ENERGY AUDIT – FINAL REPORT

SCHOOL DISTRICT OF THE CHATHAMS
MILTON AVENUE SCHOOL

16 MILTON AVENUE
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 the energy audit conducted for:

Chatham Township
Milton Avenue School
16 Milton Avenue
Chatham, NJ 07928

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

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program. The energy audit is conducted to promote the mission of the office of Clean Energy, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs at this facility are as follows:

Electricity	$ 25,382
Natural Gas	$ 42,999
Total	$ 68,381

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	$684	$77	8.9	68.5%
ECM #2	Lightinf Controls	$5,300	$777	6.8	119.8%
ECM #3	Lighting Upgrade - Gym	$3,000	$400	7.5	233.6%
ECM #4	LED Exit Sign	$46	$47	1.0	2443.5%
ECM #5	Domestic Water Heater Replacement	$6,950	$128	54.3	-77.9%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	21.16 KW PV System	$190,440	$12,820	14.9	68.3%

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's 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	0.5	387	-
ECM #2	Lightinf Controls	0	5,392	-
ECM #3	Lighting Upgrade - Gym	1	2,746	-
ECM #4	LED Exit Sign	0	228	-
ECM #5	Domestic Water Heater Replacement	-	-	83
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	21.16 KW PV System	23.69	29,054	0

*Elec. Demand Savings are calculated for cooling season only. Elec. consumption savings are totaled annually.

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

- **ECM #1:** Lighting Upgrade - General
- **ECM #2:** Lighting Controls
- **ECM#3:** Lighting Upgrade - Gym
- **ECM #4:** LED Exit Sign

Although ECM #5 does not provide a payback less than 10 years, it is recommended to proceed with the installation of an efficient water heater unit as suggested in ECM #5 (or equal) for the Milton Avenue School, since the existing water heater is past its expected lifespan.

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.

II. INTRODUCTION

The comprehensive energy audit covers the 37,964 square foot Milton Avenue School, which classrooms, auditorium, library, gymnasiums, locker rooms, cafeteria and offices.

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

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

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

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

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

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

III. METHOD OF ANALYSIS

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

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

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

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

ECM Calculation Equations:

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

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

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

$$Lifetime\ Ma\,\mathrm{int}\,enance\ Savings = \left(Yearly\ Ma\,\mathrm{int}\,enance\ Savings \times ECM\ Lifetime \right)$$

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

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

Net Present Value calculations based on Interest Rate of 3%.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner.

The electric usage profile (below) represents the actual electrical usage for the facility. Jersey Central Power and Light (JCP&L) provides electricity to the facility under their General Service Secondary Three-Phase rate structure. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile shows the actual natural gas energy usage for the facility. Public Service Electric and Gas (PSE&G) provides natural gas to the facility under the Large Volume Gas (LVG) rate structure. In addition to PSE&G providing primary service, HESS is a third party supplier for Milton Avenue School. 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	14.4¢ / kWh
Natural Gas	$1.542 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: JCP&L
Rate: General Service Secondary 3 Phase
Meter No: G21077377
Customer ID No: 0801577897 0006273672
Third Party Utility N/A
TPS Meter / Acct No: 10 00 48 4135 0 2

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Sep-08	13,680	110.2	$2,929
Oct-08	21,480	113.9	$3,656
Nov-08	11,760	99.1	$2,246
Dec-08	16,560	113.9	$2,699
Jan-09	13,440	113.9	$2,335
Feb-09	15,240	113.9	$2,606
Mar-09	14,760	113.9	$2,512
Apr-09	16,560	67.7	$2,778
May-09	13,080	82.6	$944
Jun-09	15,120	67.3	$942
Jul-09	13,560	80.4	$984
Aug-09	11,280	113.9	$752
Totals	**176,520**	**113.9 Max**	**$25,382**

AVERAGE DEMAND 99.2 KW average

AVERAGE RATE $0.144 $/kWh

Figure 1
Electricity Usage Profile

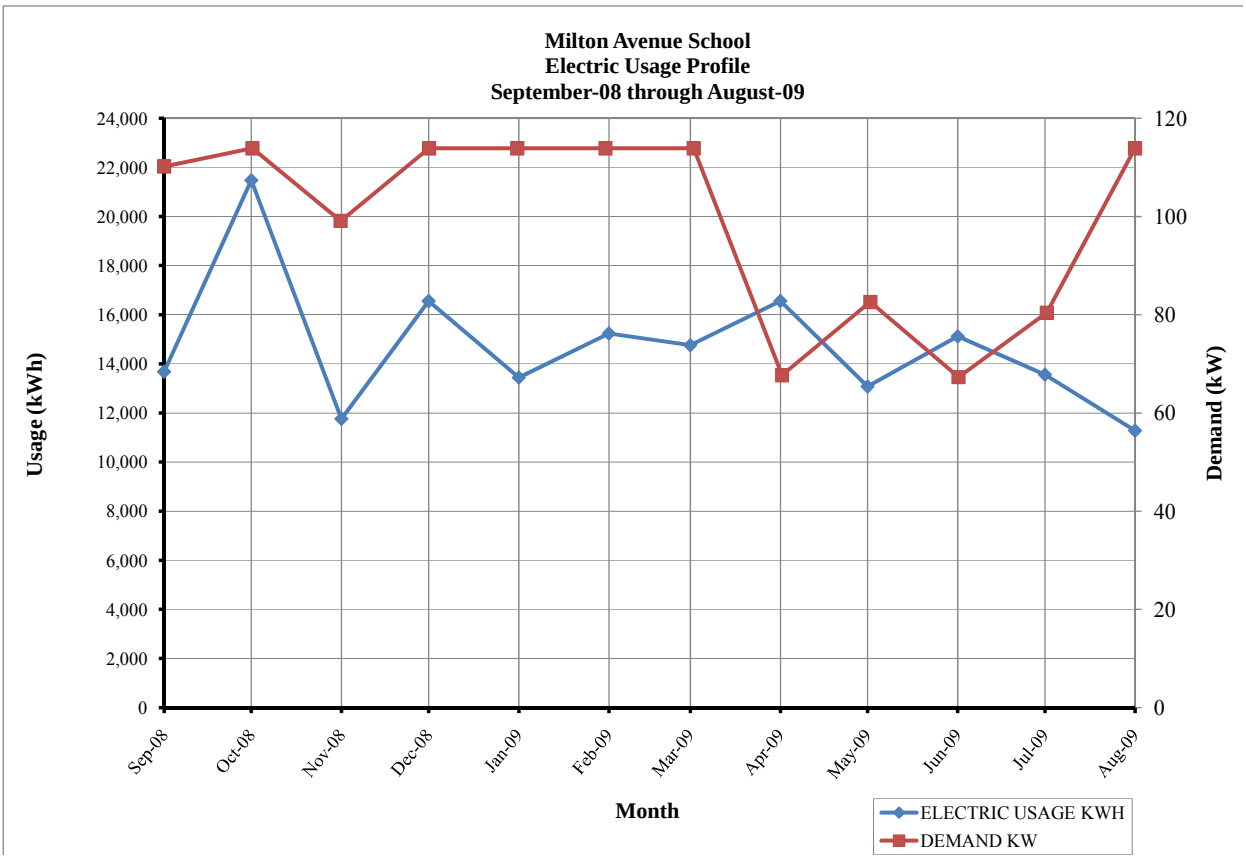


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY

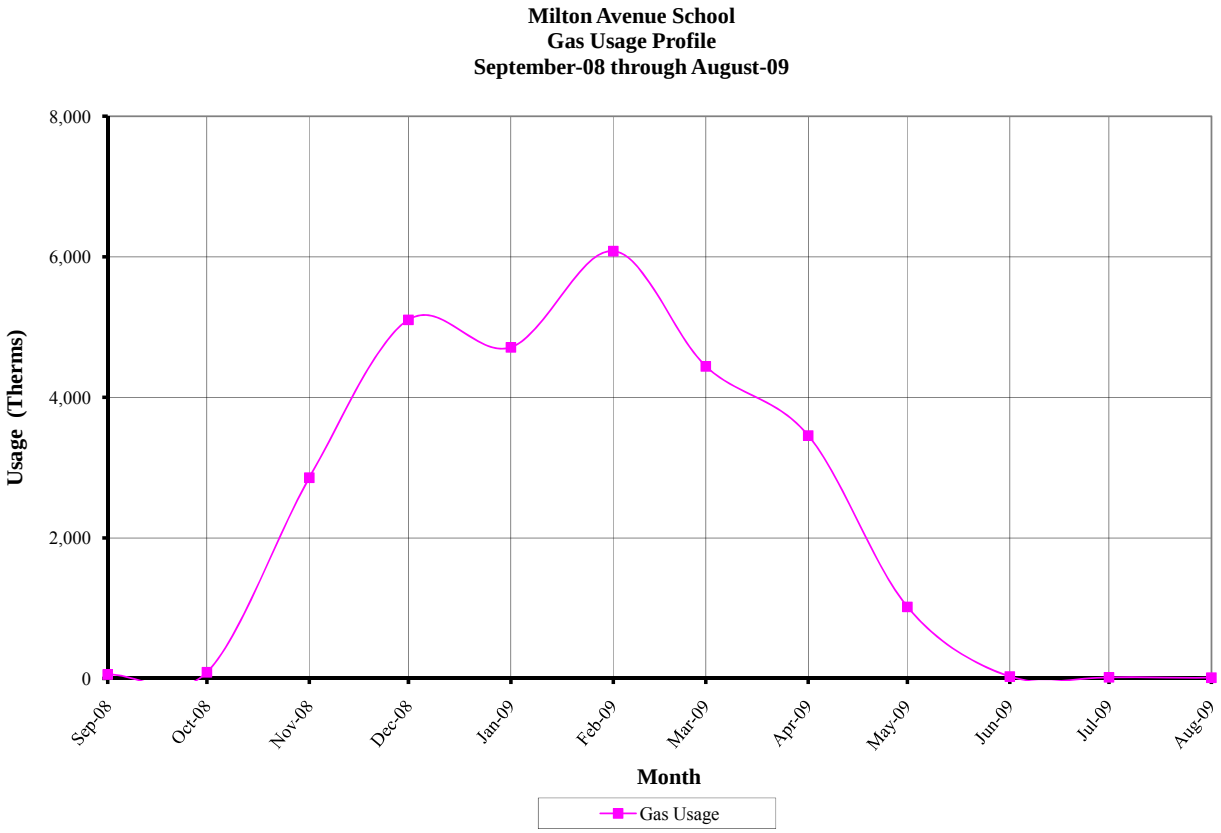
Utility Provider: PSE&G
Rate: LVG
Meter No: 3010313
Point of Delivery ID: PG000010187185304600
Third Party Utility Provider: Hess
TPS Meter No: 12 428 492 11

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Sep-08	56.39	$169.90
Oct-08	89.47	$211.43
Nov-08	2,856.83	$4,853.83
Dec-08	5,104.56	$7,951.61
Jan-09	4,711.58	$7,248.97
Feb-09	6,082.22	$9,251.69
Mar-09	4,442.25	$6,978.81
Apr-09	3,457.11	$4,577.08
May-09	1,019.93	$1,432.15
Jun-09	29.68	$132.75
Jul-09	16.50	$95.65
Aug-09	12.10	$95.16
TOTALS	**27,878.62**	**$42,999.03**

AVERAGE RATE: **$1.542** **$/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):

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

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

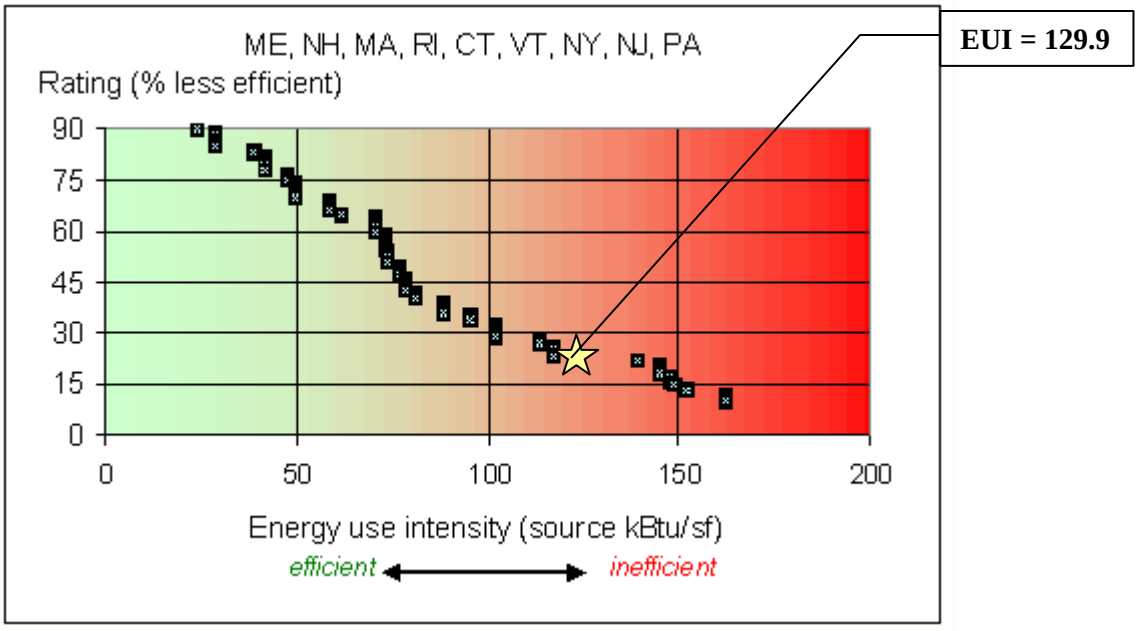
Table 5

Milton Avenue School EUI Calculations

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	176,520.0			602,639	3.340	2,012,815
NATURAL GAS		27,878.6		2,787,862	1.047	2,918,891
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				3,390,501		4,931,707
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		37,964	SQUARE FEET			
BUILDING SITE EUI		*89.31*	kBtu/SF/YR			
BUILDING SOURCE EUI		*129.90*	kBtu/SF/YR			

Table Figure 3 below depicts a national EUI grading for the source use of Elementary / Middle Schools.

Figure 3
Source Energy Use Intensity Distributions: Elementary/ Middle School



C. EPA Energy Benchmarking System

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

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

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

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

[redacted]

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

Table 6
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	**ENERGY PERFORMANCE RATING**	**NATIONAL AVERAGE**
Milton Avenue School	53	50

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

V. FACILITY DESCRIPTION

The Milton Avenue School is a block with face brick constructed, two story facility comprised of classrooms, a library/ media center, offices, a gymnasium and boiler rooms. The original building was approximately 26,022 square feet and was built in 1948. An addition was built in 2001 that added approximately 11,940 square feet, bringing the building total to 37,964 square feet. The building operates for 40 hours during a typical week. There are different roof types on the building. The roof throughout is asphalt shingles on 15# felt on 4" nailable insulation on 3" structural metal deck. The flat portions are a cold process built up roofing system on uniform insulation. The windows in the original building are single pane. The windows in the 2001 addition are tempered, insulated glass with aluminum frame.

Heating

There are two (2) boiler plants at this facility. The first boiler room is located in the original building. There are four (4) natural gas fired, Fulton pulse boilers model PVLP-115 having 1,150,000 BTU/hr input and 978,000 BTU/hr maximum output, producing steam and have a combustion efficiency of 85%. These boilers serve the original building equipment via pipe tunnel. The original building equipment consists of classroom unit ventilators and fin tube radiation.

The boiler plant in the 2001 addition has one (1) H.B. Smith series 28A four (4) section boiler with a Power Flame burner model JR30A-12UHBS-4. The maximum natural gas input is 1,154,000 BTU/hr and a maximum output of 783,000 BTU/hr and a combustion efficiency of 78%. The HB Smith boiler serves the 2001 addition. There are two (2) TACO model 1600-028 in-line pumps in a lead/lag configuration serving as loop pumps and a TACO series 1600-155BF2 that serves as a recirculation pump. The boilers and pumps are eight years old and are in good condition.

There are three (3) Carrier series 48HJ Weather Maker packaged roof top units that provide heat for portions of the building. The units have natural gas heat inputs ranging from 72,000 BTU/hr to 125,000BTU/hr and have an AFUE of 81% to 82.9%. The units are located on the 2001 addition roof, serving the 2001 addition.

Cooling

There are three (3) Carrier series 48HJ Weather Maker packaged roof top units serving the 2001 addition as described in the heating section above. The units have cooling capacities from 4 to 7.5 nominal tons. There are eight (8) split systems having cooling capacities ranging from 0.75 to 4 tons. The split systems serve the 2001 addition and are in good condition.

Controls System

There are pneumatic controls serving the original school building. A Quincy air compressor that is approximately 3 years old provides air to the controls system. The system appears to be operational but is antiquated. There is an Automated Logic DDC system that controls the 2001 addition and allows read only status of the boilers.

Exhaust System

There are a couple of exhaust fans exhausting the bathroom areas. They are fractional horse power fan motors and are in fair condition.

Domestic Hot Water

There is a Rheem Fury model 22-50-3 domestic water heater having a 50 gallon tank, 50 MBH natural gas input. It serves the original building and is approximately 32 years old, is past its useful service life and is in poor condition.

There is a Rheem model G75-125 domestic water heater having a 75 gallon tank, 125 MBH natural gas input. It serves the 2001 addition and is approximately 8 years old and is in fair condition.

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 compact fluorescent. The predominant lamps in the fluorescent light fixtures are 32 Watts and wattage for the incandescent lamp is 100 watts. The compact fluorescent lamp is 13 watts. The two (2) exit signs units that have (2) 15 watt incandescent lamps there are seventeen (17) exit signs that use LED technology and are 4 watts each.

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:

The lighting in the Milton Avenue School is primarily made up of fluorescent fixtures with T-8 lamps with electronic ballasts. There are a few T12 fluorescent fixtures in the boiler room and storage rooms. There is an incandescent lighting fixture in the Gym Office.

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 fixtures to compact fluorescent fixtures. 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 Investment Grade Lighting Audit appendix outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, the 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) = $10 per fixture; T-5 or T-8 (3-4 lamp) = $20 per fixture.

$$\text{Smart Start®}\ \textit{Incentive} = \left(\#\ \textit{of}\ 1-2\ \textit{lamp fixtures} \times \$10\right) + \left(\#\ \textit{of}\ 3-4\ \textit{lamp fixtures} \times \$20\right)$$

$$\text{Smart Start®}\ \textit{Incentive} = \left(3 \times \$20\right) = \underline{\$60}$$

There is no incentive available to replace an incandescent bulb with a CFL bulb. There is an incentive available to replace an entire fixture with a CFL fixture but is not necessary to incur the expense to replace the entire fixture.

Replacement and Maintenance Savings for fluorescent lamps are calculated as follows:

$$Savings = (reduction\ in\ lamps\ replaced\ \ per\ \ year) \times (repacment\ \$\ per\ lamp + Labor\ \$\ per\ lamp)$$
$$Savings = (3\ lamps\ \ per\ \ year) \times (\$2.00 + \$5.00) = \underline{\$}21$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$744
NJ Smart Start Equipment Incentive ($):	$60
Net Installation Cost ($):	$684
Maintenance Savings ($/Yr):	$21
Energy Savings ($/Yr):	$56
Total Yearly Savings ($/Yr):	$77
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.9
Simple Lifetime ROI	68.5%
Simple Lifetime Maintenance Savings	$315
Simple Lifetime Savings	$1,152
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	$232.96

* 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: Lighting Controls

Description:

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

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

ASHRAE Standard 90.1-2004, Appendix G is a reference standard for modeling building efficiency. The standard estimates that lighting controls provide a 10% reduction in lighting power usage for daytime occupancies in buildings over 5,000 SF, and 15% reduction in buildings under 5,000 SF. This ECM includes dual technology occupancy sensors in each classroom, private office, open office, conference room, restrooms, lunch room, boiler room, Library and.

The ECM includes replacement of standard wall switches with sensors wall switches for individual rooms, ceiling mount sensors for large office areas or restrooms, and photocell sensors for the rotunda sky-lit accent lights. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. See the **Investment Grade Lighting Audit Appendix** for details.

The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by 10% for all areas that include occupancy sensor lighting controls and 20% for areas that include occupancy sensors as well as photocell daylight sensors.

Light Energy = 53,924 kWh/Yr. occupancy sensor controlled lighting

Energy Savings Calculations:

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

$$Energy\ Savings = 10\% \times 53{,}924\ (kWh) = 5{,}392\ (kWh)$$

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

$$Savings. = 5{,}392\ (kWh) \times 0.144\left(\frac{\$}{kWh}\right) = \$776$$

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

Installation Cost = $160 x 47 motion sensors = $7,520

From the NJ Smart Start appendix, the installation of a lighting control device warrants the following incentive: occupancy = $20 per sensor.

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ wall\ mount\ devices \times\ \$\ 20) = (47 \times \$20)$$

$$\text{Smart Start®}\ Incentive = \$940\ Total$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,240
NJ Smart Start Equipment Incentive ($):	$940
Net Installation Cost ($):	$5,300
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$777
Total Yearly Savings ($/Yr):	$777
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.8
Simple Lifetime ROI	119.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$11,648
Internal Rate of Return (IRR)	12%
Net Present Value (NPV)	$3,969.93

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

ECM #3: Install T-5 Lighting System in Gym

Description:

The Gym is currently lit via twelve (12) 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 twelve (12), 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 Investment Grade Lighting Audit can be found in **Investment Grade Lighting Audit Appendix – ECM#4** 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.

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

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 two (5) complete lamp replacements required for the metal halide system at the time when one (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:

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

$$Maintenance\ Savings = (12\ lamps \times \$25\ per\ lamp) - (36\ lamps \times \$5\ per\ lamp) = \underline{\$120}$$
$$= \$120 / 25\ years = \$5/year\ average\ maintenance\ savings$$

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

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,600
NJ Smart Start Equipment Incentive ($):	$600
Net Installation Cost ($):	$3,000
Maintenance Savings ($/Yr):	$5
Energy Savings ($/Yr):	$395
Total Yearly Savings ($/Yr):	$400
Estimated ECM Lifetime (Yr):	25
Simple Payback	7.5
Simple Lifetime ROI	233.6%
Simple Lifetime Maintenance Savings	$125
Simple Lifetime Savings	$10,009
Internal Rate of Return (IRR)	13%
Net Present Value (NPV)	$3,971.70

ECM #4: 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 ECM 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 1 fixtures = 227.8 kWh/yr. saved

227.8 kWh/yr x $0.144/kWh = $33 / yr. saved

Maintenance savings = 1 fixtures x 2 bulbs/fixture x ($3/bulb + $4/bulb installation) = $14/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).

1 LED Exit signs x $10/ LED Exit sign = $10

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$56
NJ Smart Start Equipment Incentive ($):	$10
Net Installation Cost ($):	$46
Maintenance Savings ($/Yr):	$14
Energy Savings ($/Yr):	$33
Total Yearly Savings ($/Yr):	$47
Estimated ECM Lifetime (Yr):	25
Simple Payback	1.0
Simple Lifetime ROI	2443.5%
Simple Lifetime Maintenance Savings	$350
Simple Lifetime Savings	$1,170
Internal Rate of Return (IRR)	102%
Net Present Value (NPV)	$768.94

ECM #5: Domestic Water Heater Replacement

Description:

The existing Rheem model Fury 22-50-3 with a 50 gallon tank, 50,000 BTUH input natural gas heater with 80% thermal efficiency and a nameplate recovery rate of 42 gallon per hour.

This energy conservation measure will replace each of the existing water heater 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 = 50 MBH input; 50 gallons storage
Combustion Efficiency = 80%
Age & Radiation Losses = 20%
Thermal Efficiency = 60%

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

Operating Data for Domestic Water Heater

$$\text{Estimated Consumption} = \frac{50 MBH input}{6{,}241 MBH bldg input} x 27{,}878.62 Therms / year = 223.35 Therms / year$$

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

Energy Savings = 223.35 Therms x $\frac{(95.5\% - 60\%)}{(95.5\%)}$ = 83 Therms

Average Cost of Natural Gas = $1.542/Therm

Yearly Savings = 83 Therm x $1.542/ Therm = $128/year

Cost of one (1) Commercial Domestic Water Heater and Installation = $7,070

Smart Start Incentive = $2.00/MBh x (60) /installed MBh = $120.

Simple Payback = $7070 / $128 = 55 years

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,070
NJ Smart Start Equipment Incentive ($):	$120
Net Installation Cost ($):	$6,950
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$128
Total Yearly Savings ($/Yr):	$128
Estimated ECM Lifetime (Yr):	12
Simple Payback	54.3
Simple Lifetime ROI	-77.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,536
Internal Rate of Return (IRR)	-18%
Net Present Value (NPV)	($5,675.89)

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy measures (REM) for the municipality utilizing renewable technologies and concluded that there is potential for solar energy generation. The solar photovoltaic system calculation summary will be concluded as **REM#1** within this report.

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

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 1,500 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 21.16 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 25,952 KWh annually, reducing the overall utility bill by approximately 14.7% 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	14.85 Years	N/A	N/A
Direct Purchase	14.85 Years	68.3%	5%

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

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the facility. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. Based on CEG's review of

the applicability of wind energy for the facility, it was determined that the average wind speed is not adequate, and the kilowatt demand for the building is below the threshold (200 kW) for purchase of a commercial wind turbine. Therefore, wind energy is not a viable option to implement.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The Electric Usage Profile demonstrates a fairly flat load profile throughout the year. This is unusual for a school, because typically schools are closed in the summer. However the steady and elevated summer load profile (April – October), with a peak in October is supported by classrooms, library/media center, office, gymnasium and boiler rooms. The majority and elevated electric loads seen throughout the year are provided by cooling. Air-conditioning in this facility is provided by (3) three Carrier roof-top units serving the 2001 addition, with 4 – 7.5 tons of capacity. There are also (8) eight, split systems having cooling capacities ranging from .75 – 4 tons of capacity. Currently this facility's electric supply is provided by JCP&L (Jersey Central Power and Light). 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 October through April during the standard heating season. Heating for this facility is provided by (2) two boiler plants. The first boiler is located in the original building and has (4) four pulse boilers producing steam. The boiler in the 2001 addition has (1) one H.B. Smith 4-section natural gas fired boiler. In addition there are (4) four Carrier packaged roof-top units, which are natural gas fired and serve the 2001 addition. Domestic hot water is supplied by a 50 Gallon Rheem, natural gas fired hot water heater in the original building. The 2001 addition has a 75 Gallon Rheem 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 new Third Party Suppliers.

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 facility owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

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

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

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

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

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

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

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

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

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

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

XI. ADDITIONAL RECOMMENDATIONS

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

A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

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

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Milton Avenue School

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT.	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	$744	$0	$60	$684	$56	$21	$77	15	$837	$315	22.4%	8.9	7.36%	$232.96
ECM #2	Lightinf Controls	$6,240	$0	$940	$5,300	$777	$0	$777	15	$11,648	$0	119.8%	6.8	11.96%	$3,969.93
ECM #3	Lighting Upgrade - Gym	$3,600	$0	$600	$3,000	$395	$5	$400	25	$9,884	$125	229.5%	7.5	12.67%	$3,971.70
ECM #4	LED Exit Sign	$56	$0	$10	$46	$33	$14	$47	25	$820	$350	1682.6%	1.0	101.74%	$768.94
ECM #5	Domestic Water Heater Replacement	$7,070	$0	$120	$6,950	$128	$0	$128	12	$1,536	$0	-77.9%	54.3	-17.95%	($5,675.89)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	21.16 KW PV System	$190,440	$0	$0	$190,440	$3,737	$9,083	$12,820	25	$93,425	$227,075	-50.9%	14.9	4.48%	$32,796.55

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

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Milton Avenue School

Boiler

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room		Fulton	1	PVPL-1150	103747	575-1150	489-978	84.5	NG	2	30	28	
Boiler Room		Fulton	1	PVPL-1150	103746	575-1150	489-978	84.5	NG	2	30	28	
Boiler Room		Fulton	1	PVPL-1150	103762	575-1150	489-978	84.5	NG	2	30	28	
Boiler Room		Fulton	1	PVPL-1150	103745	575-1150	489-978	84.5	NG	2	30	28	
SGI	2001 Addition	HB Smith	1	Series 28A-4	N2001-592	1154	783	86.2	NG	8	30	22	

Boiler - Burner

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
SGI	HB Smith	Power Flame	1	JR30-12UHBS-4	60146220	1154		NG	8	20	12	1/3 HP MOTOR

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	
Boiler Room	condensate		1			(2) 3/4							1989	10	(-10)	Past service life - should replace; no incentiveless than 1h
Boiler Room	condensate		1			(2) 1.5							2007	10	8	
SGI		TACO	2	1600-028									2000	10	1	
		TACO	1	1600 155 bf2	1610022								2001	10	2	

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
Boiler Room		Rheem	1	Fury 22-50-3	RN 1077 304863	50	42	50		NG	32	10	(-22)	
		Rheem	1	G 75-125	URNG 1000GO1331	125	121.2	75			8	10	2	

DHW - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	Volts	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room		Bell & Gosset	1	Series 100 AB	106192	12-Jan			1991	10	(-8)	Past service life - should replace; no incentiveless tha

Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Rooftop		Carrier	1	48HJD008---531HE	2500G34407	R-22				92/125	74.4/102.5	82%	NG	208-230	3		9	15	6	
Rooftop		Carrier	1	48HJE007---531--	0901G20357	R-22				82/115	66.4/93.2	81%	NG	208-230	3		8	15	7	
Rooftop		Carrier	1	48HJD005---531HE	0501G20161	R-22				50/72	41/59	82%	NG	208/230	3		8	15	7	

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		Mitsubishi	1	MU09TW	30 00041	9000		R-22	115	1		9	15	6	
Rooftop		Lennox	1	HS29-030-1P	5801E 66998	30000		R-22	208/230	1		2001	15	7	
Rooftop		Lennox	3	HS29-048-9Y	5801E 23684	48000		R-22	208/230	3		2001	15	7	
Rooftop		Lennox	2	HS29-024-IP	5801E 39741	24000		R-22	208/230	1		2001	15	7	
Rooftop		Lennox	1	HS29-042-94	5801E 40261	42000		R-22	208/230	3		2001	15	7	

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	
Classrooms		Emerson Quiet Kool	2	18FD44	FE618831 1743	18000/17500		R-22	230/208	1	7.9/8.5	1993	15	(-1)	
Classrooms		Airtemp	1	B3D18E7A	LG423189 3195	18000/17500		R-22	230/208	1	7.9/8.5	1995	15	1	
Classrooms		Friedrich	1	KM18L30-B	LGDR12987	17800/17600		R-22	230/208	1	8.1/8.8	2007	15	13	
Classrooms		Samsung	1	AW075~~~~	P2EkC008~~~	17800/~~~~		R-22	115	1	~~~	2002	15	8	
Classrooms		Frigideaire	7	FAS185J245	JK205243	18000/17800		R-22	230/208		8.5/9	2002	15	8	
Classrooms		Emerson Quiet Kool	1	10FT13	EE498 030 1393	10200		R-22	115		10.5	1993	15	(-1)	
Classrooms		Friedrich	1	KM18J30C-A	DDR04521	18000/17700		R-22	230/208	1	8.3/9.2	2004	15	10	

Air Compressor

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	Pressure	Capacity	Volts	Phase	FLA	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room	HVAC Controls	Quincey Climate Control	1	QC01508DOO118	5154823	(2) 2hp			200			8	15	7	

Heating and Ventilation Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Heating Coil	Capacity (Btu/h)	Fan HP	Fan RPM	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
		Herman Nelson	18													
		AAF	6										2001	15	7	

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Milton Avenue School

Building ID: 1830632
For 12-month Period Ending: August 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: September 22, 2009

Facility
Milton Avenue School
16 Milton Ave
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: 1948
Gross Floor Area (ft²): 37,964

Energy Performance Rating[2] (1-100) 53

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	602,286
Natural Gas (kBtu)[4]	2,787,862
Total Energy (kBtu)	3,390,148

Energy Intensity[5]

Site (kBtu/ft²/yr)	89
Source (kBtu/ft²/yr)	130

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	240

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	92
National Average Source EUI	134
% Difference from National Average Source EUI	-3%
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	Milton Avenue 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	16 Milton Ave, 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		☐
Milton Ave (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	37,964 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?	Yes	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	64	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	No	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	100 %	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: Milton Ave Electric (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
08/01/2009	08/31/2009	11,280.00
07/01/2009	07/31/2009	13,560.00
06/01/2009	06/30/2009	15,120.00
05/01/2009	05/31/2009	13,080.00
04/01/2009	04/30/2009	16,560.00
03/01/2009	03/31/2009	14,760.00
02/01/2009	02/28/2009	15,240.00
01/01/2009	01/31/2009	13,440.00
12/01/2008	12/31/2008	16,560.00
11/01/2008	11/30/2008	11,760.00
10/01/2008	10/31/2008	21,480.00
09/01/2008	09/30/2008	13,680.00
Milton Ave Electric Consumption (kWh (thousand Watt-hours))		**176,520.00**
Milton Ave Electric Consumption (kBtu (thousand Btu))		**602,286.24**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**602,286.24**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Milton Ave Gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
08/01/2009	08/31/2009	12.10
07/01/2009	07/31/2009	16.50
06/01/2009	06/30/2009	29.68
05/01/2009	05/31/2009	1,019.93
04/01/2009	04/30/2009	3,457.11
03/01/2009	03/31/2009	4,442.25
02/01/2009	02/28/2009	6,082.22
01/01/2009	01/31/2009	4,711.58
12/01/2008	12/31/2008	5,104.56
11/01/2008	11/30/2008	2,856.83

10/01/2008	10/31/2008	89.47
09/01/2008	09/30/2008	56.39
Milton Ave Gas Consumption (therms)		**27,878.62**
Milton Ave Gas Consumption (kBtu (thousand Btu))		**2,787,862.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**2,787,862.00**
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
Milton Avenue School
16 Milton Ave
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

Milton Avenue School	
Gross Floor Area Excluding Parking: (ft^2)	37,964
Year Built	1948
For 12-month Evaluation Period Ending Date:	August 31, 2009

Facility Space Use Summary

Milton Ave	
Space Type	K-12 School
Gross Floor Area(ft^2)	37,964
Open Weekends?	Yes
Number of PCs	64
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	No
Percent Cooled	60
Percent Heated	100
Months[o]	10
High School?	No
School District[o]	Chatham

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 08/31/2009)	**Baseline** (Ending Date 08/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	53	53	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	89	89	72	N/A	92
Source ($kBtu/ft^2$)	130	130	105	N/A	134
Energy Cost					
$/year	$ 68,382.03	$ 68,382.03	$ 55,333.54	N/A	$ 70,755.87
$/$ft^2$/year	$ 1.80	$ 1.80	$ 1.46	N/A	$ 1.86
Greenhouse Gas Emissions					
$MtCO_2e$/year	240	240	194	N/A	248
$kgCO_2e/ft^2$/year	6	6	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.

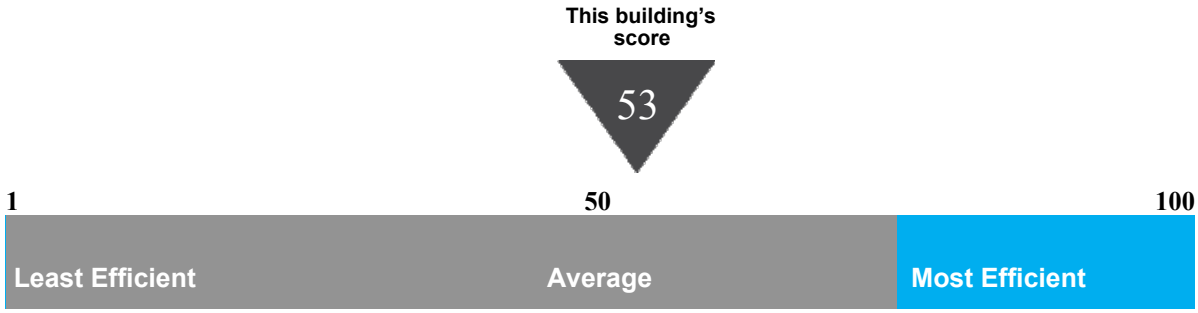
Statement of Energy Performance

2009

Milton Avenue School
16 Milton Ave
Chatham, NJ 07928

Portfolio Manager Building ID: 1830632

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 130 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending August 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: 09/22/2009

CEG Job #: 9C09078
Project: School District of the Chathams
Address: 16 Milton Ave
Chatham, NJ
Building SF: 37,964

Milton Avenue School

KWH COST: **$0.144**

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
12	108	1880	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,308.5	$188.42	12	2	No Replacement	58	0.70	1308.48	$188.42	$0.00	$0.00	0.00	0	$0.00	0.00
12	109	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	No Replacement	58	0.70	1447.68	$208.47	$0.00	$0.00	0.00	0	$0.00	0.00
12	110	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	No Replacement	58	0.70	1447.68	$208.47	$0.00	$0.00	0.00	0	$0.00	0.00
6	Office	2080	4	1	T8 1x4 1 Lamp Electronic Ballast Surface Mounting Prismatic Lens	28	0.11	233.0	$33.55	4	1	No Replacement	28	0.11	232.96	$33.55	$0.00	$0.00	0.00	0	$0.00	0.00
8	Boiler Room	2080	11	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting No Lens	58	0.64	1,327.0	$191.09	11	2	No Replacement	58	0.64	1327.04	$191.09	$0.00	$0.00	0.00	0	$0.00	0.00
4	Boiler Room	2080	1	1	T12 1x2 1 Lamp Magnetic Ballast Surface Mounting No Lens	20	0.02	41.6	$5.99	1	1	No Replacement	20	0.02	41.6	$5.99	$0.00	$0.00	0.00	0	$0.00	0.00
11	Hallway	8760	25	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	1.45	12,702.0	$1,829.09	25	2	No Replacement	58	1.45	12702	$1,829.09	$0.00	$0.00	0.00	0	$0.00	0.00
11	Stairwell	8760	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	0.06	508.1	$73.16	1	2	No Replacement	58	0.06	508.08	$73.16	$0.00	$0.00	0.00	0	$0.00	0.00
12	Stairwell	8760	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.46	4,064.6	$585.31	8	2	No Replacement	58	0.46	4064.64	$585.31	$0.00	$0.00	0.00	0	$0.00	0.00
12	Bathroom	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	No Replacement	58	0.12	241.28	$34.74	$0.00	$0.00	0.00	0	$0.00	0.00
5	**Storage**	**520**	**3**	**4**	**T12 1x8 4 Lamps Magnetic Ballast Pendant Mounting No Lens**	**316**	**0.95**	**493.0**	**$70.99**	**3**	**3**	**8' 3 Lamp T-8, no lens, Electronic Balast Cooper Metalux 8TDIM-332-UNV-EB82-U**	**177**	**0.53**	**276.12**	**$39.76**	**$246.00**	**$738.00**	**0.42**	**216.84**	**$31.22**	**23.63**
12	Office	2080	10	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.58	1,206.4	$173.72	10	2	No Replacement	58	0.58	1206.4	$173.72	$0.00	$0.00	0.00	0	$0.00	0.00
12	Storage	520	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.23	120.6	$17.37	4	2	No Replacement	58	0.23	120.64	$17.37	$0.00	$0.00	0.00	0	$0.00	0.00
14	107	2080	8	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.66	1,364.5	$196.49	8	3	No Replacement	82	0.66	1364.48	$196.49	$0.00	$0.00	0.00	0	$0.00	0.00
12	Gym Office	2080	6	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.35	723.8	$104.23	6	2	No Replacement	58	0.35	723.84	$104.23	$0.00	$0.00	0.00	0	$0.00	0.00

18	**Gym Office**	**2080**	**1**	**1**	**Incandescent 100 w**	**100**	**0.10**	**208.0**	**$29.95**	**1**	**1**	**18 W CFL Lamp**	**18**	**0.02**	**37.44**	**$5.39**	**$5.75**	**$5.75**	**0.08**	**170.56**	**$24.56**	**0.23**
12	Bathroom	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	No Replacement	58	0.12	241.28	$34.74	$0.00	$0.00	0.00	0	$0.00	0.00
12	106	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	No Replacement	58	0.70	1447.68	$208.47	$0.00	$0.00	0.00	0	$0.00	0.00
12	105	2080	6	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.35	723.8	$104.23	6	2	No Replacement	58	0.35	723.84	$104.23	$0.00	$0.00	0.00	0	$0.00	0.00
17	101	2080	12	1	T8 1x4 1 Lamp Electronic Ballast Surface Mounting Prismatic Lens	28	0.34	698.9	$100.64	12	1	No Replacement	28	0.34	698.88	$100.64	$0.00	$0.00	0.00	0	$0.00	0.00
12	101	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2	No Replacement	58	0.06	120.64	$17.37	$0.00	$0.00	0.00	0	$0.00	0.00
12	101	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2	No Replacement	58	0.06	120.64	$17.37	$0.00	$0.00	0.00	0	$0.00	0.00
13	102	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.98	2,046.7	$294.73	12	3	No Replacement	82	0.98	2046.72	$294.73	$0.00	$0.00	0.00	0	$0.00	0.00
12	102	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2	No Replacement	58	0.06	120.64	$17.37	$0.00	$0.00	0.00	0	$0.00	0.00
12	Hallway	8760	6	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.35	3,048.5	$438.98	6	2	No Replacement	58	0.35	3048.48	$438.98	$0.00	$0.00	0.00	0	$0.00	0.00
13	104	2080	13	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.07	2,217.3	$319.29	13	3	No Replacement	82	1.07	2217.28	$319.29	$0.00	$0.00	0.00	0	$0.00	0.00
12	104	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	No Replacement	58	0.12	241.28	$34.74	$0.00	$0.00	0.00	0	$0.00	0.00
13	103	2080	13	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.07	2,217.3	$319.29	13	3	No Replacement	82	1.07	2217.28	$319.29	$0.00	$0.00	0.00	0	$0.00	0.00
12	103	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	No Replacement	58	0.12	241.28	$34.74	$0.00	$0.00	0.00	0	$0.00	0.00
12	Stairwell	8760	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	1,016.2	$146.33	2	2	No Replacement	58	0.12	1016.16	$146.33	$0.00	$0.00	0.00	0	$0.00	0.00
12	Stairwell	8760	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.23	2,032.3	$292.65	4	2	No Replacement	58	0.23	2032.32	$292.65	$0.00	$0.00	0.00	0	$0.00	0.00
12	Bathroom	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	No Replacement	58	0.12	241.28	$34.74	$0.00	$0.00	0.00	0	$0.00	0.00
11	Hallway	8760	25	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	1.45	12,702.0	$1,829.09	25	2	No Replacement	58	1.45	12702	$1,829.09	$0.00	$0.00	0.00	0	$0.00	0.00

2	Hallway	8760	1	1	CFL 1 Lamp	28	0.03	245.3	$35.32	1	1	No Replacement	28	0.03	245.28	$35.32	$0.00	$0.00	0.00	0	$0.00	0.00
11	Hallway	8760	6	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	0.35	3,048.5	$438.98	6	2	No Replacement	58	0.35	3048.48	$438.98	$0.00	$0.00	0.00	0	$0.00	0.00
12	214	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	No Replacement	58	0.70	1447.68	$208.47	$0.00	$0.00	0.00	0	$0.00	0.00
12	213	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	No Replacement	58	0.70	1447.68	$208.47	$0.00	$0.00	0.00	0	$0.00	0.00
14	212	2080	8	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.66	1,364.5	$196.49	8	3	No Replacement	82	0.66	1364.48	$196.49	$0.00	$0.00	0.00	0	$0.00	0.00
13	211	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.98	2,046.7	$294.73	12	3	No Replacement	82	0.98	2046.72	$294.73	$0.00	$0.00	0.00	0	$0.00	0.00
12	Hallway	8760	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.46	4,064.6	$585.31	8	2	No Replacement	58	0.46	4064.64	$585.31	$0.00	$0.00	0.00	0	$0.00	0.00
12	Stairwell	8760	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.23	2,032.3	$292.65	4	2	No Replacement	58	0.23	2032.32	$292.65	$0.00	$0.00	0.00	0	$0.00	0.00
11	Stairwell	8760	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	0.06	508.1	$73.16	1	2	No Replacement	58	0.06	508.08	$73.16	$0.00	$0.00	0.00	0	$0.00	0.00
8	Boiler Room	2080	3	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting No Lens	58	0.17	361.9	$52.12	3	2	No Replacement	58	0.17	361.92	$52.12	$0.00	$0.00	0.00	0	$0.00	0.00
13	204/205	2080	7	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.57	1,193.9	$171.92	7	3	No Replacement	82	0.57	1193.92	$171.92	$0.00	$0.00	0.00	0	$0.00	0.00
1	206	2080	18	2	T5 1x4 2 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Sylvania FP54/835/HO	54	0.97	2,021.8	$291.13	18	2	No Replacement	54	0.97	2021.76	$291.13	$0.00	$0.00	0.00	0	$0.00	0.00
7	Library	2080	45	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Direct/Indirect	58	2.61	5,428.8	$781.75	45	2	No Replacement	58	2.61	5428.8	$781.75	$0.00	$0.00	0.00	0	$0.00	0.00
13	203	2080	6	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.49	1,023.4	$147.36	6	3	No Replacement	82	0.49	1023.36	$147.36	$0.00	$0.00	0.00	0	$0.00	0.00
13	Faculty Rm	2080	6	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.49	1,023.4	$147.36	6	3	No Replacement	82	0.49	1023.36	$147.36	$0.00	$0.00	0.00	0	$0.00	0.00
12	Kitchen	2080	5	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.29	603.2	$86.86	5	2	No Replacement	58	0.29	603.2	$86.86	$0.00	$0.00	0.00	0	$0.00	0.00
12	Girls Room	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2	No Replacement	58	0.06	120.64	$17.37	$0.00	$0.00	0.00	0	$0.00	0.00
12	Boys Room	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2	No Replacement	58	0.06	120.64	$17.37	$0.00	$0.00	0.00	0	$0.00	0.00

12	207	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	No Replacement	58	0.70	1447.68	$208.47	$0.00	$0.00	0.00	0	$0.00	0.00
9	202	2080	12	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	No Replacement	58	0.70	1447.68	$208.47	$0.00	$0.00	0.00	0	$0.00	0.00
12	208	2080	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.46	965.1	$138.98	8	2	No Replacement	58	0.46	965.12	$138.98	$0.00	$0.00	0.00	0	$0.00	0.00
12	Boys Room	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	No Replacement	58	0.12	241.28	$34.74	$0.00	$0.00	0.00	0	$0.00	0.00
12	Girls Room	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2	No Replacement	58	0.06	120.64	$17.37	$0.00	$0.00	0.00	0	$0.00	0.00
14	201	2080	4	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.33	682.2	$98.24	4	3	No Replacement	82	0.33	682.24	$98.24	$0.00	$0.00	0.00	0	$0.00	0.00
12	209	2080	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.46	965.1	$138.98	8	2	No Replacement	58	0.46	965.12	$138.98	$0.00	$0.00	0.00	0	$0.00	0.00
13	210	2080	13	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.07	2,217.3	$319.29	13	3	No Replacement	82	1.07	2217.28	$319.29	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		452	126			28.86	93,105.4	$13,407.18	452	125			28.361	92718.04	$13,351.40		$743.75	0.50	387.4	$55.79	13.33

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: 16 Milton Ave
Chatham, NJ
Building SF: 37,964

Milton Avenue School

KWH COST: **$0.144**

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
12	108	1880	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,308.5	$188.42	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1177.632	$169.58	$160.00	$160.00	0.00	130.848	$18.84	8.49
12	109	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$187.62	$160.00	$160.00	0.00	144.768	$20.85	7.68
12	110	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$187.62	$160.00	$160.00	0.00	144.768	$20.85	7.68
6	Office	2080	4	1	T8 1x4 1 Lamp Electronic Ballast Surface Mounting Prismatic Lens	28	0.11	233.0	$33.55	4	1	Dual Technology Occupancy Sensor	28	0.11	10%	209.664	$30.19	$160.00	$160.00	0.00	23.296	$3.35	47.70
8	Boiler Room	2080	11	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting No Lens	58	0.64	1,327.0	$191.09	11	2	Dual Technology Occupancy Sensor	58	0.64	10%	1194.336	$171.98	$160.00	$160.00	0.00	132.704	$19.11	8.37
4		2080	1	1	T12 1x2 1 Lamp Magnetic Ballast Surface Mounting No Lens	20	0.02	41.6	$5.99	1	1		20	0.02	10%	37.44	$5.39	$0.00	$0.00	0.00	4.16	$0.60	0.00
11	Hallway	8760	25	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	1.45	12,702.0	$1,829.09	25	2	None	58	1.45	0%	12702	$1,829.09	$0.00	$0.00	0.00	0	$0.00	0.00
11	Stairwell	8760	1	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	0.06	508.1	$73.16	1	2	None	58	0.06	0%	508.08	$73.16	$0.00	$0.00	0.00	0	$0.00	0.00
12	Stairwell	8760	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.46	4,064.6	$585.31	8	2	None	58	0.46	0%	4064.64	$585.31	$0.00	$0.00	0.00	0	$0.00	0.00
12	Bathroom	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	Dual Technology Occupancy Sensor	58	0.12	10%	217.152	$31.27	$160.00	$160.00	0.00	24.128	$3.47	46.05
5	Storage	520	3	4	T12 1x8 4 Lamps Magnetic Ballast Pendant Mounting No Lens	316	0.95	493.0	$70.99	3	4	None	316	0.95	0%	492.96	$70.99	$0.00	$0.00	0.00	0	$0.00	0.00
3	Gym	2080	12	1	Metal Halide -High-Bay Fixture	292	3.50	7,288.3	$1,049.52	12	3	Dual Technology Occupancy Sensor	292	3.50	10%	6559.488	$944.57	$160.00	$160.00	0.00	728.832	$104.95	1.52
2		2080	2	1	CFL 1 Lamp	28	0.06	116.5	$16.77	2	1		28	0.06	10%	104.832	$15.10	$0.00	$0.00	0.00	11.648	$1.68	0.00
12	Office	2080	10	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.58	1,206.4	$173.72	10	2	Dual Technology Occupancy Sensor	58	0.58	10%	1085.76	$156.35	$160.00	$160.00	0.00	120.64	$17.37	9.21
12	Storage	520	4	2	T8 2x4 2 Lamps Electronic Ballast	58	0.23	120.6	$17.37	4	2	None	58	0.23	0%	120.64	$17.37	$0.00	$0.00	0.00	0	$0.00	0.00
14	107	2080	8	3	T8 2x4 3 Lamps Electronic Ballast	82	0.66	1,364.5	$196.49	8	3	Dual Technology Occupancy Sensor	82	0.66	10%	1228.032	$176.84	$160.00	$160.00	0.00	136.448	$19.65	8.14
12	Gym Office	2080	6	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.35	723.8	$104.23	6	2	Dual Technology Occupancy Sensor	58	0.35	10%	651.456	$93.81	$160.00	$160.00	0.00	72.384	$10.42	15.35
18		2080	1	1	Incandescent 100 w	100	0.10	208.0	$29.95	1	1		100	0.10	10%	187.2	$26.96	$0.00	$0.00	0.00	20.8	$3.00	0.00

12	Bathroom	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	Dual Technology Occupancy Sensor	58	0.12	10%	217.152	$31.27	$160.00	$160.00	0.00	24.128	$3.47	46.05
12	106	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$187.62	$160.00	$160.00	0.00	144.768	$20.85	7.68
12	105	2080	6	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.35	723.8	$104.23	6	2	Dual Technology Occupancy Sensor	58	0.35	10%	651.456	$93.81	$160.00	$160.00	0.00	72.384	$10.42	15.35
17	101	2080	12	1	T8 1x4 1 Lamp Electronic Ballast Surface Mounting Prismatic Lens	28	0.34	698.9	$100.64	12	1	Dual Technology Occupancy Sensor	28	0.34	10%	628.992	$90.57	$160.00	$160.00	0.00	69.888	$10.06	15.90
12		2080	1	2	T8 2x4 2 Lamps Electronic Ballast	58	0.06	120.6	$17.37	1	2		58	0.06	10%	108.576	$15.63	$0.00	$0.00	0.00	12.064	$1.74	0.00
12		2080	1	2	T8 2x4 2 Lamps Electronic Ballast	58	0.06	120.6	$17.37	1	2		58	0.06	10%	108.576	$15.63	$0.00	$0.00	0.00	12.064	$1.74	0.00
13	102	2080	12	3	T8 2x4 3 Lamps Electronic Ballast	82	0.98	2,046.7	$294.73	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$265.25	$160.00	$160.00	0.00	204.672	$29.47	5.43
12		2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2		58	0.06	10%	108.576	$15.63	$0.00	$0.00	0.00	12.064	$1.74	0.00
12	Hallway	8760	6	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.35	3,048.5	$438.98	6	2	None	58	0.35	0%	3048.48	$438.98	$0.00	$0.00	0.00	0	$0.00	0.00
13	104	2080	13	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.07	2,217.3	$319.29	13	3	Dual Technology Occupancy Sensor	82	1.07	10%	1995.552	$287.36	$160.00	$160.00	0.00	221.728	$31.93	5.01
12		2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2		58	0.12	10%	217.152	$31.27	$0.00	$0.00	0.00	24.128	$3.47	0.00
13	103	2080	13	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.07	2,217.3	$319.29	13	3	Dual Technology Occupancy Sensor	82	1.07	10%	1995.552	$287.36	$160.00	$160.00	0.00	221.728	$31.93	5.01
12		2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2		58	0.12	10%	217.152	$31.27	$0.00	$0.00	0.00	24.128	$3.47	0.00
12	Stairwell	8760	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	1,016.2	$146.33	2	2	None	58	0.12	0%	1016.16	$146.33	$0.00	$0.00	0.00	0	$0.00	0.00
12	Stairwell	8760	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.23	2,032.3	$292.65	4	2	None	58	0.23	0%	2032.32	$292.65	$0.00	$0.00	0.00	0	$0.00	0.00
12	Bathroom	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	Dual Technology Occupancy Sensor	58	0.12	10%	217.152	$31.27	$160.00	$160.00	0.00	24.128	$3.47	46.05
11	Hallway	8760	25	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	1.45	12,702.0	$1,829.09	25	2	None	58	1.45	0%	12702	$1,829.09	$0.00	$0.00	0.00	0	$0.00	0.00
2	Hallway	8760	1	1	CFL 1 Lamp	28	0.03	245.3	$35.32	1	1	None	28	0.03	0%	245.28	$35.32	$0.00	$0.00	0.00	0	$0.00	0.00
11	Hallway	8760	6	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	0.35	3,048.5	$438.98	6	2	None	58	0.35	0%	3048.48	$438.98	$0.00	$0.00	0.00	0	$0.00	0.00
12	214	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$187.62	$160.00	$160.00	0.00	144.768	$20.85	7.68

12	213	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$187.62	$160.00	$160.00	0.00	144.768	$20.85	7.68
14	212	2080	8	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.66	1,364.5	$196.49	8	3	Dual Technology Occupancy Sensor	82	0.66	10%	1228.032	$176.84	$160.00	$160.00	0.00	136.448	$19.65	8.14
13	211	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.98	2,046.7	$294.73	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$265.25	$160.00	$160.00	0.00	204.672	$29.47	5.43
12	Hallway	8760	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.46	4,064.6	$585.31	8	2	None	58	0.46	0%	4064.64	$585.31	$0.00	$0.00	0.00	0	$0.00	0.00
12	Stairwell	8760	4	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.23	2,032.3	$292.65	4	2	None	58	0.23	0%	2032.32	$292.65	$0.00	$0.00	0.00	0	$0.00	0.00
11	Stairwell	8760	1	2	T8 1x4 2 Lamps Electronic Ballast Surface	58	0.06	508.1	$73.16	1	2	None	58	0.06	0%	508.08	$73.16	$0.00	$0.00	0.00	0	$0.00	0.00
8	Boiler Room	2080	3	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting No Lens	58	0.17	361.9	$52.12	3	2	Dual Technology Occupancy Sensor	58	0.17	10%	325.728	$46.90	$160.00	$160.00	0.00	36.192	$5.21	30.70
13	204/205	2080	7	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.57	1,193.9	$171.92	7	3	Dual Technology Occupancy Sensor	82	0.57	10%	1074.528	$154.73	$160.00	$160.00	0.00	119.392	$17.19	9.31
1	206	2080	18	2	T5 1x4 2 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Sylvania FP54/835/HO	54	0.97	2,021.8	$291.13	18	2	Dual Technology Occupancy Sensor	54	0.97	10%	1819.584	$262.02	$160.00	$160.00	0.00	202.176	$29.11	5.50
7	Library	2080	45	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Direct/Indirect	58	2.61	5,428.8	$781.75	45	2	Dual Technology Occupancy Sensor	58	2.61	10%	4885.92	$703.57	$160.00	$160.00	0.00	542.88	$78.17	2.05
13	203	2080	6	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.49	1,023.4	$147.36	6	3	Dual Technology Occupancy Sensor	82	0.49	10%	921.024	$132.63	$160.00	$160.00	0.00	102.336	$14.74	10.86
13	Faculty Rm	2080	6	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.49	1,023.4	$147.36	6	3	Dual Technology Occupancy Sensor	82	0.49	10%	921.024	$132.63	$160.00	$160.00	0.00	102.336	$14.74	10.86
12	Kitchen	2080	5	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.29	603.2	$86.86	5	2	Dual Technology Occupancy Sensor	58	0.29	10%	542.88	$78.17	$160.00	$160.00	0.00	60.32	$8.69	18.42
12	Girls Room	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$15.63	$160.00	$160.00	0.00	12.064	$1.74	92.10
12	Boys Room	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$17.37	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$15.63	$160.00	$160.00	0.00	12.064	$1.74	92.10
12	207	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$187.62	$160.00	$160.00	0.00	144.768	$20.85	7.68
9	202	2080	12	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	58	0.70	1,447.7	$208.47	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$187.62	$160.00	$160.00	0.00	144.768	$20.85	7.68
12	208	2080	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.46	965.1	$138.98	8	2	Dual Technology Occupancy Sensor	58	0.46	10%	868.608	$125.08	$160.00	$160.00	0.00	96.512	$13.90	11.51

12	Boys Room	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.12	241.3	$34.74	2	2	Dual Technology Occupancy Sensor	58	0.12	10%	217.152	$31.27	$160.00	$160.00	0.00	24.128	$3.47	46.05
12	Girls Room	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting	58	0.06	120.6	$17.37	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$15.63	$160.00	$160.00	0.00	12.064	$1.74	92.10
14	201	2080	4	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting	82	0.33	682.2	$98.24	4	3	Dual Technology Occupancy Sensor	82	0.33	10%	614.016	$88.42	$160.00	$160.00	0.00	68.224	$9.82	16.29
12	209	2080	8	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.46	965.1	$138.98	8	2	Dual Technology Occupancy Sensor	58	0.46	10%	868.608	$125.08	$160.00	$160.00	0.00	96.512	$13.90	11.51
13	210	2080	13	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.07	2,217.3	$319.29	13	3	Dual Technology Occupancy Sensor	82	1.07	10%	1995.552	$287.36	$160.00	$160.00	0.00	221.728	$31.93	5.01
15	Throughout	8760	1	2	Exit Sign (2) 15 W incadescent	30	0.03	262.8	$37.84	1	0	None	30	0.03	0%	262.8	$37.84	$0.00	$0.00	0.00	0	$0.00	0.00
16	Throughout	8760	17	0	LED Exit Signs	4	0.07	595.7	$85.78	17	0	None	4	0.07	0%	595.68	$85.78	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		484	130			32.52	101,368.7	$14,597.10	484	130			32.518		95976.3	$13,820.59		$6,240.00	0.00	5392.4	$776.51	8.04

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: 16 Milton Ave
Chatham, NJ
Building SF: 37,964

Milton Avenue School

KWH COST: **$0.144**

ECM #3: 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
3	Gym	2080	12	1	Metal Halide -High-Bay Fixture	292	3.50	7,288.3	$1,049.52	12	3	3-Lamp T-5 HO Cooper F-Bay	182	2.18	4542.72	$654.15	$300.00	$3,600.00	1.32	2745.6	$395.37	9.11
2	Gym	2080	2	1	CFL 1 Lamp	28	0.06	116.5	$16.77	2	1	No Replacement	28	0.06	116.48	$16.77	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		14	2			3.56	7,404.8	$1,066.29	14	4			2.24	4659.2	$670.92		$3,600.00	1.32	2745.6	$395.37	9.11

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: 16 Milton Ave
Chatham, NJ
Building SF: 37,964

Milton Avenue School

KWH COST: **$0.144**

ECM #4: LED Exit Sign

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
15	**Throughout**	**8760**	**1**	**2**	**Exit Sign (2) 15 W incadescent**	**30**	**0.03**	**262.8**	**$37.84**	**1**	**0**	**Exit Sign - LED**	**4**	**0.00**	**35.04**	**$5.05**	**$56.00**	**$56.00**	**0.03**	**227.76**	**$32.80**	**1.71**
16	Throughout	8760	17	0	LED Exit Signs	4	0.07	595.7	$85.78	17	0	No Replacement	4	0.07	595.68	$85.78	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		18	2			0.10	858.5	$123.62	18	0			0.072	630.72	$90.82		$56.00	0.03	227.8	$32.80	1.71

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

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

Simple Payback Analysis

	Photovoltaic System 95% Financing - 25 year
Total Construction Cost	$190,440
Annual kWh Production	25,952
Annual Energy Cost Reduction	$3,737
Annual SREC Revenue	$9,083
First Cost Premium	**$190,440**
Simple Payback:	**14.85** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	300	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.144**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/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	$9,522	0	0	0	$0	0	0	(9,522)	0
1	$0	25,952	$3,737	$0	$9,083	$12,577	$2,768	($2,524)	($12,046)
2	$0	25,822	$3,849	$0	$9,038	$12,377	$2,968	($2,457)	($14,503)
3	$0	25,693	$3,965	$0	$8,993	$12,162	$3,182	($2,387)	($16,890)
4	$0	25,565	$4,084	$0	$8,948	$11,932	$3,412	($2,313)	($19,203)
5	$0	25,437	$4,206	$262	$8,903	$11,685	$3,659	($2,497)	($21,701)
6	$0	25,310	$4,332	$261	$8,858	$11,421	$3,924	($2,414)	($24,115)
7	$0	25,183	$4,462	$259	$8,814	$11,137	$4,207	($2,327)	($26,442)
8	$0	25,057	$4,596	$258	$8,770	$10,833	$4,511	($2,236)	($28,678)
9	$0	24,932	$4,734	$257	$8,726	$10,507	$4,837	($2,141)	($30,819)
10	$0	24,807	$4,876	$256	$8,683	$10,157	$5,187	($2,041)	($32,861)
11	$0	24,683	$5,022	$254	$8,639	$9,782	$5,562	($1,937)	($34,798)
12	$0	24,560	$5,173	$253	$8,596	$9,380	$5,964	($1,828)	($36,626)
13	$0	24,437	$5,328	$252	$8,553	$8,949	$6,395	($1,715)	($38,341)
14	$0	24,315	$5,488	$250	$8,510	$8,487	$6,858	($1,597)	($39,937)
15	$0	24,193	$5,653	$249	$8,468	$7,991	$7,353	($1,473)	($41,410)
16	$0	24,072	$5,822	$248	$8,425	$7,459	$7,885	($1,345)	($42,755)
17	$0	23,952	$5,997	$247	$8,383	$6,889	$8,455	($1,211)	($43,966)
18	$0	23,832	$6,177	$245	$8,341	$6,278	$9,066	($1,072)	($45,038)
19	$0	23,713	$6,362	$244	$8,300	$5,623	$9,722	($927)	($45,965)
20	$0	23,594	$6,553	$243	$8,258	$4,920	$10,424	($776)	($46,741)
21	$0	23,476	$6,750	$242	$8,217	$4,482	$9,583	$659	($46,082)
22	$0	23,359	$6,952	$241	$8,176	$3,622	$7,886	$3,379	($42,703)
23	$0	23,242	$7,161	$239	$8,135	$0	$0	$15,056	($27,647)
24	$0	23,126	$7,375	$238	$8,094	$0	$0	$15,231	($12,415)
25	$0	23,010	$7,597	$237	$8,054	$0	$0	$15,413	$2,998
	Totals:	495,110	$100,417	$4,038	$173,288	$190,544	$116,342	$133,811	($768,685)
					Net Present Value (NPV)			**($18,626)**	
					Internal Rate of Return (IRR)			**N/A**	

Project Name: LGEA Solar PV Project - Milton Avenue School
Location: Chatham, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$190,440
Annual kWh Production	25,952
Annual Energy Cost Reduction	$3,737
Annual SREC Revenue	$9,083
First Cost Premium	**$190,440**
Simple Payback:	**14.85** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.144**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$190,440	0	0	0	$0	(190,440)	0
1	$0	25,952	$3,737	$0	$9,083	$12,820	($177,620)
2	$0	25,822	$3,849	$0	$9,038	$12,887	($164,733)
3	$0	25,693	$3,965	$0	$8,993	$12,957	($151,775)
4	$0	25,565	$4,084	$0	$8,948	$13,031	($138,744)
5	$0	25,437	$4,206	$262	$8,903	$12,847	($125,897)
6	$0	25,310	$4,332	$261	$8,858	$12,930	($112,967)
7	$0	25,183	$4,462	$259	$8,814	$13,017	($99,950)
8	$0	25,057	$4,596	$258	$8,770	$13,108	($86,842)
9	$0	24,932	$4,734	$257	$8,726	$13,203	($73,639)
10	$0	24,807	$4,876	$256	$8,683	$13,303	($60,336)
11	$0	24,683	$5,022	$254	$8,639	$13,407	($46,928)
12	$0	24,560	$5,173	$253	$8,596	$13,516	($33,412)
13	$0	24,437	$5,328	$252	$8,553	$13,629	($19,783)
14	$0	24,315	$5,488	$250	$8,510	$13,748	($6,035)
15	$0	24,193	$5,653	$249	$8,468	$13,871	$7,836
16	$0	24,072	$5,822	$248	$8,425	$14,000	$21,835
17	$0	23,952	$5,997	$247	$8,383	$14,133	$35,969
18	$0	23,832	$6,177	$245	$8,341	$14,273	$50,241
19	$0	23,713	$6,362	$244	$8,300	$14,417	$64,659
20	$0	23,594	$6,553	$243	$8,258	$14,568	$79,227
21	$1	23,476	$6,750	$242	$8,217	$14,725	$93,952
22	$2	23,359	$6,952	$241	$8,176	$14,887	$108,839
23	$3	23,242	$7,161	$239	$8,135	$15,056	$123,895
24	$4	23,126	$7,375	$238	$8,094	$15,231	$139,126
25	$5	23,010	$7,597	$237	$8,054	$15,413	$154,539
Totals:		495,110	$100,417	$4,038	$173,288	$344,979	$269,667
				Net Present Value (NPV)		**$154,564**	
				Internal Rate of Return (IRR)		**5.0%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Milton Ave	1500	Sunpower SPR230	92	14.7	1,353	21.16	25,952	3,036	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):	21.16	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):	22	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

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:	21.2 kW
DC to AC Derate Factor:	0.810
AC Rating:	17.1 kW
Array Type:	Fixed Tilt
Array Tilt:	22.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	1.4 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	2.85	1548	22.29
2	3.61	1770	25.49
3	4.39	2322	33.44
4	4.96	2440	35.14
5	5.68	2820	40.61
6	5.83	2722	39.20
7	5.71	2721	39.18
8	5.47	2580	37.15
9	4.94	2330	33.55
10	4.06	2039	29.36
11	2.74	1378	19.84
12	2.41	1282	18.46
Year	4.39	25952	373.71

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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