ENERGY AUDIT – FINAL REPORT

SCHOOL DISTRICT OF THE CHATHAMS
WASHINGTON AVENUE SCHOOL

102 WASHINGTON AVENUE
CHATHAM, NJ 07928
ATTN: RALPH GOODWIN
SCHOOL BUSINESS ADMINISTRATOR BOARD SECRETARY

CEG PROJECT NO. 9C09078

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I. EXECUTIVE SUMMARY

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

Washington Avenue School
102 Washington Avenue
Chatham, NJ 07928

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

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

The annual energy costs at this facility are as follows:

Electricity	$55,510
Natural Gas	$51,573
Total	$107,083

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	$49	$158	0.3	4735.2%
ECM #2	Lighting Controls	$5,880	$1,567	3.8	299.6%
ECM #3	Install NEMA Premium Efficient Pump Motor	$5,012	$214	23.4	-57.3%
ECM #4	DDC System	$131,514	$7,156	18.4	-18.4%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solar PV Project	$1,039,972	$26,040	39.9	-37.4%

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

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

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Lighting Upgrade - General	0.5	918.3	-
ECM #2	Lighting Controls	0.0	9,108.1	-
ECM #3	Install NEMA Premium Efficient Pump Motor	0.3	1,244.1	-
ECM #4	DDC System	-	-	2,995.2
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	Solar PV Project	121.4	151,393.0	-

Recommendation:

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

- **ECM #1:** Lighting Upgrade
- **ECM #2:** Install Lighting Controls

Equipment that has past its useful service life should be replaced such as the equipment described in ECM#3. Although this ECM will not have a payback in less than 10 years, this equipment should be replaced and will save energy as summarized above in Table 2 on page 5.

In addition to the ECMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit. The ECMs listed above represent investments that can be made to the facility which are justified by the savings seen overtime. However, the maintenance items and small operational improvements below are typically achievable with on site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building:

1. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
2. Maintain all weather stripping on entrance doors.
3. Clean all light fixtures to maximize light output.
4. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

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

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

II. INTRODUCTION

The Washington Avenue School is a 43,838 square foot facility that includes restrooms, classrooms, offices, Library, gymnasium, multi-purpose room, art room and boiler room.

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

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

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

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

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

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

III. METHOD OF ANALYSIS

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

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

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

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ SmartStart Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The costs and savings are applied and a simple payback and simple return on investment (ROI) is calculated. The simple payback is based on the years that it takes for the savings to pay back the net installation cost (Net Installation divided by Net Savings.) A simple return on investment is calculated as the percentage of the net installation cost that is saved in one year (Net Savings divided by Net Installation.)

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

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

There is one (1) electric service for the facility. The primary service is located just outside of the boiler room. 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 Three-Phase rate structure. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile shows the actual natural gas energy usage for the facility. Public Service Electric and Gas (PSE&G) provides natural gas to the facility under the Basic General Supply Service- Large Volume Gas (LVG) rate structure. Hess Corporation is a third party supplier. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provide, the average cost for utilities at this facility is as follows:

Description	Average
Electricity	17.2¢ / kWh
Natural Gas	$1.521 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: JCP&L
Rate: JC_GS3_01F
Meter No: G28890566
Customer ID No: 0801577897 0000426058
Third Party Utility Provider: N/A
TPS Meter / Acct No: N/A

MONTH OF USE	CONSUMPTION (KWH)	DEMAND (KW)	TOTAL BILL
Aug-08	25,120	175.9	$5,186
Sep-08	27,760	152.1	$4,757
Oct-08	29,120	117.4	$4,734
Nov-08	29,600	100.8	$4,774
Dec-08	26,720	99.0	$4,503
Jan-09	28,320	95.2	$4,728
Feb-09	26,720	98.7	$4,472
Mar-09	27,200	112.2	$4,570
Apr-09	28,720	146.7	$4,861
May-09	26,160	144.9	$4,526
Jun-09	23,600	143.0	$4,191
Jul-09	24,360	127.7	$4,207
Totals	**323,400**	**175.9 Max**	**$55,510**

AVERAGE DEMAND 126.1 KW average
AVERAGE RATE $0.172 $/kWh

Figure 1
Electricity Usage Profile

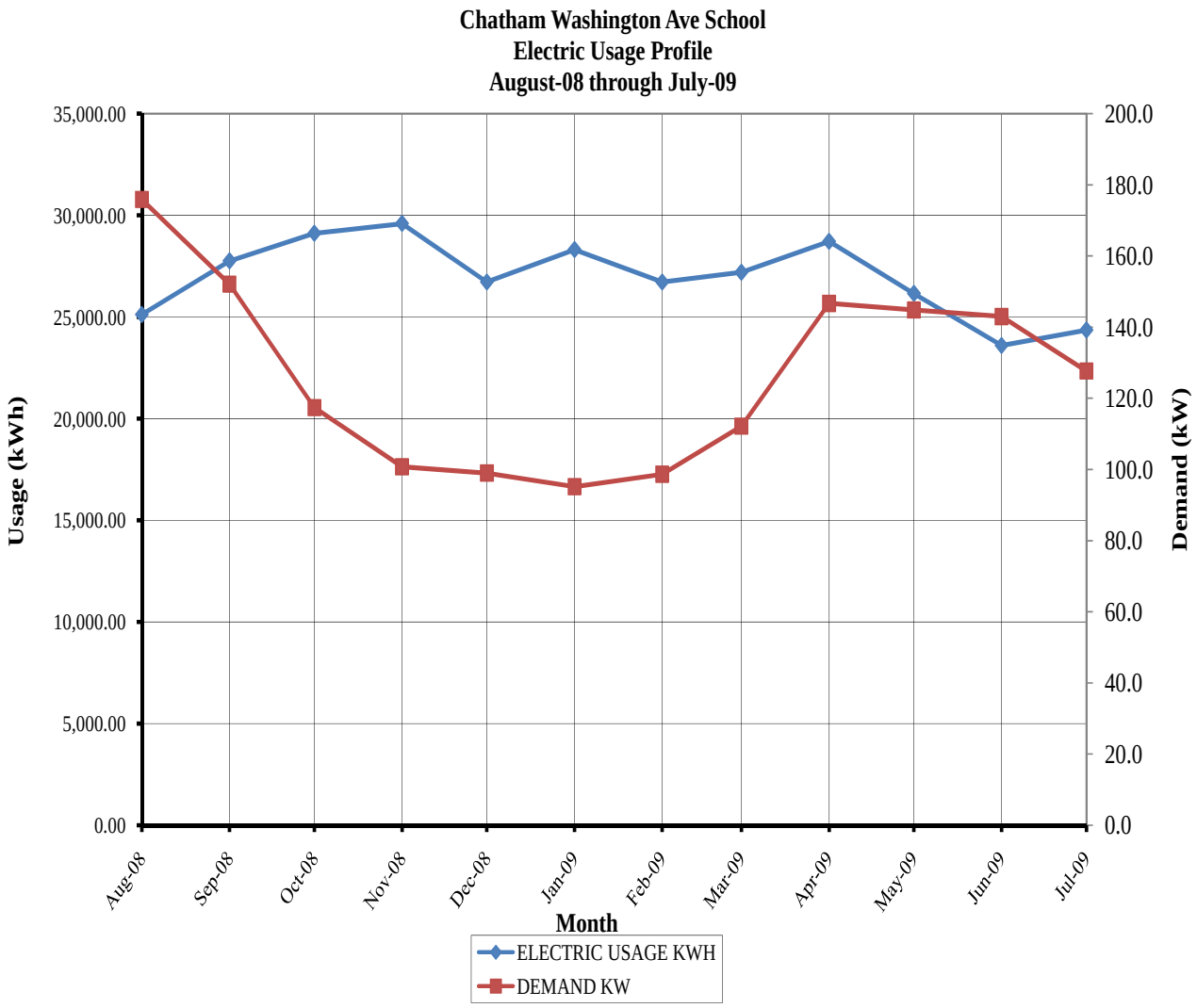


Table 4
Natural Gas Billing Data

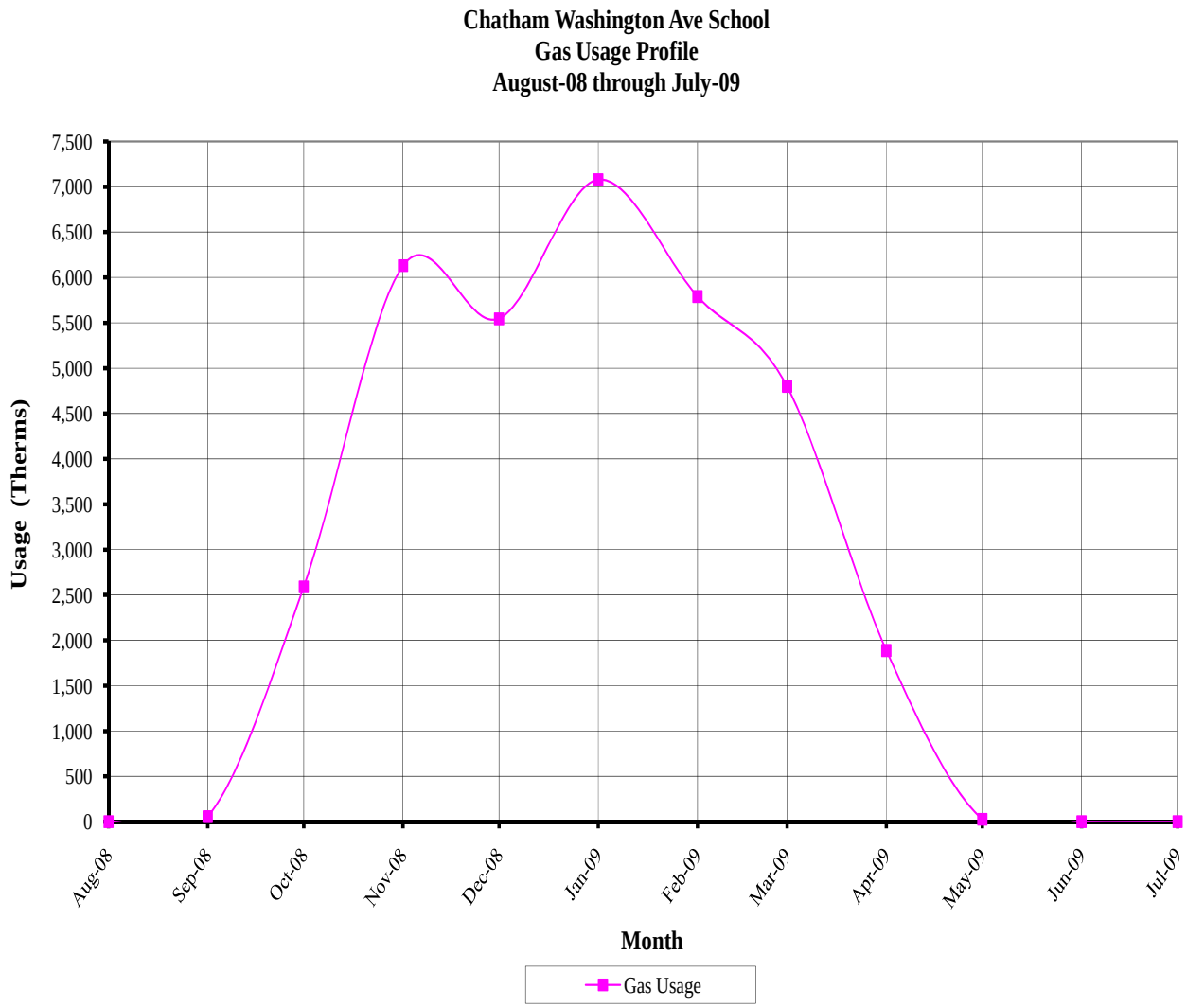
GAS USAGE SUMMARY

Utility Provider:	PSE&G
Rate:	LVG
Meter No:	3274106 and 2808799
Point of Delivery ID:	PG000010675177904612
Third Party Utility Provider:	Hess Corporation
TPS Meter No:	394872/394904

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Aug-08	2.21	$94.93
Sep-08	56.33	$167.31
Oct-08	2,589.80	$4,537.44
Nov-08	6,130.77	$9,417.96
Dec-08	5,546.09	$8,443.61
Jan-09	7,078.64	$10,757.21
Feb-09	5,791.06	$8,972.05
Mar-09	4,800.21	$6,310.74
Apr-09	1,888.02	$2,552.74
May-09	28.58	$131.30
Jun-09	1.10	$93.84
Jul-09	0.00	$93.72
TOTALS	**33,912.81**	**$51,572.85**

AVERAGE RATE: **$1.521** **$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

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

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

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

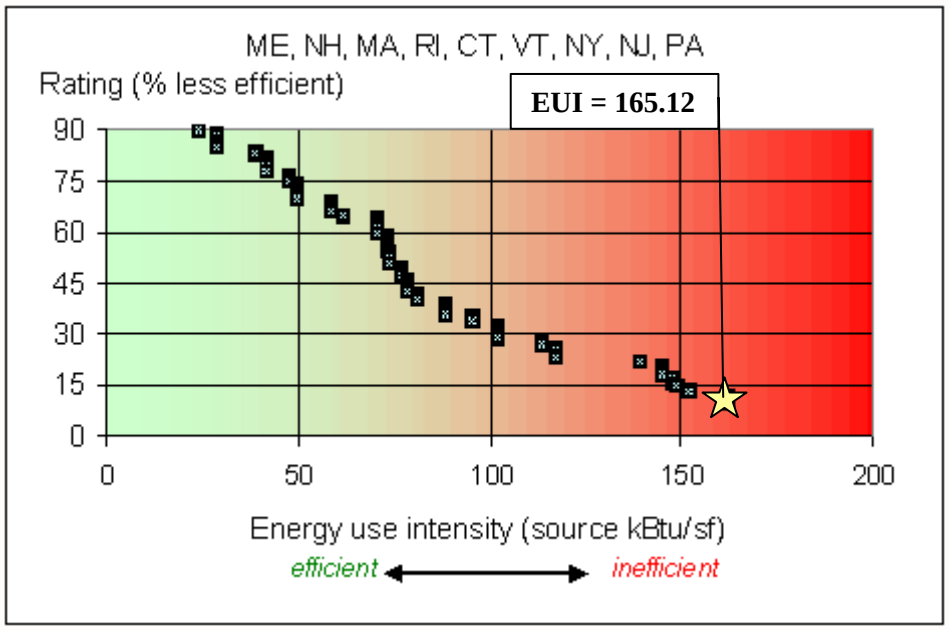
$$Building\ \ Site\ EUI = \frac{(Electric\ Usage\ in\ kBtu + Gas\ Usage\ in\ kBtu)}{Building\ \ Square\ \ Footage}$$

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

Table 5
Washington Avenue School EUI Calculations

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	323,400.0			1,104,088	3.340	3,687,653
NATURAL GAS		33,912.8		3,391,281	1.047	3,550,671
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				4,495,368		7,238,323
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		43,838	SQUARE FEET			
BUILDING SITE EUI		*102.55*	kBtu/SF/YR			
BUILDING SOURCE EUI		*165.12*	kBtu/SF/YR			

Figure 3
Source Energy Use Intensity Distributions: Elementary Schools



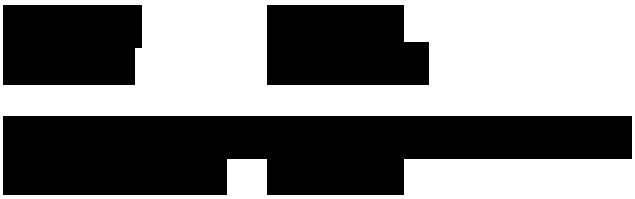
C. EPA Energy Benchmarking System

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

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

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the municipality to access and monitoring the facility's yearly energy usage as it compares to facilities of similar type. The following is the user name and password for this account:

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



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

Table 6
ENERGY STAR Performance Rating

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Washington Avenue School	11	50

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

V. FACILITY DESCRIPTION

The original Washington Avenue School building was built in 1952. The original school is a one-story block and brick faced building, and is 23,318 square feet. An addition of similar construction was built in 1996 and in 2006 that added approximately 20,520 square feet, bringing the building total to 43,838 square feet.

The facility currently houses the rest rooms, classrooms, offices, Library, gymnasium, multi-purpose room, art room and boiler room. The building operates for 40 hours during a typical week. There is a asphalt rolled roof on the 2006 addition. The original building and the 1996 addition has an EPDM roof membrane roof. The windows in the original 1952 building are single pane wire glass. The windows in the 1996 and 2006 additions are tempered, insulated glass with aluminum frame.

Heating System

The boiler plant consists of five (5) Fulton Pulse model PVLP 1150 steam boilers, each rated for 1,150,000 BTU/hr max input and 978,000 BTU/hr net maximum output. Each boiler has a maximum natural gas input rating of 1,150,000 BTU/hr. The boilers are 84.4% thermal efficient. The steam is piped via pipe tunnel to the existing building classroom unit ventilators. A portion of the steam is diverted to a heat exchanger to generate heating hot water. The heating hot water is pumped to unit heaters, fin tube radiation, classroom units and unit ventilators in the 2006 addition. The 5 hp in-line pumps operate in a lead/lag configuration. These pumps are approximately 3 years old and in good condition.

There are three (3) roof top units with natural gas heat serving the 2006 addition. The heating input ranges from 55.9 MBH to 631.8 MBH. These units are three (3) years old and are in good condition.

Domestic Hot Water

There is a Rheem Fury model 82V52-2 electric, domestic water heater provides hot water for the 2006 addition. This unit has an input of 4,500 watts, 50 gallon tank and a recovery rate of 18.6 gallons per hour at 100°F rise and a .91 energy factor. The water heater was manufactured in 2007 and is in good condition.

There is a Paterson-Kelley steam to hot water generator. An Armstrong model S-25 circulator pump is used. The hot water generator and pump are two (2) years old and in good condition.

Cooling System

The facility is cooled via eleven (11) split system air conditioning systems and eighteen (18) window air conditioners and three (3) roof top units. All cooling units are air cooled, direct expansion cooling. The split systems range from 1.5 to 4 nominal tons. The split systems range from five (5) to fourteen (14) years old and range from good to fair condition. The window air conditioners range from four (4) to nine (9) years old and are in good condition. The three (3) packaged roof top units are 2, 2.5 and 40 nominal tons cooling with gas heat exchangers as listed above in the heating section, are three (3) years old and in good condition.

Controls System

There are pneumatic controls serving the original school building. The system appears to be operational but is antiquated. The 2006 addition has Automated Logic DDC controls. The boilers are monitored through the DDC contols.

Exhaust System

There are five (5) fractional horse power exhaust fans exhausting the toilet rooms and gym in the 2006 addition.

Lighting

The building is lit by varying types and sizes of light bulb types. The types used include the use of T-8 fluorescent, incandescent and compact fluorescent. The lamp wattages range from 26 watts to 200 watts with the majority being fluorescent T8 light fixtures with 32 Watt lamps. The incandescent lamps range from 90 watts to 200 watts. There are seventeen (17) LED exit signs.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade - General

Description: General

The lighting in the Washington Avenue School is primarily made up of fluorescent fixtures with T-8 lamps with electronic ballasts, incandescent lamps and compact fluorescent lamps. There are a few closets, room 14, Library with incandescent lighting and Faculty room and hallway with compact fluorescent fixtures.

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

Energy Savings Calculations:

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

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

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$49
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$49
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$158
Total Yearly Savings ($/Yr):	$158
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.3
Simple Lifetime ROI	4735.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,369
Internal Rate of Return (IRR)	322%
Net Present Value (NPV)	$1,836.60

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

ECM #2: Install Lighting Controls

Description:

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

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

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

Energy Savings Calculations:

The **Investment Grade Lighting Audit ECM#2- Lighting Controls Appendix** outlines the proposed retrofits, costs, savings, and payback periods. The hallways of the building is a 24/7 facility while the majority of the building is only occupied 40 hours a week and other areas are only a few hours a day. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors and was calculated to be 6,046.6 kWh/year and $1,040/year.

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is $160/unit including material and labor. The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $140/unit. Total number of rooms to be retrofitted is 34. Total cost to install sensors is $140/ceiling unit x 42 units = $5,880.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,720
NJ Smart Start Equipment Incentive ($):	$840
Net Installation Cost ($):	$5,880
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,567
Total Yearly Savings ($/Yr):	$1,567
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.8
Simple Lifetime ROI	299.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$23,499
Internal Rate of Return (IRR)	26%
Net Present Value (NPV)	$12,821.97

ECM #3: Install NEMA Premium Efficient Pump Motor

Description:

Replacing the old system booster pump motor with new efficient motor is a simple change that can provide substantial savings.

Existing electric motors equal to or greater than one horsepower ranged from 78 to 93% efficient. The improved efficiency of the NEMA premium efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95 % of its total lifetime operating cost. Because many motors operate 40-80 hours per week, even small increases in efficiency can yield substantial energy and dollar savings.

This energy conservation measure would replace all motors equal to or greater than 1 HP with NEMA Premium® Efficient Motors. NEMA Premium® is the most efficient motor designation in the marketplace today. Using MotorMaster+, Version 4, the energy & cost savings were calculated for the fan/pump motors in this facility that are greater than or equal to 1 HP.

Energy Savings Calculations:

Existing: A 1.5 HP system circulation pump motor with the following characteristics:
Existing Motor Efficiency = 78%
Annual Hours of Operations = 4500 (Average)
1 HP = 0.746 Watt
Load Factor = 75%
Cost of electricity = $0.172 / kWh

Existing 1.5HP Motor Operating Cost =
{0.746 Watt/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency
= [0.746 x 1.5 x 0.75 x 4,500 x 0.172] ÷ 0.78 = $833 / Year

New NEMA Premium Motor Efficiency = 88.9%

New NEMA Premium Efficiency 5HP Motor Operating Cost =
{0.746 x 5 x 0.75 x 4,500 x 0.172} ÷ 0.889 = $731 / Year

Savings = $833 - $731 = $102 / Year x 2 motors = $204 / Year

Installed Cost of a 1.5 HP NEMA Premium® Efficiency Motor = $1,234 minus the SmartStart Building® incentive for a 1.5hp ($50/motor) is $1,189 or $2,368 for two (2) motors.

Simple Payback = $2,368 / $204 = 11.6 Years

kWh saved = $204 / $0.172/kWh = 1186 kWh
kW saved = 593 kWh / 4,500 hrs./yr. = 0.26 Kw

Existing: A 5 HP system circulation pump motor with the following characteristics:
Existing Motor Efficiency = 90%
Annual Hours of Operations = 4500 (Average)
1 HP = 0.746 Watt
Load Factor = 75%
Cost of electricity = $0.172 / kWh

Existing 1.5HP Motor Operating Cost =
{0.746 Watt/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency
= [0.746 x 5 x 0.75 x 4,500 x 0.172] ÷ 0.90 = $2,406 / Year

New NEMA Premium Motor Efficiency = 90.2%

New NEMA Premium Efficiency 5HP Motor Operating Cost =
{0.746 x 5 x 0.75 x 4,500 x 0.172} ÷ 0.902 = $2401 / Year

Savings = $2,406 - $2,401 = $5 / Year x 2 motors = $10 / Year

Installed Cost of a 5 HP NEMA Premium® Efficiency Motor = $1,382 minus the SmartStart Building® incentive for a 5hp ($60/motor) is $1,322 or $2,644 for two (2) motors.

Simple Payback = $2,644 / $10 = 264.4 Years

kWh saved = $10 / $0.172/kWh = 58.1 kWh
kW saved = 58.1 kWh / 4,500 hrs./yr. = 0.01 kW

The following table outlines the motor replacement plan for this facility:

MOTOR REPLACEMENT PLAN

MOTOR HP	QTY	ENCLOSURE TYPE	NUMBER OF POLES	INSTALLED COST ** PER MOTOR	TOTAL COST	TOTAL SAVINGS	SIMPLE PAYBACK	SIMPLE RETURN ON INVESTMENT
5	2	TEFC	4-Pole	$1,322	$2,644	$10	264.4	0.4%
1.5	2	TEFC	4-Pole	$1,184	$2,368	$204	11.6	8.6%
				Totals:	*$5,012*	*$214*	*23.4*	*4.3 %*

**** Net Cost after the SmartStart Buildings® incentive is applied.**

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,232
NJ Smart Start Equipment Incentive ($):	$220
Net Installation Cost ($):	$5,012
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$214
Total Yearly Savings ($/Yr):	$214
Estimated ECM Lifetime (Yr):	10
Simple Payback	23.4
Simple Lifetime ROI	-57.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,140
Internal Rate of Return (IRR)	-13%
Net Present Value (NPV)	($3,186.54)

ECM #4: DDC System – Washington Avenue School

Description:

The current HVAC systems within the Washington Avenue School are controlled via two types of systems. The original building has pneumatic thermostats. An Automated Logic Direct Digital Control (DDC) system is serving the new classrooms in the 2006 addition and can monitor the boilers. The DDC system is not a web based system. Thermostats are 2-stage for a day/night (occupied/unoccupied) function by means if a mechanical time clock. During initial discussions with the Owner it was noted that the hours of operation of the facility are generally 40 hours per week. Occasionally, there are additional after-hour usage during weeknights and weekends and thermostat adjustments are made by the person currently occupying the space instead on one general setpoint. This is a means for a cycling amongst different HVAC systems attempting to meet various setpoints throughout the year, independent of heating or cooling season. Therefore, a DDC system providing the Owner with full control over the HVAC equipment within the building appears to be an energy saving opportunity.

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

The new DDC system has the potential to provide substantial savings by controlling the HVAC systems as a whole and provide operating schedules and features such as space averaging, night set-back, temperature override control, etc. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the referenced report:

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

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

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $4.00 per SF in accordance with recent Contractor pricing for systems of this magnitude. Savings from the implementation of this ECM will be from the reduced

energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Cost of complete DDC System = ($3.00/SF x 43,838 SF) = $131,514

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

Cooling Season Full Load Cooling Hrs. = 1,129 hrs / yr
Average Cost of Electricity = $0.172/ kWh

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

Energy Savings Calculations:

10% Savings on Heating Calculations

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

$$Heat\ Load = \frac{50\left(\frac{Btu}{Hr\ SF}\right) \times 43{,}838\ (SF)}{1000\left(\frac{Btu}{kBtu}\right)} = 2{,}192\left(\frac{kBtu}{Hr}\right)$$

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

$$Est\ Heat\ Cons. = \frac{2{,}192\left(\frac{kBtu}{Hr}\right) \times 4{,}996\ (HDD) \times 24\ Hrs \times 0.6}{65\ (^{\circ}F) \times 81\% \times 100\left(\frac{kBtu}{Therm}\right)} = 29{,}952(Therms)$$

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

$$Savings. = 29{,}952\ (Therms) \times 10\% \times 1.521\left(\frac{\$}{Therm}\right) = \$4{,}556$$

10% Savings on Cooling Calculations**:**

Cooling equipment that would be served by the DDC system is already connected to the DDC system and would not materialize into any further savings.

Total Annual Energy Savings = $4,556 + $0 = $4,556 per year

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

Estimated Maintenance Savings:

This ECM would eliminate the need to manually control this equipment and the savings is estimated as follows:

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

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$131,514
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$131,514
Maintenance Savings ($/Yr):	$2,600
Energy Savings ($/Yr):	$4,556
Total Yearly Savings ($/Yr):	$7,156
Estimated ECM Lifetime (Yr):	15
Simple Payback	18.4
Simple Lifetime ROI	-18.4%
Simple Lifetime Maintenance Savings	$39,000
Simple Lifetime Savings	$107,340
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	($46,086.14)

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 7,764 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 121.44 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 151,393 KWh annually, reducing the overall utility bill by approximately 46.8% 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	13.8 Years	-37.4%	4.6%
Direct Purchase	13.8 Years	-37.4%	5.9%

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

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

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

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The Electric Usage Profile demonstrates a very flat load profile throughout the year. A load profile of this consistency is not standard when compared to school profiles. In this case there is a steady electric consumption throughout the year, which represents elevated activity in this facility especially in the summer. This active facility has the following types of rooms: restrooms, classrooms, offices, library, gymnasium, multi-purpose room, art room and boiler room. The steady summer load profile is supported by steady cooling (air-conditioning) load. Cooling in this facility is provided by (11) eleven split system air conditioning systems and (18) eighteen window units and (3) three rooftop units. The capacity of the split system units ranges from 1.5 – 4 tons. The three packaged air conditioning units range in capacity from 2.5 – 40 ton of capacity.

In addition, domestic hot water is supplied by a Rheem Fury electric hot water heater that provides hot water for the 2006 addition. There is a Paterson-Kelley steam to hot water generator present. An Armstrong circulating pump is used.

Currently this facility's electric supply is provided by JCP&L (Jersey Central Power and Light). CEG will provide options for this under the Recommendations section. A flatter load profile of this type, will allow for more competitive energy prices when shopping for alternative energy suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical heating load profile. An increase in consumption is observed September through April during the standard heating season. Heating in this facility is sourced from a boiler plant. This plant consists of (5) five Fulton Pulse steam boilers. The boilers are sourced with natural gas and a portion of the steam is diverted to a heat exchanger to generate hot water. The heating hot water is pumped to unit heaters, fin tube radiation, classroom units and ventilators in the 2006 addition. There are (3) three natural gas sourced roof-top units that serve the 2006 addition. Natural gas Delivery-service is provided by Public Service Electric and Gas Company (PSE&G) on an LVG rate schedule. Commodity service is supplied by the Hess Corporation, the Third Party Supplier. This consistent load profile is beneficial when looking at supply options with a new Third Party Supplier.

Tariff:

Electricity:

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

Natural Gas:

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

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

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

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

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

Recommendations:

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

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

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

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

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

X. INSTALLATION FUNDING OPTIONS

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

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

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

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

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

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

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

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

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

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

XI. ADDITIONAL RECOMMENDATIONS

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

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

B. Maintain all weather stripping on windows and doors.

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

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

E. Recalibrate existing zone thermostats.

F. Clean all fixtures to maximize light output.

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

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Washington Avenue School

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY														
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT.	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - General	$49	$0	$0	$49	$158	$0	$158	15	$2,369	$0	4735.2%	0.3	322.35%	$1,836.60
ECM #2	Lighting Controls	$6,720	$0	$840	$5,880	$1,567	$0	$1,567	15	$23,499	$0	299.6%	3.8	25.79%	$12,821.97
ECM #3	Install NEMA Premium Efficient Pump Motor	$5,232	$0	$220	$5,012	$214	$0	$214	10	$2,140	$0	-57.3%	23.4	-13.08%	($3,186.54)
ECM #4	DDC System	$131,514	$0	$0	$131,514	$4,556	$2,600	$7,156	15	$107,340	$39,000	-18.4%	18.4	-2.44%	($46,086.14)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solar PV Project	$1,092,960	$0	$52,988	$1,039,972	$26,040	$0	$26,040	25	$651,000	$0	-37.4%	39.9	-3.32%	($586,533.63)

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

Washington Avenue School

Boiler

Location	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Rm	Fulton	1	PVLP 1150	103768	575-1150	489-978	84.4	NG	2	30	28	
Boiler Rm	Fulton	1	PVLP 1150	103766	575-1150	489-978	84.4	NG	2	30	28	
Boiler Rm	Fulton	1	PVLP 1150	103788	575-1150	489-978	84.4	NG	2	30	28	
Boiler Rm	Fulton	1	PVLP 1150	103785	575-1150	489-978	84.4	NG	2	30	28	
Boiler Rm	Fulton	1	PVLP 1150	103767	575-1150	489-978	84.4	NG	2	30	28	

Boiler - Pumps

Location	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Frame Size	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	
Boiler Room	Baldor	2	EJMM3218T	36G687T832	5	1750				230/460	3	22	10	(-12)	
Boiler Room	Emerson	2	P55BLZ-696	132-066	0.5	1725				200	3	13	10	(-3)	
	Bell & Gosset	2	Series 90 1-1/2A 5.625	1634799 B29	1.5	1800	20	30				17	10	(-7)	

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	Rheem	1	82V52-2	RH0707245625	4500 W	67	50	.91 Energy Factor	Electric	2	12	10	

DHW - Pumps

Location	Manufacturer	Qty.	Model #	Serial #	HP	Volts	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
	Armstrong	1	S-25	AB/B-1				2007	10	8	
	Taco	1	AC25F	1615B3E2	5			2007	10	8	

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	RM-A01-9-0-BA01-319	200612-AMGA29800	R-410A		1		69	56	81%	NG	208	1		3	15	12	
Rooftop	Aaon	1	RN-040-8-0-BB04-3B9	200612-BNGV02423	R-410A				780	632	81%	NG	208	3		3	15	12	
Rooftop	Aaon	1	RM-A02-9-0BA01-319	200612-AMGB29801	R-410A		2		69	56	81%	NG	208	1		3	15	12	

Split Systems and AC Condensers

Location	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity (Btu/h)	Eff.	Refrigerant	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Rooftop	Lennox	2	HS29-048-94	5801A 50930	48000		R-22	208/230	3		8	15	7	
Rooftop	Lennox	1	AC13-030-230-02	5806H65900	30000		R-22	208/230	1		3	15	12	
Rooftop	Lennox	1	HS20-036-134	5807B56170	36000		R-22	208/230	3		2	15	13	
Rooftop	Trane XE1200	1	TTP024C100AZ	L015KB9FF	24000	12 Seer	R-22	200/230	1		Jan-96	15	2	
Rooftop	Trane	1	TTA042D300B0	Z09445W3F	42000		R-22	200/230	3		Mar-01	15	7	
Rooftop	Trane XE1200	1	TTP018C100AZ	K304RXCFF	18000	12 Seer	R-22	200/230	1		Jul-95	15	1	
Rooftop	Fedders	1	C1048BBD3V	HS354553 224X	48000	10 SEER	R-22	208/230	1		2004	15	10	
Rooftop	EMI	1	No Info								5	15	10	
Rooftop	York	2	H2RD024S06B	W0N6295122	24000		R-22	208	1					

Window AC Units

Location	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity (Btu/h)	Eff.	Refrigerant	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Classrooms	Friedrich	2	KM18L30-A	LEBR01200	17800/17600	10	R-22	197	1		2005	15	11	
Classrooms	Emerson Quiet Coo	4	180044-E		18000/17500			230/208			5	15	10	
Classrooms	Friedrich	6	KM18J30C-A	LDDR03791	18000/17700		R-22	230/208	1		2004	15	10	
Classrooms	Frididaire	1	FAS185J2A1				R-22	230/208	1		Jun-00	15	6	
Classrooms	Westinghouse	1	WAS18JH2A1				R-22	230/208	1		5	15	10	
Classrooms	Airedale	4	CMX4-208	S321500303155006-1471			R-22	208/230	3		5	15	10	
Classrooms	Friedrich	3	KS15J10-A	LCAR06056	14500	10.9	R-22	115	1		2003	15	9	

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
	Herman Nelson	12										2			

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Washington Avenue School

Building ID: 1830654
For 12-month Period Ending: July 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 15, 2009

Facility
Washington Avenue School
102 Washington Ave
Chatham, NJ 07928

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

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

Year Built: 1952
Gross Floor Area (ft²): 43,838

Energy Performance Rating[2] (1-100) 11

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,103,441
Natural Gas (kBtu)[4]	3,391,281
Total Energy (kBtu)	4,494,722

Energy Intensity[5]

Site (kBtu/ft²/yr)	103
Source (kBtu/ft²/yr)	165

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	348

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	68
National Average Source EUI	110
% Difference from National Average Source EUI	50%
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	Washington Avenue School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	102 Washington Ave, Chatham, NJ 07928	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Washington Ave School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	43,838 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	No	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	73	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	No	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	70 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	90 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	10 (Optional)	Is this school in operation for at least 8 months of the year?		☐

High School?	No	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.		

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Jersey Central Power & Lt Co

Fuel Type: Electricity

Meter: G28890566 JCP&L (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
07/01/2009	07/31/2009	24,360.00
06/01/2009	06/30/2009	23,600.00
05/01/2009	05/31/2009	26,160.00
04/01/2009	04/30/2009	28,720.00
03/01/2009	03/31/2009	27,200.00
02/01/2009	02/28/2009	26,720.00
01/01/2009	01/31/2009	28,320.00
12/01/2008	12/31/2008	26,720.00
11/01/2008	11/30/2008	29,600.00
10/01/2008	10/31/2008	29,120.00
09/01/2008	09/30/2008	27,760.00
08/01/2008	08/31/2008	25,120.00
G28890566 JCP&L Consumption (kWh (thousand Watt-hours))		**323,400.00**
G28890566 JCP&L Consumption (kBtu (thousand Btu))		**1,103,440.80**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,103,440.80**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: 3274106 PSE&G (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
07/01/2009	07/31/2009	0.00
06/01/2009	06/30/2009	0.00
05/01/2009	05/31/2009	0.00
04/01/2009	04/30/2009	0.00
03/01/2009	03/31/2009	0.00
02/01/2009	02/28/2009	5,791.06
01/01/2009	01/31/2009	7,078.64
12/01/2008	12/31/2008	5,546.09
11/01/2008	11/30/2008	6,130.77
10/01/2008	10/31/2008	2,589.80

09/01/2008	09/30/2008	56.33
08/01/2008	08/31/2008	2.21
3274106 PSE&G Consumption (therms)		**27,194.90**
3274106 PSE&G Consumption (kBtu (thousand Btu))		**2,719,490.00**
Meter: 2808799 PSE&G (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
07/01/2009	07/31/2009	0.00
06/01/2009	06/30/2009	1.10
05/01/2009	05/31/2009	28.58
04/01/2009	04/30/2009	1,888.02
03/01/2009	03/31/2009	4,800.21
02/01/2009	02/28/2009	0.00
01/01/2009	01/31/2009	0.00
12/01/2008	12/31/2008	0.00
11/01/2008	11/30/2008	0.00
10/01/2008	10/31/2008	0.00
09/01/2008	09/30/2008	0.00
08/01/2008	08/31/2008	0.00
2808799 PSE&G Consumption (therms)		**6,717.91**
2808799 PSE&G Consumption (kBtu (thousand Btu))		**671,791.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**3,391,281.00**
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
Washington Avenue School
102 Washington Ave
Chatham, NJ 07928

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

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

General Information

Washington Avenue School	
Gross Floor Area Excluding Parking: (ft^2)	43,838
Year Built	1952
For 12-month Evaluation Period Ending Date:	July 31, 2009

Facility Space Use Summary

Washington Ave School	
Space Type	K-12 School
Gross Floor Area(ft^2)	43,838
Open Weekends?	No
Number of PCs	73
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	No
Percent Cooled	70
Percent Heated	90
Months°	10
High School?	No
School District°	Rutherford

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 07/31/2009)	**Baseline** (Ending Date 07/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	11	11	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	103	103	53	N/A	68
Source ($kBtu/ft^2$)	165	165	86	N/A	110
Energy Cost					
$/year	$ 62,401.40	$ 62,401.40	$ 32,524.44	N/A	$ 41,592.82
$/$ft^2$/year	$ 1.42	$ 1.42	$ 0.74	N/A	$ 0.95
Greenhouse Gas Emissions					
$MtCO_2e$/year	348	348	181	N/A	232
$kgCO_2e/ft^2$/year	8	8	4	N/A	5

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.

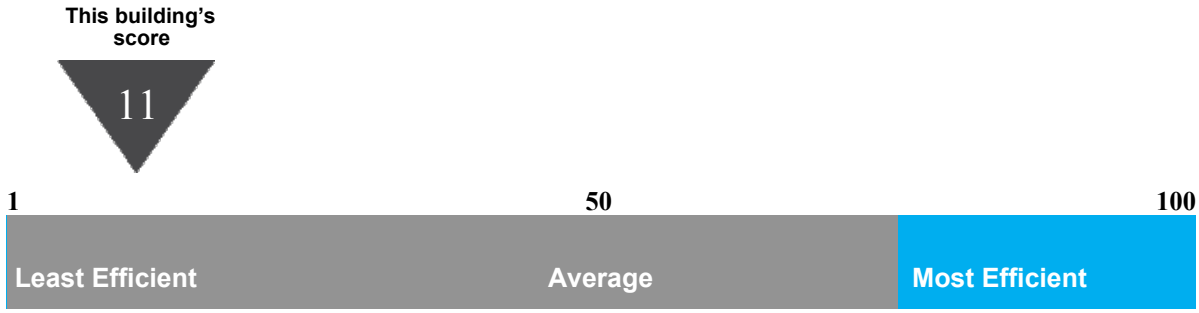
Statement of Energy Performance

2009

Washington Avenue School
102 Washington Ave
Chatham, NJ 07928

Portfolio Manager Building ID: 1830654

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 165 kBtu per square foot per year.*

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

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

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

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 10/15/2009

CEG Job #: 9C09078
Project: School District of the Chathams
Address: 102 Washington Ave
Chatham, NJ
Building SF: 43,838

Washington Avenue School

KWH COST: **$0.172**

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
18	3	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
14	Closet	520	1	1	Incadescent 100 Watt	100	0.10	52.0	$8.94	1	1	26 W CFL Lamp	26	0.03	13.52	$2.33	$5.75	$5.75	0.07	38.48	$6.62	0.87
18	2	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	8	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
3	Restrooms	2080	4	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	0.23	482.6	$83.00	4	3	No Change	58	0.23	482.56	$83.00	$0.00	$0.00	0.00	0	$0.00	0.00
18	1	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
18	6	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
10	5	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$249.00	12	2	No Change	58	0.70	1447.68	$249.00	$0.00	$0.00	0.00	0	$0.00	0.00
11	SG1	2080	9	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.74	1,535.0	$264.03	9	3	No Change	82	0.74	1535.04	$264.03	$0.00	$0.00	0.00	0	$0.00	0.00
10	4	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$249.00	12	3	No Change	58	0.70	1447.68	$249.00	$0.00	$0.00	0.00	0	$0.00	0.00
12	Faculty Rm	2080	1	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	109	0.11	226.7	$39.00	1	2	No Change	109	0.11	226.72	$39.00	$0.00	$0.00	0.00	0	$0.00	0.00
11		2080	4	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting	82	0.33	682.2	$117.35	4	2	No Change	82	0.33	682.24	$117.35	$0.00	$0.00	0.00	0	$0.00	0.00
16		2080	2	2	CFL 2 High Hat Lamps Electronic Ballast Recessed Mounting No Cover	28	0.06	116.5	$20.03	2	0	No Change	28	0.06	116.48	$20.03	$0.00	$0.00	0.00	0	$0.00	0.00
11	24	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
11	22	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
11	21	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00

11	Closet	520	3	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.25	127.9	$22.00	3	0	No Change	82	0.25	127.92	$22.00	$0.00	$0.00	0.00	0	$0.00	0.00
11	20	2080	14	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.15	2,387.8	$410.71	14	0	No Change	82	1.15	2387.84	$410.71	$0.00	$0.00	0.00	0	$0.00	0.00
7		2080	1	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	108	0.11	224.6	$38.64	1	0	No Change	108	0.11	224.64	$38.64	$0.00	$0.00	0.00	0	$0.00	0.00
18	17	2080	19	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	1.56	3,240.6	$557.39	19	0	No Change	82	1.56	3240.64	$557.39	$0.00	$0.00	0.00	0	$0.00	0.00
5		2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.07	151.8	$26.12	1	0	No Change	73	0.07	151.84	$26.12	$0.00	$0.00	0.00	0	$0.00	0.00
18	18	2080	15	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	1.23	2,558.4	$440.04	15	0	No Change	82	1.23	2558.4	$440.04	$0.00	$0.00	0.00	0	$0.00	0.00
5		2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.07	151.8	$26.12	1	0	No Change	73	0.07	151.84	$26.12	$0.00	$0.00	0.00	0	$0.00	0.00
5	Bathrooms	2080	2	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.15	303.7	$52.23	2	0	No Change	73	0.15	303.68	$52.23	$0.00	$0.00	0.00	0	$0.00	0.00
10	Faculty Rm	2080	3	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.17	361.9	$62.25	3	0	No Change	58	0.17	361.92	$62.25	$0.00	$0.00	0.00	0	$0.00	0.00
18	Special Services	2080	3	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.25	511.7	$88.01	3	0	No Change	82	0.25	511.68	$88.01	$0.00	$0.00	0.00	0	$0.00	0.00

10	14	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$249.00	12	0	No Change	58	0.70	1447.68	$249.00	$0.00	$0.00	0.00	0	$0.00	0.00
15		2080	1	1	Incadescent 200 Watt	200	0.20	416.0	$71.55	1	0	65 W CFL Lamp	65	0.07	135.2	$23.25	$20.25	$20.25	0.14	280.8	$48.30	0.42
10	Library	2080	31	2	T8 2x4 2 Lamps Electronic Ballast	58	1.80	3,739.8	$643.25	31	0	No Change	58	1.80	3739.84	$643.25	$0.00	$0.00	0.00	0	$0.00	0.00
9		2080	10	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	58	0.58	1,206.4	$207.50	10	0	No Change	58	0.58	1206.4	$207.50	$0.00	$0.00	0.00	0	$0.00	0.00
1		2080	23	1	T8 1x4 1 Lamps Electronic Ballast Pendant Mounting Parabolic Lens	28	0.64	1,339.5	$230.40	23	0	No Change	28	0.64	1339.52	$230.40	$0.00	$0.00	0.00	0	$0.00	0.00
5		2080	6	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.44	911.0	$156.70	6	0	No Change	73	0.44	911.04	$156.70	$0.00	$0.00	0.00	0	$0.00	0.00
13		2080	4	1	Incadescent 90 Watt	90	0.36	748.8	$128.79	4	0	18 W CFL Lamp	18	0.07	149.76	$25.76	$5.75	$23.00	0.29	599.04	$103.03	0.22
11	19	2080	15	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.23	2,558.4	$440.04	15	0	No Change	82	1.23	2558.4	$440.04	$0.00	$0.00	0.00	0	$0.00	0.00
5		2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.07	151.8	$26.12	1	0	No Change	73	0.07	151.84	$26.12	$0.00	$0.00	0.00	0	$0.00	0.00
10	13	2080	7	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.41	844.5	$145.25	7	0	No Change	58	0.41	844.48	$145.25	$0.00	$0.00	0.00	0	$0.00	0.00
10	Restroom	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting	58	0.06	120.6	$20.75	1	0	No Change	58	0.06	120.64	$20.75	$0.00	$0.00	0.00	0	$0.00	0.00
18	7	2080	12	3	T8 2x4 3 Lamps Electronic Ballast	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
18	8	2080	12	3	T8 2x4 3 Lamps Electronic Ballast	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
10	Storage	2080	3	2	T8 2x4 2 Lamps Electronic Ballast	58	0.17	361.9	$62.25	3	0	No Change	58	0.17	361.92	$62.25	$0.00	$0.00	0.00	0	$0.00	0.00
10	Hallway	8760	34	2	T8 2x4 2 Lamps Electronic Ballast	58	1.97	17,274.7	$2,971.25	34	0	No Change	58	1.97	17274.72	$2,971.25	$0.00	$0.00	0.00	0	$0.00	0.00
5		8760	4	2	T8 2x2 2 U-Tube Lamps Electronic Ballast	73	0.29	2,557.9	$439.96	4	0	No Change	73	0.29	2557.92	$439.96	$0.00	$0.00	0.00	0	$0.00	0.00
6		8760	19	3	T8 2x2 3 Twin Tube Lamps Electronic	40	0.76	6,657.6	$1,145.11	19	0	No Change	40	0.76	6657.6	$1,145.11	$0.00	$0.00	0.00	0	$0.00	0.00
16		8760	5	2	CFL 2 High Hat Lamps Electronic Ballast	28	0.14	1,226.4	$210.94	5	0	No Change	28	0.14	1226.4	$210.94	$0.00	$0.00	0.00	0	$0.00	0.00
5		8760	17	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	1.24	10,871.2	$1,869.84	17	0	No Change	73	1.24	10871.16	$1,869.84	$0.00	$0.00	0.00	0	$0.00	0.00
8	Boiler Room	2080	2	2	T8 2x4 2 Lamps Electronic Ballast	58	0.12	241.3	$41.50	2	0	No Change	58	0.12	241.28	$41.50	$0.00	$0.00	0.00	0	$0.00	0.00
2		2080	3	2	T8 1x4 2 Lamps Electronic Ballast	58	0.17	361.9	$62.25	3	0	No Change	58	0.17	361.92	$62.25	$0.00	$0.00	0.00	0	$0.00	0.00
10	Bathrooms	2080	1	2	T8 2x4 2 Lamps Electronic Ballast	58	0.06	120.6	$20.75	1	0	No Change	58	0.06	120.64	$20.75	$0.00	$0.00	0.00	0	$0.00	0.00
18	11	2080	12	3	T8 2x4 3 Lamps Electronic Ballast	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
18	10	2080	12	3	T8 2x4 3 Lamps Electronic Ballast	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00

18	12	2080	12	3	T8 2x4 3 Lamps Electronic Ballast	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
18	9	2080	12	3	T8 2x4 3 Lamps Electronic Ballast	82	0.98	2,046.7	$352.04	12	0	No Change	82	0.98	2046.72	$352.04	$0.00	$0.00	0.00	0	$0.00	0.00
2	Storage	2080	6	2	T8 1x4 2 Lamps Electronic Ballast	58	0.35	723.8	$124.50	6	0	No Change	58	0.35	723.84	$124.50	$0.00	$0.00	0.00	0	$0.00	0.00
19	Gym	2080	18	2	T8 2x2 2 U-Tube Lamps Electronic Ballast	73	1.31	2,733.1	$470.10	18	0	No Change	73	1.31	2733.12	$470.10	$0.00	$0.00	0.00	0	$0.00	0.00
3	Office	2080	19	2	T8 1x4 2 Lamps Electronic Ballast	58	1.10	2,292.2	$394.25	19	0	No Change	58	1.10	2292.16	$394.25	$0.00	$0.00	0.00	0	$0.00	0.00
10		2080	20	2	T8 2x4 2 Lamps Electronic Ballast	58	1.16	2,412.8	$415.00	20	0	No Change	58	1.16	2412.8	$415.00	$0.00	$0.00	0.00	0	$0.00	0.00
10	Principal	2080	21	2	T8 2x4 2 Lamps Electronic Ballast	58	1.22	2,533.4	$435.75	21	0	No Change	58	1.22	2533.44	$435.75	$0.00	$0.00	0.00	0	$0.00	0.00
3		2080	22	2	T8 1x4 2 Lamps Electronic Ballast	58	1.28	2,654.1	$456.50	22	0	No Change	58	1.28	2654.08	$456.50	$0.00	$0.00	0.00	0	$0.00	0.00
5	Boys	2080	23	2	T8 2x2 2 U-Tube Lamps Electronic Ballast	73	1.68	3,492.3	$600.68	23	0	No Change	73	1.68	3492.32	$600.68	$0.00	$0.00	0.00	0	$0.00	0.00
5	Girls	2080	24	2	T8 2x2 2 U-Tube Lamps Electronic Ballast	73	1.75	3,644.2	$626.80	24	0	No Change	73	1.75	3644.16	$626.80	$0.00	$0.00	0.00	0	$0.00	0.00
20	Gym 2006 Addition	2080	25	8	8 26w CFL Lamps Electronic Ballast	208	5.20	10,816.0	$1,860.35	25	0	No Change	208	5.20	10816	$1,860.35	$0.00	$0.00	0.00	0	$0.00	0.00
7	Gym Office	2080	26	3	T8 2x2 3 U-Tube Lamps Electronic Ballast	108	2.81	5,840.6	$1,004.59	26	0	No Change	108	2.81	5840.64	$1,004.59	$0.00	$0.00	0.00	0	$0.00	0.00
22	New Hallway	2080	27	3	2'x2' 3-Lamp 40w Biax, Center Mount Split	102	2.75	5,728.3	$985.27	27	0	No Change	102	2.75	5728.32	$985.27	$0.00	$0.00	0.00	0	$0.00	0.00
10	Closet	520	28	2	T8 2x4 2 Lamps Electronic Ballast	58	1.62	844.5	$145.25	28	0	No Change	58	1.62	844.48	$145.25	$0.00	$0.00	0.00	0	$0.00	0.00
21	Closet	520	29	2	Compact Fluorescent High Hat - 2 lamp	56	1.62	844.5	$145.25	29	0	No Change	56	1.62	844.48	$145.25	$0.00	$0.00	0.00	0	$0.00	0.00
23	Throughout	8760	17	0	Exit Sign - LED	4	0.07	595.7	$102.46	17		No Change	4	0.07	595.68	$102.46	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		767	157			56.1	140,931.9	$24,240.28	767	30			55.6	140,013.6	$24,082.33		$49.00	0.5	918.3	$157.95	0.31

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

CEG Job #: 9C09078
Project: School District of the Chathams
Address: 102 Washington Ave
Chatham, NJ
Building SF: 43,838

Washington Avenue School

KWH COST: $0.172

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
18	3	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
14	Closet	520	1	1	Incadescent 100 Watt	100	0.10	52.0	$8.94	1	1	None	100	0.10	0%	52	$8.94	$0.00	$0.00	0.00	0	$0.00	0.00
18	2	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
3	Restrooms	2080	4	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	0.23	482.6	$83.00	4	2	Dual Technology Occupancy Sensor	58	0.23	10%	434.304	$74.70	$160.00	$160.00	0.00	48.256	$8.30	19.28
18	1	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
18	6	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
10	5	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$249.00	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$224.10	$160.00	$160.00	0.00	144.768	$24.90	6.43
11	SG1	2080	9	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting	82	0.74	1,535.0	$264.03	9	3	Dual Technology Occupancy Sensor	82	0.74	10%	1381.536	$237.62	$160.00	$160.00	0.00	153.504	$26.40	6.06
10	4	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$249.00	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$224.10	$160.00	$160.00	0.00	144.768	$24.90	6.43
12	Faculty Rm	2080	1	4	T8 2x4 4 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	109	0.11	226.7	$39.00	1	4	Dual Technology Occupancy Sensor	109	0.11	10%	204.048	$35.10	$160.00	$160.00	0.00	22.672	$3.90	9.07
11		2080	4	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting	82	0.33	682.2	$117.35	4	3		82	0.33	10%	614.016	$105.61	$0.00	$0.00	0.00	68.224	$11.73	
16		2080	2	2	CFL 2 High Hat Lamps Electronic Ballast	28	0.06	116.5	$20.03	2	2		28	0.06	10%	104.832	$18.03	$0.00	$0.00	0.00	11.648	$2.00	
11	24	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
11	22	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
11	21	2080	12	3	T8 2x4 3 Lamps Electronic Ballast	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
11	Closet	520	3	3	T8 2x4 3 Lamps Electronic Ballast	82	0.25	127.9	$22.00	3	3	None	82	0.25	0%	127.92	$22.00	$0.00	$0.00	0.00	0	$0.00	0.00

11	20	2080	14	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.15	2,387.8	$410.71	14	3	Dual Technology Occupancy Sensor	82	1.15	10%	2149.056	$369.64	$160.00	$160.00	0.00	238.784	$41.07	3.56
7		2080	1	3	T8 2x2 3 U-Tube Lamps Electronic Ballast	108	0.11	224.6	$38.64	1	3		108	0.11	10%	202.176	$34.77	$0.00	$0.00	0.00	22.464	$3.86	
18	17	2080	19	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	1.56	3,240.6	$557.39	19	3	Dual Technology Occupancy Sensor	82	1.56	10%	2916.576	$501.65	$160.00	$160.00	0.00	324.064	$55.74	2.74
5		2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.07	151.8	$26.12	1	2		73	0.07	10%	136.656	$23.50	$0.00	$0.00	0.00	15.184	$2.61	
18	18	2080	15	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	1.23	2,558.4	$440.04	15	3	Dual Technology Occupancy Sensor	82	1.23	10%	2302.56	$396.04	$160.00	$160.00	0.00	255.84	$44.00	3.43
5		2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.07	151.8	$26.12	1	2		73	0.07	10%	136.656	$23.50	$0.00	$0.00	0.00	15.184	$2.61	
5	Bathrooms	2080	2	2	T8 2x2 2 U-Tube Lamps Electronic Ballast	73	0.15	303.7	$52.23	2	2	Dual Technology Occupancy Sensor	73	0.15	10%	273.312	$47.01	$160.00	$160.00	0.00	30.368	$5.22	30.63
10	Faculty Rm	2080	3	2	T8 2x4 2 Lamps Electronic Ballast	58	0.17	361.9	$62.25	3	2	Dual Technology Occupancy Sensor	58	0.17	10%	325.728	$56.03	$160.00	$160.00	0.00	36.192	$6.23	25.70
18	Special Services	2080	3	3	T8 2x4 3 Lamps Electronic Ballast	82	0.25	511.7	$88.01	3	3	Dual Technology Occupancy Sensor	82	0.25	10%	460.512	$79.21	$160.00	$160.00	0.00	51.168	$8.80	18.18
10	14	2080	12	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.70	1,447.7	$249.00	12	2	Dual Technology Occupancy Sensor	58	0.70	10%	1302.912	$224.10	$160.00	$160.00	0.00	144.768	$24.90	4.99
15		2080	1	1	Incadescent 200 Watt	200	0.20	416.0	$71.55	1	1		200	0.20	10%	374.4	$64.40	$0.00	$0.00	0.00	41.6	$7.16	
10	Library	2080	31	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	1.80	3,739.8	$643.25	31	2	Dual Technology Occupancy Sensor	58	1.80	10%	3365.856	$578.93	$160.00	$160.00	0.00	373.984	$64.33	1.17
9		2080	10	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	58	0.58	1,206.4	$207.50	10	2		58	0.58	10%	1085.76	$186.75	$0.00	$0.00	0.00	120.64	$20.75	
1		2080	23	1	T8 1x4 1 Lamps Electronic Ballast Pendant Mounting Parabolic Lens	28	0.64	1,339.5	$230.40	23	1		28	0.64	10%	1205.568	$207.36	$0.00	$0.00	0.00	133.952	$23.04	
5		2080	6	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.44	911.0	$156.70	6	2		73	0.44	10%	819.936	$141.03	$0.00	$0.00	0.00	91.104	$15.67	
13		2080	4	1	Incadescent 90 Watt	90	0.36	748.8	$128.79	4	1		90	0.36	10%	673.92	$115.91	$0.00	$0.00	0.00	74.88	$12.88	
11	19	2080	15	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Parabolic Lens	82	1.23	2,558.4	$440.04	15	3	Dual Technology Occupancy Sensor	82	1.23	10%	2302.56	$396.04	$160.00	$160.00	0.00	255.84	$44.00	3.43
5		2080	1	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.07	151.8	$26.12	1	2		73	0.07	10%	136.656	$23.50	$0.00	$0.00	0.00	15.184	$2.61	
10	13	2080	7	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.41	844.5	$145.25	7	2	Dual Technology Occupancy Sensor	58	0.41	10%	760.032	$130.73	$160.00	$160.00	0.00	84.448	$14.53	11.02

10	Restroom	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting	58	0.06	120.6	$20.75	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$18.68	$160.00	$160.00	0.00	12.064	$2.08	77.11
18	7	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
18	8	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
10	Storage	2080	3	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.17	361.9	$62.25	3	2	Dual Technology Occupancy Sensor	58	0.17	10%	325.728	$56.03	$160.00	$160.00	0.00	36.192	$6.23	25.70
10	Hallway	8760	34	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	1.97	17,274.7	$2,971.25	34	2	None	58	1.97	0%	17274.72	$2,971.25	$0.00	$0.00	0.00	0	$0.00	0.00
5		8760	4	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	0.29	2,557.9	$439.96	4	2		73	0.29	0%	2557.92	$439.96	$0.00	$0.00	0.00	0	$0.00	
6		8760	19	3	T8 2x2 3 Twin Tube Lamps Electronic Ballast Recessed Mounting Direct/Indirect Lens	40	0.76	6,657.6	$1,145.11	19	3		40	0.76	0%	6657.6	$1,145.11	$0.00	$0.00	0.00	0	$0.00	
16		8760	5	2	CFL 2 High Hat Lamps Electronic Ballast Recessed Mounting No Cover	28	0.14	1,226.4	$210.94	5	2		28	0.14	0%	1226.4	$210.94	$0.00	$0.00	0.00	0	$0.00	
5		8760	17	2	T8 2x2 2 U-Tube Lamps Electronic Ballast	73	1.24	10,871.2	$1,869.84	17	2		73	1.24	0%	10871.16	$1,869.84	$0.00	$0.00	0.00	0	$0.00	
8	Boiler Room	2080	2	2	T8 2x4 2 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	58	0.12	241.3	$41.50	2	2	Dual Technology Occupancy Sensor	58	0.12	10%	217.152	$37.35	$160.00	$160.00	0.00	24.128	$4.15	15.42
2		2080	3	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	58	0.17	361.9	$62.25	3	2		58	0.17	10%	325.728	$56.03	$0.00	$0.00	0.00	36.192	$6.23	
10	Bathrooms	2080	1	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	0.06	120.6	$20.75	1	2	Dual Technology Occupancy Sensor	58	0.06	10%	108.576	$18.68	$160.00	$160.00	0.00	12.064	$2.08	77.11
18	11	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
18	10	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
18	12	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
18	9	2080	12	3	T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	82	0.98	2,046.7	$352.04	12	3	Dual Technology Occupancy Sensor	82	0.98	10%	1842.048	$316.83	$160.00	$160.00	0.00	204.672	$35.20	4.54
2	Storage	2080	6	2	T8 1x4 2 Lamps Electronic Ballast Pendant Mounting Prismatic Lens	58	0.35	723.8	$124.50	6	2	Dual Technology Occupancy Sensor	58	0.35	10%	651.456	$112.05	$160.00	$160.00	0.00	72.384	$12.45	12.85
19	Gym	2080	18	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Prismatic Lens	73	1.31	2,733.1	$470.10	18	2	Dual Technology Occupancy Sensor	73	1.31	10%	2459.808	$423.09	$160.00	$160.00	0.00	273.312	$47.01	3.40

3	Office	2080	19	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	1.10	2,292.2	$394.25	19	2	Dual Technology Occupancy Sensor	58	1.10	10%	2062.944	$354.83	$160.00	$160.00	0.00	229.216	$39.43	1.98
10		2080	20	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	1.16	2,412.8	$415.00	20	2		58	1.16	10%	2171.52	$373.50	$0.00	$0.00	0.00	241.28	$41.50	
10	Principal	2080	21	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	1.22	2,533.4	$435.75	21	2	Dual Technology Occupancy Sensor	58	1.22	10%	2280.096	$392.18	$160.00	$160.00	0.00	253.344	$43.58	1.79
3		2080	22	2	T8 1x4 2 Lamps Electronic Ballast Surface Mounting Prismatic Lens	58	1.28	2,654.1	$456.50	22	2		58	1.28	10%	2388.672	$410.85	$0.00	$0.00	0.00	265.408	$45.65	
5	Boys	2080	23	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	1.68	3,492.3	$600.68	23	2	Dual Technology Occupancy Sensor	73	1.68	10%	3143.088	$540.61	$160.00	$160.00	0.00	349.232	$60.07	2.66
5	Girls	2080	24	2	T8 2x2 2 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	73	1.75	3,644.2	$626.80	24	2	Dual Technology Occupancy Sensor	73	1.75	10%	3279.744	$564.12	$160.00	$160.00	0.00	364.416	$62.68	2.55
20	Gym 2006 Addition	2080	25	2	CFL 2 High Hat Lamps Electronic Ballast Recessed Mounting No Cover	56	1.40	2,912.0	$500.86	25	2	Dual Technology Occupancy Sensor	56	1.40	10%	2620.8	$450.78	$160.00	$160.00	0.00	291.2	$50.09	3.19
7	Gym Office	2080	26	3	T8 2x2 3 U-Tube Lamps Electronic Ballast Recessed Mounting Parabolic Lens	108	2.81	5,840.6	$1,004.59	26	3	Dual Technology Occupancy Sensor	108	2.81	10%	5256.576	$904.13	$160.00	$160.00	0.00	584.064	$100.46	1.59
22	New Hallway	2080	27	2	CFL 2 High Hat Lamps Electronic Ballast Recessed Mounting No Cover	56	1.51	3,145.0	$540.93	27	2	Dual Technology Occupancy Sensor	56	1.51	10%	2830.464	$486.84	$160.00	$160.00	0.00	314.496	$54.09	2.96
10	Closet	520	28	2	T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens	58	1.62	844.5	$145.25	28	2	Dual Technology Occupancy Sensor	58	1.62	10%	760.032	$130.73	$160.00	$160.00	0.00	84.448	$14.53	5.51
21		520	29	2	CFL 2 High Hat Lamps Electronic Ballast Recessed Mounting No Cover	56	1.62	844.5	$145.25	29	2		56	1.62	10%	760.032	$130.73	$0.00	$0.00	0.00	84.448	$14.53	
	Totals		750	150			50.976	129,848.8	$22,334.00	750	150			50.976		120,740.7	$20,767.41		$6,720.00	0	9,108.1	$1,566.60	4.29

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

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

Simple Payback Analysis

	Photovoltaic System 95% Financing - 25 year
Total Construction Cost	$1,092,960
Annual kWh Production	151,393
Annual Energy Cost Reduction	$26,040
Annual SREC Revenue	$52,988
First Cost Premium	**$1,092,960**
Simple Payback:	**13.83** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	300	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.172**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$54,648	0	0	0	$0	0	0	(54,648)	0
1	$0	151,393	$26,040	$0	$52,988	$72,179	$15,884	($9,036)	($63,684)
2	$0	150,636	$26,821	$0	$52,723	$71,030	$17,033	($8,519)	($72,203)
3	$0	149,883	$27,625	$0	$52,459	$69,799	$18,264	($7,978)	($80,182)
4	$0	149,133	$28,454	$0	$52,197	$68,479	$19,584	($7,412)	($87,594)
5	$0	148,388	$29,308	$1,528	$51,936	$67,063	$21,000	($8,348)	($95,941)
6	$0	147,646	$30,187	$1,521	$51,676	$65,545	$22,518	($7,721)	($103,662)
7	$0	146,908	$31,093	$1,513	$51,418	$63,917	$24,146	($7,066)	($110,728)
8	$0	146,173	$32,025	$1,506	$51,161	$62,172	$25,891	($6,382)	($117,110)
9	$0	145,442	$32,986	$1,498	$50,905	$60,300	$27,763	($5,670)	($122,780)
10	$0	144,715	$33,976	$1,491	$50,650	$58,293	$29,770	($4,927)	($127,708)
11	$0	143,991	$34,995	$1,483	$50,397	$56,141	$31,922	($4,154)	($131,862)
12	$0	143,271	$36,045	$1,476	$50,145	$53,833	$34,230	($3,349)	($135,210)
13	$0	142,555	$37,126	$1,468	$49,894	$51,359	$36,704	($2,511)	($137,721)
14	$0	141,842	$38,240	$1,461	$49,645	$48,706	$39,357	($1,639)	($139,360)
15	$0	141,133	$39,387	$1,454	$49,397	$45,860	$42,203	($733)	($140,093)
16	$0	140,427	$40,569	$1,446	$49,150	$42,810	$45,253	$209	($139,883)
17	$0	139,725	$41,786	$1,439	$48,904	$39,538	$48,525	$1,188	($138,696)
18	$0	139,027	$43,039	$1,432	$48,659	$36,030	$52,033	$2,204	($136,492)
19	$0	138,332	$44,331	$1,425	$48,416	$32,269	$55,794	$3,259	($133,233)
20	$0	137,640	$45,661	$1,418	$48,174	$28,236	$59,827	$4,354	($128,879)
21	$0	136,952	$47,030	$1,411	$47,933	$25,725	$55,000	$12,829	($116,050)
22	$0	136,267	$48,441	$1,404	$47,693	$20,787	$45,260	$28,684	($87,366)
23	$0	135,586	$49,895	$1,397	$47,455	$0	$0	$95,953	$8,587
24	$0	134,908	$51,391	$1,390	$47,218	$0	$0	$97,220	$105,806
25	$0	134,233	$52,933	$1,383	$46,982	$0	$0	$98,532	$204,338
	Totals:	3,566,206	949,385	30,541	1,248,172	1,140,070	767,959	258,986	(2,227,704)
						Net Present Value (NPV)		**($37,224)**	
						Internal Rate of Return (IRR)		**4.6%**	

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

Simple Payback Analysis

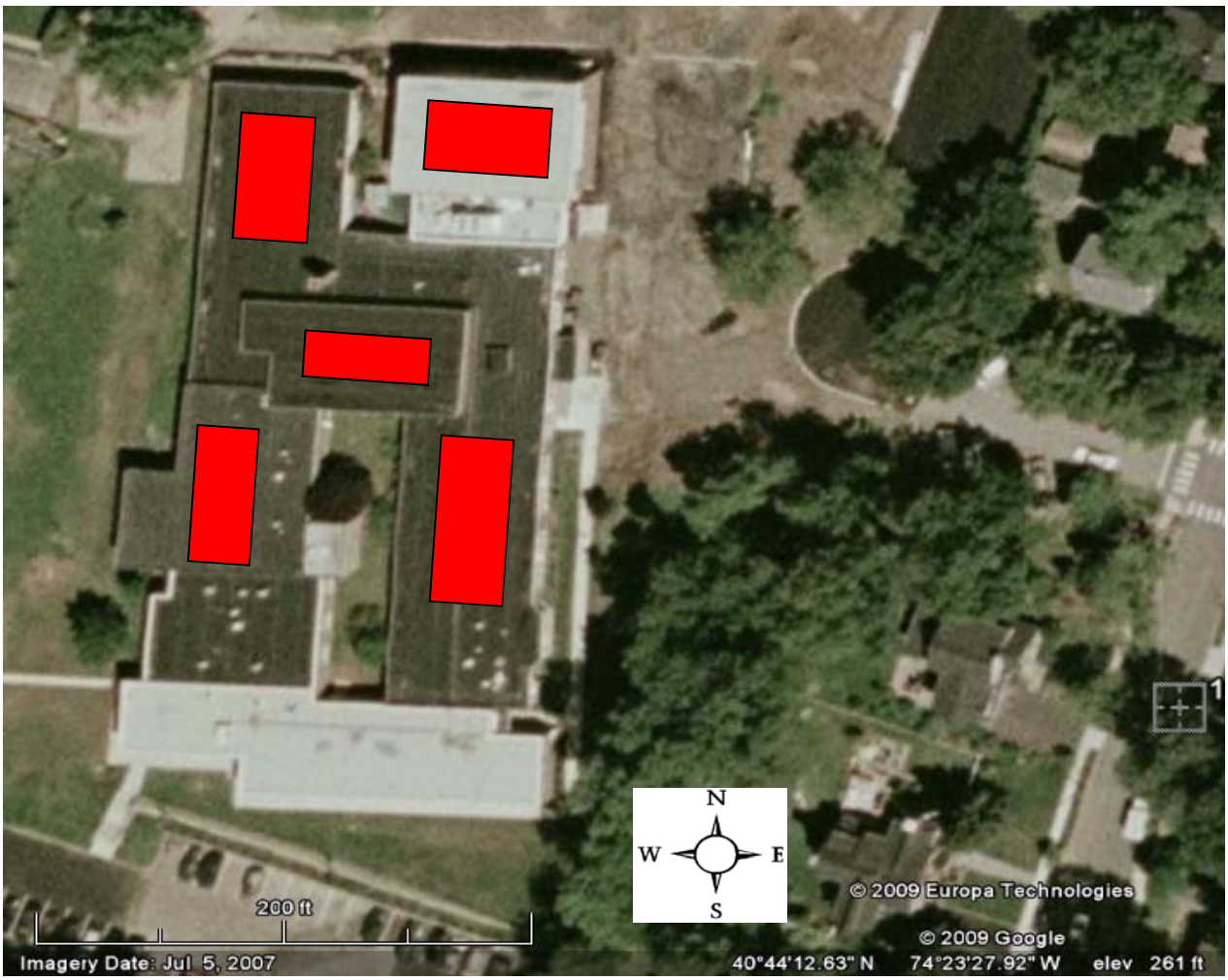
	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,092,960
Annual kWh Production	151,393
Annual Energy Cost Reduction	$26,040
Annual SREC Revenue	$52,988
First Cost Premium	**$1,092,960**
Simple Payback:	**13.83** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.172**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	$1,092,960	0	0	0	$0	(1,092,960)	0
1	$0	151,393	$26,040	$0	$52,988	$79,027	($1,013,933)
2	$0	150,636	$26,821	$0	$52,723	$79,543	($934,389)
3	$0	149,883	$27,625	$0	$52,459	$80,084	($854,305)
4	$0	149,133	$28,454	$0	$52,197	$80,651	($773,654)
5	$0	148,388	$29,308	$1,528	$51,936	$79,715	($693,939)
6	$0	147,646	$30,187	$1,521	$51,676	$80,342	($613,597)
7	$0	146,908	$31,093	$1,513	$51,418	$80,997	($532,600)
8	$0	146,173	$32,025	$1,506	$51,161	$81,680	($450,919)
9	$0	145,442	$32,986	$1,498	$50,905	$82,393	($368,526)
10	$0	144,715	$33,976	$1,491	$50,650	$83,135	($285,391)
11	$0	143,991	$34,995	$1,483	$50,397	$83,909	($201,482)
12	$0	143,271	$36,045	$1,476	$50,145	$84,714	($116,768)
13	$0	142,555	$37,126	$1,468	$49,894	$85,552	($31,215)
14	$0	141,842	$38,240	$1,461	$49,645	$86,424	$55,208
15	$0	141,133	$39,387	$1,454	$49,397	$87,330	$142,539
16	$0	140,427	$40,569	$1,446	$49,150	$88,272	$230,811
17	$0	139,725	$41,786	$1,439	$48,904	$89,251	$320,061
18	$0	139,027	$43,039	$1,432	$48,659	$90,267	$410,328
19	$0	138,332	$44,331	$1,425	$48,416	$91,322	$501,650
20	$0	137,640	$45,661	$1,418	$48,174	$92,417	$594,067
21	$1	136,952	$47,030	$1,411	$47,933	$93,553	$687,620
22	$2	136,267	$48,441	$1,404	$47,693	$94,731	$782,351
23	$3	135,586	$49,895	$1,397	$47,455	$95,953	$878,304
24	$4	134,908	$51,391	$1,390	$47,218	$97,220	$975,523
25	$5	134,233	$52,933	$1,383	$46,982	$98,532	$1,074,056
	Totals:	3,566,206	949,385	30,541	1,248,172	2,167,016	(218,202)
					Net Present Value (NPV)	**$1,074,081**	
					Internal Rate of Return (IRR)	**5.9%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Washington Avenue	7750	Sunpower SPR230	528	14.7	7,764	121.44	151,393	17,424	15.64



.= Proposed PV Layout

Notes:

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

PVWatts Version 1 Input Screen

PV System Specifications:

DC Rating (kW):	121.44	Inputted From Roof Space Cell "G2" Total KW
DC to AC Derate Factor:	0.81	Inputted From Derate Factor Calculated Below in Cell "B37"
Array Type:	Fixed Tilt 1 - Axis Tracking 2 - Axis Tracking	There are 3 inputs for Array Type in all cases you should be using **Fixed Tilt** as the Selection
Fixed Tilt of Single Axis Tracking System:		
Array Tilt (degrees):	10	Based on Roof Type: For Flat Roof use 10 degrees, For Pitched Roof this is based on roof pitch.
Array Azimuth (degrees):	180	Based on Direction Array is Facing.

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

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

Station Identification:

WBAN Number:	14734
City:	Newark
State:	New_Jersey

PV System Specifications:

DC Rating (kW): 121.44

DC to AC Derate Factor: .81 (Derate Factor Help)

Array Type: Fixed Tilt

Fixed Tilt or 1-Axis Tracking System:

Array Tilt (degrees): 40.7 (Default = Latitude)

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

Energy Data:

Cost of Electricity (cents/kWh): .172

Calculate HELP Reset Form

PVWatts * * * AC Energy & Cost Savings

Cautions for Interpreting the Results

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	121.4 kW
DC to AC Derate Factor:	0.810
AC Rating:	98.4 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	0.2 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	10592	18.22
2	4.05	11434	19.67
3	4.58	13866	23.85
4	4.84	13558	23.32
5	5.30	14943	25.70
6	5.33	14103	24.26
7	5.27	14242	24.50
8	5.25	14087	24.23
9	5.06	13657	23.49
10	4.46	12862	22.12
11	3.15	9186	15.80
12	2.87	8862	15.24
Year	4.46	151393	260.40

Output Hourly Performance Data * Output Results as Text

About the Hourly Performance Data — Saving Text from a Browser

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

Please send questions and comments regarding PVWATTS to Webmaster

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