10.30	15.54
14	Music Rm	2080	17	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	1.85	3,854.2	$635.95	17	4	Dual Technology Occupancy Sensor	109	1.85	10%	3468.816	$572.35	$160.00	$160.00	0.00	385.424	$63.59	2.52
14	Basement Rms	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	Dual Technology Occupancy Sensor	109	0.22	10%	408.096	$67.34	$160.00	$160.00	0.00	45.344	$7.48	21.39
14	Basement Rms	2080	10	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	1.09	2,267.2	$374.09	10	4	Dual Technology Occupancy Sensor	109	1.09	10%	2040.48	$336.68	$160.00	$160.00	0.00	226.72	$37.41	4.28
26	Basement Rms	2080	6	2	T8 1x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.35	723.8	$119.43	6	2	Dual Technology Occupancy Sensor	58	0.35	10%	651.456	$107.49	$160.00	$160.00	0.00	72.384	$11.94	13.40
10	Basement Rms	2080	7	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.41	844.5	$139.34	7	2	Dual Technology Occupancy Sensor	58	0.41	10%	760.032	$125.41	$160.00	$160.00	0.00	84.448	$13.93	11.48
21	Basement Rms	2080	1	1	Incadescent 40 watt	40	0.04	83.2	$13.73	1	0	Dual Technology Occupancy Sensor	40	0.04	10%	74.88	$12.36	$160.00	$160.00	0.00	8.32	$1.37	116.55
10	Bathroom	2080	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.23	482.6	$79.62	4	2	Dual Technology Occupancy Sensor	58	0.23	10%	434.304	$71.66	$160.00	$160.00	0.00	48.256	$7.96	20.09
10	Exit Stairs	2080	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.23	482.6	$79.62	4	2	None	58	0.23	0%	482.56	$79.62	$0.00	$0.00	0.00	0	$0.00	0.00
9	Library	2080	41	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Parabolic Lens	108	4.43	9,210.2	$1,519.69	41	3	Dual Technology Occupancy Sensor	108	4.43	10%	8289.216	$1,367.72	$160.00	$160.00	0.00	921.024	$151.97	1.05
20	Library	2080	16	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	58	0.93	1,930.2	$318.49	16	2	Dual Technology Occupancy Sensor	58	0.93	10%	1737.216	$286.64	$160.00	$160.00	0.00	193.024	$31.85	5.02
12	Library	2080	3	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	82	0.25	511.7	$84.43	3	3	Dual Technology Occupancy Sensor	82	0.25	10%	460.512	$75.98	$160.00	$160.00	0.00	51.168	$8.44	18.95
12	124	2080	14	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Parabolic Lens	82	1.15	2,387.8	$393.99	14	3	Dual Technology Occupancy Sensor	82	1.15	10%	2149.056	$354.59	$160.00	$160.00	0.00	238.784	$39.40	4.06
9	124	2080	4	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Parabolic Lens	108	0.43	898.6	$148.26	4	3	Dual Technology Occupancy Sensor	108	0.43	10%	808.704	$133.44	$160.00	$160.00	0.00	89.856	$14.83	10.79
10	Storage	260	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.06	15.1	$2.49	1	2	None	58	0.06	0%	15.08	$2.49	$0.00	$0.00	0.00	0	$0.00	0.00
10	Bathroom	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.06	120.6	$19.91	1	2	None	58	0.06	0%	120.64	$19.91	$0.00	$0.00	0.00	0	$0.00	0.00
14	Boys Room	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	Dual Technology Occupancy Sensor	109	0.22	10%	408.096	$67.34	$160.00	$160.00	0.00	45.344	$7.48	21.39
7	Boys Room	2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.07	151.8	$25.05	1	2	Dual Technology Occupancy Sensor	73	0.07	10%	136.656	$22.55	$160.00	$160.00	0.00	15.184	$2.51	63.86
14	Girls Room	2080	2	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	109	0.22	453.4	$74.82	2	4	Dual Technology Occupancy Sensor	109	0.22	10%	408.096	$67.34	$160.00	$160.00	0.00	45.344	$7.48	21.39
7	Girls Room	2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.07	151.8	$25.05	1	2	Dual Technology Occupancy Sensor	73	0.07	10%	136.656	$22.55	$160.00	$160.00	0.00	15.184	$2.51	63.86

1	107	2080	20	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.56	1,164.8	$192.19	20	1	Dual Technology Occupancy Sensor	28	0.56	10%	1048.32	$172.97	$160.00	$160.00	0.00	116.48	$19.22	8.33
7	107	2080	2	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mouting Prismatic Lens	73	0.15	303.7	$50.11	2	2	Dual Technology Occupancy Sensor	73	0.15	10%	273.312	$45.10	$160.00	$160.00	0.00	30.368	$5.01	31.93

1	108	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	Dual Technology Occupancy Sensor	28	0.50	10%	943.488	$155.68	$160.00	$160.00	0.00	104.832	$17.30	9.25
1	108	2080	18	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.50	1,048.3	$172.97	18	1	Dual Technology Occupancy Sensor	28	0.50	10%	943.488	$155.68	$160.00	$160.00	0.00	104.832	$17.30	9.25
2	Boys Room	2080	2	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.12	241.3	$39.81	2	2	Dual Technology Occupancy Sensor	58	0.12	10%	217.152	$35.83	$160.00	$160.00	0.00	24.128	$3.98	40.19
1	109	2080	14	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.39	815.4	$134.53	14	1	Dual Technology Occupancy Sensor	28	0.39	10%	733.824	$121.08	$160.00	$160.00	0.00	81.536	$13.45	11.89
1	110	2080	14	1	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	28	0.39	815.4	$134.53	14	1	Dual Technology Occupancy Sensor	28	0.39	10%	733.824	$121.08	$160.00	$160.00	0.00	81.536	$13.45	11.89
13	111	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
13	112	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
13	206	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
13	207	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
10	Boys Room	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	58	0.12	241.3	$39.81	2	2	Dual Technology Occupancy Sensor	58	0.12	10%	217.152	$35.83	$160.00	$160.00	0.00	24.128	$3.98	40.19
13	205	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.98	2,046.7	$337.71	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$303.94	$160.00	$160.00	0.00	204.672	$33.77	4.74
2	Stairwell	2080	5	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.29	603.2	$99.53	5	2	None	58	0.29	0%	603.2	$99.53	$0.00	$0.00	0.00	0	$0.00	0.00
2	Stairwell	2080	5	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	58	0.29	603.2	$99.53	5	2	None	58	0.29	0%	603.2	$99.53	$0.00	$0.00	0.00	0	$0.00	0.00
9	Staff Bathroom	2080	1	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mouting Parabolic Lens	108	0.11	224.6	$37.07	1	3	Dual Technology Occupancy Sensor	108	0.11	10%	202.176	$33.36	$160.00	$160.00	0.00	22.464	$3.71	43.17
13	Staff Bathroom	2080	2	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mouting Prismatic Lens	82	0.16	341.1	$56.28	2	3	Dual Technology Occupancy Sensor	82	0.16	10%	307.008	$50.66	$160.00	$160.00	0.00	34.112	$5.63	28.43
18	Gym Office	2080	8	2	T12 1x8 2 Lamps Magnetic Ballast Pendant Mouting No Lens	210	1.68	3,494.4	$576.58	8	2	Dual Technology Occupancy Sensor	210	1.68	10%	3144.96	$518.92	$160.00	$160.00	0.00	349.44	$57.66	2.78
19	Storage	2080	2	2	T12 1x8 2 Lamps Magnetic Ballast Surface Mounting Prismatic Lens	210	0.42	873.6	$144.14	2	2	None	210	0.42	0%	873.6	$144.14	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		701	211			51.31	106,012.9	$17,492.13	701	206			51.309		96646.47	$15,946.67		$11,520.00	0.00	9366.4	$1,545.46	7.45

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

CEG Job #: 9C09078
Project: School District of the Chathams
Address: 192 Southern Blvd
Chatham, NJ
Building SF: 61,907

Southern Boulevard School

KWH COST **$0.165**

ECM #3: LED EXIT SIGNS

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
24	Throughout	8760	28	0	LED Exit Signs	4	0.11	981.1	$161.88	28	0	No Change	4	0.11	981.12	$161.88	$0.00	$0.00	0.00	0	$0.00	0.00
25	Throughout	8760	9	0	INC Exit Signs	30	0.27	2,365.2	$390.26	9	0	Exit Sign - LED	4	0.04	315.36	$52.03	$56.00	$504.00	0.23	2049.84	$338.22	1.49
	Totals		37	0			0.38	3,346.3	$552.14	37	0			0.148	1296.48	$213.92		$504.00	0.23	2049.8	$338.22	1.49

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

CEG Job #: 9C09078
Project: School District of the Chathams
Address: 192 Southern Blvd
Chatham, NJ
Building SF: 61,907

Southern Boulevard School

KWH COST **$0.165**

ECM #4: Lighting Upgrade - GYM

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
17	Gym	2080	18	1	Halogen 1 Lamp Magnetic Ballast Surface Mounting	250	4.50	9,360.0	$1,544.40	18	3	3-Lamp T-5 HO Cooper F-Bay	182	3.28	6814.08	$1,124.32	$300.00	$5,400.00	1.22	2545.92	$420.08	12.85
	Totals		18	1			4.50	9,360.0	$1,544.40	18	3			3.276	6814.08	$1,124.32		$5,400.00	1.22	2545.9	$420.08	12.85

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

Project Name: LGEA Solar PV Project - Southern Boulevard School
Location: Chatham, NJ
Description: Photovoltaic System 95% Financing - 25 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 25 year
Total Construction Cost	$1,374,480
Annual kWh Production	190,380
Annual Energy Cost Reduction	$31,413
Annual SREC Revenue	$66,633
First Cost Premium	**$1,374,480**
Simple Payback:	**14.02** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	300	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.165**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$68,724	0	0	0	$0	0	0	(68,724)	0
1	$0	190,380	$31,413	$0	$66,633	$90,770	$19,976	($12,700)	($81,424)
2	$0	189,428	$32,355	$0	$66,300	$89,326	$21,420	($12,091)	($93,515)
3	$0	188,481	$33,326	$0	$65,968	$87,778	$22,968	($11,452)	($104,967)
4	$0	187,539	$34,326	$0	$65,638	$86,117	$24,628	($10,782)	($115,748)
5	$0	186,601	$35,355	$1,922	$65,310	$84,337	$26,409	($12,002)	($127,750)
6	$0	185,668	$36,416	$1,912	$64,984	$82,428	$28,318	($11,258)	($139,009)
7	$0	184,740	$37,508	$1,903	$64,659	$80,381	$30,365	($10,481)	($149,490)
8	$0	183,816	$38,634	$1,893	$64,336	$78,186	$32,560	($9,670)	($159,160)
9	$0	182,897	$39,793	$1,884	$64,014	$75,832	$34,914	($8,823)	($167,983)
10	$0	181,982	$40,986	$1,874	$63,694	$73,308	$37,438	($7,940)	($175,923)
11	$0	181,072	$42,216	$1,865	$63,375	$70,601	$40,144	($7,019)	($182,942)
12	$0	180,167	$43,483	$1,856	$63,058	$67,699	$43,046	($6,060)	($189,003)
13	$0	179,266	$44,787	$1,846	$62,743	$64,588	$46,158	($5,062)	($194,065)
14	$0	178,370	$46,131	$1,837	$62,429	$61,251	$49,495	($4,023)	($198,088)
15	$0	177,478	$47,515	$1,828	$62,117	$57,673	$53,073	($2,942)	($201,030)
16	$0	176,591	$48,940	$1,819	$61,807	$53,836	$56,910	($1,818)	($202,848)
17	$0	175,708	$50,408	$1,810	$61,498	$49,722	$61,023	($650)	($203,497)
18	$0	174,829	$51,920	$1,801	$61,190	$45,311	$65,435	$564	($202,933)
19	$0	173,955	$53,478	$1,792	$60,884	$40,581	$70,165	$1,825	($201,109)
20	$0	173,085	$55,082	$1,783	$60,580	$35,508	$75,237	$3,134	($197,975)
21	$0	172,220	$56,735	$1,774	$60,277	$32,351	$69,166	$13,721	($184,254)
22	$0	171,359	$58,437	$1,765	$59,976	$26,142	$56,917	$33,588	($150,666)
23	$0	170,502	$60,190	$1,756	$59,676	$0	$0	$118,109	($32,556)
24	$0	169,649	$61,996	$1,747	$59,377	$0	$0	$119,626	$87,069
25	$0	168,801	$63,856	$1,739	$59,080	$0	$0	$121,197	$208,266
	Totals:	4,484,582	$1,145,284	$38,406	1,569,604	$1,433,725	$965,766	276,990	($3,360,600)
					Net Present Value (NPV)			**($64,739)**	
					Internal Rate of Return (IRR)			**3.7%**	

Project Name: **LGEA Solar PV Project - Southern Boulevard School**
Location: **Chatham, NJ**
Description: **Photovoltaic System - Direct Purchase**

Simple Payback Analysis

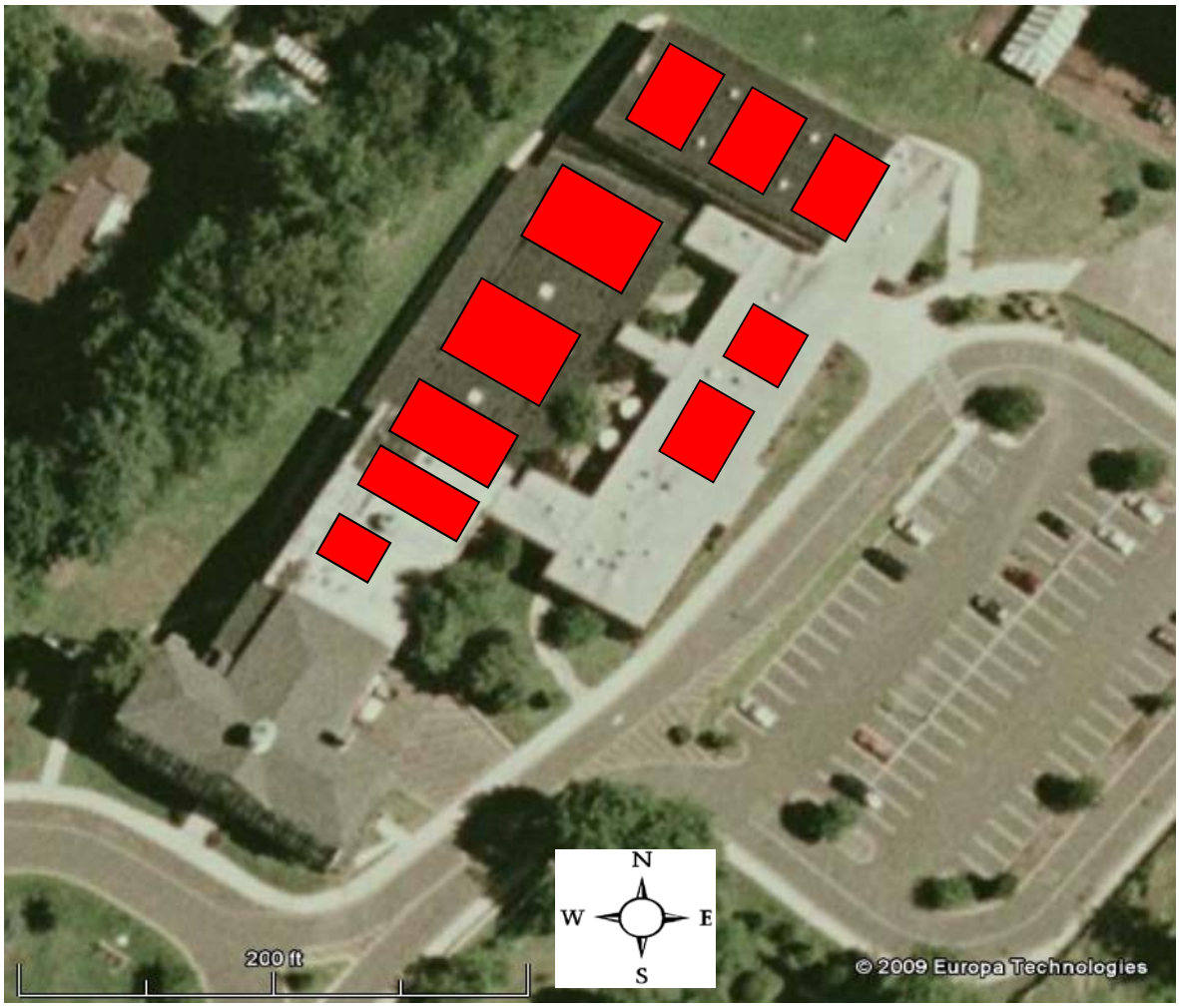
	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,374,480
Annual kWh Production	190,380
Annual Energy Cost Reduction	$31,413
Annual SREC Revenue	$66,633
First Cost Premium	**$1,374,480**
Simple Payback:	**14.02** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.165**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$1,374,480	0	0	0	$0	(1,374,480)	0
1	$0	190,380	$31,413	$0	$66,633	$98,046	($1,276,434)
2	$0	189,428	$32,355	$0	$66,300	$98,655	($1,177,779)
3	$0	188,481	$33,326	$0	$65,968	$99,294	($1,078,485)
4	$0	187,539	$34,326	$0	$65,638	$99,964	($978,521)
5	$0	186,601	$35,355	$1,922	$65,310	$98,744	($879,778)
6	$0	185,668	$36,416	$1,912	$64,984	$99,487	($780,290)
7	$0	184,740	$37,508	$1,903	$64,659	$100,264	($680,026)
8	$0	183,816	$38,634	$1,893	$64,336	$101,076	($578,950)
9	$0	182,897	$39,793	$1,884	$64,014	$101,923	($477,027)
10	$0	181,982	$40,986	$1,874	$63,694	$102,806	($374,222)
11	$0	181,072	$42,216	$1,865	$63,375	$103,726	($270,495)
12	$0	180,167	$43,483	$1,856	$63,058	$104,685	($165,810)
13	$0	179,266	$44,787	$1,846	$62,743	$105,684	($60,126)
14	$0	178,370	$46,131	$1,837	$62,429	$106,723	$46,597
15	$0	177,478	$47,515	$1,828	$62,117	$107,804	$154,400
16	$0	176,591	$48,940	$1,819	$61,807	$108,928	$263,328
17	$0	175,708	$50,408	$1,810	$61,498	$110,096	$373,424
18	$0	174,829	$51,920	$1,801	$61,190	$111,310	$484,734
19	$0	173,955	$53,478	$1,792	$60,884	$112,571	$597,304
20	$0	173,085	$55,082	$1,783	$60,580	$113,879	$711,184
21	$1	172,220	$56,735	$1,774	$60,277	$115,238	$826,422
22	$2	171,359	$58,437	$1,765	$59,976	$116,647	$943,069
23	$3	170,502	$60,190	$1,756	$59,676	$118,109	$1,061,179
24	$4	169,649	$61,996	$1,747	$59,377	$119,626	$1,180,804
25	$5	168,801	$63,856	$1,739	$59,080	$121,197	$1,302,001
	Totals:	4,484,582	1,145,284	38,406	1,569,604	2,676,481	(833,499)
					Net Present Value (NPV)	**$1,302,026**	
					Internal Rate of Return (IRR)	**5.7%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Southern Boulevard School	9755	Sunpower SPR230	664	14.7	9,764	152.72	190,380	21,912	15.64



.= Proposed PV Layout

Notes:

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

PVWatts Version 1 Input Screen

PV System Specifications:

DC Rating (kW):	152.72	Inputted From Roof Space Cell "G2" Total KW
DC to AC Derate Factor:	0.81	Inputted From Derate Factor Calculated Below in Cell "B37"
Array Type:	Fixed Tilt 1 - Axis Tracking 2 - Axis Tracking	There are 3 inputs for Array Type in all cases you should be using **Fixed Tilt** as the Selection
Fixed Tilt of Single Axis Tracking System:		
Array Tilt (degrees):	10	Based on Roof Type: For Flat Roof use 10 degrees, For Pitched Roof this is based on roof pitch.
Array Azimuth (degrees):	180	Based on Direction Array is Facing.

PV Watts Derate Factor for AC Power Rating at STC		
Component Derate Factors	PVWatts Default	Range
PV module nameplate DC rating	1.00	0.80–1.05
Inverter and transformer	0.95	0.88–0.96
Mismatch	0.98	0.97–0.995
Diodes and connections	1.00	0.99–0.997
DC wiring	0.98	0.97–0.99
AC wiring	0.99	0.98–0.993
1. Estimated kWH based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.	0.95	0.30–0.995
System availability	0.95	0.00–0.995
Shading	1.00	0.00–1.00
Sun-tracking	1.00	0.95–1.00
Age	1.00	0.70–1.00
Overall DC-to-AC derate factor	**0.81**	0.96001–0.09999

Click on **Calculate** if default values are acceptable, or after selecting your system specifications. Click on **Help** for information about system specifications. To use a DC to AC derate factor other than the default, click on **Derate Factor Help** for information.

Station Identification:

WBAN Number:	14734
City:	Newark
State:	New_Jersey

PV System Specifications:

DC Rating (kW): 152.72

DC to AC Derate Factor: .81 [Derate Factor Help]

Array Type: Fixed Tilt

Fixed Tilt or 1-Axis Tracking System:

Array Tilt (degrees): 40.73 (Default = Latitude)

Array Azimuth (degrees): 180.0 (Default = South)

Energy Data:

Cost of Electricity (cents/kWh): 0.165

[Calculate] [HELP] [Reset Form]

PVWatts * * * AC Energy & Cost Savings

Cautions for Interpreting the Results

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	152.7 kW
DC to AC Derate Factor:	0.810
AC Rating:	123.7 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
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	3.36	13323	21.98
2	4.05	14380	23.73
3	4.58	17437	28.77
4	4.84	17048	28.13
5	5.30	18788	31.00
6	5.32	17732	29.26
7	5.27	17907	29.55
8	5.25	17712	29.22
9	5.06	17174	28.34
10	4.46	16177	26.69
11	3.15	11554	19.06
12	2.87	11147	18.39
Year	4.46	190380	314.13

Output Hourly Performance Data * Output Results as Text

About the Hourly Performance Data — Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location
Run PVWATTS v.2 (US only)

Please send questions and comments regarding PVWATTS to Webmaster

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