ENERGY AUDIT – FINAL REPORT

SCHOOL DISTRICT OF THE CHATHAMS
CHATHAM MIDDLE SCHOOL

480 MAIN STREET
CHATHAM, NJ 07928
ATTN: RALPH GOODWIN
SCHOOL BUSINESS ADMINISTRATOR BOARD SECRETARY

CEG PROJECT NO. 9C09078

CONCORD ENGINEERING GROUP

520 SOUTH BURNT MILL ROAD
VOORHEES, NJ 08043
TELEPHONE: (856) 427-0200
FACSIMILE: (856) 427-6529
WWW.CEG-INC.NET

CONTACT: MICHAEL FISCHETTE, PRESIDENT
EMAIL: mfischette@ceg-inc.net

Table of Contents

REPORT DISCLAIMER

The information contained within this report, including any attachment(s), is intended solely for use by the named addressee(s). If you are not the intended recipient, or a person designated as responsible for delivering such messages to the intended recipient, you are not authorized to disclose, copy, distribute or retain this report, in whole or in part, without written authorization from Concord Engineering Group, Inc., 520 S. Burnt Mill Road, Voorhees, NJ 08043.

This report may contain proprietary, confidential or privileged information. If you have received this report in error, please notify the sender immediately. Thank you for your anticipated cooperation.

I. EXECUTIVE SUMMARY

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

Chatham School District
Chatham Middle School
480 Main Street
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	$ 206,786
Natural Gas	$ 115,630
Total	$ 322,416

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	$3,062	$812	3.8	297.8%
ECM #2	Install Compact Fluorescents	$426	$2,053	0.2	7137.4%
ECM #3	Lighting Contrls	$6,215	$5,535	1.1	1235.9%
ECM #4	Install T-5 Lighting System in Gym	$9,000	$1,412	6.4	135.3%
ECM #5	Boiler Replacement	$277,414	$12,069	23.0	52.3%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	253.46 KW PV System	$2,281,140	$150,543	15.2	65.0%

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

The estimated demand and energy savings for each ECM and REM is shown below in Table 2. The 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	4.75	9,874	0
ECM #2	Install Compact Fluorescents	6.02	12,517	0
ECM #3	Lighting Contrls	0	33,749	0
ECM #4	Install T-5 Lighting System in Gym	4.07	8,461	0
ECM #5	Boiler Replacement	0	0	6,936
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	253.46 KW PV System	253	292,885	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:** Install Compact Fluorescents
- **ECM #3:** Lighting Controls
- **ECM #4:** Intall T-5 Lighting System in Gym

Although ECM #5 does not provide a payback less than 10 years, it is recommended to proceed with the installation of efficient boiler units as suggested in ECM #5 (or equal) for the Middle School, since the existing boilers are past their 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.

Incentives provide financial motivation and much needed support for the implementation of energy conservation measures. Along with the NJ Smart Start program, the Pay for Performance Program incentives, sponsored by NJ Clean Energy Program, are suited favorably for this facility and its energy saving opportunities. It is expected through the implementation of multiple recommended ECMs, that this facility could reduce its overall energy consumption by more than 15%. The existing average operating demand above 200 KW and high energy consumption suggests the potential to qualify for the pay for performance program through the implementation of multiple ECMs. The incentive based on a 15% energy reduction for this facility would qualify for an additional $75,840 in the pay for performance program. This option is one to consider for a whole-building approach to energy reduction. CEG recommends the Owner review this option in more detail with a Pay for Performance Partner.

II. INTRODUCTION

The comprehensive energy audit covers the 148,396 square foot Middle School, which includes 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 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 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 the middle 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	16.4¢ / kWh
Natural Gas	$1.74 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY			
Utility Provider:	JCP&L, General Service Secondary 3 phase		
Rate:	JC_GS3_01F		
Meter No:	(G28873585, G21060890)		
Customer ID No:	(0801577897 0000424954, 0801577897 0005984109)		
TPS Meter / Acct No:	(10 00 06 2966 59, 10 00 42 4972 8 7)		
MONTH OF USE	**CONSUMPTION**	**DEMAND**	**TOTAL BILL**
Sep-08	95,035	420.4	$18,050
Oct-08	98,961	401.5	$16,169
Nov-08	106,111	327.8	$16,735
Dec-08	107,931	329.7	$17,325
Jan-09	111,020	311.2	$18,220
Feb-09	100,203	322.9	$16,781
Mar-09	106,580	318.9	$17,499
Apr-09	97,778	313.8	$15,999
May-09	98,286	315.0	$16,027
Jun-09	106,761	362.6	$16,673
Jul-09	89,108	353.2	$14,719
Aug-09	92,072	260.5	$13,716
Totals	**1,209,846**	**420.4 Max**	**$197,913**
	AVERAGE DEMAND	**336.5 KW average**	
	AVERAGE RATE	**$0.164 $/kWh**	

Figure 1
Electricity Usage Profile

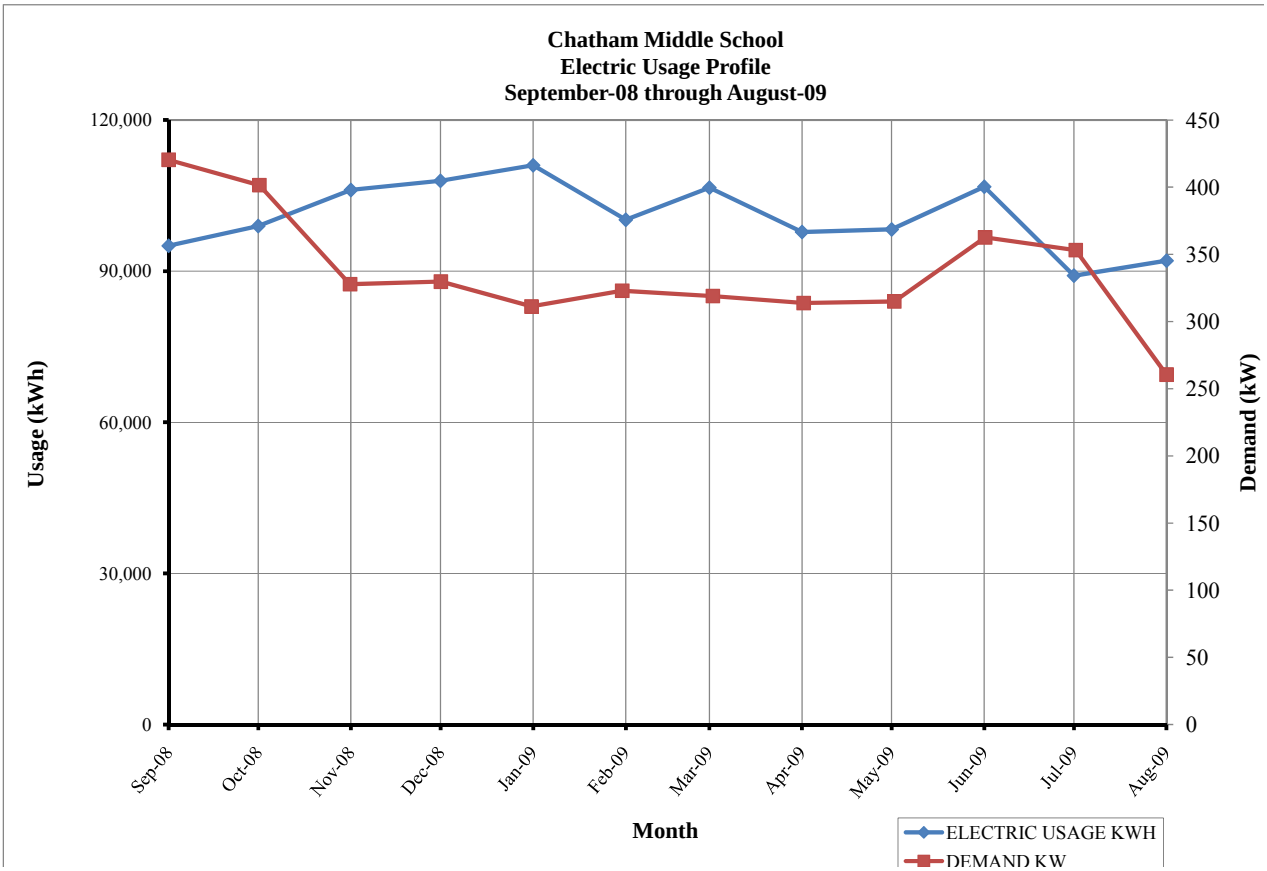
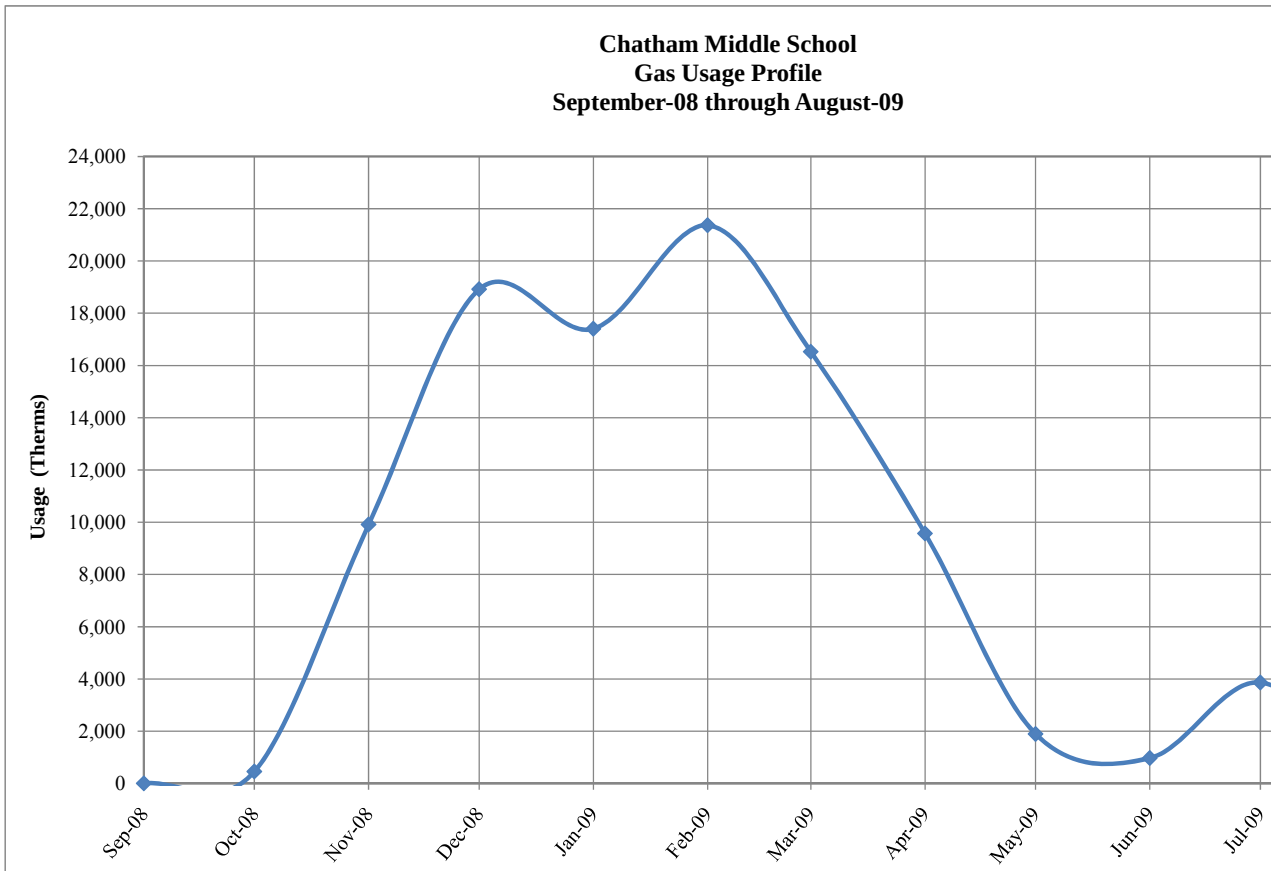


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	PSE&G	
Rate:	LVG	
Meter No:	1810088	
Point of Delivery ID:	PG000009701158904569	
Third Party Utility Provider:	HESS	
TPS Meter No:	394872/394900	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Sep-08	7.30	$102.11
Oct-08	462.31	$710.11
Nov-08	9,915.48	$14,951.08
Dec-08	18,918.68	$28,321.73
Jan-09	17,404.92	$26,161.17
Feb-09	21,368.43	$32,225.97
Mar-09	16,526.88	$25,515.46
Apr-09	9,571.25	$46,632.53
May-09	1,897.06	$2,564.25
Jun-09	977.14	$1,377.79
Jul-09	3,866.72	$478.81
Aug-09	48.75	$99.54
TOTALS	**100,964.91**	**$179,140.55**
AVERAGE RATE:	**$1.774**	**$/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):

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

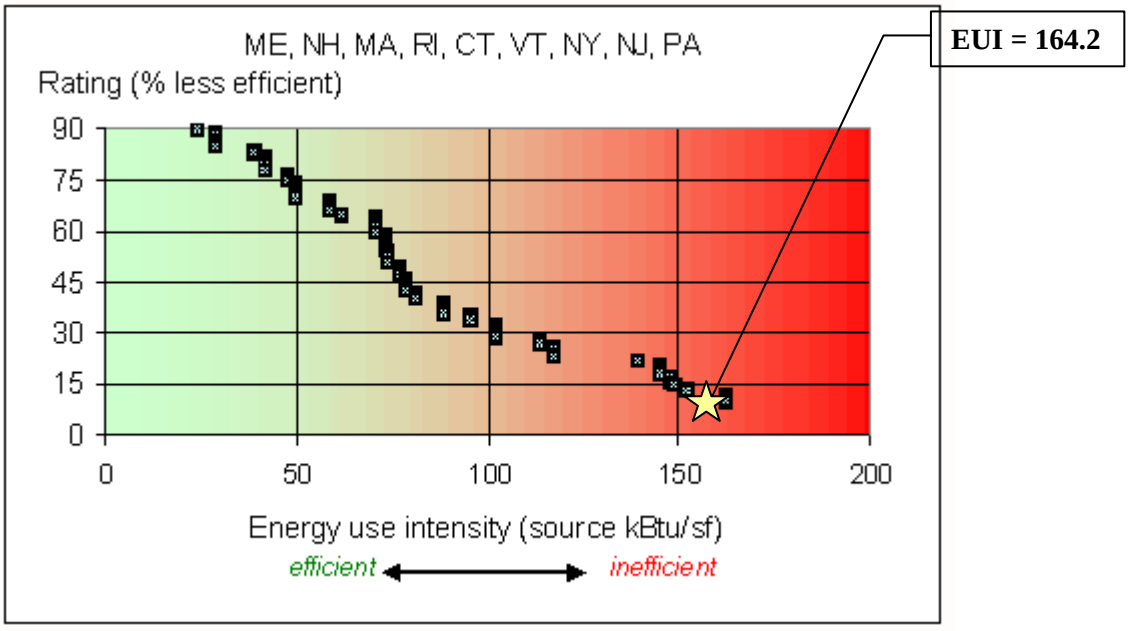
$$Building\ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ X\ SS\ Ratio + Gas\ Usage\ in\ kBtu\ X\ SS\ Ratio)}{Building\ Square\ Footage}$$

Table 5
Chatham Middle School EUI Calculations

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	1209845.5			4,130,413	3.340	13,795,578
NATURAL GAS		100964.9		10,096,491	1.047	10,571,026
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				14,226,904		24,366,604
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		148,396	SQUARE FEET			
BUILDING SITE EUI		*95.87*	kBtu/SF/YR			
BUILDING SOURCE EUI		*164.20*	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**
Chatham Middle School	25	50

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

V. FACILITY DESCRIPTION

The 148,396 SF Middle School is a two story building comprised of an auditorium, cafeteria, kitchen, classrooms, offices, gymnasiums, locker rooms, and library. The building operates for 40 hours during a typical week. The building was originally 115,294 SF when it was built in 1957 and has been through several additions. The first addition in 1989 added approximately 3,200 SF. The second addition in 2000 added approximately 10,091 SF. The last addition was in 2006 and added 19,811 SF. There are three (3) different roofing types for this building. The first type is built up roofing with gravel topping and two (2) inches of insulation which is located on the original building. There is a roof section on the new gymnasium which is part of the 2006 addition built containing built up rubber roofing. The last roof type is on the 1989 music room addition which is comprised of rubber spray on roofing. Exterior walls are brick construction. The windows throughout the facility are in good condition and appear to be maintained. Typical windows throughout the facility are double pane, ¼" clear glass with aluminum frames.

Heating System

There is one boiler plant providing hot water for heating and there are natural gas fired roof top air handling and split system units that provide heat for this facility. The boiler plant consists of two (2) Smith cast iron boilers, model M450A, 3,603 MBH input, natural gas, water boiler. These boilers provide heating hot water to unit heaters, unit ventilators, unit heaters and packaged rooftop units.

Cooling System

Cooling for the building is provided through packaged rooftop DX units, split AC units, window air conditioning units, unit ventilators, and supply fans. The rooftop units are mostly manufactured by Aaon and range in capacity from 5 tons to 31 tons and provide cooling to larger areas such as the new gym, library, cafeteria, etc. Almost every classroom contains a window air conditioning unit or Airedale model CMX.

Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters. The toilet room exhaust fan is operated based on the facility occupancy schedule. In addition to this ventilation, there is a fan room located below the old gym. This fan room contains two (2) large fan blower units which provide make up are and ventilation to the old gym.

Domestic Hot Water

A 28 gallon A.O. Smith gas fired hot water heater, capacity of 300,000 Btu/h, runs only during the summer months to supplement the boiler in the supply of hot water to the Middle School. During the winter months when the two (2) Smith boilers are active, they heat a holding tank for domestic hot water use. In the summer months when the boilers are shut down, this small A.O. Smith heater supplies the hot water thereafter. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The domestic hot water piping insulation appeared to be in good condition.

Lighting

Typical lighting throughout building are fluorescent tube lay-in fixtures with T-8 lamps and electronic ballasts. Storage rooms and closets lit with a mixture of incandescent lamps, compact fluorescent lamps, and industrial surface mounted T-8 fixtures. The parking lot is lit with light poles and high pressure sodium lamps.

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 Chatham Middle School is comprised mostly of T-8 and fluorescent fixtures throughout. There are a few places in the Middle School which contain T-12 and incandescent lighting which should be retrofitted to match the rest of the school.

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.

Hours of Operation: 2,080 Hrs per year.

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.

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

$$\text{Smart Start®}\ Incentive = (2 \times\ \$\,10) + (18 \times\ \$\,20) = \underline{\$380}$$

Replacement and Maintenance Savings are calculated as follows:

$$Savings = (reduction\ in\ lamps\ replaced\ \ per\ \ year) \times (repacment\ \$\ \ per\ lamp + Labor\ \$\ \ per\ lamp)$$
$$Savings = (58\ lamps\ \ per\ \ year) \times (\$2.00 + \$5.00) = \underline{\$580}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,442
NJ Smart Start Equipment Incentive ($):	$380
Net Installation Cost ($):	$3,062
Maintenance Savings ($/Yr):	$580
Energy Savings ($/Yr):	$232
Total Yearly Savings ($/Yr):	$812
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.8
Simple Lifetime ROI	297.8%
Simple Lifetime Maintenance Savings	$8,700
Simple Lifetime Savings	$12,180
Internal Rate of Return (IRR)	26%
Net Present Value (NPV)	$6,631.60

ECM #2: Install Compact Fluorescent Lamps

Description:

Compact fluorescent lamps (CFL's) were created to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 40-Watt incandescent lamp, a 15-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 23-Watt CFL for a 100-Watt incandescent lamp.

The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures.

This ECM involves replacing all incandescent lamps in the facility with energy efficient compact fluorescent lamps.

Energy Savings Calculations:

There are two (2) 75-Watt and seventy-two (72) 100-Watt incandescent lamps in the facility that can be upgraded to 18 Watt CFL units respectively. The average operating hours for these lamps is estimated to be 2,080.

Energy cost savings:

[2 units * (75W – 18W) + 72 units * (100W – 18W)] 2,080 hours * 1 kW/1,000 W * $0.164/kWh] = $2,053.00/yr

The installed cost of seventy-four (74) 18-Watt CFL's is $425.50.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$426
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$426
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,053
Total Yearly Savings ($/Yr):	$2,053
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.2
Simple Lifetime ROI	7137.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$30,795
Internal Rate of Return (IRR)	482%
Net Present Value (NPV)	$24,083.08

ECM #3: 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.

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

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

The ECM includes replacement of standard wall switches with sensors wall switches for individual classrooms, ceiling mount sensors for large cafeteria areas or restrooms. 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 20% for all areas that include occupancy sensor lighting controls.

Light Energy = 168,746 kWh/Yr. occupancy sensor controlled lighting

Energy Savings Calculations:

$$Energy\ Savings = 20\% \times Occupancy\ Sensored\ Light\ Energy\ (kWh/Yr)$$

$$Energy\ Savings = 20\% \times 168{,}746\ (kWh) = 33{,}749.2\ (kWh)$$

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

$$Savings. = 33{,}749.2\ (kWh) \times 0.164\left(\frac{\$}{kWh}\right) = \$5{,}535$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is $75/unit including material and labor.

Installation Cost = $75 x 113 motion sensors = $8,475

From the **Smart Start Incentive Appendix**, the installation of a lighting control device warrants the following incentive: occupancy = $20 per fixture, daylight = $25 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ wall\ mount\ devices \times\ \$\ 20) = (113 \times \$20) = \$2{,}260$$
$$\text{Smart Start®}\ Incentive = \$2{,}260\ Total$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,475
NJ Smart Start Equipment Incentive ($):	$2,260
Net Installation Cost ($):	$6,215
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$5,535
Total Yearly Savings ($/Yr):	$5,535
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.1
Simple Lifetime ROI	1235.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$83,025
Internal Rate of Return (IRR)	89%
Net Present Value (NPV)	$59,861.47

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

Description:

The Upstairs Gym is currently lit via thirty-six (36) 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 thirty-sex (36), 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 Appendix** that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

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

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ fixtures \times\ \$50) = (36 \times \$50) = \underline{\$1{,}800}$$

Maintenance savings are calculated based on the facility operational hours as indicated by the Owner. For the Gym, the estimated operational hours are 2,080 hours per year. Based on the lamp life comparison, there will be five (5) complete lamp replacements required for the metal halide system at the time when two (2) complete lamp replacements 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:

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

$$Maintenance\ Savings = (36\ lamps \times\ \ \$25\ \ per\ lamp) - (108\ lamps \times \$5\ \ per\ lamp) = \underline{\$360}$$
$$= \$360 / 15 \text{ years} = \$24/\text{year average maintenance savings}$$

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

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$10,800
NJ Smart Start Equipment Incentive ($):	$1,800
Net Installation Cost ($):	$9,000
Maintenance Savings ($/Yr):	$24
Energy Savings ($/Yr):	$1,388
Total Yearly Savings ($/Yr):	$1,412
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.4
Simple Lifetime ROI	135.3%
Simple Lifetime Maintenance Savings	$360
Simple Lifetime Savings	$21,180
Internal Rate of Return (IRR)	13%
Net Present Value (NPV)	$7,856.36

ECM #5: Boiler Replacement

Description:

There is one boiler plant providing hot water for heating and there are natural gas fired roof top air handling and split system units that provide heat for this facility. The boiler plant consists of two (2) Smith cast iron boilers, model M450A, 3,603 MBH input, natural gas, water boiler. The existing units are inefficient with an estimated combustion efficiency of 80% for heating, when new. The estimated service life for this type of gas fired boiler is thirty-five (35) years; these hot water boilers are 42 years old and have exceeded their ASHRAE service life and should be replaced due to their poor condition.

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

Energy Savings Calculations:

Existing Gas Fired Hot Water Boilers, Typical for (2) Iron Fireman:

Rated Capacity = 7,212 MBh Input, 6,434 MBh Output (Natural Gas)

Combustion Efficiency = 89%
Age & Radiation Losses = 10%
Thermal Efficiency = 79%

Replacement Gas Fired Boiler (Hot water) (3 Aerco Benchmark):

High-Efficiency Gas Fired Boiler

Rated Capacity = 9,000 MBh Input, 8,343 MBh Output (Natural Gas)

Combustion Efficiency = 87.5%
Radiation Losses = 0.5%
Thermal Efficiency = 87%

Natural Gas Equipment List - Estimated Annual Usage per unit						
Concord Engineering Group Chatham Middle School						
Location	**Qty.**	**Model #**	**Serial #**	**Input (MBh)**	**% of Total Input**	**Estimated Annual Therms**
Boiler Room 1	1	M450A	MB95-20	3603	37.36%	37,715.66
Boiler Room 1	1	M450A	MB95-20	3603	37.36%	37,715.66
Boiler Room 1	1	HW 300 932	932 E 00 56787	300	3.11%	3,140.35
Rooftop (RTU-1)	1	RN-031-3-0-BB04-3A9	200609-BNGU02289	540	5.60%	5,652.64
Rooftop (RTU-2)	1	RM-008-3-0-BA02-339	200609-AMGH28518	180	1.87%	1,884.21
Rooftop (RTU-3)	1	RM-A02-9-0-BA01-319	200609-AMGB28530	69	0.72%	722.28
Rooftop (RTU-4)	1	DL-10N24ATAAA3B	NANM001143	0.24	0.00%	2.51
Rooftop (RTU-5)	1	RM-013-3-0-BB02-349	200609-AMGK28548	270	2.80%	2,826.32
Rooftop	1	RM-008-3-0-BA02-339	200609-AMGH28519	180	1.87%	1,884.21
Rooftop	1	RN-031-3-0-BB04-3A9	200609-BNGU02288	540	5.60%	5,652.64
Boiler Room 1	1	RM-013-3-0-B002-349	200609-AMGK28547	270	2.80%	2,826.32
Boiler Room 2	2	RM-A05-3-0-BB01-329	200 609-AMGE29054	90	0.93%	942.11
			Total Input MBH	**9,645**		
			Total Input Therms	96.5		
			Total Gas Consumption Therms / yr.	100964.91		

Operating Data:

Heating Season Fuel Consumption = 2 x 37,715.66 = 75,431 Therms

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

Heating Energy Savings = 75,431 Therms x ((87% - 79%) / (87%)) = 6,936 Therms

Total Heating Cost savings

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

Heating Energy Cost Savings = 6,936 Therms x $1.74/Therm = $12,069/ yr.

Installed cost of a new gas fired heating plant $293,164. Cost for asbestos abatement was not included in this estimate.

Equipment Incentives:

Heating Smart Start Equipment Incentive = $2.00/MBh for boilers < 300 MBh and $1.75/MBh for boilers ≥ 300 MBh.

Total Smart Start Equipment Incentive = ($1.75/MBh x 9,000 MBh)
Total Smart Start Equipment Incentive = $15,750

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$293,164
NJ Smart Start Equipment Incentive ($):	$15,750
Net Installation Cost ($):	$277,414
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$12,069
Total Yearly Savings ($/Yr):	$12,069
Estimated ECM Lifetime (Yr):	35
Simple Payback	23.0
Simple Lifetime ROI	52.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$422,415
Internal Rate of Return (IRR)	3%
Net Present Value (NPV)	($18,084.74)

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 18,000 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 253.46 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 292,885 KWh annually, reducing the overall utility bill by approximately 24% 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	15.15 Years	-	-
Direct Purchase	15.15 Years	65%	4.9%

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

The resultant Internal Rate of Return indicates that if the Owner was able to "self-finance" the solar project, the project would be slightly more beneficial to the Owner. However, if the Owner was able to work out a Power Purchase Agreement with a third-party and agree upon a decent base energy rate for kilowatt hour production, the "direct purchase" option could also, prove to be a beneficial route.

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 very flat load shape throughout the year. This is a bit unusual for a school, because typically schools are closed in the summer. However the steady load profile (especially the summer) is supported by summer school, auditorium, locker rooms, kitchen, library, weekend activities and some ongoing projects. The auditorium is in use throughout the year. A steady load throughout the summer is a sign of consistent cooling load (air-conditioning). Air-conditioning in this facility is provided by packaged DX roof-top units, split AC units, window units, unit ventilators and supply fans. The roof-top units range in capacity from 5 – 31 tons. Almost every classroom contains a unit ventilator and either a window unit or Airedale model CMX. 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 supplied by (1) one, boiler plant providing hot-water for heating and natural gas fired roof top air handling and split system units that provide heat for the facility. The boiler plant consists of (2) two Smith cast iron boilers. The boilers provide hot water to unit heaters, unit ventilators and packaged roof-top units. Domestic hot water for the restrooms and kitchen lounge is provided by a 1,625 gallon A.O. Smith natural gas fired hot water heater. The domestic hot water is circulated throughout the building by a hot water re-circ pump.

Natural gas Delivery-service is provided by Public Service Electric and Gas Company (PSE&G) on an LVG rate schedule. Commodity service is supplied by the Hess Corporation, the Third Party Supplier. This consistent load profile is beneficial when looking at supply options with a Third Party Supplier.

Tariff:

Electricity:

This facility receives electrical service through Jersey Central Power & Light (JCP&L) on a GSS (General Service Secondary – 3 Phase) rate. Service classification GS is available for general service purposes on secondary voltages not included under Service Classifications RS, RT, RGT or GST. This facility's rate is a three phase service at secondary voltages. For electric supply (generation), the customer uses the service of a JCP&L. This facility uses the Delivery Service of the utility (JCP&L). The Delivery Service includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI. The Generation Service is provided by JCP&L under BGS (Basic Generation Service). BGS Energy and Reconciliation Charges are provided in Rider BGS-FP (fixed pricing) or BGS-CIEP (Commercial Industrial Energy Pricing). BGS also has a Transmission component to its charge.

Natural Gas:

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

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

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

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

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

Please see CEG recommendations below.

Recommendations:

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

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

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Chatham School District could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before energy prices increase. Based on electric supply from JCP&L and utilizing the historical consumption data provided (August 2008 through July 2009) and current electric rates, the school(s) could see an improvement in its electric costs of up to 25 % annually. (Note: Savings were calculated using Average Annual Consumption and a variance to a Fixed Average One-Year commodity contract). CEG recommends aggregating the entire electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".

CEG's second recommendation coincides with the natural gas costs. Based on the current alternative market pricing supplied by the Hess Corporation (ACES Agreement), CEG feels that School District could see an improvement of up to 33 % in its natural gas costs. CEG has experience with the mechanism for schools to buy energy in New Jersey. It is through the ACES Agreement (The Alliance for Competitive Energy Services) which is an energy aggregation program. From our experience, the basis price is the reason that the overall average price per dekatherm is ($12.08/dth). Therefore the average pricing formula supplied by Hess is 25 % above today's competitive market pricing. CEG recommends the school receive further advisement on these prices through an energy advisor. They should also consider procuring energy (natural gas) through an alternative supply source.

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

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

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the 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

Chatham Middle School

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT./ SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - General	$3,442	$0	$380	$3,062	$232	$580	$812	15	$12,180	$8,700	297.8%	3.8	25.66%	$6,631.60
ECM #2	Install Compact Fluorescents	$426	$0	$0	$426	$2,053	$0	$2,053	15	$30,795	$0	7137.4%	0.2	482.49%	$24,083.08
ECM #3	Lighting Contrls	$8,475	$0	$2,260	$6,215	$5,535	$0	$5,535	15	$83,025	$0	1235.9%	1.1	89.05%	$59,861.47
ECM #4	Install T-5 Lighting System in Gym	$10,800	$0	$1,800	$9,000	$1,388	$24	$1,412	15	$21,180	$360	135.3%	6.4	13.27%	$7,856.36
ECM #5	Boiler Replacement	$293,164	$0	$15,750	$277,414	$12,069	$0	$12,069	35	$422,415	$0	52.3%	23.0	2.55%	($18,084.74)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	253.46 KW PV System	$2,281,140	$0	$0	$2,281,140	$48,033	$102,510	$150,543	25	$3,763,575	$2,562,750	65.0%	15.2	4.29%	$340,287.49

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

"Chatham Middle School"

Boiler

Location	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room	Smith	2	M450A	MB95-20	3603	3217	89%	Natural Gas	42	35	(7.00)	

Boiler - Pumps

Location	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Frame Size	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	
Fan Room	Baldor Pumps	1	VM3159T	F0502170957	1.5	1140	-	-	-	230/460	3	9	10	1	
Fan Room	Baldor Pumps	1	VM5154	F295	1.5	1725	-	-	-	208-230/480	3	14	10	-4	
Boiler Room	Baldor Pumps	2	VM33NT	F0406090209	7 1/2	1725	-	-	-	208-230/460	3	5	10	5	
Boiler Room	Allied Pump Corp	2	4SE	41161	-	-	-	-	-	-	-	14	10	-4	
Boiler Room	Marathon Electric	2	EVA 56T34F5326E P	-	3	3450	-	-	56C-80	208-230/460	3	14	10	-4	CAT# P107
Boiler Room	Baldor Pumps	2	VJMM3154T	35E422-372	1 1/2	1725	-	-	-	230-460	3	9	10	1	
Boiler Room	A.O. Smith	2	7-850115-01-05	BX05	7 1/2	1745	-	-	-	230/460	3	4	10	6	
Boiler Room	Bell & Gossett	1	FVJ 48T17D177B P	903585	1	1725	-	-	-	208-230/460	3	19	10	-9	
Boiler Room	Baldor Pumps	2	EJMM3311T	37F784T863	7 1/2	1770	-	-	-	230/460	3	9	10	1	

Domestic Hot Water Heater

Location	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room	A.O. Smith	1	HW 300 932	932 E 00 56787	300	247	28	82%	Natural Gas	9	12	3	

DHW - Pumps

Location	Manufacturer	Qty.	Model #	Serial #	HP	Volts	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room	B&G	1	M80037	-	0.5	208/230/460	-	10	10	0	
Boiler Room	B&G	1	M10711-1-1	-	0.167	115	-	10	10	0	
Boiler Room	B&G	2	M09181	-	0.083	115	-	10	10	0	

Air Handling Units

Location	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity (Tons)	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Rooftop	AAON	1	RN-031-3-0-BB04-3A9	200609-BNGU02289	410A	-	31	HTX	540	437	81%	NG	460	3	"	3	15	12	
Rooftop	AAON	1	RM-008-3-0-BA02-339	200609-AMGH28518	410A	-	8	HTX	180	146	81%	NG	460	3	"	3	15	12	
Rooftop	York	1	D1EE036A25EBC	(S) WHKM102586	-	-	-	-	-	-	-	-	208/230	3	"	26	15	-11	
Rooftop	AAON	1	RM-A02-9-0-BA01-319	200609-AMGB28530	410A	-	2	HTX	69	58	84%	NG	208	1	"	3	15	12	
Rooftop	York	1	DL-10N24ATAA3B	NANM001143	-	-	-	-	0.24	-	-	-	208/230	3	"	29	15	-14	
Rooftop	AAON	1	RM-013-3-0-BB02-349	200609-AMGK28548	410A	-	13	HTX	270	219	81%	NG	460	3	"	3	15	12	
Rooftop	AAON	1	RM-008-3-0-BA02-339	200609-AMGH28519	410A	-	8	HTX	180	146	81%	NG	460	3	"	3	15	12	
Rooftop	AAON	1	RN-031-3-0-BB04-3A9	200609-BNGU02288	410A	-	31	HTX	540	437	81%	NG	460	3	"	3	15	12	
Rooftop	AAON	1	RM-013-3-0-B002-349	200609-AMGK28547	410A	-	13	HTX	270	219	81%	NG	460	3	"	3	15	12	
Rooftop	AAON	1	RM-A05-3-0-BB01-329	200 609-AMGE29054	410A	-	5	HTX	90	73	81%	NG	460	3	"	3	15	12	

Unit Heaters and Cabinet Unit Heaters

Location	Manufacturer	Qty.	Model #	Serial #	Heating Type	Heating Capacity (MBH)	CFM	RPM / HP	GPM	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Work Shop Classroom	Modine	1	PA50A	01011173R	HX	50000	-	-	-	9	13	4	

Split Systems and AC Condensers

Location	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Rooftop	EMI	1	S1CA2000D00	1-06-L-8427-48	-	-	R-22	208/230	1	-	3	15	12	
Rooftop	EMI	1	S1CAA2000D00	1-06-L-8425-48	-	-	R-22	208/230	1	-	3	15	12	
Rooftop	York	1	H2RD024S06B	W0L6087475	-	-	R-22	208/230	1	-	3	15	12	
Rooftop	York	1	H2RD024S06B	W0L6087468	-	-	R-22	208/230	1	-	3	15	12	
Rooftop	AAON	1	CA0185 CA-02-3:0AA00A0	200610-CCCB06595	-	-	R-22	460	3	-	3	15	12	
Rooftop	AAON	1	CA0853 CA-03-3:0AA00A0	200610-CCCC06592	-	-	R-22	460	3	-	3	15	12	
Rooftop	Mitsubishi	1	MU09TW	3000449	-	-	R-22	115	1	-	9	15	6	
Rooftop	Mitsubishi	1	PUY-A18NHA	51U00641B	-	-	R410A	208/230	1	-	9	15	6	
Rooftop	AAON	1	CA0853 CA-03-3:0AA00A0	200610-CCCC06591	-	-	R-22	460	3	-	3	15	12	
Rooftop	EMI	1	S1CA2000D00	1-06-L-8426-48	-	-	R-22	208/230	1	-	3	15	12	
Rooftop	AAON	1	CA0185 CA-02-3:0AA00A0	200610-CCCB06596	-	-	R-22	460	3	-	3	15	12	
Rooftop	AAON	1	CA0853 CA-03-3:0AA00A0	200610-CCCC06593	-	-	R-22	460	3	-	3	15	12	
Rooftop	AAON	1	CA0853 CA-03-3:0AA00A0	200610-CCCC06594	-	-	R-22	460	3	-	3	15	12	
Rooftop	York	1	DIEE036A25EBC	NHKM102587	-	-	R-22	208/230	3	-	8	15	7	

Heating and Ventilation Units

Location	Manufacturer	Qty.	Model #	Serial #	Heating Coil	Capacity (Btu/h)	Fan HP	Fan RPM	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Classroms	Nesbit	11	580 NR 4 W	-	HW	24,000	1/12 HP	-	208	1	-	21	20	-1	
Classroms	AAF	11	V.AVV.6.S15.A.Z.65.S.23.AK.22.G.W	E803748010	HW	-	1/4 HP	-	115	1	-	21	20	-1	
Fan Room	Delco AC Motor	1	62450	J77	HEX	-	3 HP	1160	240/460	3	-	21	20	-1	
Fan Room	General Electric	1	5K215AG601	-	HEX	-	3 HP	1160	240/260	3	-	21	20	-1	
Fan Room	General Electric	2	5K184AG611	2N		-	1.5 HP	-	208-220/440	3	-	21	20	-1	

PTAC - Units

Location	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity - DX	Heating Capacity - HW	Fan HP	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Classrooms	Airedale	13	CMX4-460	S321500303154406-1363	45500	N/A	-	460	3	-	3	10	7	
Classrooms	Panasonic	3	CW-C200NU	1465900459	20300	N/A	-	208	1	-	12	10	-2	
Classrooms	Westinghouse	5	WAS185F2A1	JK70312176	18000/17600	N/A	-	208	1	-	12	10	-2	
Classrooms	Friedrich	3	KS15L10-A	LECR02945	14500	N/A	-	115	1	-	12	10	-2	
Classrooms	Friedrich	8	KM18L30-B	LGAR 14019	17800/17600	N/A	-	208	1	-	12	10	-2	
Classrooms	Air Temp	1	B3J12E7A	AG563726 0185	12000/11500	N/A	-	208/230	-	-	12	10	-2	
Classrooms	Emerson Quiet Coo	3	7NW76K	DR 634618 118E	-	N/A	-	-	-	-	12	10	-2	

STATEMENT OF ENERGY PERFORMANCE
Chatham Middle School

Building ID: 1830612
For 12-month Period Ending: August 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 26, 2009

Facility
Chatham Middle School
480 Main Street
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: 1957
Gross Floor Area (ft²): 148,396

Energy Performance Rating[2] (1-100) 25

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	4,127,995
Natural Gas (kBtu)[4]	10,096,492
Total Energy (kBtu)	14,224,487

Energy Intensity[5]

Site (kBtu/ft²/yr)	96
Source (kBtu/ft²/yr)	164

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	1,166

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	77
National Average Source EUI	131
% Difference from National Average Source EUI	25%
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	Chatham Middle 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	480 Main Street, 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		☐
Chatham Middle School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	148,396 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	235	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	60 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	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: Middle School 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	92,072.00
07/01/2009	07/31/2009	89,108.00
06/01/2009	06/30/2009	106,761.00
05/01/2009	05/31/2009	98,286.00
04/01/2009	04/30/2009	97,778.00
03/01/2009	03/31/2009	106,580.00
02/01/2009	02/28/2009	100,203.00
01/01/2009	01/31/2009	111,020.00
12/01/2008	12/31/2008	107,931.00
11/01/2008	11/30/2008	106,111.00
10/01/2008	10/31/2008	98,961.00
09/01/2008	09/30/2008	95,035.00
Middle School Electric Consumption (kWh (thousand Watt-hours))		**1,209,846.00**
Middle School Electric Consumption (kBtu (thousand Btu))		**4,127,994.55**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**4,127,994.55**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

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

Start Date	End Date	Energy Use (therms)
08/01/2009	08/31/2009	48.75
07/01/2009	07/31/2009	3,866.72
06/01/2009	06/30/2009	977.14
05/01/2009	05/31/2009	1,897.06
04/01/2009	04/30/2009	9,571.25
03/01/2009	03/31/2009	16,526.88
02/01/2009	02/28/2009	21,368.43
01/01/2009	01/31/2009	17,404.92
12/01/2008	12/31/2008	18,918.68
11/01/2008	11/30/2008	9,915.48

10/01/2008	10/31/2008	462.31
09/01/2008	09/30/2008	7.30
Middle School Gas Consumption (therms)		**100,964.92**
Middle School Gas Consumption (kBtu (thousand Btu))		**10,096,492.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**10,096,492.00**
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
Chatham Middle School
480 Main Street
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

Chatham Middle School	
Gross Floor Area Excluding Parking: (ft^2)	148,396
Year Built	1957
For 12-month Evaluation Period Ending Date:	August 31, 2009

Facility Space Use Summary

Chatham Middle School	
Space Type	K-12 School
Gross Floor Area(ft^2)	148,396
Open Weekends?	Yes
Number of PCs	235
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
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	25	25	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	96	96	60	N/A	77
Source (kBtu/ft^2)	164	164	103	N/A	131
Energy Cost					
$/year	$ 389,449.55	$ 389,449.55	$ 243,868.15	N/A	$ 311,844.06
$/$ft^2$/year	$ 2.62	$ 2.62	$ 1.64	N/A	$ 2.10
Greenhouse Gas Emissions					
$MtCO_2e$/year	1,166	1,166	730	N/A	934
$kgCO_2e/ft^2$/year	8	8	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.

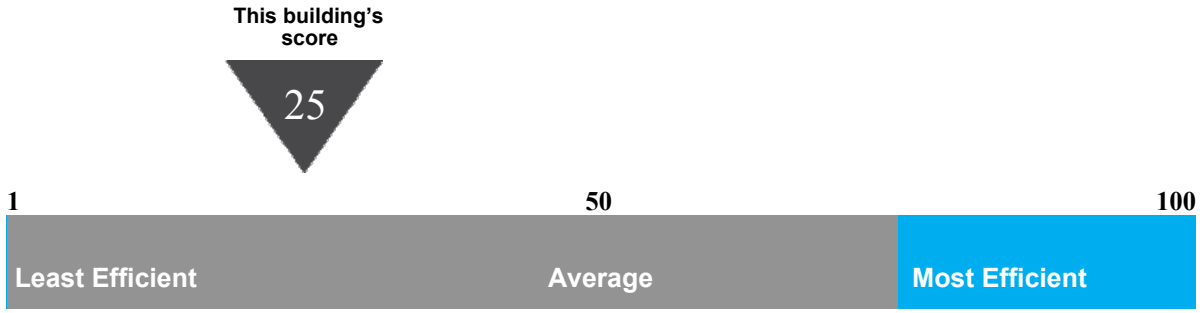
Statement of Energy Performance

2009

Chatham Middle School
480 Main Street
Chatham, NJ 07928

Portfolio Manager Building ID: 1830612

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 164 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: 10/26/2009

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: 9C09078
Project: Chatham School District Energy Audit
Address: 480 Main Street
City: Chatham, NJ
Building SF: **148,396**

"Chatham Middle School"

DATE: 11/4/2009
KWH COST: **$0.164**

EXISTING LIGHTING											PROPOSED LIGHTING								SAVINGS			
Line No.		Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1		Audio Visual	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting No Lense	2080	58	0.12	241.28	$39.57	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
2		201	8	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.66	1364.48	$223.77	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
3		203	9	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.74	1535.04	$251.75	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
4		207	8	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.66	1364.48	$223.77	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
5		204	12	T8 16' Total 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
6		206	16	T8 16' Total 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	1.31	2728.96	$447.55	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
7		Women's Room	3	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.17	361.92	$59.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
8		208	10	T8 16' Total 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	0.82	1705.6	$279.72	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
9		210	14	T8 4' Sections 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	1.15	2387.84	$391.61	14	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
10		212	6	T8 4' Sections 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	0.49	1023.36	$167.83	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
11		214	8	T8 2x4 4 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	109	0.87	1813.76	$297.46	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
12		214	2	U Tube 2 Lamps 2x2 Electronic Ballast Recessed Mounting Prismatic Lens	2080	73	0.15	303.68	$49.80	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00

13		216	4	T8 4' Sections 2 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	58	0.23	482.56	$79.14	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
14		Men's Room	1	CFL 1 Lamp Electronic Ballast Surface Mounting Parabolic Lens	2080	16	0.02	33.28	$5.46	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
15		270	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
16		272	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
17		274	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
18		276	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
19		200	6	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.49	1023.36	$167.83	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
20		205	8	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.66	1364.48	$223.77	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
21		202	12	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
22		209	8	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.66	1364.48	$223.77	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
23		Men's Room	3	T8 1x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.17	361.92	$59.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
24		Custodial Closet	1	1 Florecent Lamp Magnetic Ballast Surface Mounting No Lens	2080	75	0.08	156	$25.58	1	18 W CFL Lamp	18	0.02	37.44	$6.14	$5.75	$5.75	0.06	118.56	19.44384	0.30
25		211	14	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	1.15	2387.84	$391.61	14	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
26		213	14	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	1.15	2387.84	$391.61	14	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
27		215	5	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.29	603.2	$98.92	5	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
28		217	10	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.58	1206.4	$197.85	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
29		221	8	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.46	965.12	$158.28	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
30		221	2	T8 1x1 U-Tube Electronic Ballast Recessed Mounting Prismatic Lens	2080	35	0.07	145.6	$23.88	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
31		223	14	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	1.15	2387.84	$391.61	14	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
32		222	10	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.58	1206.4	$197.85	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
33		219	8	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.46	965.12	$158.28	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
34		219	1	T8 1x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.06	120.64	$19.78	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
35		Women's Room	2	T8 1x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.12	241.28	$39.57	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
36		271	16	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	1.31	2728.96	$447.55	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
37		273	16	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	1.31	2728.96	$447.55	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00

38		275	16	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	1.31	2728.96	$447.55	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
39		Electric Closet	1	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	58	0.06	120.64	$19.78	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
40		Locker Rooms	18	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	82	1.48	3070.08	$503.49	18	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
41		Locker Rooms	8	T8 2x2 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	47	0.38	782.08	$128.26	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
42		Team Locker Room	1	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.06	120.64	$19.78	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
43		Team Locker Room	5	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.29	603.2	$98.92	5	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
44		Upstairs Gym	36	Metal Halide 1 Lamp Pendant Mounting Clear Lens	2080	295	10.62	22089.6	$3,622.69	36	3-Lamp T-5 HO Cooper F-Bay	182	6.55	13628.2	$2,235.02	$300.00	$10,800.00	4.07	8461.44	1387.67616	7.78
45		Locker Rooms	26	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	58	1.51	3136.64	$514.41	26	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
46		Locker Rooms	1	Inc 1 Lamp Magnetic Ballast Surface Mounting No Lens	2080	100	0.10	208	$34.11	1	18 W CFL Lamp	18	0.02	37.44	$6.14	$5.75	$5.75	0.08	170.56	27.97184	0.21
47		1st Floor Hallway	23	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	1.33	2774.72	$455.05	23	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
48		1st Floor Hallway	9	CFL 2 Lamp High Hat Electronic Ballast Recessed Mounting No Cover	2080	16	0.14	299.52	$49.12	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
49		1st Floor Hallway	48	T8 2x4 4 Lamp Electronic Ballast Recessed Mounting Prismatic Lens	2080	109	5.23	10882.6	$1,784.74	48	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
50		1st Floor Hallway	4	T8 or T5 3 Twin Tube Electronic Ballast Recessed Mounting Direct/Indirect Lens	2080	96	0.38	798.72	$130.99	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
51		1st Floor Hallway	4	T8 1x4 1 Lamp Electronic Ballast Surface Mounting Prismatic Lens	2080	28	0.11	232.96	$38.21	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
52		Cafeteria	30	T8 2x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	1.74	3619.2	$593.55	30	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
53		Cafeteria	15	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	82	1.23	2558.4	$419.58	15	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
54		Cafeteria	20	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	1.64	3411.2	$559.44	20	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
55		Cafeteria	33	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	1.91	3981.12	$652.90	33	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
56		Electric Closet	2	T8 2x4 3 Lamps Electronic Ballast Recessed Surface Prismatic Lens	2080	82	0.16	341.12	$55.94	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
57		2nd Floor Hallway	5	T12 2x2 6 Lamps Magnetic Ballast Surface Mounting Prismatic Lens	2080	138	0.69	1435.2	$235.37	5	2'x 2' Troffer 3 Lamp T5 FB40BX Electronic Ballast (Biax)	130	0.65	1352	$221.73	$168.21	$841.05	0.04	83.2	13.6448	61.64
58		2nd Floor Hallway	31	T8 or T5 3 Twin Tube Electronic Ballast Recessed Mounting Direct/Indirect Lens	2080	96	2.98	6190.08	$1,015.17	31	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
59		2nd Floor Hallway	22	CFL 2 Lamp High Hat Electronic Ballast Recessed Mounting No Cover	2080	32	0.70	1464.32	$240.15	22	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
60		2nd Floor Hallway	25	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	1.45	3016	$494.62	25	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
61		Stairwell	6	T8 or T5 3 Twin Tube Electronic Ballast Recessed Mounting Direct/Indirect Lens	2080	96	0.58	1198.08	$196.49	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00

62			7	CFL 2 Lamp Wall Mount Electronic Ballast Surface Mounting Prismatic Cover	2080	32	0.22	465.92	$76.41	7	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
63		Closet	1	T8 2x4 4 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	109	0.11	226.72	$37.18	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
64		D Gym	16	CFL 8 Lamps Electronic Ballast Surface Mounting No Cover	2080	128	2.05	4259.84	$698.61	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
65		D Gym	2	CFL High Hat 2 Lamps Electronic Ballast Recessed Mounting, No cover	2080	32	0.06	133.12	$21.83	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
66		Storage	8	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.46	965.12	$158.28	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
67		Storage	36	T8 or T5 3 Twin Tube Electronic Ballast Recessed Mounting Direct/Indirect Lens	2080	96	3.46	7188.48	$1,178.91	36	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
68		Stairwell	3	CFL Wall Mount 2 Lamp Electronic Ballast Surface Mounting Prismatic Lens	2080	32	0.10	199.68	$32.75	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
69		Stairwell	12	T8 or T5 3 Twin Tube Electronic Ballast Recessed Mounting Direct/Indirect Lens	2080	120	1.44	2995.2	$491.21	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
70		Cafeteria Hall	1	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.06	120.64	$19.78	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
71		Cafeteria Hall	1	CFL 1 Lamp Electronic Ballast	2080	23	0.02	47.84	$7.85	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
72		Custodial Closet	1	Inc 1 Lamp Magnetic Ballast Surface Mounting	2080	100	0.10	208	$34.11	1	18 W CFL Lamp	18	0.02	37.44	$6.14	$5.75	$5.75	0.08	170.56	27.97184	0.21
73		Attendance Office	12	T8 2x2 3 U Tubes Electronic Ballast Recessed Mounting Parabolic Lens	2080	108	1.30	2695.68	$442.09	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
74		Attendance Office	7	T8 2x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	0.57	1193.92	$195.80	7	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
75		Attendance Office	1	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.06	120.64	$19.78	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
76		Guidance Office	16	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.93	1930.24	$316.56	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
77		Storage	3	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.17	361.92	$59.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
78		Office	5	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.29	603.2	$98.92	5	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
79		Office	12	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.70	1447.68	$237.42	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
80		Office	1	Inc 1 Lamp Magnetic Ballast Surface Mounting	2080	100	0.10	208	$34.11	1	18 W CFL Lamp	18	0.02	37.44	$6.14	$5.75	$5.75	0.08	170.56	27.97184	0.21
81		100	6	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.49	1023.36	$167.83	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
82		Library	26	T8 2x2 3 U Tubes Electronic Ballast Recessed Mounting Parabolic Lens	2080	108	2.81	5840.64	$957.86	26	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
83		Library	41	CFL 2 Lamps Electronic Ballast Recessed Mounting No Cover	2080	46	1.89	3922.88	$643.35	41	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
84		Library	36	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	2.95	6140.16	$1,006.99	36	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
85		Library	8	CFL Wall Mount 2 Lamp Electronic Ballast Surface Mounting Direct/Indirect Lens	2080	140	1.12	2329.6	$382.05	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
86		118	14	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.81	1688.96	$276.99	14	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
87		Men's Room	4	T8 1x4 4 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	109	0.44	906.88	$148.73	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
88		Women's Room	3	T8 1x4 4 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	109	0.33	680.16	$111.55	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00

89		Custodial Closet	1	Inc 1 Lamp Magnetic Ballast Surface Mounting	2080	100	0.10	208	$34.11	1	18 W CFL Lamp	18	0.02	37.44	$6.14	$5.75	$5.75	0.08	170.56	27.97184	0.21
90		Men's Room	3	T8 1x4 4 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	109	0.33	680.16	$111.55	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
91		Women's Room	3	T8 1x4 4 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	109	0.33	680.16	$111.55	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
92		Nurse's Office	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
93		Nurse's Office	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.12	241.28	$39.57	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
94		Nurse's Office	1	T8 2x2 4 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	56	0.06	116.48	$19.10	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
95		Office	12	T8 2x4 2 Lamps Electonic Ballast Recessed Mounting Prismatic Lens	2080	58	0.70	1447.68	$237.42	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
96		Office	1	T8 Circular Lamp Electronic Ballast Surface Mounting Prismatic Lens	2080		0.00	0	$0.00	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
97		Library	8	CFL 2 Lamps Electronic Ballast Surface Mounting Direct/Indirect	2080	140	1.12	2329.6	$382.05	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
98		119	29	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	2.38	4946.24	$811.18	29	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
99		121	12	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.70	1447.68	$237.42	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
100		125	6	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	82	0.49	1023.36	$167.83	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
101		127	16	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	1.31	2728.96	$447.55	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
102		129	18	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	1.48	3070.08	$503.49	18	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
103		134	24	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens	2080	82	1.97	4093.44	$671.32	24	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
104		Storage	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.12	241.28	$39.57	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
105		126	10	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	0.82	1705.6	$279.72	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
106		128	12	T8 1x4 1 Lamp Electronic Ballast Pendant Mounting Prismatic Lens	2080	28	0.34	698.88	$114.62	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
107		130	4	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	0.33	682.24	$111.89	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
108		131	12	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
109		132	12	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
110		136	24	T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	2080	82	1.97	4093.44	$671.32	24	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
111		Men's Room	3	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.17	361.92	$59.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
112		Women's Room	3	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.17	361.92	$59.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
113		Closet	1	Inc 1 Lamp Magnetic Ballast Surface Mounting	2080	100	0.10	208	$34.11	1	18 W CFL Lamp	18	0.02	37.44	$6.14	$5.75	$5.75	0.08	170.56	27.97184	0.21
114		Hallway	12	T12 2x2 6 Lamps Magnetic Ballast Surface Mounting Prismatic Lens	2080	138	1.66	3444.48	$564.89	12	2'x 2' Troffer 3 Lamp T5 FB40BX Electronic Ballast (Biax)	103	1.24	2570.88	$421.62	$168.21	$2,018.52	0.42	873.6	143.2704	14.09

115		143	2	T12 8' 2 Lamps Magnetic Ballast Surface Mounting Prismatic Lens	2080	210	0.42	873.6	$143.27	2	8' 2-Lamp T-8 Cooper Metalux, Electronic Ballast M/N 8TDIM-232-UNV-EB81-U	118	0.24	490.88	$80.50	$207.00	$414.00	0.18	382.72	62.76608	6.60
116		144	1	Inc 1 Lamp Magnetic Ballast Surface Mounting	2080	100	0.10	208	$34.11	1	18 W CFL Lamp	18	0.02	37.44	$6.14	$5.75	$5.75	0.08	170.56	27.97184	0.21
117		160	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
118		162	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
119		164	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
120		171	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
121		173	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
122		175	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
123		Front Stairwell	3	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.17	361.92	$59.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
124		Front Stairwell	3	Inc 1 Lamp Magnetic Ballast Recessed Mounting	2080	100	0.30	624	$102.34	3	18 W CFL Lamp	18	0.05	112.32	$18.42	$5.75	$17.25	0.25	511.68	83.91552	0.21
125		Stairwell	1	T12 2x2 6 Lamps Magnetic Ballast Surface Mounting Prismatic Lens	2080	138	0.14	287.04	$47.07	1	2'x 2' Troffer 3 Lamp T5 FB40BX Electronic Ballast (Biax)	103	0.10	214.24	$35.14	$168.21	$168.21	0.04	72.8	11.9392	14.09
126		Stairwell	4	Inc 1 Lamp Magnetic Ballast Recessed Mounting Prismatic Lens	2080	100	0.40	832	$136.45	4	18 W CFL Lamp	18	0.07	149.76	$24.56	$5.75	$23.00	0.33	682.24	111.88736	0.21
127		141	21	T8 1x4 3 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	2080	82	1.72	3581.76	$587.41	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
128		146	16	T8 1x4 3 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	2080	82	1.31	2728.96	$447.55	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
129		146	6	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	2080	58	0.35	723.84	$118.71	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
130		147	45	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	2080	58	2.61	5428.8	$890.32	45	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
131		147	1	T8 1x4 4 Lamps Electronic Ballast Pendant Mouting No Lens	2080	109	0.11	226.72	$37.18	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
132		147	1	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	2080	58	0.06	120.64	$19.78	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
133		151	6	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	2080	58	0.35	723.84	$118.71	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
134		152	20	T8 1x4 3 Lamps Electronic Ballast Pendant Mouting Prismatic Lens	2080	82	1.64	3411.2	$559.44	20	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
135		152	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mouting Parabolic Lens	2080	58	0.12	241.28	$39.57	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
136		152	1	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	2080	58	0.06	120.64	$19.78	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
137		153	12	T8 1x4 3 Lamps Electronic Ballast Surface Mouting Prismatic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
138		153	2	T8 1x4 2 Lamps Electronic Ballast Surface Mouting Prismatic Lens	2080	58	0.12	241.28	$39.57	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
139		153	1	Inc 1 Lamp Magnetic Ballast Surface Mounting No Cover	2080	75	0.08	156	$25.58	1	18 W CFL Lamp	18	0.02	37.44	$6.14	$5.75	$5.75	0.06	118.56	19.44384	0.30
140		153	1	CFL 1 Lamp Electronic Ballast Surface Mounting No Lens	2080	26	0.03	54.08	$8.87	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00

141		Band Room	38	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	2.20	4584.32	$751.83	38	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
142		Hallway	6	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.35	723.84	$118.71	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
143		Hallway	19	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	1.10	2292.16	$375.91	19	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
144		Stairwell	5	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.29	603.2	$98.92	5	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
145		Auditorium	54	Inc 1 Lamp High Hat Magnetic Ballast Recessed Mounting No Cover	2080	100	5.40	11232	$1,842.05	54	18 W CFL Lamp	18	0.97	2021.76	$331.57	$5.75	$310.50	4.43	9210.24	1510.47936	0.21
146		Auditorium	5	Inc 1 Lamp Magnetic Ballast Surface Mounting Prismatic Lens	2080	100	0.50	1040	$170.56	5	18 W CFL Lamp	18	0.09	187.2	$30.70	$5.75	$28.75	0.41	852.8	139.8592	0.21
147		Auditorium	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	2080	58	0.12	241.28	$39.57	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
148		Hallway	4	T8 2 U Tubes Electronic Ballast Recessed Mounting Prismatic Lens	2080	73	0.29	607.36	$99.61	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
149		Hallway	4	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.23	482.56	$79.14	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
150		161	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
151		163	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
152		165	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
153		167	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
154		166	9	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.52	1085.76	$178.06	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
155		170	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
156		172	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
157		174	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
158		176	12	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.98	2046.72	$335.66	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
159		177 Closet	1	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.06	120.64	$19.78	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
160		177 Closet	1	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	2080	82	0.08	170.56	$27.97	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
161		Stairwell	3	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	2080	58	0.17	361.92	$59.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
162		Stairwell	6	T8 or T5 3 Twin Tube Electronic Ballast Recessed Mounting Direct/Indirect Lens	2080	96	0.58	1198.08	$196.49	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
163		Middle School	56	LED Exit Sign	8760	4	0.22	1962.24	$321.81	56	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	0	0.00
164		Middle School	3	INC Exit Sign	8760	15	0.05	394.2	$64.65	3	LED Exit Sign	4	0.01	105.12	$17.24	$56.00	$168.00	0.03	289.08	47.40912	3.54
165							0.00	0	$0.00	0			0.00	0	$0.00		$0.00	0.00	0	0	0.00
		Totals	1733				136.13	284949	$46,731.70	1733			10.12	21131.8	$3,465.62		$14,835.28	10.80	22680.3	$3,719.57	3.99

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

Simple Payback Analysis

	Photovoltaic System 95% Financing - 25 year
Total Construction Cost	$2,281,140
Annual kWh Production	292,885
Annual Energy Cost Reduction	$48,033
Annual SREC Revenue	$102,510
First Cost Premium	**$2,281,140**
Simple Payback:	**15.15** Years

Life Cycle Cost Analysis

Analysis Period (years): 25
Financing Term (mths): 300
Average Energy Cost ($/kWh) **$0.164**
Financing Rate: 7.00%
Financing %: 95%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
SREC Value ($/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	$114,057	0	0	0	$0	0	0	(114,057)	0
1	$0	292,885	$48,033	$0	$102,510	$150,646	$33,152	($33,255)	($147,312)
2	$0	291,421	$49,474	$0	$101,997	$148,249	$35,549	($32,327)	($179,639)
3	$0	289,963	$50,958	$0	$101,487	$145,679	$38,119	($31,352)	($210,991)
4	$0	288,514	$52,487	$0	$100,980	$142,924	$40,874	($30,331)	($241,322)
5	$0	287,071	$54,062	$2,957	$100,475	$139,969	$43,829	($32,218)	($273,540)
6	$0	285,636	$55,684	$2,942	$99,973	$136,800	$46,998	($31,084)	($304,624)
7	$0	284,208	$57,354	$2,927	$99,473	$133,403	$50,395	($29,899)	($334,522)
8	$0	282,787	$59,075	$2,913	$98,975	$129,760	$54,038	($28,661)	($363,183)
9	$0	281,373	$60,847	$2,898	$98,480	$125,853	$57,945	($27,369)	($390,552)
10	$0	279,966	$62,672	$2,884	$97,988	$121,665	$62,133	($26,021)	($416,573)
11	$0	278,566	$64,553	$2,869	$97,498	$117,173	$66,625	($24,617)	($441,189)
12	$0	277,173	$66,489	$2,855	$97,011	$112,357	$71,441	($23,153)	($464,343)
13	$0	275,787	$68,484	$2,841	$96,526	$107,192	$76,606	($21,629)	($485,972)
14	$0	274,408	$70,538	$2,826	$96,043	$101,654	$82,144	($20,043)	($506,015)
15	$0	273,036	$72,654	$2,812	$95,563	$95,716	$88,082	($18,393)	($524,408)
16	$0	271,671	$74,834	$2,798	$95,085	$89,349	$94,449	($16,677)	($541,085)
17	$0	270,313	$77,079	$2,784	$94,609	$82,521	$101,277	($14,894)	($555,979)
18	$0	268,961	$79,391	$2,770	$94,136	$75,200	$108,598	($13,040)	($569,019)
19	$0	267,616	$81,773	$2,756	$93,666	$67,349	$116,449	($11,115)	($580,135)
20	$0	266,278	$84,226	$2,743	$93,197	$58,931	$124,867	($9,117)	($589,251)
21	$0	264,947	$86,753	$2,729	$92,731	$53,690	$114,791	$8,274	($580,977)
22	$0	263,622	$89,356	$2,715	$92,268	$43,386	$94,462	$41,060	($539,917)
23	$0	262,304	$92,036	$2,702	$91,806	$0	$0	$181,141	($358,776)
24	$0	260,992	$94,798	$2,688	$91,347	$0	$0	$183,457	($175,320)
25	$0	259,688	$97,641	$2,675	$90,891	$0	$0	$185,857	$10,538
	Totals:	6,899,185	$1,751,253	$59,085	$2,414,715	$2,379,465	$1,602,823	$124,595	($9,764,106)
					Net Present Value (NPV)			**($239,609)**	
					Internal Rate of Return (IRR)			**N/A**	

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

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$2,281,140
Annual kWh Production	292,885
Annual Energy Cost Reduction	$48,033
Annual SREC Revenue	$102,510
First Cost Premium	**$2,281,140**
Simple Payback:	**15.15** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.164**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$2,281,140	0	0	0	$0	(2,281,140)	0
1	$0	292,885	$48,033	$0	$102,510	$150,543	($2,130,597)
2	$0	291,421	$49,474	$0	$101,997	$151,471	($1,979,126)
3	$0	289,963	$50,958	$0	$101,487	$152,446	($1,826,680)
4	$0	288,514	$52,487	$0	$100,980	$153,467	($1,673,213)
5	$0	287,071	$54,062	$2,957	$100,475	$151,580	($1,521,634)
6	$0	285,636	$55,684	$2,942	$99,973	$152,714	($1,368,920)
7	$0	284,208	$57,354	$2,927	$99,473	$153,899	($1,215,020)
8	$0	282,787	$59,075	$2,913	$98,975	$155,137	($1,059,883)
9	$0	281,373	$60,847	$2,898	$98,480	$156,429	($903,454)
10	$0	279,966	$62,672	$2,884	$97,988	$157,777	($745,677)
11	$0	278,566	$64,553	$2,869	$97,498	$159,181	($586,496)
12	$0	277,173	$66,489	$2,855	$97,011	$160,645	($425,851)
13	$0	275,787	$68,484	$2,841	$96,526	$162,169	($263,682)
14	$0	274,408	$70,538	$2,826	$96,043	$163,755	($99,927)
15	$0	273,036	$72,654	$2,812	$95,563	$165,405	$65,478
16	$0	271,671	$74,834	$2,798	$95,085	$167,121	$232,598
17	$0	270,313	$77,079	$2,784	$94,609	$168,904	$401,503
18	$0	268,961	$79,391	$2,770	$94,136	$170,758	$572,260
19	$0	267,616	$81,773	$2,756	$93,666	$172,682	$744,943
20	$0	266,278	$84,226	$2,743	$93,197	$174,681	$919,624
21	$1	264,947	$86,753	$2,729	$92,731	$176,756	$1,096,379
22	$2	263,622	$89,356	$2,715	$92,268	$178,908	$1,275,288
23	$3	262,304	$92,036	$2,702	$91,806	$181,141	$1,456,429
24	$4	260,992	$94,798	$2,688	$91,347	$183,457	$1,639,885
25	$5	259,688	$97,641	$2,675	$90,891	$185,857	$1,825,743
	Totals:	6,899,185	$1,751,253	$59,085	$2,414,715	$4,106,883	($5,570,031)
				Net Present Value (NPV)			**$1,825,768**
				Internal Rate of Return (IRR)			**4.9%**

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
CMS	18000	Sunpower SPR230	1102	14.7	16,204	253.46	292,885	36,366	15.64

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

PV Watts Derate Factor for AC Power Rating at STC		
Component Derate Factors	PVWatts Default	Range
PV module nameplate DC rating	1.00	0.80–1.05
Inverter and transformer	0.95	0.88–0.96
Mismatch	0.98	0.97–0.995
Diodes and connections	1.00	0.99–0.997
DC wiring	0.98	0.97–0.99
AC wiring	0.99	0.98–0.993
Soiling	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:	253.5 kW
DC to AC Derate Factor:	0.810
AC Rating:	205.3 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	0.2 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	2.39	15207	24.94
2	3.17	18436	30.24
3	4.07	25802	42.32
4	4.83	28587	46.88
5	5.70	34011	55.78
6	5.94	33235	54.51
7	5.77	32976	54.08
8	5.38	30543	50.09
9	4.65	26279	43.10
10	3.61	21632	35.48
11	2.35	13797	22.63
12	2.01	12380	20.30
Year	4.16	292885	480.33

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

Disclaimer and copyright notice

Return to RReDC home page (*http://rredc.nrel.gov*)