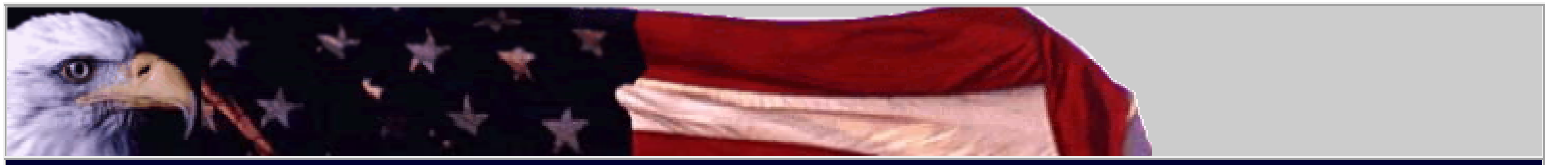


Greenbrook Elementary School, NJ

ENERGY AUDIT – FINAL REPORT
CEG PROJECT NO. 9C08134

SOUTH BRUNSWICK BOARD OF EDUCATION
PO BOX 181
MONMOUTH JUNCTION, NJ 08852
ATTN: MR. ANTHONY TONZINI
BUSINESS ADMINISTRATOR

CONCORD ENGINEERING GROUP

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

CONTACTS:

MICHAEL FISCHETTE
MFISCHETTE@CEG-INC.NET

Table of Contents

REPORT DISCLAIMER

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

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

I. EXECUTIVE SUMMARY

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

Greenbrook Elementary School
23 Roberts Street
Kendall Park, NJ 08824

Municipal Contact: Anthony Tonzini (Board Administrator)

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

The annual energy costs at this facility are as follows:

Electricity	$ 109,084
Natural Gas	$ 57,850
Total	$ 166,934

The potential annual energy cost savings are shown below in Table 1. Be aware that the measures are not additive because of the interrelation of several of the measures. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	REPLACE (3) WEIL MCLAIN BOILERS	$106,025	$7,423	14.3	-40.5%
ECM #2	VARIABLE SPEED PUMPS	$23,731	$1,653	14.4	-46.3%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	207 KW SOLAR PV	$1,863,000	$162,163	11.5	-34.1%

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 are shown below in Table 2. The information in this table corresponds to the ECM's in Table 1.

Table 2
Estimated Energy Savings

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
ECM #1	REPLACE (3) WEIL MCLAIN BOILERS	1	2,243	2,276
ECM #2	VARIABLE SPEED PUMPS	1	5,660	0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	207 KW SOLAR PV	226	353,542	0

Recommendations:

Concord Engineering Group recommends the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The potential energy and cost savings from these ECM's are economically justifiable. The following Energy Conservation Measures are recommended for the Greenbrook Elementary School:

- **ECM #2:** Replace (3) Boilers
- **REM #1:** PV Solar Panel System

*****ECM #2 is recommended due to the age of the boilers

*REM #1 is recommended due to the payback close to 10 years

Note: Remove all books, tables, papers, and other items from top of classroom unit ventilators, discharge grille. These objects are blocking the airflow into the classroom and do not allow proper air circulation.

II. INTRODUCTION

This comprehensive energy audit covers the Greenbrook Elementary School located at 23 Roberts Street, Kendall Park, NJ. Based on our survey and the documentation available, it was determined that the building area is approximately 64,000 SF.

The first task was to collect and review one year's worth of utility energy data for electricity and natural gas. This information was used to analyze operational characteristics, calculate energy benchmarks for comparison to industry averages, estimate savings potential, and establish a baseline to monitor the effectiveness of implemented measures. A computer spreadsheet was used to enter, sum, and calculate benchmarks and to graph utility information (see Appendix A).

The Energy Use Intensity (EUI) is expressed in British Thermal Units/square foot/year ($BTU/ft^2/yr$) and can be 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 annual consumption of all fuels to BTU's then dividing by the area (gross square footage) of the building. EUI is a good indicator of the relative potential for energy savings. A comparatively low EUI indicates less potential for large energy savings. Blueprints (where available) were obtained from the school district and were utilized to calculate/verify the gross area of the facility.

After gathering the utility data and calculating the EUI, the next step in the audit process is obtaining Architectural and Engineering drawings (where available). By reviewing the Architectural and Engineering drawings, questions regarding the building envelope, lighting systems/controls, HVAC equipment and controls are noted. These questions are then compared to the energy usage profiles developed during the utility data gathering step. Furthermore, 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. After this information is gathered the next step in the process is the site visit.

The site visit was spent inspecting the actual systems and answering specific questions from the preliminary review. The building manager provided occupancy schedules, O & M practices, the building energy management program, and other information that has an impact on energy consumption.

The post-site work includes evaluation of the information gathered during the site visit, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on mechanical, lighting and building envelope improvements.

III. METHOD OF ANALYSIS

CEG completed the preliminary audit tasks noted in Section II preparing for the site survey. The site survey is a critical input in deciphering where energy opportunities exist within a facility. The auditor walks the entire site to inventory the building envelope (roof, windows, etc.), the heating, ventilation, and air conditioning equipment (HVAC), the lighting equipment, other facility-specific equipment, and to gain an understanding of how each facility is used.

The collected data is then processed using energy engineering calculations, Microsoft Excel spread sheets and Trane Trace 700™ building simulation software that calculate the anticipated energy usage for the proposed energy conservation measures (ECM's). The actual energy usage is entered directly from the utility bills provided by the Owner. The anticipated energy usage is compared to the actual usage to determine energy savings for the proposed ECM's.

It is pertinent to note, that the savings noted in this report are not duplicative. The savings for each recommendation may actually be higher if the individual recommendations were installed instead of the entire project. For example, the lighting module calculates the change in wattage and multiplies it by the new operating hours instead of the existing operating hours (if there was a change in the hours at all). The lighting controls module calculates the change in hours and multiplies it by the new system wattage instead of the existing wattage. Therefore, if you chose to install the recommended lighting system but not the lighting controls, the savings achieved with the new lighting system would actually be higher because there would have been no reduction in the hours of use.

The same principal follows for heating, cooling, and temperature recommendations – even with fuel switching. If there are recommendations to change the temperature settings to reduce fuel use, then the savings for the heating/cooling equipment recommendations are reduced, as well.

Our thermal module calculates the savings for temperature reductions utilizing automated engineering calculations within Microsoft Excel™ spreadsheets and Trane Trace 700™ building simulation software. The savings are calculated in "output" values – meaning energy, not fuel savings. To show fuel savings we multiply the energy values times the fuel conversion factor (these factors are different for electricity, natural gas, fuel oil, etc.) and also take into account the heating/cooling equipment efficiency. The temperature recommendation savings are lower when the heating/cooling equipment is more efficient or is using a cheaper fuel.

Thermal recommendations (insulation, windows, etc.) are evaluated by taking the difference in the thermal load due to reduced heat transfer. Again, the "thermal load" is the thermal load after the other recommendations have been accounted for.

Lastly, installation costs, refer to Appendix B, are then applied to each recommendation and simple paybacks are calculated. Costs are derived from Means Cost Data, other industry publications, and local contractors and suppliers. The NJ SmartStart Building® program incentives (refer to Appendix C) are calculated for the appropriate ECM's and subtracted from

the installed cost prior to calculation of the simple payback. In addition, where applicable, maintenance cost savings are estimated and applied to the net savings. Simple return on investment is calculated using the standard formula of the difference of gains minus investments, divided by the investments. Included within the gains are the annual energy savings, utility incentives and maintenance savings as a total sum. The calculation is completed assuming the project is 100% direct purchased by the Owner with an energy cost escalation of 2.4% for natural gas and 2.2% for electricity.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

Electric

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from June-07 to May-08. PSE&G Electric Utility provides electricity to the facility. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. 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 most current rate structure available.

Natural Gas

Table 4 and Figure 2 show the natural gas energy usage from June-07 to May-08. Below is the average unit cost for the utilities at this facility. PSE&G Gas Utility supplies the natural gas and delivers the fuel to the burner at the facility. Below is the average unit cost for the utilities at this facility.

Description	Average
Electricity	15.2¢ / kWh (4.5¢ / kBtu)
*Natural Gas	$1.77 / therm (1.8¢ / kBtu)

*Note: The Natural Gas cost per Therm includes customer service charges.

Table 3
Electricity Billing Data

Greenbrook Elementary

Provider	Month	Start Date	End Date	Account	Utility Type	Billing Days	Peak Demand	Units	Off Peak Usage	Units	On Peak Usage	Units	Total Consumption	Units	Total $
PSE&G Co (14101)	Jun-07	6/6/2007	7/10/2007	6207408519E	Electric	34	183	kw	24900	kwh	46800	kwh	72240	kwh	$ 13,218.69
PSE&G Co (14101)	Jul-07	7/10/2007	8/6/2007	6207408519E	Electric	27	183	kw	21900	kwh	37200	kwh	59520	kwh	$ 11,087.30
PSE&G Co (14101)	Aug-07	8/6/2007	9/6/2007	6207408519E	Electric	31	183	kw	24300	kwh	41700	kwh	66000	kwh	$ 12,417.03
PSE&G Co (14101)	Sep-07	9/6/2007	10/4/2007	6207408519E	Electric	28	183	kw	19800	kwh	41400	kwh	61200	kwh	$ 9,645.33
PSE&G Co (14101)	Oct-07	10/4/2007	11/2/2007	6207408519E	Electric	29	183	kw	18000	kwh	38700	kwh	56700	kwh	$ 7,750.66
PSE&G Co (14101)	Nov-07	11/2/2007	12/5/2007	6207408519E	Electric	33	183	kw	25200	kwh	36300	kwh	61500	kwh	$ 7,805.25
PSE&G Co (14101)	Dec-07	12/5/2007	1/7/2008	6207408519E	Electric	33	207	kw	24900	kwh	34800	kwh	59700	kwh	$ 7,613.39
PSE&G Co (14101)	Jan-08	1/7/2008	2/5/2008	6207408519E	Electric	29	207	kw	22200	kwh	35400	kwh	57600	kwh	$ 7,560.40
PSE&G Co (14101)	Feb-08	2/5/2008	3/6/2008	6207408519E	Electric	30	207	kw	22500	kwh	35100	kwh	57600	kwh	$ 7,739.01
PSE&G Co (14101)	Mar-08	3/6/2008	4/7/2008	6207408519E	Electric	32	207	kw	24300	kwh	33300	kwh	57600	kwh	$ 7,457.46
PSE&G Co (14101)	Apr-08	4/7/2008	5/6/2008	6207408519E	Electric	29	207	kw	18600	kwh	33000	kwh	51600	kwh	$ 6,965.11
PSE&G Co (14101)	May-08	5/6/2008	6/5/2008	6207408519E	Electric	30	207	kw	18300	kwh	37500	kwh	55800	kwh	$ 9,824.01
						Max Peak:	207	kw			**12 Month Total:**		717,060	kwh	$ 109,083.64
															Avg. Cost per kwh: $ 0.152
															Avg. Cost per kBtu: $ 0.045

Figure 1
Electricity Usage Profile

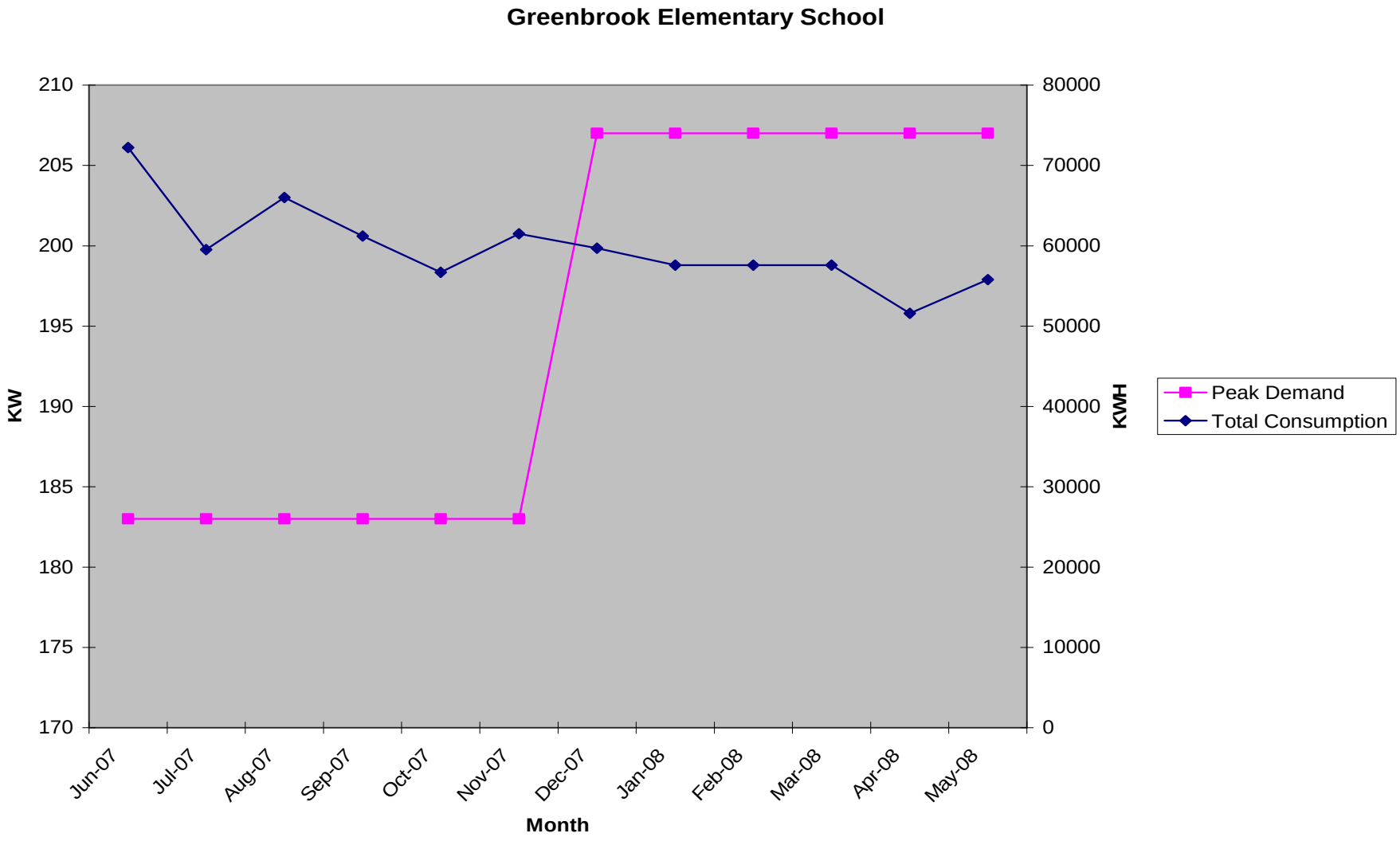


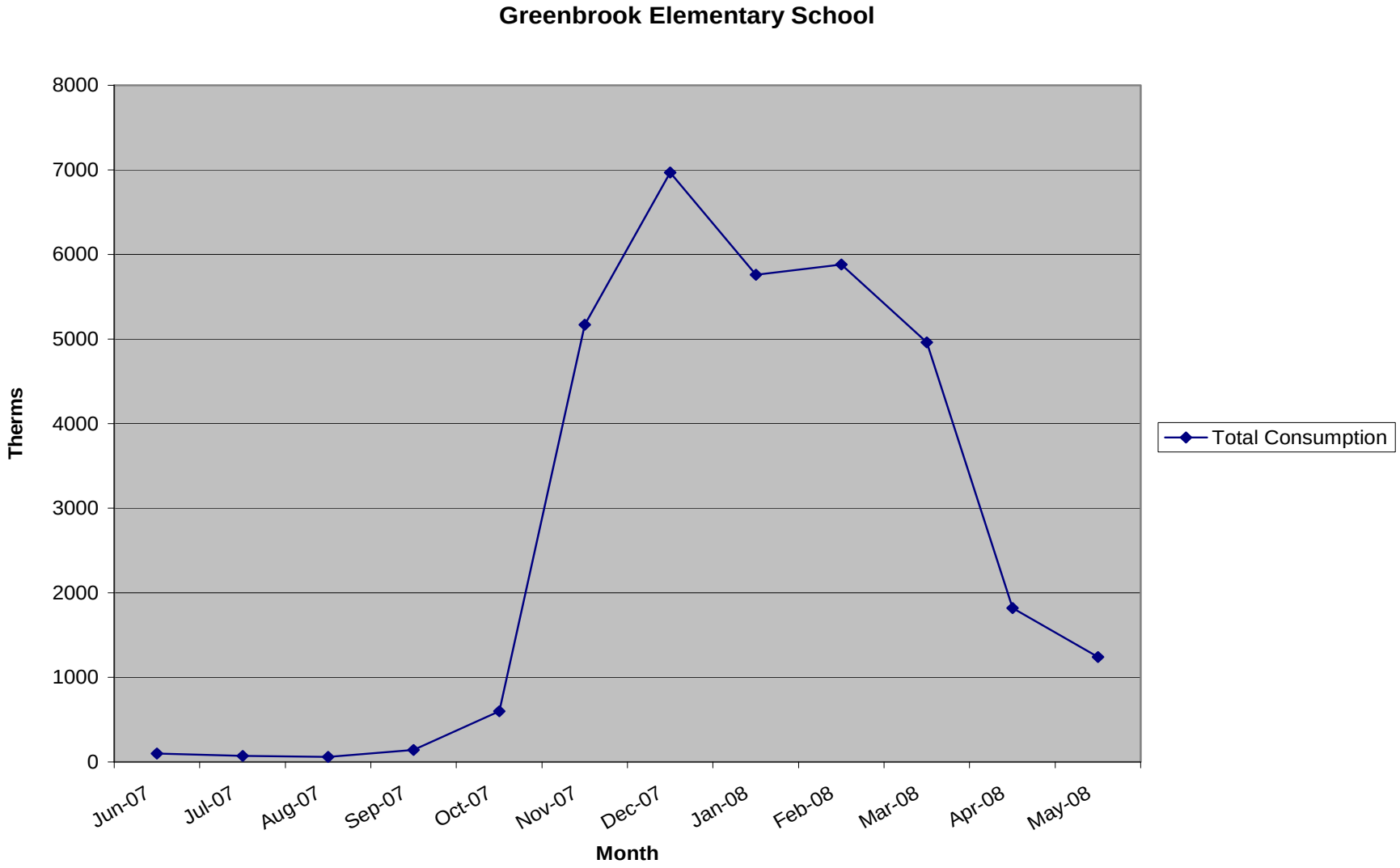
Table 4
Natural Gas Billing Data

Greenbrook Elementary

Provider	Month	Start Date	End Date	Account	Utility Type	Billing Days	Consumption	Units	Total $
PSE&G CO (14105)	Jun-07	6/6/2007	7/7/2007	6207408519G	Gas	31	100	therms	$ 237.73
PSE&G CO (14105)	Jul-07	7/7/2007	8/6/2007	6207408519G	Gas	30	70	therms	$ 192.38
PSE&G CO (14105)	Aug-07	8/6/2007	9/6/2007	6207408519G	Gas	31	60	therms	$ 183.80
PSE&G CO (14105)	Sep-07	9/6/2007	10/4/2007	6207408519G	Gas	28	140	therms	$ 305.73
PSE&G CO (14105)	Oct-07	10/4/2007	11/2/2007	6207408519G	Gas	29	600	therms	$ 2,146.21
PSE&G CO (14105)	Nov-07	11/2/2007	12/5/2007	6207408519G	Gas	33	5170	therms	$ 9,452.36
PSE&G CO (14105)	Dec-07	12/5/2007	1/7/2008	6207408519G	Gas	33	6970	therms	$ 12,324.05
PSE&G CO (14105)	Jan-08	1/7/2008	2/5/2008	6207408519G	Gas	29	5760	therms	$ 10,395.41
PSE&G CO (14105)	Feb-08	2/5/2008	3/6/2008	6207408519G	Gas	30	5880	therms	$ 10,237.27
PSE&G CO (14105)	Mar-08	3/6/2008	4/7/2008	6207408519G	Gas	32	4960	therms	$ 7,557.60
PSE&G CO (14105)	Apr-08	4/7/2008	5/6/2008	6207408519G	Gas	29	1820	therms	$ 2,840.51
PSE&G CO (14105)	May-08	5/6/2008	6/5/2008	6207408519G	Gas	30	1240	therms	$ 1,976.96
						12 Month Total:	32,770	therms	$ 57,850.01
						Average Cost per therm:	$ 1.77		

Average Cost per KBtu:	$0.0177

Figure 2
Natural Gas Usage Profile



B. Energy Use Intensity (EUI)

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

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

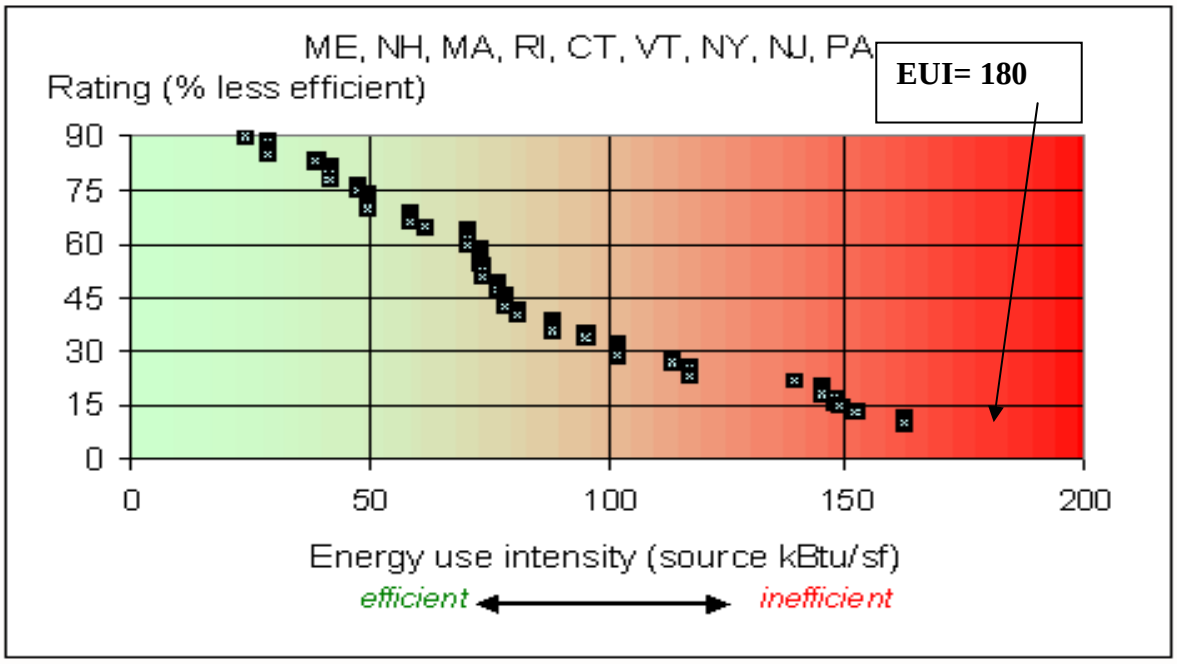
The site and source EUI for this facility is calculated as follows. (See Table 5 for details):

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

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

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	717,060			2,448,043	3.340	8,176,463
NATURAL GAS		32,770.00		3,277,000	1.047	3,431,019
FUEL OIL			0.00	0	1.010	0
PROPANE			0.00	0	1.010	0
TOTAL				5,725,043		11,607,482
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		64,312		SQUARE FEET		
BUILDING SITE EUI		89.02		kBtu/SF/YR		
BUILDING SOURCE EUI		**180.49**		**kBtu/SF/YR**		

Figure 3
Energy Use Intensity Distributions – 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 you to track and assess 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 more emphasis is being placed throughout multiple arenas 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. Therefore, it is vital that local government municipalities assess their energy usage, benchmark this usage utilizing Portfolio Manager, set priorities and goals to lessen their energy usage and move forward with these priorites and goals. Saving energy will in-turn save the environment.

In accordance with the Local Government Energy Audit Program, CEG has created an Energy Star account for the school district in order to allow access to monitor their 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:	southbrunswick
Password:	lgeaceg09002
Security Question:	What is your birth city?
Security Answer:	“South Brunswick”

Utilizing the utility bills and other information gathered during the energy audit process, CEG entered the respective data into Portfolio Manager and the following is a summary of the results:

Table 5
ENERGY STAR Performance Rating

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Greenbrook Elementary	46	50

Specific building types are detailed on the ENERGY STAR website. Non-typical buildings are covered by an "Other" category. The "Other" category is used if your building type or a section of the building is not represented by one of the specific categories. An Energy Performance Rating cannot be calculated if more then 10% of a building is classified as "Other," or if the building is an office with less than 5,000 square feet of floor space.

The Energy Use Intensity (EUI) is also an important tool that can be used to track the energy efficiency of the building. Baselines for improvement can be set that the municipality can strive to meet. CEG recommends that the South Brunswick School District keep their Portfolio Manager account up to date to monitor the performance of the building.

The EUI calculated in the previous section and in the Energy Star Portfolio Manager is a good indicator of the energy performance of the Greenbrook Elementary School, in addition to the Energy Star Performance Rating.

The EUI distribution, Figure 3, is specific for Schools. The Greenbrook School has an EUI of 89.02 rating for this type of facility. The lower the EUI the less energy the facility uses per square foot. A low EUI indicates a more efficient building. There maybe some opportunity for improvement making the facility more energy efficient and saving more on the utility costs.

Refer to Appendix D for detailed energy benchmarking report entitled "STATEMENT OF ENERGY PERFORMANCE."

V. FACILITY DESCRIPTION

The Greenbrook Elementary School is a single story, brick, over 8 inch block CMU construction. The facility built in 1961 is approximately 64,000 square feet and consists of additions constructed in 1965 and the newest addition in 2005.

The building is constructed in the shape of a "T" running length wise with predominantly North to South wall and window exposures. The school is typical of the other elementary schools with a cafeteria, kitchen, gymnasium / multipurpose room, library / media center, mechanical rooms, storage and classrooms.

The rubberized roof is supported by a steel truss system. In the year 2000, the windows were replaced in the old sections of the building with high efficient glazing.

Cooling & Heating System

The primary cooling and heating system for the corridors, art room, music room, media center main office area, kitchen, gymnasium,consists of constant volume, packaged electric DX cooling rooftop units with hot water duct coils in each zone, the faculty, SGI rooms and nurses office use three (3) gas fired / electric DX cooling, packaged rooftop units. Five (5) energy recovery, heat wheel packaged rooftop units with integral DX cooling condition the multipurpose room, stage, cafeteria, and toilet rooms. The older section and new classroom use classroom unit ventilators with hot water coils and remote DX condensing units.

Domestic Hot Water

The domestic hot water is serviced by two (2) gas fired hot water heaters with integral storage tank.

Lighting System

Typical lighting throughout the building uses fluorescent tube fixtures with energy efficient T-8 lamps and electronic ballasts. A limited number of fixtures use compact fluorescent lamps.

The exterior lighting uses mainly high intensity discharge wall mounted fixtures and pole mounted fixtures.

The existing lighting control system utilizes energy efficient occupancy sensors and "A/B" switching in most areas. Standard switching is used in remaining locations. "A/B" switching allows the occupant the ability to control approximately 50% of the lighting in an area with one switch and the remaining 50% with a separate switch if increased light levels are needed.

School "As Built" drawings indicate that the facility has recently undergone a lighting and lighting controls upgrade and this was confirmed during the field survey. The light fixtures and

lighting controls currently installed are estimated to be approximately three years old, energy efficient and are not recommended for replacement at this time.

Refer to Appendix E for a detailed Investment Grade Lighting Audit.

VI. MAJOR EQUIPMENT LIST

Following the completion of the field survey a detailed equipment list was created. The equipment within this list is considered major energy consuming equipment whose replacement could yield substantial savings. In addition, 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 if a manufacturers 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.

Equipment denoted by an asterisk indicates an estimate of the equipment ratings due to equipment inaccessibility, worn nameplates, lack of nameplates, etc.

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

VII. ENERGY CONSERVATION MEASURES (ECM)

ECM #1 Hot Water Boiler Replacement

Description:

Replace three (3) existing Weil McLain hot water boilers with new Lochinvar 97% high efficient boilers.

The calculations for this ECM were performed using Trane Trace 700™ building simulation software and the estimated payback is approximately 14 years. Outputs from the simulation software are located in Appendix G. A summary of the calculations is shown below.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$110,400
NJ Smart Start Equipment Incentive ($):	$4,375
Net Installation Cost ($):	$106,025
Maintenance Savings ($/Yr):	$3,216
Energy Savings ($/Yr):	$4,207
Total Yearly Savings ($/Yr):	$7,423
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.3
Simple Lifetime ROI	-40.5%
Simple Lifetime Maintenance Savings	$48,240
Simple Lifetime Savings	$63,105
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	($17,409.71)

ECM #2 Variable Speed Pumping

Description:

The existing hot water pumps are constant speed. The system has a bypass valve which allows for recirculation when terminal equipments' control valves close down. We suggest installing new pumps with variable frequency drives (VFD). The existing 2-way control valves at all of the terminal equipment can remain. The new pumps would be controlled by remote pressure sensors to keep the system charged properly. The VFD's modulate the pump's speed in order to maintain the necessary system pressure as prescribed at the BMS.

The calculations for this ECM were performed using Trane Trace 700™ building simulation software and the estimated payback is approximately 3.9 years. Outputs from the simulation software are located in Appendix G. A summary of the calculations is shown below.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$26,263
NJ Smart Start Equipment Incentive ($):	$2,532
Net Installation Cost ($):	$23,731
Maintenance Savings ($/Yr):	$804
Energy Savings ($/Yr):	$849
Total Yearly Savings ($/Yr):	$1,653
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.4
Simple Lifetime ROI	-46.3%
Simple Lifetime Maintenance Savings	$12,060
Simple Lifetime Savings	$12,735
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	($3,997.59)

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

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

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). Parking lots can also be utilized for the installation of a solar array. A truss system can be installed that is high enough to park a vehicle under the array, this way no parking lot area is lost. 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 14,793 S.F. can be utilized for a PV system on the roof. A depiction of the area utilized is shown in Appendix F following the financial calculations. Using this square footage it was determined that a system size of 207 kilowatts could be installed to help reduce the maximum peak monthly demand. The required square footage for a system of this size is approximately 13,200 S.F. and has an estimated kilowatt hour production of 323,033 KWh annually, reducing the overall electric consumption by approximately 45%. A detailed financial analysis can be found in Appendix F. 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.

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

PAYMENT TYPE	SIMPLE PAYBACK	INTERNAL RATE OF RETURN
Self-Finance	11.5 Years	10.3 %
Direct Purchase	11.5 Years	7.7 %

The above information is concluded as REM #1 showing installation costs, energy savings and other pertinent summarized information in Section I of this report.

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for South Brunswick and has determined it is not a viable option. Low average wind speeds for the area are not adequate for wind turbine generation. Typical wind turbines start producing energy at 8 mph wind speeds. South Brunswick averages 4 mph wind speeds making this application impractical.

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. The Electric and Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profile for June 2007 through May 2008.

Electricity:

The Electric Usage Profile demonstrates a fairly flat load profile throughout the year. The winter (November – March) has a high level of consumption but on a flat to level basis. June registers a peak, and the usage is highest June – July. Summer loads are usually highest because of cooling or air conditioner loads. In this facility primary cooling for the corridors, art room, music room, media center main office area, kitchen, gymnasium, consists of constant volume, packaged electric DX cooling rooftop units with hot water duct coils in each zone, the faculty, SGI rooms and nurses office use three (3) gas fired / electric DX cooling, packaged rooftop units. Five (5) energy recovery, heat wheel packaged rooftop units with integral DX cooling condition the multipurpose room, stage, cafeteria, and toilet rooms. The older section and new classroom use classroom remote DX condensing units. This facility utilizes the Delivery service (LPLS), and its Commodity service (BGS) from Public Service Electric and Gas Company (PSE&G). A base-load shaping is important because a flat consumption profile will yield more competitive pricing when shopping for a Third Party Supplier.

Natural Gas:

The Natural Gas Usage Profile demonstrates a typical heating load (November –March), and complimentary cooling load (April –October). Consequently there is a clear separation between summer and winter loads consistent with Wholesale Energy Pricing. Heating loads carry a much higher average cost because of the higher demand for natural gas during the winter. In this facility the core heating for the corridors, art room, music room, media center main office area, kitchen, gymnasium, consists of constant volume, packaged electric DX cooling rooftop units with hot water duct coils in each zone, the faculty, SGI rooms and nurses office use three (3) gas fired / electric DX cooling, packaged rooftop units. Five (5) energy recovery, heat wheel packaged rooftop units with integral DX cooling condition the multipurpose room, stage, cafeteria, and toilet rooms. The older section and new classroom use classroom unit ventilators with hot water coils and remote DX condensing units. This facility utilizes the Delivery service (LVG) from Public Service Electric and Gas (PSE&G) while it receives its Commodity service from Woodruff Energy, the Third Party Supplier.

Tariff Analysis:

Electricity:

This facility receives electrical service through Public Service Electric and Gas Company (PSE&G) on a LPLS (Large Power Lighting Service) rate. This utility tariff is for delivery service for general purposes at secondary distribution voltages where the customers measured peak demand exceeds 150 kW in any given month and also at primary distribution voltages. Customers may either purchase electric supply from a Third Party Supplier (TPS) of from PSE&G's Basic Generation Service default service as detailed in the rate schedule. The rate schedule has a Delivery Charge; Distribution kW and kWh Charge, Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS). South Brunswick should investigate why there is such a high peak in electric consumption in August. A flat load profile will allow for a more competitive energy price when shopping for an "alternate energy source".

Natural Gas:

This facility receives natural gas service through Public Service Electric and Gas Company LVG (Large Volume Gas) rate class, when not receiving commodity by a Third Party Supplier. This utility tariff is for firm Delivery service for general purposes. This rate schedule has a Delivery Charge, Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS). It is pertinent to 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.

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.
From review of the information provided by the School District, South Brunswick is utilizing the services of a Third Party Supplier, Woodruff Energy for natural gas service. The contract is administered through the Middlesex Regional Educational Services Commission (MRESC) for the term, August 1, 2008 through July 31, 2010. The agreement is between the MRESC and South Brunswick BOE and it does not define the full and final price. Based on the limited data available, it appears that South Brunswick is paying over 20% above market price.

Additionally, the MRESC charges $.0325 per deka-therm for administering this RFP. The South Brunswick BOE could realize additional savings by evaluating a new natural gas contract. It should be noted that there was not a Woodruff Energy Contract available for review, nor a complete delivered natural gas price. CEG will make recommendations below for this service.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities. CEG's primary observation is seen in the electricity costs. South Brunswick's "weighted average price-to-compare" per kWh (kilowatt hour) for all buildings is $.1479/kWh (kWh is the common unit of electric measure).

The electric "price to compare" is defined as the price that would be compared to the equivalent utility price extracting the utility transmission and distribution costs (wires charges). This would be a market based price that would be supplied by a Third Party Supplier (TPS) or an alternative supplier.

The average "price-to-compare" per decatherm for natural gas is $12.50/dth (Dth is the common unit of measure). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. South Brunswick could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on last year's historical consumption (June 2007 through May 2008) and current electric rates, South Brunswick would see an improvement of over $150,000 or over 20% annually. (Note: Savings were calculated using South Brunswick High School's Average Annual Consumption of 5,749,304 kWh's and a variance of approximately $.03/kWh and utilizing a fixed one-year commodity contract). South Brunswick should aggregate its entire electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".

CEG's secondary recommendation coincides with South Brunswick's natural gas costs and the contract with MRESC and Woodruff Energy. CEG recognized a segment of the natural gas cost is not competitive with current market prices. Based on the current market, South Brunswick is paying approximately $1.717 per unit above market in the PSEG territory and about $.58 per unit above market in the Elizabethtown Gas and New Jersey Natural Gas territories. CEG recommends further advisement on these prices. South Brunswick should also consider procuring energy (natural gas) on its own. By procuring energy through the MRESC it is paying a premium of $.0325 per unit. CEG recommends alternative sourcing strategies.

CEG has observed that there is a cost differential from Phase I. For the facilities in Phase II CEG observes improvement of up to $100,000 in natural gas costs. Since energy prices have dropped since last we analyzed the energy costs, South Brunswick could now see an improvement of up to 60% in the variance to market based pricing.

CEG recommends that South Brunswick 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 might be available to South Brunswick. Through its meeting with the Local Distribution Company (LDC), South Brunswick will learn more about the competitive supply process. South Brunswick can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. South Brunswick 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 South Brunswick pay attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, South Brunswick 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 South Brunswick frequently changes its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

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

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

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

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

All in all, incentives provide financial motivation and much needed support for the implementation of energy conservation measures. Along with the NJ Smart Start program, the Pay for Performance Program incentives, sponsored by NJ Clean Energy Program, are applicable for this facility. The existing average operating demand above 200 KW and high energy consumption qualifies for the Pay for Performance Program. The incentive based on a 15% electrical energy reduction for this facility would qualify for an additional $16,363 in the Pay for Performance Program. If natural gas consumption could be reduced by 15% the resultant incentive would be approximately $8,678. This would equate to a total incentive equal to approximately $25,041. This option is one to consider for a whole-building approach to energy reduction. The Pay for Performance Program represents a significant commitment to energy reduction of a facility. This option should be reviewed in more detail with a Pay for Performance Program partner.

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. Use cog-belts instead of v-belts on all belt-driven fans, etc. These can reduce electrical consumption of the motor by 2-5%.

D. Reduce lighting in specified areas where the foot candle levels are above 70 in private offices and above 30 in corridor, lobbies, etc.

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

F. Recalibrate existing sensors serving the office spaces

G. Install a Vending Miser system to turn off the vending machines in the lunch room when not in use.

H. Clean all light fixtures to maximize light output.

I. Confirm that outside air economizers on the rooftop units that serve the Office Areas are functioning properly to take advantage of free cooling.

APPENDIX

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Greenbrook Elementary 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	REPLACE (3) WEIL MCLAIN BOILERS	$43,100	$67,300	$4,375	$106,025	$4,207	$3,216	$7,423	15	$63,105	$48,240	-40.5%	14.3	0.62%	($17,409.71)
ECM #2	VARIABLE SPEED PUMPS	$9,550	$16,713	$2,532	$23,731	$849	$804	$1,653	15	$12,735	$12,060	-46.3%	14.4	0.55%	($3,997.59)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	207 KW SOLAR PV	$0	$0	$0	$1,863,000	$49,101	$113,062	$162,163	25	$1,227,525	$2,826,550	-34.1%	11.5	7.16%	$960,768.27

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 th*difetime of ECM* and Cn is the *cash flow during each period* .

CONSTRUCTION COST AND REBATES

BASE CASE - EXISTING EQUIPMENT	Qty	Unit Cost $	Material $	Labor $	Total $
Total Cost			$0	$0	**$0**
ECM # 1 - REPLACE BOILERS	Qty	Unit Cost $	Material $	Labor $	Total $
1000 MBH Input Lochinvar Boiler (97% Eff.)	1	$15,500	$15,500	$23,250	$38,750
750 MBH Input Lochinvar Boiler (97% Eff.)	2	$13,500	$27,000	$40,500	$67,500
Demo Old Boilers				$2,500	$2,500
Controls	3	$200	$600	$1,050	$1,650
Boiler Rebate					$4,375
Total after Rebate					**$106,025**
ECM # 2 - VARIABLE SPEED PUMPING	Qty	Unit Cost $	Material $	Labor $	Total $
Hot Water Pump (7.5 HP)	2	$1,800	$3,600	$6,300	$9,900
Hot Water Pump (1 HP)	1	$950	$950	$1,663	$2,613
Variable Frequency Drive < 5HP	1	$1,500	$1,500	$2,625	$4,125
Variable Frequency Drive > 5HP	2	$1,750	$3,500	$6,125	$9,625
VFD Rebate ($155/HP)					$2,325
Premium Eff Motor Rebate					$207
Total after Rebate					**$23,731**
REM # 1 - PV SOLAR	Qty	Unit Cost $	Material $	Labor $	Total $
PV Solar	900	$1,525	$1,372,500	$490,500	$1,863,000
Total					**$1,863,000**

Annual Maintenance Cost

ECM	Base	Additional	Solar PV	Total
BASE CASE - EXISTING EQUIPMENT	$16,078	$0	$0	$16,078
ECM # 1 - REPLACE BOILERS	$16,078	-$3,216	$0	$12,862
ECM # 2 - VARIABLE SPEED PUMPING	$16,078	-$804	$0	$15,274
REM # 1 - SOLAR PV SYSTEM	$16,078	$0	$1,500	$17,578

EQUIPMENT REPLACEMENT COST FOR EACH ALTERNATE

BASE CASE - EXISTING EQUIPMENT

	$	Life	Yr Incurred
Existing Weil McLain Boilers (3)	$60,000	25	4
Existing Constant Speed Pumps (3)	$16,500	20	2
New Lochinvar Boilers	$0	24	24
New Variable Speed Pumps	$0	20	20

ECM # 1 - HIGH EFFICIENCY BOILERS

	$	Life	Yr Incurred
Existing Weil McLain Boilers (3)	$0	25	4
Existing Constant Speed Pumps (3)	$16,500	20	2
New Lochinvar Boilers	$48,500	25	25
New Variable Speed Pumps	$0	20	20

ECM # 2 - VARIABLE SPEED PUMPS

	$	Life	Yr Incurred
Existing Weil McLain Boilers (3)	$60,000	25	4
Existing Constant Speed Pumps (3)	$0	20	2
New Lochinvar Boilers	$0	24	24
New Variable Speed Pumps	$4,550	20	20

REM # 1 - PV SOLAR

	$	Life	Yr Incurred
Existing Weil McLain Boilers (3)	$60,000	25	4
Existing Constant Speed Pumps (3)	$16,500	20	2
New Lochinvar Boilers	$0	24	24
New Variable Speed Pumps	$0	20	20

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

	$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

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

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

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

Greenbrook Elementary School

TAG	MAKE	MODEL	TYPE	CAPACITY	EFFICIENCY	SERVES	LOCATION	REMAINING USEFUL LIFE	NOTES
RTU-1	TRANE	TCD-181-C40CCA	DX COOLING ONLY	15 TONS	12 EER	CR-D406, D407, D410, TEACHER OFFICE	ROOF OVER CORRIDOR NEAR D407	11 YEARS	CONSTANT VOLUME W/HW DUCT COILS
RTU-2	TRANE	THC-102A4R0A1FG100	DX COOLING ONLY	8.5 TONS	11.2 SEER	CORRIDOR, D408, D409, D411	ROOF OVER CORRIDOR NEAR D408	11 YEARS	CONSTANT VOLUME W/HW DUCT COILS
RTU-3	TRANE	TCD-241C40CCA	DX COOLING ONLY	20 TONS	11 EER	CORR. D & E, D401, D402, D403, D404	ROOF OVER CORRIDOR-NORTHEAST	11 YEARS	CONSTANT VOLUME W/HW DUCT COILS
RTU-4	TRANE	TSC-060A4ROA	DX COOLING ONLY	5 TONS	13 SEER	ART CLASSROOM E501	ROOF OVER CORRIDOR NORTH EAST - ENTRY C13	11 YEARS	CONSTANT VOLUME W/HW DUCT COILS
RTU-5	TRANE	TSC-072A4ROA	DX COOLING ONLY	6 TONS	11.2 EER	MUSIC ROOM E502	ROOF OVER NE CORRIDOR NEAR ENTRYB10	11 YEARS	CONSTANT VOLUME W/HW DUCT COILS
RTU-6	TRANE	TSC-O72A3ROA	DX COOLING ONLY	6 TONS	11.2 EER	MEDIA CENTER A105	ROOF OVER STORAGE CLOSET NEXT TO BOILER ROOM	11 YEARS	CONSTANT VOLUME W/HW DUCT COILS
RTU-7	TRANE	TSC-048A3ROA	DX COOLING ONLY	4 TONS	13 SEER	MAIN OFFICE AREA	ROOF SOUTH SIDE OF MEDIA CENTER	11 YEARS	CONSTANT VOLUME W/HW DUCT COILS
RTU-8	TRANE	TSC-120A4ROA	DX COOLING ONLY	10 TONS	11.3 EER	KITCHEN, GYM STORAGE, REAR CORR. ENTRY B8	ROOF OVER KITCHEN	11 YEARS	CONSTANT VOLUME W/HW DUCT COILS
RTU-R-1	RUUD	UKKA-A048CK13E	DX COOLING / ELECT. HEAT	4 TONS	N/A	FACULTY ROOM	ROOF NEAR FACULTY ROOM	5 YEARS	CONSTANT VOLUME, PACKAGED ELECTRIC ROOFTOP, 1999
RTU-R-2	RUUD	UKKA-A048CK13E	DX COOLING / ELECT. HEAT	4 TONS	N/A	SMALL GROUP INST., A101, A102	LOWER ROOF FRONT RT CORNER	5 YEARS	CONSTANT VOLUME, PACKAGED ELECTRIC ROOFTOP, 1999
RTU-ICP-1	INTERNATIONAL-ARCOAIRE	PAF-036K000A	DX COOLING / ELECT. HEAT	3 TONS	N/A	NURSE'S OFFICE A113	ROOF FRONT LEFT CORNER	5 YEARS	CONSTANT VOLUME, PACKAGED ELECTRIC ROOFTOP, 1999
ERU-1	ANNEXAIR	CRP-E-04-HW-H-C-AC	PACKAGED ROOFTOP HEAT RECOVERY DX / HW COIL	23.6 TONS, 4400 CFM	75%	MULTIPURPOSE ROOM WEST SIDE	ROOF NEXT TO GYM	11 YEARS	INTEGRAL DX CONDENSING UNIT, POWER EXHAUST, CURB MOUNTED, HORIZ. DISCHARGE
ERU-2	ANNEXAIR	CRP-E-04-HW-H-C-AC	PACKAGED ROOFTOP HEAT RECOVERY DX / HW COIL	23.6 TONS, 4400 CFM	75%	MULTIPURPOSE ROOM EAST SIDE	ROOF NEXT TO GYM	11 YEARS	INTEGRAL DX CONDENSING UNIT, POWER EXHAUST, CURB MOUNTED, HORIZ. DISCHARGE
ERU-3	ANNEXAIR	CRP-E-04-HW-H-C-AC	PACKAGED ROOFTOP HEAT RECOVERY DX / HW COIL	13.6 TONS, 4400 CFM	80%	STAGE	ROOF NEXT TO STAGE	11 YEARS	INTEGRAL DX CONDENSING UNIT, POWER EXHAUST, CURB MOUNTED, HORIZ. DISCHARGE
ERU-4	ANNEXAIR	CRP-E-04-HW-H-C-AC	PACKAGED ROOFTOP HEAT RECOVERY DX / HW COIL	17.1 TONS, 4400 CFM	73%	CAFETERIA	ROOF NEXT TO CAFETERIA	11 YEARS	INTEGRAL DX CONDENSING UNIT, POWER EXHAUST, CURB MOUNTED, HORIZ. DISCHARGE
ERU-5	ANNEXAIR	CRP-E-01-HW-H-C-AC	PACKAGED ROOFTOP HEAT RECOVERY HW COIL	34 MBH HEATING ONLY, 750 CFM	N/A	TOILET ROOMS	ROOF NEXT TO GYM NE SIDE	11 YEARS	POWER EXHAUST, CURB MOUNTED DUCTED VERTIAL DISCHARGE THRU ROOF.
MAU-1	TRANE	TSCB010U0C	ROOFTOP AIR HANDLER	5,000 CFM, 368 MBH	N/A	KITCHEN MAKE-UP AIR	ROOF OVER KITCHEN	11 YEARS	HW HEATING COIL, 100 % OUTSIDE AIR
AC-1	THERMAL ZONE	MS29A13115CA	CONDENSING UNIT	9,000 BTU	10 SEER	OFFICE	LOWER ROOF FRONT	11 YEARS	
ACCU-1	TRANE	TTA0036A3000AA	CONDENSING UNIT	3 TONS	13 SEER	UV-1	ROOF OVER CLASSROOM	11 YEARS	REMOTE ROOF MOUNTED, SPLIT DX CONDENSING UNIT, MATCHED WITH ACCU UNITS
ACCU-2	TRANE	TTA0036A3000AA	CONDENSING UNIT	3 TONS	13 SEER	UV-2	ROOF OVER CLASSROOM	11 YEARS	REMOTE ROOF MOUNTED, SPLIT DX CONDENSING UNIT, MATCHED WITH ACCU UNITS
ACCU-3	TRANE	TTA0036A3000AA	CONDENSING UNIT	3 TONS	13 SEER	UV-3, FACULTY ROOM	ROOF OVER CLASSROOM	11 YEARS	REMOTE ROOF MOUNTED, SPLIT DX CONDENSING UNIT, MATCHED WITH ACCU UNITS
ACCU-4	TRANE	TTA0036A3000AA	SPLIT CONDENSING UNIT	3 TONS	13 SEER	UV-4, SGI	ROOF OVER CLASSROOM	11 YEARS	REMOTE ROOF MOUNTED, SPLIT DX CONDENSING UNIT, MATCHED WITH ACCU UNITS
UV-1	TRANE	VUVC125	UNIT VENTILATOR	1250 CRM	N/A	AI06	CLASSROOM A106	16 YEARS	VERTICL FLOOR MOUNTED, DX COOLING, HW HEATING, ECONOMIZER, FULL MODULATING
UV-2	TRANE	VUVC125	UNIT VENTILATOR	1250 CRM	N/A	A107	CLASSROOM A107	16 YEARS	VERTICL FLOOR MOUNTED, DX COOLING, HW HEATING, ECONOMIZER, FULL MODULATING
UV-3	TRANE	VUVC125	UNIT VENTILATOR	1250 CRM	N/A	A110	CLASSROOM A110	16 YEARS	VERTICL FLOOR MOUNTED, DX COOLING, HW HEATING, ECONOMIZER, FULL MODULATING

Greenbrook Elementary School

TAG	MAKE	MODEL	TYPE	CAPACITY	EFFICIENCY	SERVES	LOCATION	REMAINING USEFUL LIFE	NOTES
UV-4	TRANE	VUVC125	UNIT VENTILATOR	1250 CRM	N/A	A111	CLASSROOM A111	16 YEARS	VERTICL FLOOR MOUNTED, DX COOLING, HW HEATING, ECONOMIZER, FULL MODULATING
B-1	AERCO	BMK-2.0 GWB	HOT WATER BOILER	2000 MBH INPUT, 1720 MBH OUTPUT	86%	NEW ADDITION HW LOOP, RTU'S & HW DUCT COILS, WALL FIN, UNIT VENT	NEW BOILER ROOM BY GYM	21 YEARS	HIGH EFFICIENCY, CONDENSING BOILER, NATURAL GAS FIRED. LED-LAG B-1, B-2, TO MATCH BUILING LOAD.
B-2	AERCO	BMK-2.0 GWB	HOT WATER BOILER	2000 MBH INPUT, 1720 MBH OUTPUT, 200 GPM.	86%	NEW ADDITION HW LOOP, RTU'S & HW DUCT COILS, WALL FIN, UNIT VENT	NEW BOILER ROOM BY GYM	21 YEARS	HIGH EFFICIENCY, CONDENSING BOILER, NATURAL GAS FIRED. LED-LAG B-1, B-2, TO MATCH BUILING LOAD.
HWP-1	TACO	F12511E2FAJ	BASE MOUNTED END SUCTION - CONSTANT SPEED	7.5 HP	N/A	NEW ADDITION HW LOOP, RTU'S & HW DUCT COILS, WALL FIN, UNIT VENT	NEW BOILER ROOM BY GYM	16 YEARS	LEAD / LAG HOT WATER PUMPS RUN WITH HEATING LOAD. ONE PUMP IS STAND-BY.
HWP-2	TACO	F12511E2FAJ	BASE MOUNTED END SUCTION - CONSTANT SPEED	7.5 HP	N/A	NEW ADDITION HW LOOP, RTU'S & HW DUCT COILS, WALL FIN, UNIT VENT	NEW BOILER ROOM BY GYM	16 YEARS	LEAD / LAG HOT WATER PUMPS RUN WITH HEATING LOAD. ONE PUMP IS STAND-BY.
B-1A	WEIL MCLAIN	CR2-00-15	HOT WATER BOILER	2200 MBH, 1600 GPH REC.	78%	CLASSROOMS & HALL OLD SECTION	OLD BOILER ROOM	4 YEARS	NATURAL GAS, SN 069154299
B-1B	WEIL MCLAIN	CR1-60-12	HOT WATER BOILER	732.2 MBH	78%	MIDDLE SECTION, CR, MEDIA AREA	MIDDLE BOILER ROOM	4 YEARS	NATURAL GAS
B-2B	WEIL MCLAIN	CR1-60-12	HOT WATER BOILER	732.2 MBH	78%	MIDDLE SECTION, CR, MEDIA AREA	MIDDLE BOILER ROOM	4 YEARS	NATURAL GAS
HWP-3	MARATHON	2VF143TTDR	BASE MOUNTED END SUCTION - CONSTANT SPEED	1 HP	N/A	CLASSROOMS & HALL OLD SECTION	OLD BOILER ROOM	5 YEARS	
DHW-1	AO SMITH	PROMAX	50 GALLON	86 MBH	83%	MIDDLE SECTION, CR, MEDIA AREA	MIDDLE BOILER ROOM	18 YEARS	
DHW-2	AO SMITH	BTP-139-104	81 GALLON	140 MBH	83%	TOILET ROOMS, KITCHEN	NEW SECTION UTILITY ROOM	18 YEARS	PREFERRED

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Greenbrook Elementary School

Building ID: 1819614
For 12-month Period Ending: May 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: August 14, 2009

Facility
Greenbrook Elementary School
23 Roberts Street
Kendall Park, NJ 08824

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1961
Gross Floor Area (ft²): 64,312

Energy Performance Rating[2] (1-100) 46

Site Energy Use Summary[3]

Natural Gas (kBtu)[4]	3,257,000
Electricity (kBtu)	2,415,901
Total Energy (kBtu)	5,672,901

Energy Intensity[5]

Site (kBtu/ft²/yr)	89
Source (kBtu/ft²/yr)	180

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	541

Electric Distribution Utility
PSE&G - Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	86
National Average Source EUI	175
% Difference from National Average Source EUI	3%
Building Type	K-12 School

Stamp of Certifying Professional

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

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	Greenbrook Elementary 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	23 Roberts Street, Kendall Park, NJ 08824	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		☐

Greenbrook Elementary School (K-12 School)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	64,312 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	113 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	1	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	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: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: Electricity (kWh (thousand Watt-hours)) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
04/06/2008	05/05/2008	51,600.00
03/06/2008	04/05/2008	57,600.00
02/06/2008	03/05/2008	57,600.00
01/06/2008	02/05/2008	57,600.00
12/06/2007	01/05/2008	59,700.00
11/06/2007	12/05/2007	61,500.00
10/06/2007	11/05/2007	56,700.00
09/06/2007	10/05/2007	61,200.00
08/06/2007	09/05/2007	66,000.00
07/06/2007	08/05/2007	59,520.00
06/06/2007	07/05/2007	72,240.00
Electricity Consumption (kWh (thousand Watt-hours))		**661,260.00**
Electricity Consumption (kBtu)		**2,256,219.12**
Total Electricity Consumption (kBtu)		**2,256,219.12**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
04/06/2008	05/05/2008	1,820.00
03/06/2008	04/05/2008	4,960.00
02/06/2008	03/05/2008	5,880.00
01/06/2008	02/05/2008	5,760.00
12/06/2007	01/05/2008	6,970.00
11/06/2007	12/05/2007	5,170.00
10/06/2007	11/05/2007	600.00
09/06/2007	10/05/2007	140.00
08/06/2007	09/05/2007	60.00
07/06/2007	08/05/2007	70.00

06/06/2007	07/05/2007	100.00
Gas Consumption (therms)		**31,530.00**
Gas Consumption (kBtu)		**3,153,000.00**
Total Natural Gas Consumption (kBtu)		**3,153,000.00**
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.	☐

Certifying Professional

(When applying for the ENERGY STAR, this must be the same 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
Greenbrook Elementary School
23 Roberts Street
Kendall Park, NJ 08824

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Greenbrook Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	64,312
Year Built	1961
For 12-month Evaluation Period Ending Date:	May 31, 2008

Facility Space Use Summary

Greenbrook Elementary School	
Space Type	K-12 School
Gross Floor Area(ft^2)	64,312
Open Weekends?	Yes
Number of PCs[d]	113
Number of walk-in refrigeration/freezer units	1
Presence of cooking facilities	Yes
Percent Cooled	100
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 05/31/2008)	**Baseline** (Ending Date 05/31/2008)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	46	46	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	89	89	68	N/A	86
Source (kBtu/ft^2)	180	180	137	N/A	175
Energy Cost					
$/year	$ 165,030.27	$ 165,030.27	$ 124,933.78	N/A	$ 159,775.35
$/$ft^2$/year	$ 2.57	$ 2.57	$ 1.95	N/A	$ 2.49
Greenhouse Gas Emissions					
$MtCO_2e$/year	541	541	410	N/A	524
$kgCO_2e/ft^2$/year	8	8	6	N/A	8

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.

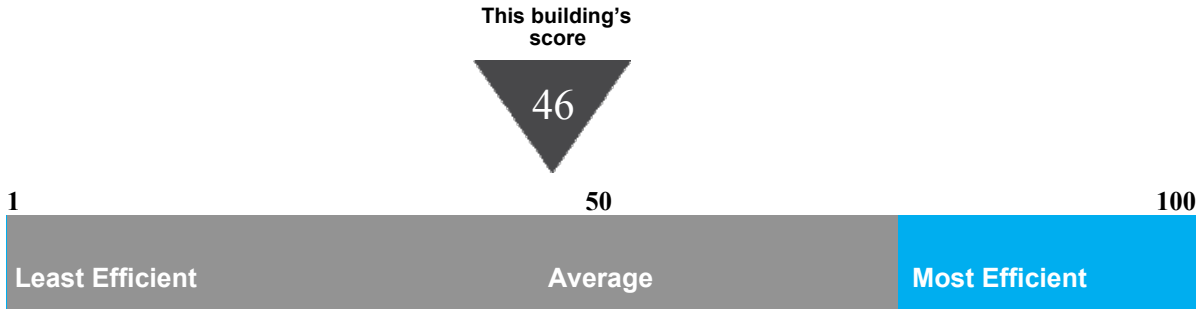
Statement of Energy Performance

2008

Greenbrook Elementary School
23 Roberts Street
Kendall Park, NJ 08824

Portfolio Manager Building ID: 1819614

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 180 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending May 2008

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: 08/14/2009

Lighting Analysis

Greenbrook Elementary School

CEG Project #: 9C08134
Project Name : South Brunswick Schools Energy Audit
Address: 23 Roberts Street
City, State: Kendall Park, NJ

Date 10/28/09
kWh Cost $0.152

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
Fixture Location	Usage, Hrs/Yr	Fixt Qty	Lighting Fixture Description	Total Watts - Location	Annual Energy Cost	Fixt Qty	Lighting Fixture Description	Total Watts - Location	Energy Savings, Watts	Energy Savings, kWh/Yr	Savings/Yr, $	Simple Payback, Yrs	Unit Cost, Installed	Total Cost, Installed	Rebate Estimate
First Floor - Block "A"															
Existing Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
Existing Mechanical Room	900	4	(1)150w Inc. Lamp. Recessed Square Fixture -150w	600	$82.08	4	Existing to Remain	600	0	0	$0.00		$0.00	$0.00	$0.00
Existing Work Room	900	4	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	220	$30.10	4	Existing to Remain	220	0	0	$0.00		$0.00	$0.00	$0.00
Existing Custodial Closet	400	2	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	110	$6.69	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	300	10	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	870	$39.67	10	Existing to Remain	870	0	0	$0.00		$0.00	$0.00	$0.00
Existing Toilet Room	300	1	(1)100w Inc. Lamp. Wall Bracket Fixture -100w	100	$4.56	1	Existing to Remain	100	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	300	10	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	870	$39.67	10	Existing to Remain	870	0	0	$0.00		$0.00	$0.00	$0.00
Existing Toilet Room	300	1	(1)100w Inc. Lamp. Wall Bracket Fixture -100w	100	$4.56	1	Existing to Remain	100	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	300	11	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	957	$43.64	11	Existing to Remain	957	0	0	$0.00		$0.00	$0.00	$0.00

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
Fixture Location	Usage, Hrs/Yr	Fixt Qty	Lighting Fixture Description	Total Watts - Location	Annual Energy Cost	Fixt Qty	Lighting Fixture Description	Total Watts - Location	Energy Savings, Watts	Energy Savings, kWh/Yr	Savings/Yr, $	Simple Payback, Yrs	Unit Cost, Installed	Total Cost, Installed	Rebate Estimate
Existing Toilet Room	300	1	(1)100w Inc. Lamp. Wall Bracket Fixture -100w	100	$4.56	1	Existing to Remain	100	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	300	11	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	957	$43.64	11	Existing to Remain	957	0	0	$0.00		$0.00	$0.00	$0.00
Existing Toilet Room	300	1	(1)100w Inc. Lamp. Wall Bracket Fixture -100w	100	$4.56	1	Existing to Remain	100	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	300	10	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	870	$39.67	10	Existing to Remain	870	0	0	$0.00		$0.00	$0.00	$0.00
Existing Toilet Room	300	1	(1)100w Inc. Lamp. Wall Bracket Fixture -100w	100	$4.56	1	Existing to Remain	100	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	300	10	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	870	$39.67	10	Existing to Remain	870	0	0	$0.00		$0.00	$0.00	$0.00
Existing Toilet Room	300	1	(1)100w Inc. Lamp. Wall Bracket Fixture -100w	100	$4.56	1	Existing to Remain	100	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	300	11	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	957	$43.64	11	Existing to Remain	957	0	0	$0.00		$0.00	$0.00	$0.00
Existing Toilet Room	300	1	(1)100w Inc. Lamp. Wall Bracket Fixture -100w	100	$4.56	1	Existing to Remain	100	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	300	14	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1218	$55.54	14	Existing to Remain	1218	0	0	$0.00		$0.00	$0.00	$0.00
Existing Toilet Room	300	1	(1)100w Inc. Lamp. Wall Bracket Fixture -100w	100	$4.56	1	Existing to Remain	100	0	0	$0.00		$0.00	$0.00	$0.00
Existing Corridor - End to End (224')	1800	21	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1827	$499.87	21	Existing to Remain	1827	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	15	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	825	$203.15	15	Existing to Remain	825	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	15	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	825	$203.15	15	Existing to Remain	825	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	15	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	825	$203.15	15	Existing to Remain	825	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	15	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	825	$203.15	15	Existing to Remain	825	0	0	$0.00		$0.00	$0.00	$0.00
Existing Kindergarden	1400	21	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	1155	$245.78	21	Existing to Remain	1155	0	0	$0.00		$0.00	$0.00	$0.00

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
Fixture Location	**Usage, Hrs/Yr**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Annual Energy Cost**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Energy Savings, Watts**	**Energy Savings, kWh/Yr**	**Savings/Yr, $**	**Simple Payback, Yrs**	**Unit Cost, Installed**	**Total Cost, Installed**	**Rebate Estimate**
Existing Kindergarden 2 Toilet Rooms	300	4	(1)150w Inc. Lamp. Recessed Square Fixture -150w	600	$27.36	4	Existing to Remain	600	0	0	$0.00		$0.00	$0.00	$0.00
Existing Speech	800	6	(1)32w T8 Lamps. 6" x 4' Fixture w/Elec. Ballast - 25w	150	$18.24	6	Existing to Remain	150	0	0	$0.00		$0.00	$0.00	$0.00
Existing Work Room	900	2	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	110	$15.05	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00
Existing Boys room	300	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$9.85	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00
Existing Girls Room	300	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$9.85	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00
General Classroom	1620	11	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	957	$235.65	11	Existing to Remain	957	0	0	$0.00		$0.00	$0.00	$0.00
Staff Toilet	550	1	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	55	$4.60	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00
General Classroom	1620	11	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	957	$235.65	11	Existing to Remain	957	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	9	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	783	$192.81	9	Existing to Remain	783	0	0	$0.00		$0.00	$0.00	$0.00
Existing Classroom	1620	9	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	783	$192.81	9	Existing to Remain	783	0	0	$0.00		$0.00	$0.00	$0.00
General Classroom	1620	9	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	783	$192.81	9	Existing to Remain	783	0	0	$0.00		$0.00	$0.00	$0.00
General Classroom	1620	9	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	783	$192.81	9	Existing to Remain	783	0	0	$0.00		$0.00	$0.00	$0.00
Existing Maintenance	900	6	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	330	$45.14	6	Existing to Remain	330	0	0	$0.00		$0.00	$0.00	$0.00
Existing Boys room	300	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$9.85	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00
Existing Girls Room	300	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$9.85	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00
Existing Storage Room	500	9	(1)32w T8 Lamps. Pendant Strip Fixture w/Elec. Ballast - 25w	225	$17.10	9	Existing to Remain	225	0	0	$0.00		$0.00	$0.00	$0.00
Existing Storage Room	500	1	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	108	$8.21	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
Fixture Location	**Usage, Hrs/Yr**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Annual Energy Cost**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Energy Savings, Watts**	**Energy Savings, kWh/Yr**	**Savings/Yr, $**	**Simple Payback, Yrs**	**Unit Cost, Installed**	**Total Cost, Installed**	**Rebate Estimate**
Existing Toilet Room	300	1	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	108	$4.92	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00
Existing Office	1800	4	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	348	$95.21	4	Existing to Remain	348	0	0	$0.00		$0.00	$0.00	$0.00
Existing Faculty Room	600	13	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	715	$65.21	13	Existing to Remain	715	0	0	$0.00		$0.00	$0.00	$0.00
New Counselors Office	1500	6	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	522	$119.02	6	Existing to Remain	522	0	0	$0.00		$0.00	$0.00	$0.00
New Small Group Classroom	1300	4	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	348	$68.76	4	Existing to Remain	348	0	0	$0.00		$0.00	$0.00	$0.00
New Nurse's Office & Waiting Room	1450	4	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	348	$76.70	4	Existing to Remain	348	0	0	$0.00		$0.00	$0.00	$0.00
New Cot Area & Toilet	500	7	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	756	$57.46	7	Existing to Remain	756	0	0	$0.00		$0.00	$0.00	$0.00
Corridor Around Main Office & Media Center	1800	32	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	2784	$761.70	32	Existing to Remain	2784	0	0	$0.00		$0.00	$0.00	$0.00
Lobby & Corridor - Offset Lights	1800	19	(3)13w CF Lamps. Surface Square' Fixture - 128w	2432	$665.40	19	Existing to Remain	2432	0	0	$0.00		$0.00	$0.00	$0.00
New Ass't. Principal's Office	1500	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$39.67	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00
New Conference Room	750	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$19.84	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00
New Principal's Office	1500	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$39.67	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00
New Media Center Office	1600	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$42.32	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00
New Main Office	2000	8	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	696	$211.58	8	Existing to Remain	696	0	0	$0.00		$0.00	$0.00	$0.00
New Copy Room	1500	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$39.67	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00
New Media Display Area	1600	6	(3)13w CF Lamps. Surface Square' Fixture - 128w	768	$186.78	6	Existing to Remain	768	0	0	$0.00		$0.00	$0.00	$0.00
New Media Center	1700	56	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	3080	$795.87	56	Existing to Remain	3080	0	0	$0.00		$0.00	$0.00	$0.00
New Media Center - Lower Ceiling Area	1200	3	(3)13w CF Lamps. Surface Square' Fixture - 128w	384	$70.04	3	Existing to Remain	384	0	0	$0.00		$0.00	$0.00	$0.00
New Media Center Storage Room	500	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$13.22	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
Fixture Location	**Usage, Hrs/Yr**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Annual Energy Cost**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Energy Savings, Watts**	**Energy Savings, kWh/Yr**	**Savings/Yr, $**	**Simple Payback, Yrs**	**Unit Cost, Installed**	**Total Cost, Installed**	**Rebate Estimate**
First Floor Block "A" Summary		**525**		**41578**	**$7,878**	**525**		**41578**	**0**	**0**	**$0**			**$0**	**$0**
First Floor Block "B"															
New General Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Closet	600	1	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	108	$9.85	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Counter	600	2	(3)13w CF Lamps. Surface Square' Fixture - 128w	256	$23.35	2	Existing to Remain	256	0	0	$0.00		$0.00	$0.00	$0.00
New General Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Closet	600	1	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	108	$9.85	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Counter	600	2	(3)13w CF Lamps. Surface Square' Fixture - 128w	256	$23.35	2	Existing to Remain	256	0	0	$0.00		$0.00	$0.00	$0.00
New General Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Closet	600	1	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	108	$9.85	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Counter	600	2	(3)13w CF Lamps. Surface Square' Fixture - 128w	256	$23.35	2	Existing to Remain	256	0	0	$0.00		$0.00	$0.00	$0.00
New General Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Closet	600	1	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	108	$9.85	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Counter	600	2	(3)13w CF Lamps. Surface Square' Fixture - 128w	256	$23.35	2	Existing to Remain	256	0	0	$0.00		$0.00	$0.00	$0.00
New General Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Closet	600	1	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	108	$9.85	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Counter	600	2	(3)13w CF Lamps. Surface Square' Fixture - 128w	256	$23.35	2	Existing to Remain	256	0	0	$0.00		$0.00	$0.00	$0.00
New General Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Closet	600	1	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	108	$9.85	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
Fixture Location	**Usage, Hrs/Yr**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Annual Energy Cost**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Energy Savings, Watts**	**Energy Savings, kWh/Yr**	**Savings/Yr, $**	**Simple Payback, Yrs**	**Unit Cost, Installed**	**Total Cost, Installed**	**Rebate Estimate**
New Classroom Counter	600	2	(3)13w CF Lamps. Surface Square' Fixture - 128w	256	$23.35	2	Existing to Remain	256	0	0	$0.00		$0.00	$0.00	$0.00
New General Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Closet	600	1	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	108	$9.85	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Counter	600	2	(3)13w CF Lamps. Surface Square' Fixture - 128w	256	$23.35	2	Existing to Remain	256	0	0	$0.00		$0.00	$0.00	$0.00
New General Classroom	1620	12	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1044	$257.07	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Closet	600	1	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	108	$9.85	1	Existing to Remain	108	0	0	$0.00		$0.00	$0.00	$0.00
New Classroom Counter	600	2	(3)13w CF Lamps. Surface Square' Fixture - 128w	256	$23.35	2	Existing to Remain	256	0	0	$0.00		$0.00	$0.00	$0.00
New Small Group Instruction	1300	6	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	522	$103.15	6	Existing to Remain	522	0	0	$0.00		$0.00	$0.00	$0.00
New Small Group Instruction	1300	6	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	522	$103.15	6	Existing to Remain	522	0	0	$0.00		$0.00	$0.00	$0.00
All New Corridor Lights	1800	36	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	3888	$1,063.76	36	Existing to Remain	3888	0	0	$0.00		$0.00	$0.00	$0.00
All Corridor & Offset Lights	1800	24	(3)13w CF Lamps. Surface Square' Fixture - 128w	3072	$840.50	24	Existing to Remain	3072	0	0	$0.00		$0.00	$0.00	$0.00
New Art Classroom	1050	28	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	1540	$245.78	28	Existing to Remain	1540	0	0	$0.00		$0.00	$0.00	$0.00
New Storage Room	500	2	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	110	$8.36	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00
New Boys Room	300	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$7.93	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00
New Boys Room	300	1	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	55	$2.51	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00
New Janitor's Closet	400	1	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	55	$3.34	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00
New Girls Room	300	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$7.93	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00
New Girls Room	300	1	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	55	$2.51	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00
New Storage Room	500	2	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	110	$8.36	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00
New Music Room	1500	19	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1653	$376.88	19	Existing to Remain	1653	0	0	$0.00		$0.00	$0.00	$0.00
Relocated Practice Room	800	4	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	220	$26.75	4	Existing to Remain	220	0	0	$0.00		$0.00	$0.00	$0.00

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
Fixture Location	**Usage, Hrs/Yr**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Annual Energy Cost**	**Fixt Qty**	**Lighting Fixture Description**	**Total Watts - Location**	**Energy Savings, Watts**	**Energy Savings, kWh/Yr**	**Savings/Yr, $**	**Simple Payback, Yrs**	**Unit Cost, Installed**	**Total Cost, Installed**	**Rebate Estimate**
New Cafeteria	800	26	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	2262	$275.06	26	Existing to Remain	2262	0	0	$0.00		$0.00	$0.00	$0.00
New Kitchen	900	14	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1218	$166.62	14	Existing to Remain	1218	0	0	$0.00		$0.00	$0.00	$0.00
New Kitchen Office	600	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$7.93	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00
New Kitchen Storage Room	300	2	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	110	$5.02	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00
New Lockers & Toilet Rooms	300	2	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	110	$5.02	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00
New Stage Storage Room	300	4	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	220	$10.03	4	Existing to Remain	220	0	0	$0.00		$0.00	$0.00	$0.00
New Mechanical Room	900	6	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	330	$45.14	6	Existing to Remain	330	0	0	$0.00		$0.00	$0.00	$0.00
New Custodial Office	1900	3	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	165	$47.65	3	Existing to Remain	165	0	0	$0.00		$0.00	$0.00	$0.00
New Gymnasium House Lighting	300	14	(1)300 Inc. Lamps. Hi-hat Fixture - 300w	4200	$191.52	14	Existing to Remain	4200	0	0	$0.00		$0.00	$0.00	$0.00
New Gymnasium Gym Lighting	900	24	(8)42w T42 Lamps. Hi-hat Fixture - 318w	7632	$1,044.06	24	Existing to Remain	7632	0	0	$0.00		$0.00	$0.00	$0.00
First Floor Block "B" Summary		**350**		**39748**	**$6,921**	**350**		**39748**	**0**	**0**	**$0**			**$0**	**$0**
	Totals:	**875**		**81326**	**$14,799**	**875**		**81326**	**0**	**0**	**$0**			**$0**	**$0**
COMMENTS:															

Project Name: Greenbrook Elementary School
Location: Kendall Park, NJ
Description: Photovoltaic System 95% Financing - 20 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 20 year
Total Construction Cost	$1,863,000
Annual kWh Production	323,033
Annual Energy Cost Reduction	$49,101
Annual SREC Revenue	$113,062
First Cost Premium	**$1,863,000**
Simple Payback:	**11.49** Years

Life Cycle Cost Analysis

Analysis Period (years): 25
Financing Term (mths): 240
Average Energy Cost ($/kWh) **$0.152**
Financing Rate: 7.00%
Financing %: 95%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
SREC Value ($/kWh) $0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$93,150	0	0	0	$0	0	0	(93,150)	0
1	$0	323,033	$49,101	$0	$113,062	$122,556	$42,104	($2,497)	($95,647)
2	$0	321,418	$50,574	$0	$112,496	$119,512	$45,148	($1,589)	($97,236)
3	$0	319,811	$52,091	$0	$111,934	$116,248	$48,411	($634)	($97,871)
4	$0	318,212	$53,654	$0	$111,374	$112,749	$51,911	$369	($97,502)
5	$0	316,621	$55,264	$3,261	$110,817	$108,996	$55,664	($1,840)	($99,342)
6	$0	315,038	$56,922	$3,245	$110,263	$104,972	$59,687	($720)	($100,062)
7	$0	313,462	$58,629	$3,229	$109,712	$100,657	$64,002	$453	($99,609)
8	$0	311,895	$60,388	$3,213	$109,163	$96,031	$68,629	$1,679	($97,930)
9	$0	310,336	$62,200	$3,196	$108,617	$91,069	$73,590	$2,961	($94,969)
10	$0	308,784	$64,066	$3,180	$108,074	$85,749	$78,910	$4,300	($90,668)
11	$0	307,240	$65,988	$3,165	$107,534	$80,045	$84,614	$5,698	($84,971)
12	$0	305,704	$67,967	$3,149	$106,996	$73,928	$90,731	$7,155	($77,816)
13	$0	304,175	$70,006	$3,133	$106,461	$67,369	$97,290	$8,675	($69,140)
14	$0	302,654	$72,107	$3,117	$105,929	$60,336	$104,323	$10,259	($58,882)
15	$0	301,141	$74,270	$3,102	$105,399	$52,795	$111,865	$11,908	($46,974)
16	$0	299,635	$76,498	$3,086	$104,872	$44,708	$119,952	$13,624	($33,350)
17	$0	298,137	$78,793	$3,071	$104,348	$36,037	$128,623	$15,410	($17,939)
18	$0	296,647	$81,157	$3,055	$103,826	$26,738	$137,921	$17,268	($671)
19	$0	295,163	$83,591	$3,040	$103,307	$16,768	$147,891	$19,199	$18,527
20	$0	293,687	$86,099	$3,025	$102,791	$6,077	$158,583	$21,205	$39,732
21	$0	292,219	$88,682	$3,010	$102,277	$5,152	$145,786	$37,011	$76,743
22	$0	290,758	$91,342	$2,995	$101,765	$3,526	$119,968	$66,618	$143,361
23	$0	289,304	$94,083	$2,980	$101,256	$0	$0	$192,359	$335,721
24	$0	287,858	$96,905	$2,965	$100,750	$0	$0	$194,690	$530,411
25	$0	286,418	$99,812	$2,950	$100,246	$0	$0	$197,109	$727,519
	Totals:	6,162,793	$1,319,363	$50,267	$2,156,978	$1,523,341	$1,769,850	$2,035,604	$511,436
				Net Present Value (NPV)				**$77,390**	
				Internal Rate of Return (IRR)				**10.3%**	

Project Name: **Greenbrook Elementary School**
Location: **Kendall Park, NJ**
Description: **Photovoltaic System - Direct Purchase**

Simple Payback Analysis

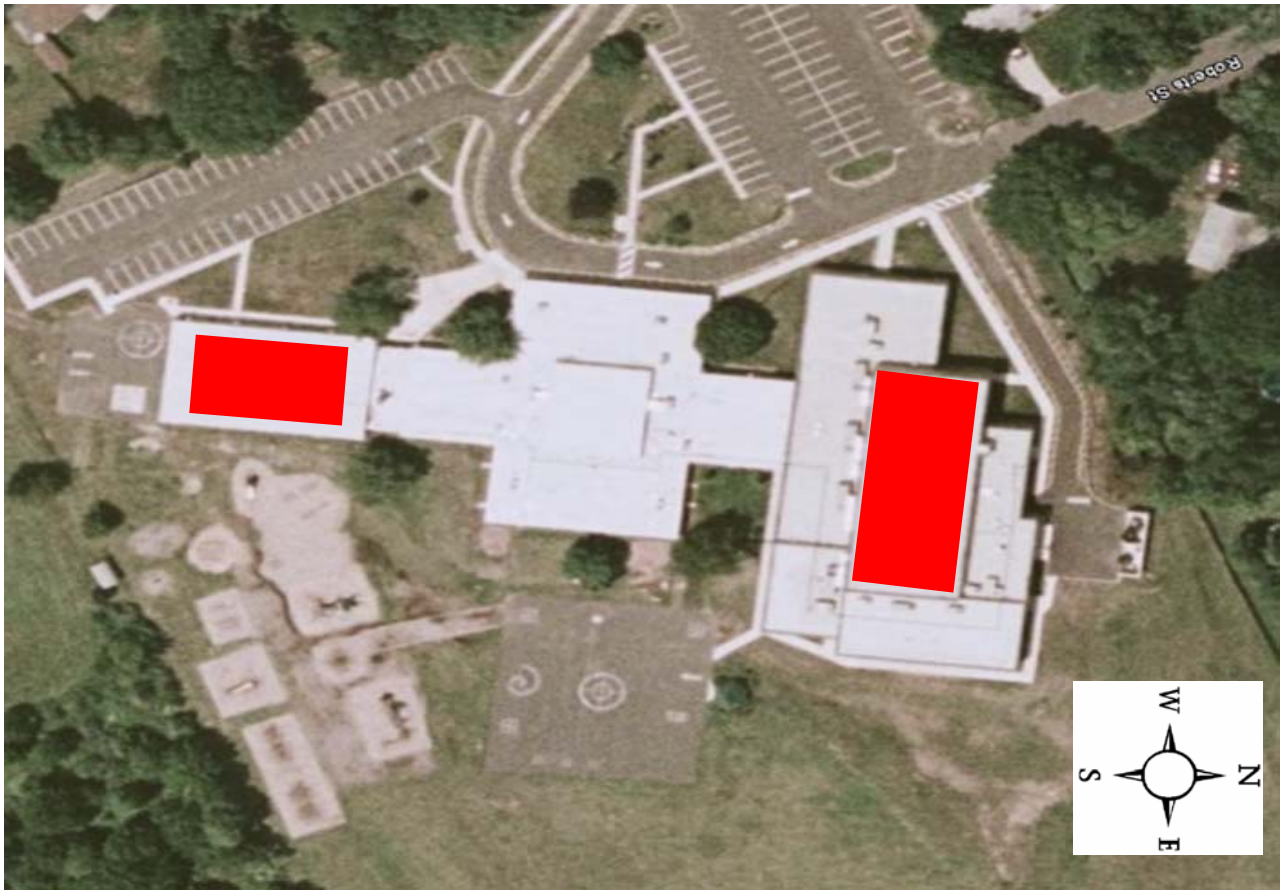
	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,863,000
Annual kWh Production	323,033
Annual Energy Cost Reduction	$49,101
Annual SREC Revenue	$113,062
First Cost Premium	**$1,863,000**
Simple Payback:	**11.49** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.152**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	$1,863,000	0	0	0	$0	(1,863,000)	0
1	$0	323,033	$49,101	$0	$113,062	$162,163	($1,700,837)
2	$0	321,418	$50,574	$0	$112,496	$163,070	($1,537,767)
3	$0	319,811	$52,091	$0	$111,934	$164,025	($1,373,742)
4	$0	318,212	$53,654	$0	$111,374	$165,028	($1,208,714)
5	$0	316,621	$55,264	$3,261	$110,817	$162,820	($1,045,894)
6	$0	315,038	$56,922	$3,245	$110,263	$163,940	($881,955)
7	$0	313,462	$58,629	$3,229	$109,712	$165,112	($716,842)
8	$0	311,895	$60,388	$3,213	$109,163	$166,339	($550,503)
9	$0	310,336	$62,200	$3,196	$108,617	$167,621	($382,883)
10	$0	308,784	$64,066	$3,180	$108,074	$168,960	($213,923)
11	$0	307,240	$65,988	$3,165	$107,534	$170,357	($43,566)
12	$0	305,704	$67,967	$3,149	$106,996	$171,815	$128,249
13	$0	304,175	$70,006	$3,133	$106,461	$173,335	$301,584
14	$0	302,654	$72,107	$3,117	$105,929	$174,918	$476,502
15	$0	301,141	$74,270	$3,102	$105,399	$176,567	$653,069
16	$0	299,635	$76,498	$3,086	$104,872	$178,284	$831,353
17	$0	298,137	$78,793	$3,071	$104,348	$180,070	$1,011,423
18	$0	296,647	$81,157	$3,055	$103,826	$181,927	$1,193,350
19	$0	295,163	$83,591	$3,040	$103,307	$183,858	$1,377,208
20	$0	293,687	$86,099	$3,025	$102,791	$185,865	$1,563,073
21	$1	292,219	$88,682	$3,010	$102,277	$187,949	$1,751,022
22	$2	290,758	$91,342	$2,995	$101,765	$190,113	$1,941,135
23	$3	289,304	$94,083	$2,980	$101,256	$192,359	$2,133,494
24	$4	287,858	$96,905	$2,965	$100,750	$194,690	$2,328,184
25	$5	286,418	$99,812	$2,950	$100,246	$197,109	$2,525,293
	Totals:	6,162,793	$1,319,363	$50,267	$2,156,978	$4,388,293	$3,426,073
				Net Present Value (NPV)		**$2,525,318**	
				Internal Rate of Return (IRR)		**7.7%**	

Building	Usable Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Greenbrook Elementary	14,793	Sunpower SPR230	900	14.7	13,234	207.00	323,033	29,700	15.64



.= Proposed PV Layout

Roof Area	9,000	90%	8,100 S.F.	550 Panels	126.5 Kw
Roof Area	7,437	90%	6,693 S.F.	350 Panels	80.5 Kw
Total Roof Area			14,793 S.F.	900 Panels	207 Kw

Notes:

1. Estimated kWH based on 4.68 hours full output per day per 365 day year. Actual kWH will vary day to day.

ENERGY CONSUMPTION SUMMARY

By CAE

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Existing System					
Primary heating					
Primary heating	16,924	2,153,446	40.1 %	2,211,206	2,440,083
Other Htg Accessories	17,412		1.1 %	59,426	178,296
Heating Subtotal	**34,335**	**2,153,446**	**41.1 %**	**2,270,632**	**2,618,379**
Primary cooling					
Cooling Compressor	144,306		8.9 %	492,516	1,477,695
Tower/Cond Fans	18,900		1.2 %	64,507	193,540
Condenser Pump			0.0 %	0	0
Other Clg Accessories	3,167		0.2 %	10,808	32,428
Cooling Subtotal....	**166,373**		**10.3 %**	**567,831**	**1,703,663**
Auxiliary					
Supply Fans	176,125		10.9 %	601,115	1,803,525
Pumps	6,713		0.4 %	22,910	68,738
Stand-alone Base Utilities	7,118	876,000	16.3 %	900,292	994,989
Aux Subtotal....	189,955	876,000	27.6 %	1,524,317	2,867,251
Lighting					
Lighting	305,913		18.9 %	1,044,080	3,132,553
Receptacle					
Receptacles	33,558		2.1 %	114,533	343,634
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	**730,134**	**3,029,446**	**100.0 %**	**5,521,393**	**10,665,480**

* Note: Resource Utilization factors are included in the Total Source Energy value.
** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

ENERGY CONSUMPTION SUMMARY

By CAE

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
ECM #1 Boilers					
Primary heating					
Primary heating	16,924	1,925,798	37.5 %	1,983,558	2,200,454
Other Htg Accessories	15,880		1.0 %	54,198	162,611
Heating Subtotal	**32,804**	**1,925,798**	**38.6 %**	**2,037,756**	**2,363,065**
Primary cooling					
Cooling Compressor	144,306		9.3 %	492,516	1,477,695
Tower/Cond Fans	18,900		1.2 %	64,507	193,540
Condenser Pump			0.0 %	0	0
Other Clg Accessories	3,167		0.2 %	10,808	32,428
Cooling Subtotal....	**166,373**		**10.7 %**	**567,831**	**1,703,663**
Auxiliary					
Supply Fans	176,125		11.4 %	601,115	1,803,525
Pumps	6,001		0.4 %	20,482	61,452
Stand-alone Base Utilities	7,118	876,000	17.0 %	900,292	994,989
Aux Subtotal....	189,244	876,000	28.8 %	1,521,889	2,859,966
Lighting					
Lighting	305,913		19.8 %	1,044,080	3,132,553
Receptacle					
Receptacles	33,558		2.2 %	114,533	343,634
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	**727,891**	**2,801,798**	**100.0 %**	**5,286,088**	**10,402,879**

* Note: Resource Utilization factors are included in the Total Source Energy value.
** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

ENERGY CONSUMPTION SUMMARY

By CAE

Pump VFD's

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Primary heating					
Primary heating	16,924	2,153,481	40.2 %	2,211,241	2,440,121
Other Htg Accessories	17,444		1.1 %	59,536	178,625
Heating Subtotal	**34,367**	**2,153,481**	**41.3 %**	**2,270,777**	**2,618,746**
Primary cooling					
Cooling Compressor	144,306		9.0 %	492,516	1,477,695
Tower/Cond Fans	18,900		1.2 %	64,507	193,540
Condenser Pump			0.0 %	0	0
Other Clg Accessories	3,167		0.2 %	10,808	32,428
Cooling Subtotal....	**166,373**		**10.3 %**	**567,831**	**1,703,663**
Auxiliary					
Supply Fans	176,125		10.9 %	601,115	1,803,525
Pumps	1,020		0.1 %	3,482	10,447
Stand-alone Base Utilities	7,118	876,000	16.4 %	900,292	994,989
Aux Subtotal....	184,263	876,000	27.4 %	1,504,889	2,808,961
Lighting					
Lighting	305,913		19.0 %	1,044,080	3,132,553
Receptacle					
Receptacles	33,558		2.1 %	114,533	343,634
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	**724,474**	**3,029,481**	**100.0 %**	**5,502,110**	**10,607,555**

* Note: Resource Utilization factors are included in the Total Source Energy value.
** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.