real estate advisory & development services

LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR:

REAL ESTATE ADVISORY AND DEVELOPMENT SERVICES
GREATER BRUNSWICK CHARTER SCHOOL
429 JOYCE KILMER AVENUE
NEW BRUNSWICK, NJ 08901
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I. EXECUTIVE SUMMARY

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

Greater Brunswick Charter School
429 Joyce Kilmer Avenue
New Brunswick, NJ 08901

READS Contact Person: Mr. Keith Timko, Director
Facility Contact Person: Michael DiBlasio, Director

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

The annual energy costs at this facility are as follows:

Electricity	$ 42,207
Natural Gas	$ 23,572
Total	$ 65,779

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 and REM'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	$90	$25	3.6	316.7%
ECM #2	Lighting Controls	$1,710	$822	2.1	621.1%
ECM #3	Rooftop HVAC Replacement	$76,195	$4,102	18.6	-19.2%
ECM #4	Hot Water Heater Replacement	$8,190	$997	8.2	82.6%
ECM #5	DDC Controls	$28,350	$3,289	8.6	74.0%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	97.29 kW Solar Array	$453,330	$60,517	7.5	233.7%

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

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

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Lighting Upgrade	14.6	43429.0	0.0
ECM #2	Lighting Controls	1.3	3850.2	0.0
ECM #3	Rooftop HVAC Replacement	6.6	11913.0	0.0
ECM #4	Hot Water Heater Replacement	12.0	12480.0	-1129.0
ECM #5	DDC Controls	0.0	9036.0	1455.0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	97.29 kW Solar Array	97.3	113754.0	0.0

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

- **ECM #1:** Lighting Upgrade
- **ECM #2:** Lighting Controls
- **ECM #4:** Domestic Hot Water Heater Replacement
- **ECM #5:** DDC Control System

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.

Renewable Energy Measures (REMs) were also reviewed for implementation at the Memorial Elementary School. CEG utilized a roof mounted solar array to house a substantial PV system. The recommended 97.3 kW PV system will produce approximately 113,754 kWh of electricity annually and will reduce the schools electrical consumption from the grid by 49%. The system's calculated simple payback of 14.5 years is past the standard 10 year simple payback threshold; however, with alternative funding this payback could be lessened. CEG recommends the Owner review all funding options before deciding to not implement this renewable energy measure.

II. INTRODUCTION

The comprehensive energy audit covers the 21,090 square foot School Building which includes the following spaces: Classrooms, Cafeteria/Multi-Purpose Room, Science Labs and Offices.

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

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

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

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

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

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

III. METHOD OF ANALYSIS

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

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

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

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

ECM Calculation Equations:

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

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

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

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

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

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

The electric usage profile represents the actual electrical usage for the facility. Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under their General Lighting and Power (GLP) 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. PSE&G also provides natural gas to the facility under the GSGH rate structure. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

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

Description	Average
Electricity	18.2¢ / kWh
Natural Gas	$1.13 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: PSE&G
Rate: GLP
Meter No: 728005998 ; 678003022
Customer ID No: 67 564 531 06; 67 458 767 01
Third Party Utility N/A
TPS Meter / Acct No: N/A

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Nov-08	17,695	55.6	$2,905
Dec-08	13,870	48.2	$2,449
Jan-09	23,720	98.6	$3,784
Feb-09	17,675	55.7	$3,041
Mar-09	20,935	55.4	$3,344
Apr-09	17,675	156.6	$3,025
May-09	19,790	77.2	$3,969
Jun-09	22,400	79.7	$4,635
Jul-09	20,975	78.0	$4,479
Aug-09	21,705	74.1	$4,511
Sep-09	19,975	75.7	$3,499
Oct-09	15,340	54.8	$2,566
Totals	**231,755**	**156.6 Max**	**$42,207**

AVERAGE DEMAND 75.8 KW average

AVERAGE RATE $0.182 $/kWh

Figure 1
Electricity Usage Profile

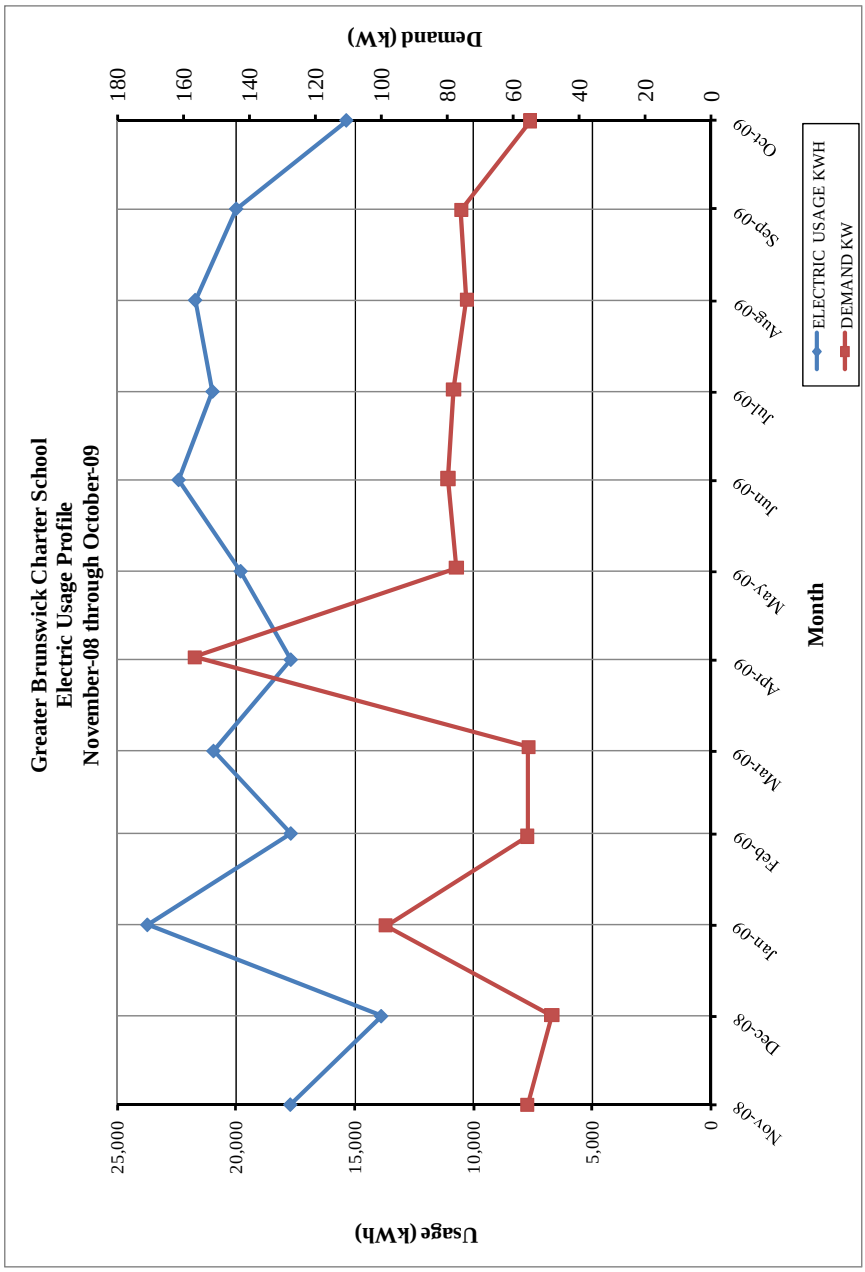
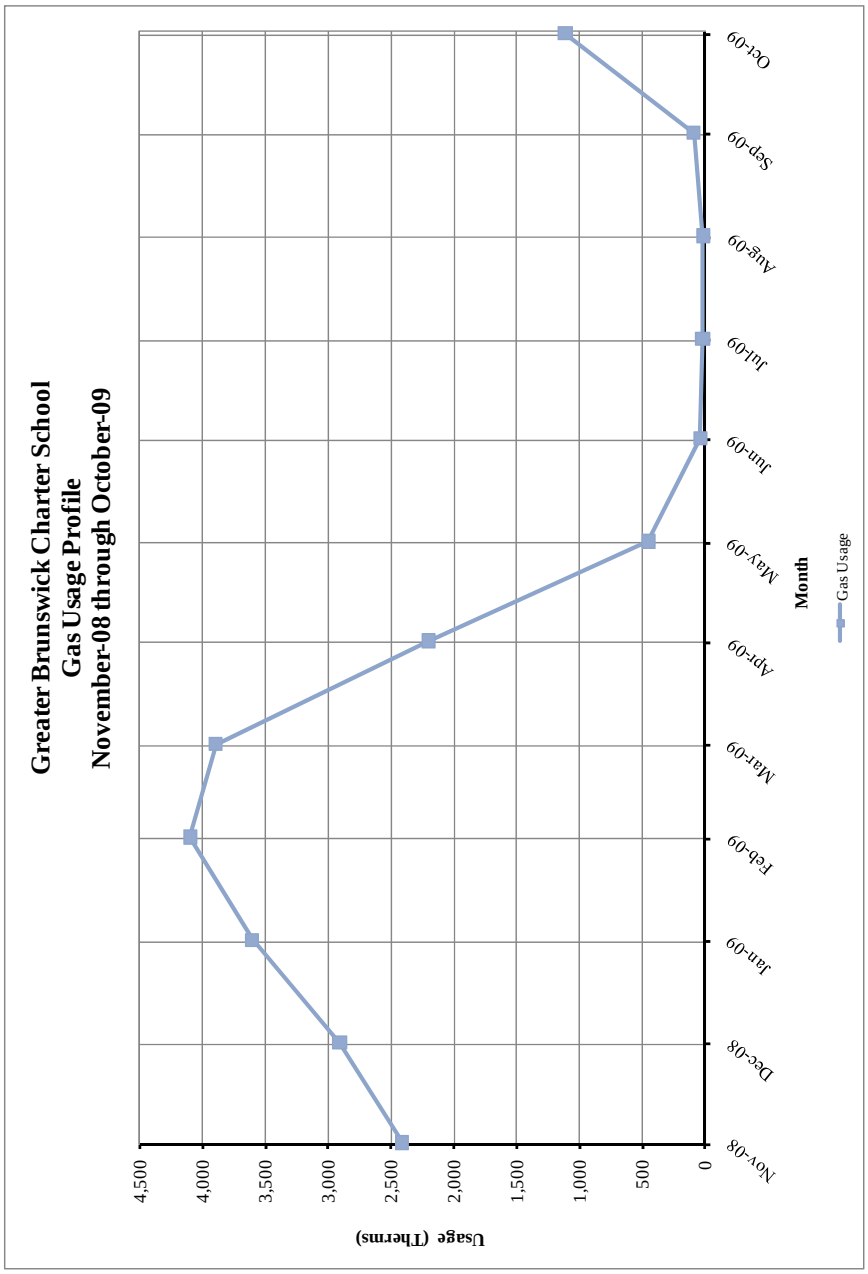


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	PSE&G	
Rate:	GSGH	
Meter No:	1970699 ; 1626312	
Point of Delivery ID:	62 146 099 58 ; 62 146 038 52	
Third Party Utility Provider:	N/A	
TPS Meter No:	N/A	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Nov-08	2,410.92	$3,219.12
Dec-08	2,910.70	$3,968.93
Jan-09	3,605.21	$4,660.50
Feb-09	4,101.70	$4,433.99
Mar-09	3,895.15	$3,152.67
Apr-09	2,201.52	$1,666.49
May-09	450.90	$415.93
Jun-09	40.65	$133.84
Jul-09	20.85	$120.13
Aug-09	17.72	$116.94
Sep-09	90.95	$163.59
Oct-09	1,112.12	$1,519.73
TOTALS	**20,858.39**	**$23,571.86**
AVERAGE RATE:	**$1.13**	**$/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:

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

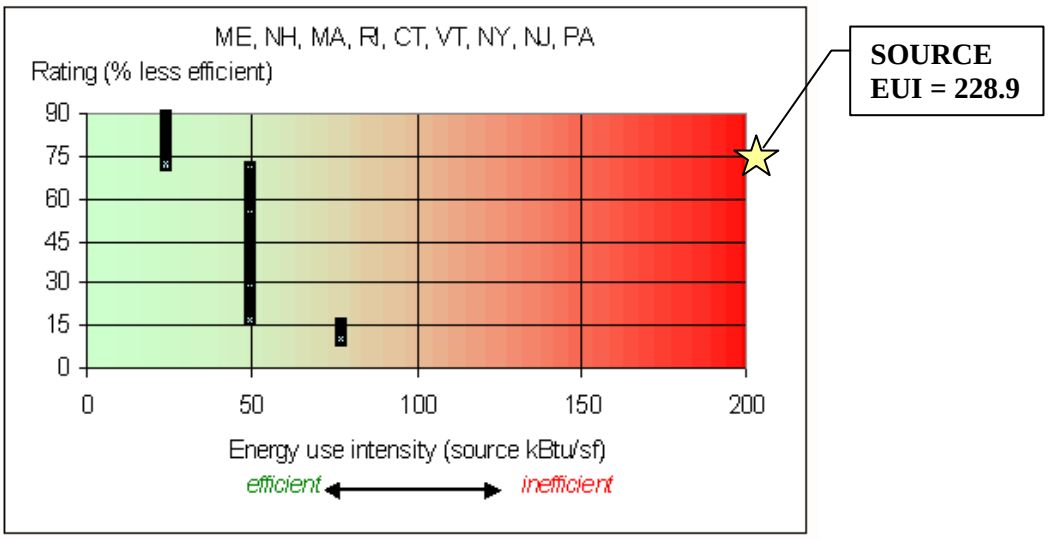
$$Building\ \ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio + Gas\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio)}{Building\ \ Square\ \ Footage}$$

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	231755.0			791,212	3.340	2,642,647
NATURAL GAS		20858.4		2,085,839	1.047	2,183,873
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				2,877,050		4,826,520
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		21,090	SQUARE FEET			
BUILDING SITE EUI		*136.42*	kBtu/SF/YR			
BUILDING SOURCE EUI		*228.85*	kBtu/SF/YR			

Figure 3 below depicts a national EUI grading for the source use of *High Schools*.

Figure 3
Source Energy Use Intensity Distributions: High 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 login page for the account can be accessed at the following web address; the username and password are also listed below:

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

User Name: gbcharterschool
Password: lgeaceg2010

Security Question: What city were you born in?
Security Answer: "New Brunswick"

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

Table 6
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	**ENERGY PERFORMANCE RATING**	**NATIONAL AVERAGE**
Greater Brunswick Charter School	5	50

Refer to **Statement of Energy Performance Appendix** for the detailed energy summary.
It should be noted that the School does not fit the prototypical Elementary School in terms of operating hours and building construction. It is partly because of these factors that the Energy

Star Rating and EUI Ratings are not in line with other Elementary Schools. However, there are areas in which the school's energy efficiency and conservation can improve.

V. FACILITY DESCRIPTION

The 21,090 SF School Building is a single story facility comprised of: Classrooms, cafeteria/multi-purpose room, science labs, and teacher/administration offices. Typical hours of operation for the school are 8:30 am to 3:00 pm Monday through Friday, with early dismissal every Wednesday at 1:00 pm. The School remains in partial operation Monday through Friday after school until 5:30 pm for after school care. In addition to regular operating hours, the school is utilized by the community 3 to 4 nights per week and in the summer months for children's day camps.

The original construction date of the school building is unknown. The original intent and use of the building was a bowling alley. The building was converted to a school and fit out in 2004. The original fit out of the school was a partial renovation of the total building, with a finished square footage of 21,090. The school is currently in the process and under construction of fitting out the remaining square footage of the building. The new fit out includes partially renovating the existing school; however all of the existing HVAC equipment, lighting and domestic hot water heater is to remain as part of that project. The total square footage of the building when the current renovations are complete is 40,150 square feet.

The exterior walls of the building are stucco exterior on concrete block walls. The amount of insulation within the walls is unknown. The interior walls are metal studs with 2-1/2" of insulation behind 5/8" GWB. The partitions in the building are all metal framed walls with 5/8" GWB. The windows of the building are 1" non-mullioned insulated glass with aluminum frames. Blinds are utilized through the facility per occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat in the summer. The roof of the building is the original construction and is an arched shingled roof on top of wooden underlayment and wooden roof trusses. The amount of insulation in the roof cavity is unknown.

HVAC Systems

The School is conditioned by six (6) packaged rooftop HVAC units with gas fired heating and three (3) furnace units with gas fired heating and duct mounted D/X cooling coils with remote condensing units. All of the HVAC units and fan coil units are original to the building and are still within their useful service life, as defined by ASHRAE. RTU-1 serves the multi-purpose room. RTU-2 serves classrooms 5/6, 7/8 and a portion of the corridor. RTU-3 serves the boys' and girls' restrooms, the kitchen, teachers' lounge and storage area. RTU-4 serves the Library and the Art room. RTU-5 serves the main entrance, nurse's office and the administrative offices. RTU-6 serves the Computer lab, Resources room and Basic Skills Classroom. The three fan coils provide heating and cooling to the Kindergarten through 4th grade classrooms (total of 6 rooms). The entrances of the building are heated by ceiling mounted electric unit heaters.

Exhaust System

Three exhaust fans currently serve the restrooms of the building. EF-1 serves the main boy's and girl's restrooms. The other two exhaust fans (EF-2 and EF-3) provide ventilation for the two

children's bathrooms that serve the four K/2 classrooms. The exhaust fans are currently controlled by local on/off switches.

HVAC System Control

All of the HVAC systems within the school are controlled via local, stand-alone, 7 day digital programmable thermostats. At the time of the survey (heating season) all of the thermostats were set between 70-72 degrees F.

Domestic Hot Water

Domestic hot water is provided to the building via four (4) separate electric hot water heaters. The first, WH-1, is an 80 gallon tank that provides hot water to the main boy's and girl's restrooms as well as the staff restrooms and the nurse's restroom. WH-2 is a 30 gallon tank that provides hot water to the two restrooms in the K/2 and 3/4 classrooms. WH-3 is a 20 gallon tank that provides hot water to the hand sinks in the science lab and art room classrooms. WH-4 is a 12 gallon tank that provides hot water to the two hand sinks in the 5/6 and 7/8 classrooms.

Lighting

Typical lighting throughout the school building is fluorescent tube lay-in fixtures with T-8 lamps and electronic ballasts. Storage rooms and closets lit with a mixture of incandescent lamps and compact fluorescent lamps. The exterior of the building is lit with wall mounted 150W high pressure sodium wall packs and a surface mounted T12 with magnetic ballast.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrades

Description:

The lighting in the School Building is primarily made up of fluorescent fixtures with T-12 lamps with magnetic ballasts. Some storage rooms and closets have incandescent lighting.

CEG recommends a replacement of the existing fixtures containing T12 lamps and magnetic ballasts with fixtures containing T8 lamps and electronic ballasts. The new energy efficient, T8 fixtures will provide adequate lighting and will save the Owner on electrical costs due to the better performance of the electronic ballasts. In addition to functional cost savings, the fixture replacement will also provide operational cost savings. The operational cost savings will be realized through the lesser number of lamps that will be required to be replaced per year. The expected lamp life of a T8 lamp, approximately 30,000 burn-hours, in comparison to the existing T12 lamps, approximately 20,000 burn-hours, will provide the Owner with fewer lamps to replace per year.

In addition, 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 **Investment Grade Lighting Audit 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. The existing fixtures can be re-lamped by the facility's staff 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 ($):	$100
NJ Smart Start Equipment Incentive ($):	$10
Net Installation Cost ($):	$90
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$25
Total Yearly Savings ($/Yr):	$25
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.6
Simple Lifetime ROI	316.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$375
Internal Rate of Return (IRR)	27%
Net Present Value (NPV)	$208.45

ECM #2: Lighting Controls

Description:

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

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

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

- Occupancy Sensors for Lighting Control - 20%-28%.(10% used in calcs)

The ECM includes replacement of standard wall switches with sensor wall switches for individual offices, classrooms, meeting rooms, and bathrooms. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. See the "Investment Grade Lighting Audit" appendix for details.

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

Energy Savings Calculations:

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

$$Energy\ Savings = (10\% \times 48{,}400\ (kWh)) = 4{,}840\ (kWh)$$

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

$$Savings. = 4{,}840\ (kWh) \times 0.182\left(\frac{\$}{kWh}\right) = \$881$$

Installation cost per dual-technology sensor (Basis: Sensor switch or equivalent) is $110/unit including material and labor.

Installation Cost = $110 x 19 motion sensors = $2,090

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

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ wall\ mount\ devices \times\ \$\ 20) = (19 \times \$20) = \$380$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,090
NJ Smart Start Equipment Incentive ($):	$380
Net Installation Cost ($):	$1,710
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$822
Total Yearly Savings ($/Yr):	$822
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.1
Simple Lifetime ROI	621.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$12,330
Internal Rate of Return (IRR)	48%
Net Present Value (NPV)	$8,102.98

ECM #3: Rooftop Unit Replacement –RTU's 1-6

Description:

The existing rooftop units located on the roof of the building are good candidates for replacement. They are within their service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. However, the rated Energy Effeciency Ratings (EER) of these units is well below today's standards for high efficiency. Savings could be realized if newer, high efficiency units were installed to replace these units.

This measure would replace all six (6) of the Lennox rooftop unit with high efficiency gas fired heating/DX cooling unit of equal capacity.

Energy Savings Calculations:

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

Existing Lennox 10-Ton RTU
Rated Capacity = 10 Tons
Condenser Section Efficiency = 9.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.
Average Cost of Electricity - $0.182/kWh

Proposed High-Efficiency 10-Ton Rooftop Unit
Rated Capacity = 10 Tons
New Cooling Unit Efficiency = 12.5 EER

$$EnergySavings = \frac{[10CoolingTons \times 12{,}000\,Btu/ton \div 1000\,W/kW]}{[(12.5EER_{NEW} - 9.0EER_{OLD})]} \times 0.15 \times 1800 = 9{,}257\,kWh/yr.$$

Existing Lennox 5-Ton RTU (Total of 5 Units)
Rated Capacity = 5 Tons
Condenser Section Efficiency = 8.9 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.
Average Cost of Electricity - $0.182/kWh

Proposed High-Efficiency 5-Ton Rooftop Unit (Total of 5 Units)
Rated Capacity = 5 Tons per Unit
New Cooling Unit Efficiency = 15.0 EER

$$EnergySavings = \frac{[5 CoolingTons \times 12{,}000\, Btu/ton \div 1000 W/kW]}{[(15 EER_{NEW} - 8.9 EER_{OLD})]} \times 0.15 \times 1800 = 2{,}656 kWh/yr.ea.$$

Total Energy Cost Savings = (9,257 kWh + (5 x 2,656 kWh) x $0.182/kWh = $4,102 per year
Installation costs for the rooftop replacement are estimated at $78,750. It is pertinent to note that this estimate includes the demolition of the existing units and curb modifications (if required).

NJ Smart Start® Program Incentives are calculated as follows:
From **NJ Smart Start® Incentives Appendix**, the rooftop unit replacement falls under the category "Unitary HVAC" and warrants an incentive based on efficiency (EER) at a certain cooling tonnage.

$$\text{Smart Start®}\ Incentive\ (RTU - 10\ tons) = (CoolingTons \times\ RTU\ Incentive)$$
$$= (10 tons \times \$73/ton) = \$730$$

$$\text{Smart Start®}\ Incentive\ (RTU - 5\ tons) = (CoolingTons \times\ RTU\ Incentive)$$
$$= (5\ tons \times \$73/ton) \times 5 Units = \$1{,}825$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$78,750
NJ Smart Start Equipment Incentive ($):	$2,555
Net Installation Cost ($):	$76,195
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$4,102
Total Yearly Savings ($/Yr):	$4,102
Estimated ECM Lifetime (Yr):	15
Simple Payback	18.6
Simple Lifetime ROI	-19.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$61,530
Internal Rate of Return (IRR)	-3%
Net Present Value (NPV)	($27,225.59)

ECM#4 - Domestic Hot Water Heater Replacement

Description:

This energy conservation measure will replace the three smaller existing electric, domestic hot water heaters (30 Gallon, 20 Gallon and 12 Gallon) with gas-fired, tankless point of use hot water heater. Tankless water heaters heat water directly without the use of a storage tank. Therefore, they avoid the standby heat losses associated with storage water heaters. In a gas-fired tankless water heater, a gas burner heats the water and provides a constant supply of hot water. Therefore, you do not need to wait for the storage tank to fill up with enough hot water as is typical with storage-type hot water heaters.

In addition, this measure would also replace the larger, 80 gallon electric hot water heater with a new high efficiency gas fired unit of equal storage capacity.

As-Built mechanical plans indicate that there is gas piping in the areas where the proposed hot water heaters would be located. However, before proceeding with the implementation, we recommend that the Owner verify that additional gas demand and consumption are viable and acceptable at this facility.

Energy Savings Calculations:

Existing Electric DHW Heater
Rated Capacity = 7,500 Watts total Energy Factor (EF) = 0.92

62 gallons storage total

Proposed High-Efficiency Gas-Fired Tankless Water Heater
Rated Capacity = 5 gallons per minute Natural Gas-Fired

Five (5) units required (one per restroom serving K/2, one serving hand sinks in ¾ classrooms, one serving the hand sinks in the Lab and Art Room, and one serving the hand sinks in 5/6 and 7/8 classrooms) EF= 0.65

Operating Data for Existing Electric DHW Heaters:
Average cost of electricity = 18.2¢/kWh

Electric DHW Heater Operating Hrs/Yr. = 1,040 Hrs.

Electric usage = (1,040 Hrs x 7,500 Watts) ÷ 1,000 Watts/kW = 7,800 kWh

Cost = 18.2¢/kWh x 7,800 kWh = $1,420

Operating Data for new tankless gas-fired DHW heaters:
Average cost of natural gas = $1.13/Therm

Annual gas usage for five (5) 5 GPM tankless gas-fired units = 713 Therms

Cost = 713 Therms x $ 1.13 /Therm = $805

Energy Savings = $1,420 - $805= $615

Installed cost of five (5) gas-fired 5 GPM tankless water heaters = $7,000

NJ Smart Start® Program Incentives are calculated as follows:
From **NJ Smart Start® Incentives Appendix**, a natural gas-fired domestic hot water heater less than 50 gallons warrants the following incentive:
$\text{Smart Start®}\ \textit{Incentive} = (\textit{Quantity} \times\ \$50\ \textit{per DHW Heater}) = (5 \times \$50) = \$250$

Existing Electric DHW Heaters
Rated Capacity = 4500 Watts Energy Factor (EF) = 0.92

80 gallons storage

Proposed Natural Gas-Fired, High-Efficiency DW Heaters
Rated Capacity = 40 MBH input; 50 gallons storage

Thermal Efficiency = 90%

Radiation Losses = 0.5%
Net Efficiency = 89.5%

Operating Data for Existing Electric DHW Heater:
Average cost of electricity = 18.2¢/kWh

Electric DHW Heater Operating Hrs/Yr. = 1,040 Hrs.

Electric usage = (1,040 Hrs x 4,500 Watts) ÷ 1,000 Watts/kW = 4,680 kWh

Cost = 18.2¢/kWh x 4,680 kWh = $852

Operating Data for New High Efficiency Gas Water Heater
Annual gas consumption of water heater (in therms)

40,000 Btu x 1040 hrs / 100000 Bth/therm = 416 therms

Annual cost of gas usage = 416 therms x 1.13/therm = $470

Energy Savings = $852 - $470 = $382

Installed cost of a gas fired 52 gallon, 40 MBH GPM water heaters = $1,600

***NJ Smart Start® Program Incentives** are calculated as follows:*
Smart Start Incentive = $2.00/MBh /installed MBh x (2 x 40 MBh) = $160.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,600
NJ Smart Start Equipment Incentive ($):	$410
Net Installation Cost ($):	$8,190
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$997
Total Yearly Savings ($/Yr):	$997
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.2
Simple Lifetime ROI	82.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$14,955
Internal Rate of Return (IRR)	9%
Net Present Value (NPV)	$3,712.12

ECM #5: Install DDC Controls

Description:

The existing control system of the HVAC equipment in the school is stand alone programmable thermostats. This measure would provide new DDC controllers for each existing rooftop unit and fan coil unit of the existing building. The new controllers would be tied into the new building management system (BMS) being installed as part of the school expansion project currently in progress.

The DDC system has the potential to realize 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 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 5% of the total energy cost for the facility. The lower end of the savings range was selected because the existing units are controlled via programmable thermostats which allow for nighttime set back and automatic daily temperature settings. However, because these thermostats have end user control capabilities without any temperature limits, the temperature can be adjusted well above or below the desired temperature range, thus consuming more energy. A DDC control system would still provide end user control capabilities, but it would be limited to a defined range of temperatures that is controlled and set by the BMS.

Energy Savings Calculations:

Studies have shown that the installation of a full DDC system could save an estimated 5% of the total energy costs for this facility. This includes gas and electric usage.

Annual Savings = 5% x $65,779 = $3,289.

We also assumed that one-half of the total energy savings ($3,289) is natural gas and the other half is electric savings

Electric and Gas Cost Savings:	$3,289 / 2 =	$1,644.5
Electric usage savings:	$1644.5 / $0.182/kWh =	9,036 kWh
Gas Usage Savings:	$1,644.5 / $1.13/therm =	1,455 therms

The cost of a DDC system with new field devices, wiring, thermostats, controllers, engineering, etc. is approximately $3,150 per control zone based on recent project cost data and a control contractor's budget pricing. There would be a total of 9 control zones added (one for each existing rooftop unit and one for each fan coil/condensing unit).

Total Cost of DDC Controls = $3,150 x 9 = $28,350

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$28,350
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$28,350
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$3,289
Total Yearly Savings ($/Yr):	$3,289
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.6
Simple Lifetime ROI	74.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$49,335
Internal Rate of Return (IRR)	8%
Net Present Value (NPV)	$10,913.87

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 3570 S.F. can be utilized for a PV system between the school roof and the gymnasium roof. 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 26.45 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 58,208 KWh annually, reducing the overall utility bill by approximately 26.6% 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.

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

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM			
PAYMENT TYPE	**SIMPLE PAYBACK**	**SIMPLE ROI**	**INTERNAL RATE OF RETURN**
Direct Purchase	14.5 Years	52.4%	5.5%

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

Given the large amount of capital required by the School to invest in a solar system through a Direct Purchase CEG does not recommend the School pursue this route. It would be more

advantageous for the School to solicit Power Purchase Agreement (PPA) Providers who will own, operate, and maintain the system for a period of 15 years. During this time the PPA Provider would sell all of the electric generated by Solar Arrays to the School at a reduced rate compared to their existing electric rate.

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

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The Electric Usage Profile demonstrates a fairly consistent load profile throughout the year. This would allow for more competitive energy prices when shopping for alternative suppliers. There are two points along the profile that should be further investigated by the Owner by comparing to their upcoming 2010 bills and these are as follows: the Peak Demand of 156.6 kW in April and the Peak Consumption of 23,720 kWh in January. These numbers could be exaggerated due to the use of construction equipment at the facility in the unfinished areas but should be noted by the Owner as they continue to catalog their utility usage.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical heating load profile, with increasing consumption in the winter months (October – March) and a dramatic drop in consumption in the summer months (May – September). The main heating equipment for this facility consists entirely of natural gas-fired equipment hence, the noted profile.

Tariff Analysis:

Electricity:

This facility receives electrical Delivery Service from Public Service Electric and Gas Company (PSE&G) on a GLP (General Light and Power) utility rate. The GLP utility tariff is for Delivery service for general purposes at secondary distribution voltages. Customers may either purchase electric supply from a Third Party Supplier (TPS) or from Public Service's Basic Generation Service default service as detailed in this rate schedule. This facility is currently receiving Generation service from PSE&G's Basic Generation Service. The PSE&G Delivery service has the following charges: Service Charge, Distribution Charges, Societal Benefits Charges, Non-Utility Generation Charges, Securitization Transition Charges, System Control Charges, Customer Account Services Charges, Commercial and Industrial Energy Pricing Standby Fee (CIEP), Base Rate Distribution Kilowatt Adjustment Charge, Solar Pilot Recovery Charge and Capital Adjustment Charge.

Natural Gas:

This facility receives natural gas service through Public Service Electric and Gas Company (PSE&G) on a GSGH (General Service Gas-Heating) rate when not receiving commodity by a Third Party Supplier. The utility tariff rate (GSGH) is for General Service. This is a firm delivery service (higher level of delivery) for general purposes where 1) customer does not qualify for RSG (residential) and 2) customers usage does not exceed 3,000 therms in any month. Customers may either purchase gas supply from a Third Party (TPS) or from Public Services Basic Gas Supply Service default service as detailed in the rate schedule.

The service described above has a much higher priority of delivery, based on the pipeline capacity. When the pipelines capacity was unbundled (much like the telecom service), it was divided into various levels of service. The "firm" service is the highest priority, and does not get interrupted.

This rate schedule has a Delivery Charge Mechanism which includes: 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 Supply Charge (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. Should the TPS un-deliver to the utility on behalf of the client, the utility will automatically supply this default service to the client.

Imbalances occur when Third Party Suppliers are used to supply natural gas, full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used. Otherwise, imbalances can occur, jeopardizing economics and scheduling.

Recommendations:

CEG recommends an approach that will be opportunistic for utility cost savings to coincide with the Charter School's direction of saving energy. Our recommendation is for the Charter School to review opportunities to purchase their natural gas and electricity commodity via a "consortium" based contract as the Charter School's base load is not large enough to be a major player on its own. It is estimated that approximately a 15% savings can be achieved on electricity commodity costs and approximately a 20% savings can be achieved on natural gas commodity costs based on current market pricing. However, actual estimated savings would be calculated and verified while obtaining a Third Party Supplier or Local Distribution Company. CEG highly recommends the Charter School utilize a consultant to ensure "best practice" is utilized when joining into a fixed term pricing contract for commodity. CEG further recommends that the Charter School create an energy procurement program through a "managed approach." The "managed approach" will take into account creating an "energy budget" that is in line with the Charter School's budget year and risk tolerance. Risk tolerance is the appetite that a

customer has for risk. Based on the reduced state, school and local government budgets and the general aversion for risk, the Owner is required to manage this risk.

In addition, CEG recommends the Charter School schedule a meeting with their 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), they will learn more about the competitive supply process. They can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, the Charter School should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if the Charter School frequently changes its supplier for energy, CEG recommends it closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

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

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

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

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

iv. *Direct Install Program* – The New Jersey Clean Energy's Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 200 kW. This turnkey program is aimed at providing owners a seamless, comprehensive process for analysis, equipment replacement and financial incentives to reduce consumption, lower utility costs and improve profitability. The program covers up to 80% of the cost for eligible upgrades including lighting, lighting controls, refrigeration, HVAC, motors, variable speed drives, natural gas and food service. Participating contractors (refer to www.njcleanenergy.com) conduct energy assessments in addition to your standard local government energy audit and install the cost-effective measures.

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

XI. ADDITIONAL RECOMMENDATIONS

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

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

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

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

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

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Greater Brunswick Charter School

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY														
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade	$100	$0	$10	$90	$25	$0	$25	15	$375	$0	316.7%	3.6	27.01%	$208.45
ECM #2	Lighting Controls	$2,090	$0	$380	$1,710	$822	$0	$822	15	$12,330	$0	621.1%	2.1	47.94%	$8,102.98
ECM #3	Rooftop HVAC Replacement	$42,750	$36,000	$2,555	$76,195	$4,102	$0	$4,102	15	$61,530	$0	-19.2%	18.6	-2.56%	($27,225.59)
ECM #4	Hot Water Heater Replacement	$4,300	$4,300	$410	$8,190	$997	$0	$997	15	$14,955	$0	82.6%	8.2	8.68%	$3,712.12
ECM #5	DDC Controls	$28,350	$0	$0	$28,350	$3,289	$0	$3,289	15	$49,335	$0	74.0%	8.6	7.89%	$10,913.87
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	97.29 kW Solar Array	$453,330	$0	$0	$453,330	$20,703	$39,814	$60,517	25	$1,512,925	$995,350	233.7%	7.5	12.67%	$600,461.46

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

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February, 2010:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2004

Ground Source Heat Pumps

Closed Loop & Open Loop	$450 per ton, EER ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit, AFUE ≥ 92%

Variable Frequency Drives

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

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters > 50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH
Gas Fired Tankless Water Heaters	$300 per unit

Premium Motors

Three-Phase Motors	$45 - $700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	$40 per electronic communicated motor

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$15 per fixture (1-4 lamps)
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$42 per 5 foot $65 per 6 foot

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled
Daylight Dimming - office	$50 per fixture controlled

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Greater Brunswick Charter School

Building ID: 2264851
For 12-month Period Ending: October 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: April 01, 2010

Facility
Greater Brunswick Charter School
429 Joyce Kilmer Ave
New Brunswick, NJ 08903

Facility Owner
Real Estate Advisory and Development Services
280 Amboy Ave
Metchen, NJ 08840

Primary Contact for this Facility
N/A

Year Built: 2004
Gross Floor Area (ft²): 21,090

Energy Performance Rating[2] (1-100) 5

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	790,748
Natural Gas (kBtu)[4]	2,085,839
Total Energy (kBtu)	2,876,587

Energy Intensity[5]	
Site (kBtu/ft²/yr)	136
Source (kBtu/ft²/yr)	229

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	231

Electric Distribution Utility
Public Service Elec & Gas Co

National Average Comparison	
National Average Site EUI	79
National Average Source EUI	133
% Difference from National Average Source EUI	72%
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.

Certifying Professional
N/A

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**

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	Greater Brunswick Charter 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	429 Joyce Kilmer Ave, New Brunswick, NJ 08903	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	21,090 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	10	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	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	12(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: Public Service Elec & Gas Co

Fuel Type: Electricity

Meter: Electric (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
10/01/2009	10/31/2009	15,340.00
09/01/2009	09/30/2009	19,975.00
08/01/2009	08/31/2009	21,705.00
07/01/2009	07/31/2009	20,975.00
06/01/2009	06/30/2009	22,400.00
05/01/2009	05/31/2009	19,790.00
04/01/2009	04/30/2009	17,675.00
03/01/2009	03/31/2009	20,935.00
02/01/2009	02/28/2009	17,675.00
01/01/2009	01/31/2009	23,720.00
12/01/2008	12/31/2008	13,870.00
11/01/2008	11/30/2008	17,695.00
Electric Consumption (kWh (thousand Watt-hours))		**231,755.00**
Electric Consumption (kBtu (thousand Btu))		**790,748.06**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**790,748.06**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Natural Gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
10/01/2009	10/31/2009	1,112.12
09/01/2009	09/30/2009	90.95
08/01/2009	08/31/2009	17.72
07/01/2009	07/31/2009	20.85
06/01/2009	06/30/2009	40.65
05/01/2009	05/31/2009	450.90
04/01/2009	04/30/2009	2,201.52
03/01/2009	03/31/2009	3,895.15
02/01/2009	02/28/2009	4,101.70
01/01/2009	01/31/2009	3,605.21

12/01/2008	12/31/2008	2,910.70
11/01/2008	11/30/2008	2,410.92
Natural Gas Consumption (therms)		**20,858.39**
Natural Gas Consumption (kBtu (thousand Btu))		**2,085,839.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**2,085,839.00**
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
Greater Brunswick Charter School
429 Joyce Kilmer Ave
New Brunswick, NJ 08903

Facility Owner
Real Estate Advisory and Development Services
280 Amboy Ave
Metchen, NJ 08840

Primary Contact for this Facility
N/A

General Information

Greater Brunswick Charter School	
Gross Floor Area Excluding Parking: (ft^2)	21,090
Year Built	2004
For 12-month Evaluation Period Ending Date:	October 31, 2009

Facility Space Use Summary

School	
Space Type	K-12 School
Gross Floor Area(ft^2)	21,090
Open Weekends?	No
Number of PCs	10
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	No
Percent Cooled	100
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	New Brunswick

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 10/31/2009)	**Baseline**	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	5		75	N/A	50
Energy Intensity					
Site (kBtu/ft²)	136	N/A	62	N/A	79
Source (kBtu/ft²)	229	N/A	104	N/A	133
Energy Cost					
$/year	$ 65,778.86	N/A	$ 29,909.13	N/A	$ 38,247.22
$/ft²/year	$ 3.12	N/A	$ 1.42	N/A	$ 1.81
Greenhouse Gas Emissions					
$MtCO_2e$/year	231	N/A	105	N/A	134
$kgCO_2e/ft^2$/year	11	N/A	5	N/A	6

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

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

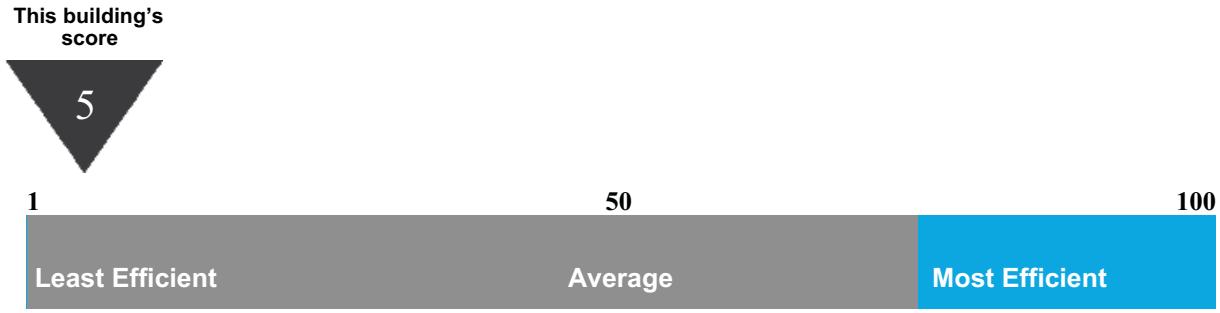
Statement of Energy Performance

2009

Greater Brunswick Charter School
429 Joyce Kilmer Ave
New Brunswick, NJ 08903

Portfolio Manager Building ID: 2264851

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 229 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending October 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: 04/01/2010

MAJOR EQUIPMENT LIST

Concord Engineering Group

Greater Brunswick Charter School

Domestic Hot Water Heater

Tag	Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (kW)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	Service Life	Remaining Life	Notes
HW-1	Janitor's Closet	Main Restrooms	Bradford White	1	M-I-80RDS2	AD4496731	4.5	20	80		Electricity	6	12	6	
HW-2	Ceiling	K/2 and 3/4 bathrooms	Bradford White	1	M-I-30RDS2	-	4.5	20	30		Electricity	6	12	6	
HW-3	Ceiling	Science Lab and Art Room	Bradford White	1	M-I-20RDS2	-	1.5	20	20		Electricity	6	12	6	
HW-4	Ceiling	5/6 and 7/8 Classrooms	Bradford White	1	M-I-12RDS2	-	1.5	20	12		Electricity	6	12	6	

Rooftop Units

Tag	Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts / Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
RTU-1	Roof	Multi-purpose room	Lennox	1	GCS16-060-120		D/X	9	10	Gas Furnace	270	216	80%	Nat. Gas	208V/3Ph	58	6	15	9	
RTU-2	Roof	Classroom 5/6 amd 7/8	Lennox	1	GCS16-060-120		D/X	8.9	5	Gas Furnace	120	96	80%	Nat. Gas	208V/3Ph	29	6	15	9	
RTU-3	Roof	Boys and Girls Restrooms	Lennox	1	GCS16-060-120		D/X	8.9	5	Gas Furnace	120	96	80%	Nat. Gas	208V/3Ph	29	6	15	9	
RTU-4	Roof	Library and Art Room	Lennox	1	GCS16-060-120		D/X	8.9	5	Gas Furnace	120	96	80%	Nat. Gas	208V/3Ph	29	6	15	9	
RTU-5	Roof	Main Entrance Admin Offices	Lennox	1	GCS16-060-120		D/X	8.9	5	Gas Furnace	120	96	80%	Nat. Gas	208V/3Ph	29	6	15	9	
RTU-6	Roof	Computer Lab	Lennox	1	GCS16-060-120		D/X	8.9	5	Gas Furnace	120	96	80%	Nat. Gas	208V/3Ph	29	6	15	9	

Fan Coil Units

Tag	Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts / Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
F-1	Ceiling	K/2 Classrooms	Lennox	1	G400H-60-110		In-duct			Gas Furnace	110	89	80%	Nat. Gas	120V/1Ph	12	6	18	12	
F-2	Ceiling	K/2 Classrooms	Lennox	1	G400H-60-110		In-duct			Gas Furnace	110	89	80%	Nat. Gas	120V/1Ph	12	6	18	12	
F-3	Ceiling	3/4 Classrooms	Lennox	1	G400H-60-110		In-duct			Gas Furnace	110	89	80%	Nat. Gas	120V/1Ph	12	6	18	12	

AC Condensers

Tag	Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity (Tons)	EER	Refrigerant	Volts / Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
C-1	Outside	F-1	Lennox	1	10ACC-60		5	10	R-22	208V/3Ph	23.5	6	20	14	
C-2	Outside	F-2	Lennox	1	10ACC-60		5	10	R-22	208V/3Ph	23.5	6	20	14	
C-3	Outside	F-3	Lennox	1	10ACC-60		5	10	R-22	208V/3Ph	23.5	6	20	14	

Unit Heaters and Cabinet Unit Heaters

Tag	Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Heating Type	Heating Capacity (kW)	CFM	RPM / HP	GPM	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
ECH-1	Ceiling	Side Exit	Qmark	1	CDF548RE		Electric Resistance	4	250	-	-	6	13	7	
ECH-1	Ceiling	Side Exit	Qmark	1	CDF548RE		Electric Resistance	4	250	-	-	6	13	7	
ECH-1	Ceiling	Main Entrance	Qmark	1	CDF548RE		Electric Resistance	4	250	-	-	6	13	7	

Investment Grade Lighting Audit

CEG Job #: 9C10029
Project: Greater Brunswick Charter School
Address: 429 Joyce Kilmer Ave
New Brunswick, NJ
Building SF: 21,090

Greater Brunswick Charter School

KWH COST: $0.182

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
242.21	Counselor's Office	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21		2600	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	86	0.17	447.2	$81	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Nurse	2600	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.31	811.2	$148	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Nurse's Restroom	650	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	86	0.09	55.9	$10	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	4-5 Classroom	2600	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.14	2,974.4	$541	11	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21	Closet	650	1	2	2x2, 2 Lamp, 32w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	58	0.06	37.7	$7	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	4-5 Classroom	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2,704.0	$492	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
247.21		2600	1	4	2x2, 4 Lamp, 17w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	60	0.06	156.0	$28	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
247.21	Closet	650	1	4	2x2, 4 Lamp, 17w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	60	0.06	39.0	$7	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	4-5 Classroom - Quiet Room	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Community Room	2600	36	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	3.74	9,734.4	$1,772	36	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Equipment Storage	650	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	135.2	$25	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Kitchen	2600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.42	1,081.6	$197	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

242.21	Men's Restroom	2600	5	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.52	1,352.0	$246	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Women's Restroom	2600	5	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.52	1,352.0	$246	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Janitor's Closet	650	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	86	0.09	55.9	$10	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Men's Handicap Restroom	1800	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	86	0.09	154.8	$28	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Women's Handicap Restroom	1800	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	86	0.09	154.8	$28	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Copy Room	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Classroom 1	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2,704.0	$492	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Closet	650	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.10	67.6	$12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Restroom	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Classroom 2	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2,704.0	$492	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Closet	650	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.10	67.6	$12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Quiet Room	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Classroom 3	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2,704.0	$492	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Closet	650	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.10	67.6	$12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Restroom	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Classroom 4	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2,704.0	$492	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

242.21	K1 Closet	650	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.10	67.6	$12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Quiet Room	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Classroom 5	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2,704.0	$492	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Closet	650	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.10	67.6	$12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Restroom	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Classroom 6	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2,704.0	$492	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Closet	650	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.10	67.6	$12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	K1 Quiet Room	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.21	540.8	$98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	ESL	2600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.42	1,081.6	$197	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Special Education	2600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.42	1,081.6	$197	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Computer Lab	2600	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.83	2,163.2	$394	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	2 - 3 Classroom	2600	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.83	2,163.2	$394	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
247.21	Closet	650	1	4	2x2, 4 Lamp, 17w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	60	0.06	39.0	$7	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	2 - 3 Classroom	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2,704.0	$492	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Art Room	2600	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.83	2,163.2	$394	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Lobby	3200	5	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.52	1,664.0	$303	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

242.21	Office	2600	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.31	811.2	$148	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Front Office	2600	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.62	1,622.4	$295	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Office	2600	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.31	811.2	$148	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Office	2600	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.31	811.2	$148	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Closet	650	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.10	67.6	$12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Corridors	3200	32	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	86	2.75	8,806.4	$1,603	32	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
600		8760	10	1	LED Exit Sign	5	0.05	438.0	$80	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
128.16	Exterior	3600	1	2	8' Channel, 2 Lamp, 75w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	142	0.14	511.2	$93	1	4	(2) 8' Lamps to (4) 4' Lamps - 32w T8, Elect Ballast; retrofit	104	0.10	374.4	$68.14	$100.00	$100.00	0.04	136.8	$24.90	4.02
731		3600	3	1	150w HPS Wallpack	188	0.56	2,030.4	$370	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		279	200			27.45	71,712.3	$13,051.64	279	4			0.104	374.4	$68.14	$100.00	$100.00	0.04	136.8	$24.90	4.02

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

2. Lamp totals only include T-12 tube replacement calculations

CEG Job #: 9C10029
Project: Greater Brunswick Charter School
Address: 429 Joyce Kilmer Ave
New Brunswick, NJ
Building SF: 21090

Greater Brunswick Charter School

KWH COST: $0.182

ECM #2: Lighting Controls

EXISTING LIGHTINC										PROPOSED LIGHTING CONTROLS											
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	Qnty.	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
242.2	Counselor's Office	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.208	540.8	$98.43	2	0			0%	540.8	$98.43	$160.00	$0.00	0	$0.00	0.00
232.2		2600	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	86	0.172	447.2	$81.39	2	0			0%	447.2	$81.39	$160.00	$0.00	0	$0.00	0.00
242.2	Nurse	2600	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.312	811.2	$147.64	3	0			0%	811.2	$147.64	$160.00	$0.00	0	$0.00	0.00
232.2	Nurse's Restroom	650	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	86	0.086	55.9	$10.17	1	0			0%	55.9	$10.17	$160.00	$0.00	0	$0.00	0.00
242.2	4-5 Classroom	2600	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.144	2974.4	$541.34	11	1	Dual Technology Occupancy Sensor	1	10%	2676.96	$487.21	$160.00	$160.00	297.44	$54.13	2.96
227.2	Closet	650	1	2	2x2, 2 Lamp, 32w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	58	0.058	37.7	$6.86	1	0			0%	37.7	$6.86	$160.00	$0.00	0	$0.00	0.00
242.2	4-5 Classroom	2600	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	1.04	2704	$492.13	10	1	Dual Technology Occupancy Sensor	1	10%	2433.6	$442.92	$160.00	$160.00	270.4	$49.21	3.25
247.2		2600	1	4	2x2, 4 Lamp, 17w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	60	0.06	156	$28.39	1	0			0%	156	$28.39	$160.00	$0.00	0	$0.00	0.00
247.2	Closet	650	1	4	2x2, 4 Lamp, 17w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	60	0.06	39	$7.10	1	0			0%	39	$7.10	$160.00	$0.00	0	$0.00	0.00
242.2	4-5 Classroom - Quiet Room	2600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed mnt., Prismatic Lens	104	0.208	540.8	$98.43	2	0			0%	540.8	$98.43	$160.00	$0.00	0	$0.00	0.00

Project Name: LGEA Solar PV Project - Greater Brunswick Charter School
Location: New Brunswick, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

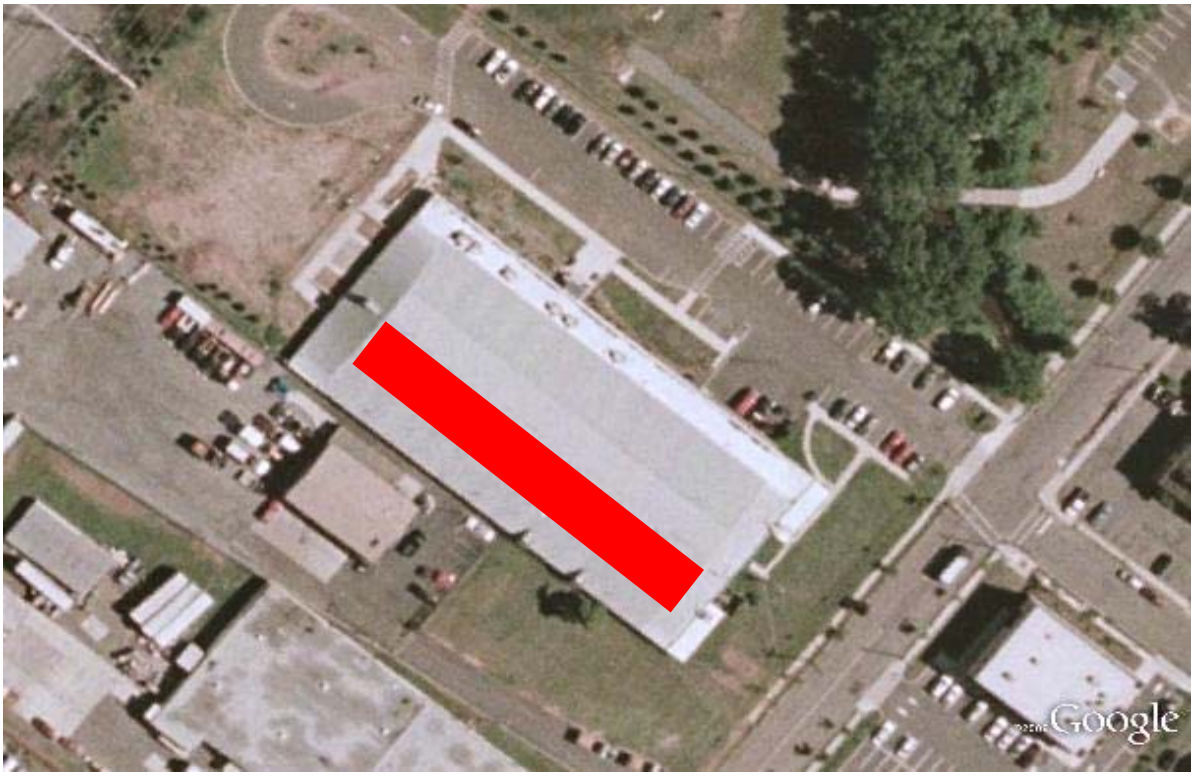
	Photovoltaic System - Direct Purchase
Total Construction Cost	$875,610
Annual kWh Production	113,754
Annual Energy Cost Reduction	$20,703
Annual SREC Revenue	$39,814
First Cost Premium	**$875,610**
Simple Payback:	**14.47** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.182**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$875,610	0	0	0	$0	(875,610)	0
1	$0	113,754	$20,703	$0	$39,814	$60,517	($815,093)
2	$0	113,185	$21,324	$0	$39,615	$60,939	($754,154)
3	$0	112,619	$21,964	$0	$39,417	$61,381	($692,773)
4	$0	112,056	$22,623	$0	$39,220	$61,843	($630,930)
5	$0	111,496	$23,302	$1,148	$39,024	$61,177	($569,753)
6	$0	110,938	$24,001	$1,143	$38,828	$61,687	($508,067)
7	$0	110,384	$24,721	$1,137	$38,634	$62,218	($445,849)
8	$0	109,832	$25,462	$1,131	$38,441	$62,772	($383,077)
9	$0	109,283	$26,226	$1,126	$38,249	$63,350	($319,727)
10	$0	108,736	$27,013	$1,120	$38,058	$63,951	($255,776)
11	$0	108,193	$27,823	$1,114	$37,867	$64,576	($191,200)
12	$0	107,652	$28,658	$1,109	$37,678	$65,227	($125,973)
13	$0	107,113	$29,518	$1,103	$37,490	$65,904	($60,068)
14	$0	106,578	$30,403	$1,098	$37,302	$66,608	$6,540
15	$0	106,045	$31,315	$1,092	$37,116	$67,339	$73,879
16	$0	105,515	$32,255	$1,087	$36,930	$68,098	$141,977
17	$0	104,987	$33,223	$1,081	$36,745	$68,887	$210,864
18	$0	104,462	$34,219	$1,076	$36,562	$69,705	$280,569
19	$0	103,940	$35,246	$1,071	$36,379	$70,554	$351,123
20	$0	103,420	$36,303	$1,065	$36,197	$71,435	$422,558
21	$1	102,903	$37,392	$1,060	$36,016	$72,349	$494,906
22	$2	102,389	$38,514	$1,055	$35,836	$73,295	$568,202
23	$3	101,877	$39,670	$1,049	$35,657	$74,277	$642,479
24	$4	101,367	$40,860	$1,044	$35,479	$75,294	$717,773
25	$5	100,860	$42,085	$1,039	$35,301	$76,348	$794,121
	Totals:	2,679,584	$754,824	$22,948	$937,854	$1,669,731	($1,047,450)
				Net Present Value (NPV)		**$794,146**	
				Internal Rate of Return (IRR)		**5.5%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
School	6900	Sunpower SPR230	423	14.7	6,220	97.29	113,754	13,959	15.64



.= Proposed PV Layout

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

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:	97.3 kW
DC to AC Derate Factor:	0.810
AC Rating:	78.8 kW
Array Type:	Fixed Tilt
Array Tilt:	15.0°
Array Azimuth:	210.0°
Energy Specifications	
Cost of Electricity:	0.2 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	2.52	6219	11.32
2	3.27	7329	13.34
3	4.14	10048	18.29
4	4.85	11011	20.04
5	5.68	12972	23.61
6	5.88	12619	22.97
7	5.76	12592	22.92
8	5.39	11698	21.29
9	4.71	10228	18.61
10	3.71	8519	15.50
11	2.41	5479	9.97
12	2.11	5040	9.17
Year	4.21	113754	207.03

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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