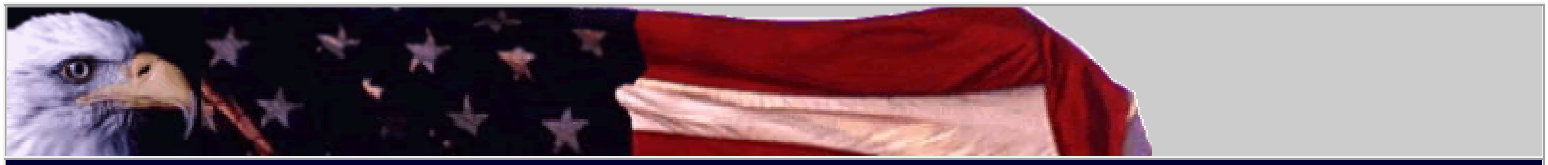

Cambridge Elementary School, NJ

ENERGY AUDIT – FINAL REPORT
CEG PROJECT NO. 9C08134

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I. EXECUTIVE SUMMARY

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

Cambridge Elementary School
35 Cambridge Road
Kendall Park, NJ 08824

Municipal Contact: Anthony Tonzini (Board Administrator)
Facility Contact: Gabe Texera

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 for the main school and adjacent building are as follows:

Electricity	$ 107,807	$ 9,648
Natural Gas	$ 39,837	$ 3,041
Total	$ 147,644	$ 12,689

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 AIR-COOLED CHILLER	$71,650	$4,956	14.5	10.4%
ECM #2	OFFICE ROOFTOP UNIT REPLACEMENT	$5,840	$2,726	2.1	471.7%
ECM #3	VFD'S ON HW PUMPS	$22,805	$4,116	5.5	217.1%
ECM #4	ADD (6) UNIT VENTILATORS TO AIR COOLED CHILLER	$28,350	$2,843	10.0	15.9%
ECM #5	REPLACE ELECTRIC DHW WITH GAS HW HEATER- KITCHEN	$2,380	$686	3.5	430.0%
ECM #6	INSTALL LIGHTING CONTROLS	$825	$507	1.6	
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	204 KW SOLAR PV	$1,842,300	$161,638	11.4	-32.4%

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

The estimated demand and energy savings 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 AIR-COOLED CHILLER	10	12,895	0
ECM #2	OFFICE ROOFTOP UNIT REPLACEMENT	-7	1,366	1,190
ECM #3	VFD'S ON HW PUMPS	0	10,628	0
ECM #4	ADD (6) UNIT VENTILATORS TO AIR COOLED CHILLER	40	8,174	246
ECM #5	REPLACE ELECTRIC DHW WITH GAS HW HEATER- KITCHEN	3	4,935	-93
ECM #6	INSTALL LIGHTING CONTROLS	0	3,269	0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	204 KW SOLAR PV	204	319,444	0

NOTE: ECM#2 shows an increase in gas usage due to a more efficient pump motor rejecting less heat to pump than base case pump.

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 Cambridge Elementary School:

- **ECM #1: Replace Air-Cooled Chiller (a)**
- **ECM #2: Replace Office Rooftop Unit**
- **ECM #3: Install VFD's on Hot Water Pumps**
- **ECM #4: Add Six Unit Ventilators to Classrooms**
- **ECM #5: Replace Electric Hot Water Heater with Natural Gas**
- **ECM #6: Install Occupancy Lighting Controls**
- **REM #1: Install PV Solar Panel System (b)**

a) The chiller is past its life expectancy and is oversized.

b) The PV Solar system is close to the 10 year simple payback and worth consideration.

II. INTRODUCTION

This comprehensive energy audit covers the Cambridge Elementary School located at 35 Cambridge Road, Kendall Park, NJ. Based on our survey and the documentation available, it was determined that the building area is approximately 59,500 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 calculates 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	15.6¢ / kWh (4.6¢ / kBtu)
*Natural Gas	$1.78 / therm (1.8¢ / kBtu)

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

Table 3
Electricity Billing Data

Cambridge Elementary **Meter #1**

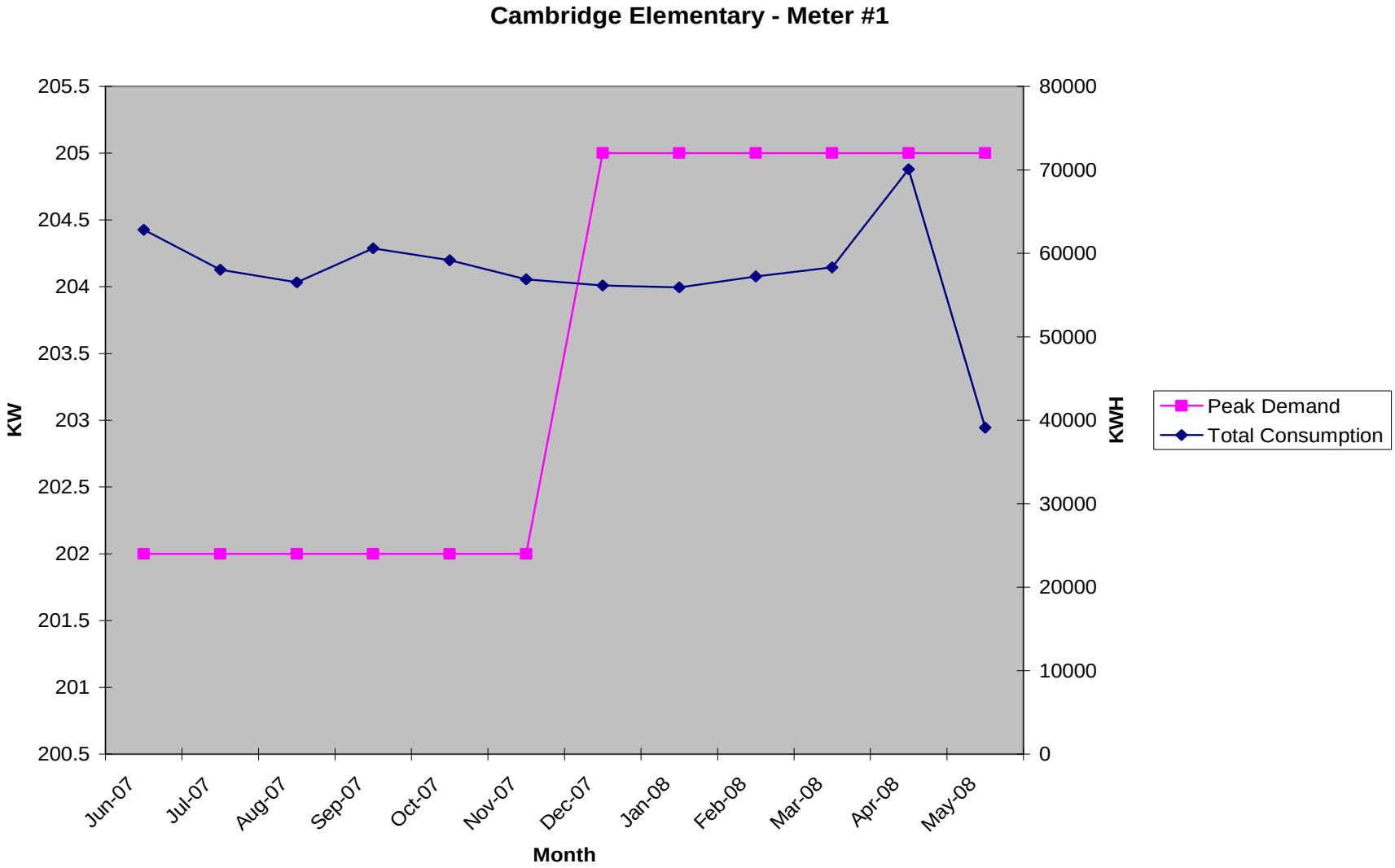
Provider	Month	Start Date	End Date	Account	Utility Type	Billing Days	Peak Demand	Units	Off Peak Usage	Units	On Peak Usage	Units	Total Consumption	Units	Total $
PSE&G Co (14101)	Jun-07	6/6/2007	7/6/2007	6204910817E	Electric	30	202	kw	16920	kwh	45360	kwh	62837	kwh	$ 12,563.35
PSE&G Co (14101)	Jul-07	7/6/2007	8/6/2007	6204910817E	Electric	31	202	kw	17760	kwh	39840	kwh	58027	kwh	$ 11,262.97
PSE&G Co (14101)	Aug-07	8/6/2007	9/6/2007	6204910817E	Electric	31	202	kw	16680	kwh	39840	kwh	56520	kwh	$ 11,424.65
PSE&G Co (14101)	Sep-07	9/6/2007	10/4/2007	6204910817E	Electric	28	202	kw	15840	kwh	44760	kwh	60600	kwh	$ 9,897.44
PSE&G Co (14101)	Oct-07	10/4/2007	11/2/2007	6204910817E	Electric	29	202	kw	15840	kwh	43320	kwh	59160	kwh	$ 8,158.04
PSE&G Co (14101)	Nov-07	11/2/2007	12/5/2007	6204910817E	Electric	33	202	kw	21240	kwh	35640	kwh	56880	kwh	$ 7,496.00
PSE&G Co (14101)	Dec-07	12/5/2007	1/7/2008	6204910817E	Electric	33	205	kw	22200	kwh	33960	kwh	56160	kwh	$ 7,323.87
PSE&G Co (14101)	Jan-08	1/7/2008	2/5/2008	6204910817E	Electric	29	205	kw	19800	kwh	36120	kwh	55920	kwh	$ 7,457.17
PSE&G Co (14101)	Feb-08	2/5/2008	3/6/2008	6204910817E	Electric	30	205	kw	20760	kwh	36480	kwh	57240	kwh	$ 7,723.74
PSE&G Co (14101)	Mar-08	3/6/2008	4/8/2008	6204910817E	Electric	33	205	kw	22320	kwh	36000	kwh	58320	kwh	$ 7,660.57
PSE&G Co (14101)	Apr-08	4/8/2008	5/15/2008	6204910817E	Electric	37	205	kw	21840	kwh	48240	kwh	70080	kwh	$ 9,956.99
PSE&G Co (14101)	May-08	5/15/2008	6/5/2008	6204910817E	Electric	21	205	kw	11760	kwh	27360	kwh	39120	kwh	$ 6,882.50
						Max Peak:	205	kw			**12 Month Total:**		690,864	kwh	$ 107,807.29
													Avg. Cost per kwh:		$ 0.156
													Avg. Cost per kBtu:		$ 0.046

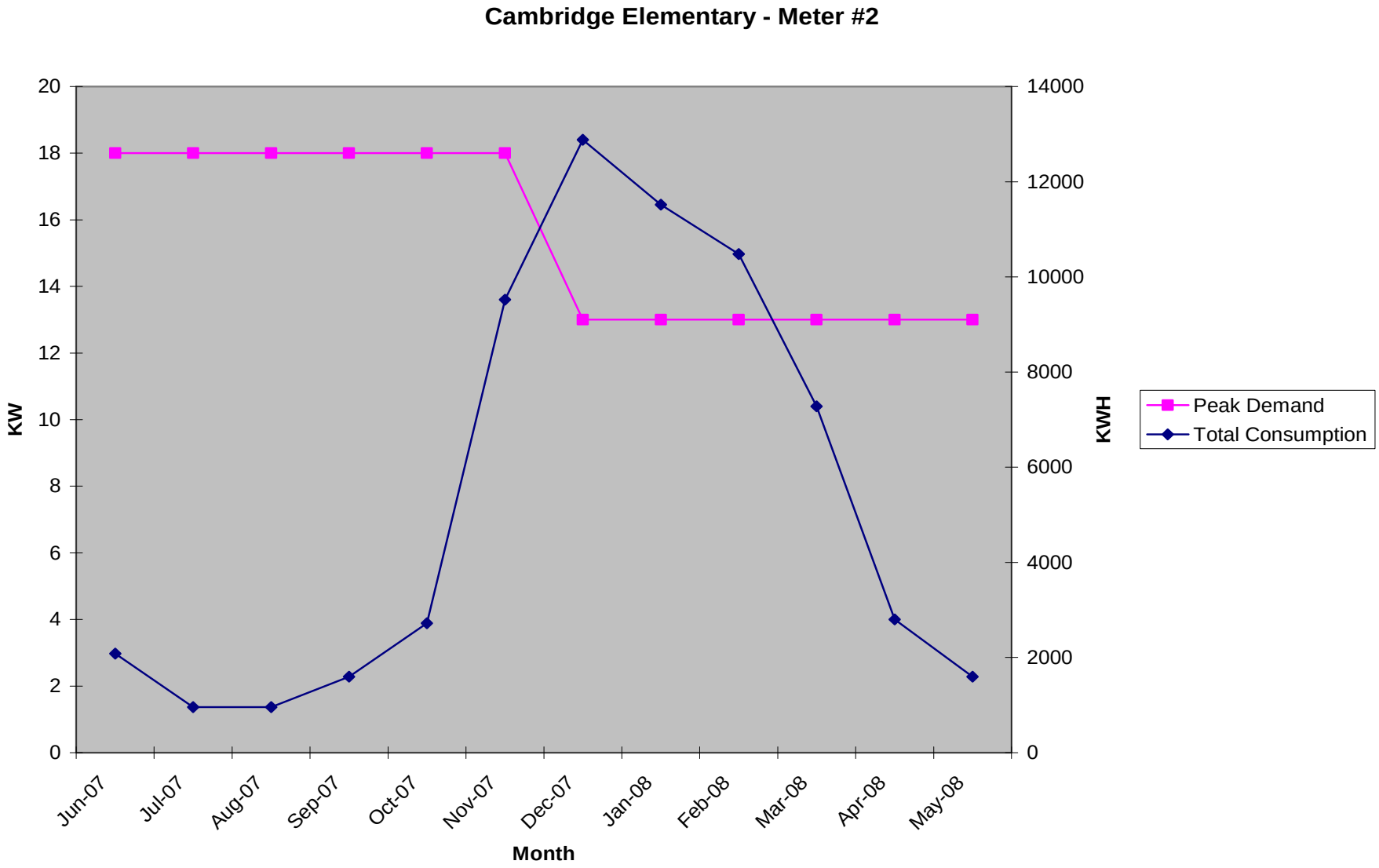
Cambridge Elementary **Meter #2**

Provider	Month	Start Date	End Date	Account	Utility Type	Billing Days	Peak Demand	Units	Off Peak Usage	Units	On Peak Usage	Units	Total Consumption Consumption	Units	Total $
PSE&G Co (14101)	Jun-07	6/6/2007	7/6/2007	6204903756	Electric	30	18	kw	N/A	kwh	N/A	kwh	2080	kwh	$ 684.01
PSE&G Co (14101)	Jul-07	7/6/2007	8/6/2007	6204903756	Electric	31	18	kw	N/A	kwh	N/A	kwh	960	kwh	$ 342.88
PSE&G Co (14101)	Aug-07	8/6/2007	9/6/2007	6204903756	Electric	31	18	kw	N/A	kwh	N/A	kwh	960	kwh	$ 399.19
PSE&G Co (14101)	Sep-07	9/6/2007	10/4/2007	6204903756	Electric	28	18	kw	N/A	kwh	N/A	kwh	1600	kwh	$ 375.20
PSE&G Co (14101)	Oct-07	10/4/2007	11/2/2007	6204903756	Electric	29	18	kw	N/A	kwh	N/A	kwh	2720	kwh	$ 452.39
PSE&G Co (14101)	Nov-07	11/2/2007	12/5/2007	6204903756	Electric	33	18	kw	N/A	kwh	N/A	kwh	9520	kwh	$ 1,203.12
PSE&G Co (14101)	Dec-07	12/5/2007	1/7/2008	6204903756	Electric	33	13	kw	N/A	kwh	N/A	kwh	12880	kwh	$ 1,559.55
PSE&G Co (14101)	Jan-08	1/7/2008	2/5/2008	6204903756	Electric	29	13	kw	N/A	kwh	N/A	kwh	11520	kwh	$ 1,439.90
PSE&G Co (14101)	Feb-08	2/5/2008	3/6/2008	6204903756	Electric	30	13	kw	N/A	kwh	N/A	kwh	10480	kwh	$ 1,350.83
PSE&G Co (14101)	Mar-08	3/6/2008	4/8/2008	6204903756	Electric	33	13	kw	N/A	kwh	N/A	kwh	7280	kwh	$ 992.61
PSE&G Co (14101)	Apr-08	4/8/2008	5/6/2008	6204903756	Electric	28	13	kw	N/A	kwh	N/A	kwh	2800	kwh	$ 413.23
PSE&G Co (14101)	May-08	5/6/2008	6/5/2008	6204903756	Electric	30	13	kw	N/A	kwh	N/A	kwh	1600	kwh	$ 435.51
						Max Peak:	18	kw			**12 Month Total:**		64,400	kwh	$ 9,648.42
													Avg. Cost per kwh:		$ 0.150
													Avg. Cost per kBtu:		$ 0.044

***** Electric Meter #2 is for the Pre-School building and is included for information purposes only.

Figure 1
Electricity Usage Profile




Cambridge Elementary - Meter #2
KW
KWH
Month
Peak Demand
Total Consumption
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2
4
6
8
10
12
14
16
18
20
0
2000
4000
6000
8000
10000
12000
14000
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08

Table 4
Natural Gas Billing Data

Cambridge Elementary **Meter #1**

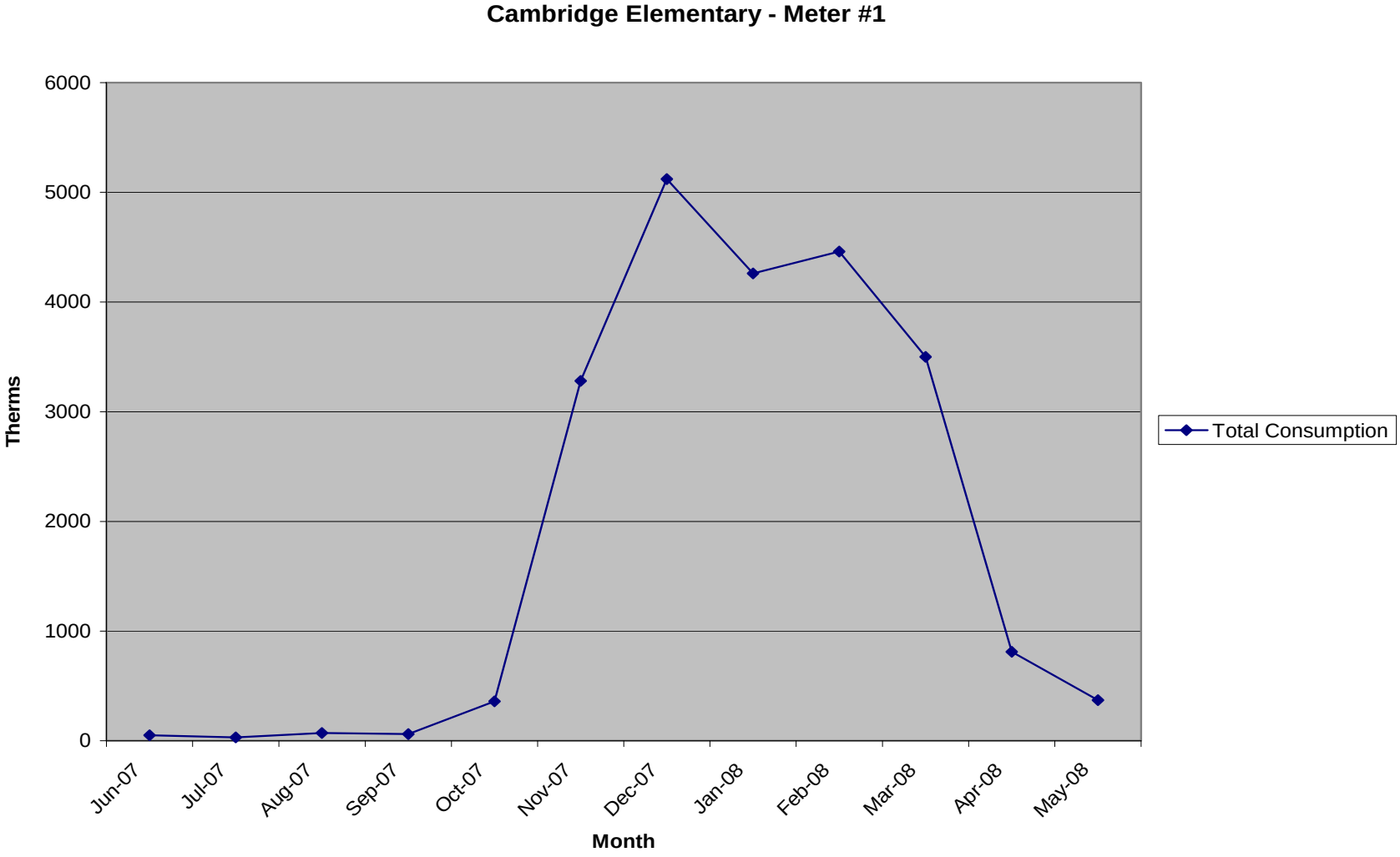
Provider	Month	Start Date	End Date	Account	Utility Type	Billing Days	Consumption	Units	Total $
PSE&G CO (14105)	Jun-07	6/6/2007	7/6/2007	6204918362	Gas	30	50	therms	$ 164.19
PSE&G CO (14105)	Jul-07	7/6/2007	8/6/2007	6204918362	Gas	31	30	therms	$ 132.32
PSE&G CO (14105)	Aug-07	8/6/2007	9/6/2007	6204918362	Gas	31	70	therms	$ 196.66
PSE&G CO (14105)	Sep-07	9/6/2007	10/4/2007	6204918362	Gas	28	60	therms	$ 182.11
PSE&G CO (14105)	Oct-07	10/4/2007	11/2/2007	6204918362	Gas	29	360	therms	$ 1,377.62
PSE&G CO (14105)	Nov-07	11/2/2007	12/5/2007	6204918362	Gas	33	3280	therms	$ 6,052.87
PSE&G CO (14105)	Dec-07	12/5/2007	1/7/2008	6204918362	Gas	33	5120	therms	$ 8,991.19
PSE&G CO (14105)	Jan-08	1/7/2008	2/5/2008	6204918362	Gas	29	4260	therms	$ 7,621.98
PSE&G CO (14105)	Feb-08	2/5/2008	3/6/2008	6204918362	Gas	30	4460	therms	$ 7,773.52
PSE&G CO (14105)	Mar-08	3/6/2008	4/8/2008	6204918362	Gas	33	3500	therms	$ 5,372.34
PSE&G CO (14105)	Apr-08	4/8/2008	5/6/2008	6204918362	Gas	28	810	therms	$ 1,319.97
PSE&G CO (14105)	May-08	5/6/2008	6/5/2008	6204918362	Gas	30	370	therms	$ 652.80
						12 Month Total:	22,370	therms	$ 39,837.57
						Average Cost per therm:	$ 1.78		

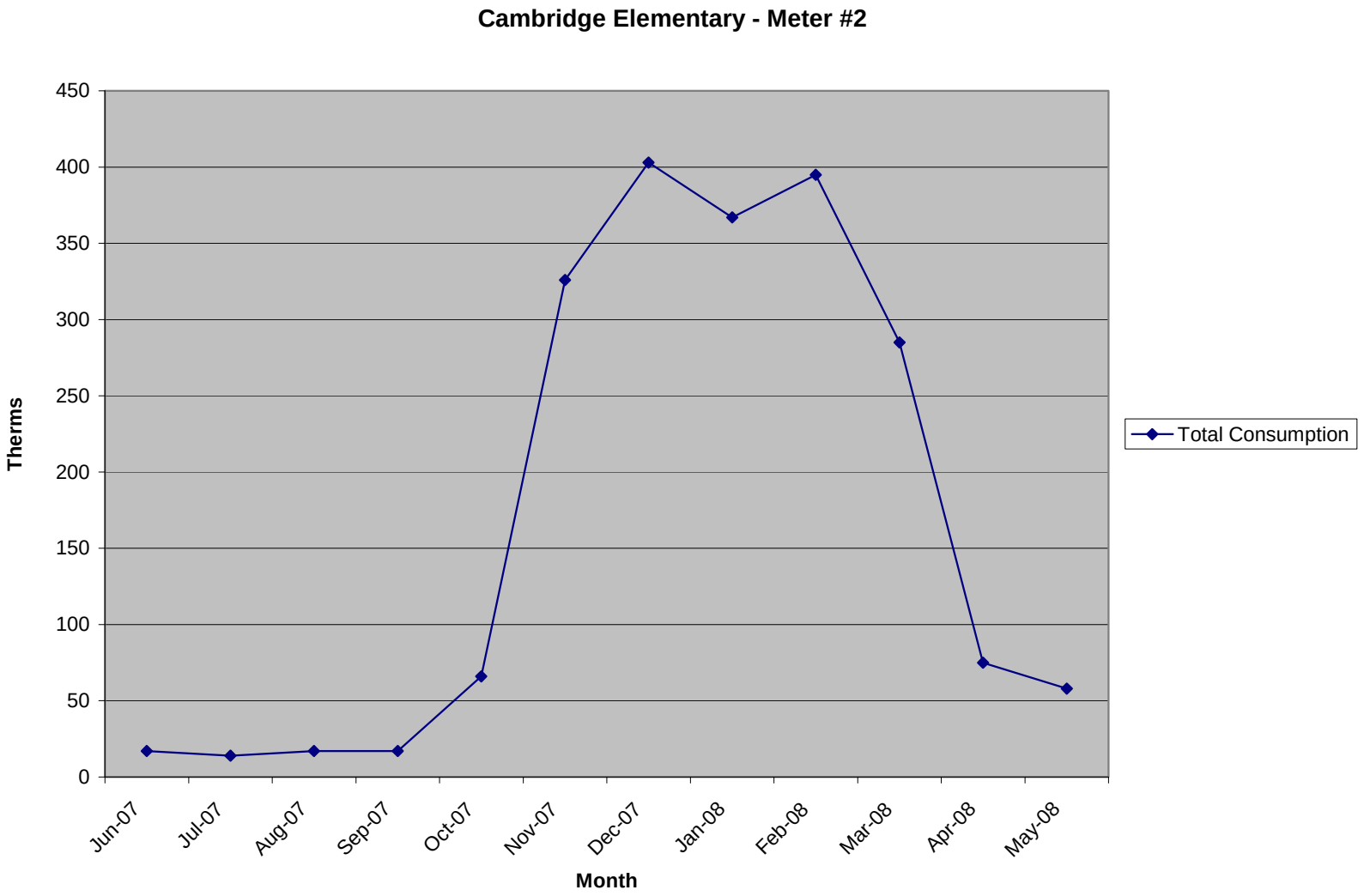
Average Cost per KBtu: $0.018

Cambridge Elementary **Meter #2**

Provider	Month	Start Date	End Date	Account	Utility Type	Billing Days	Consumption	Units	Total $
PSE&G CO (14105)	Jun-07	6/6/2007	7/6/2007	6204910817G	Gas	30	17	therms	32.14
PSE&G CO (14105)	Jul-07	7/6/2007	8/6/2007	6204910817G	Gas	31	14	therms	27
PSE&G CO (14105)	Aug-07	8/6/2007	9/6/2007	6204910817G	Gas	31	17	therms	29.37
PSE&G CO (14105)	Sep-07	9/6/2007	10/4/2007	6204910817G	Gas	28	17	therms	28.54
PSE&G CO (14105)	Oct-07	10/4/2007	11/2/2007	6204910817G	Gas	29	66	therms	93.88
PSE&G CO (14105)	Nov-07	11/2/2007	12/5/2007	6204910817G	Gas	33	326	therms	464.01
PSE&G CO (14105)	Dec-07	12/5/2007	1/7/2008	6204910817G	Gas	33	403	therms	567.81
PSE&G CO (14105)	Jan-08	1/7/2008	2/5/2008	6204910817G	Gas	29	367	therms	521.06
PSE&G CO (14105)	Feb-08	2/5/2008	3/6/2008	6204910817G	Gas	30	395	therms	598.83
PSE&G CO (14105)	Mar-08	3/6/2008	4/8/2008	6204910817G	Gas	33	285	therms	437.57
PSE&G CO (14105)	Apr-08	4/8/2008	5/6/2008	6204910817G	Gas	28	75	therms	129.65
PSE&G CO (14105)	May-08	5/6/2008	6/5/2008	6204910817G	Gas	30	58	therms	112.02
						12 Month Total:	2,040	therms	$ 3,041.88
						Average Cost per therm:	$ 1.49		

Figure 2
Natural Gas Usage Profile





* Gas Meter #2 serves the new addition and is included in our analysis.

B. Energy Use Intensity (EUI)

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. Their website allows the user to determine how well the client's building Energy Use Intensity compares with similar facilities throughout the U.S. and in your specific region or state.

Energy Use Intensity (EUI) is a measure of a building's energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically one year, to British Thermal Units (BTU) and dividing this number by the building square footage. The EUI for this facility is calculated as follows:

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

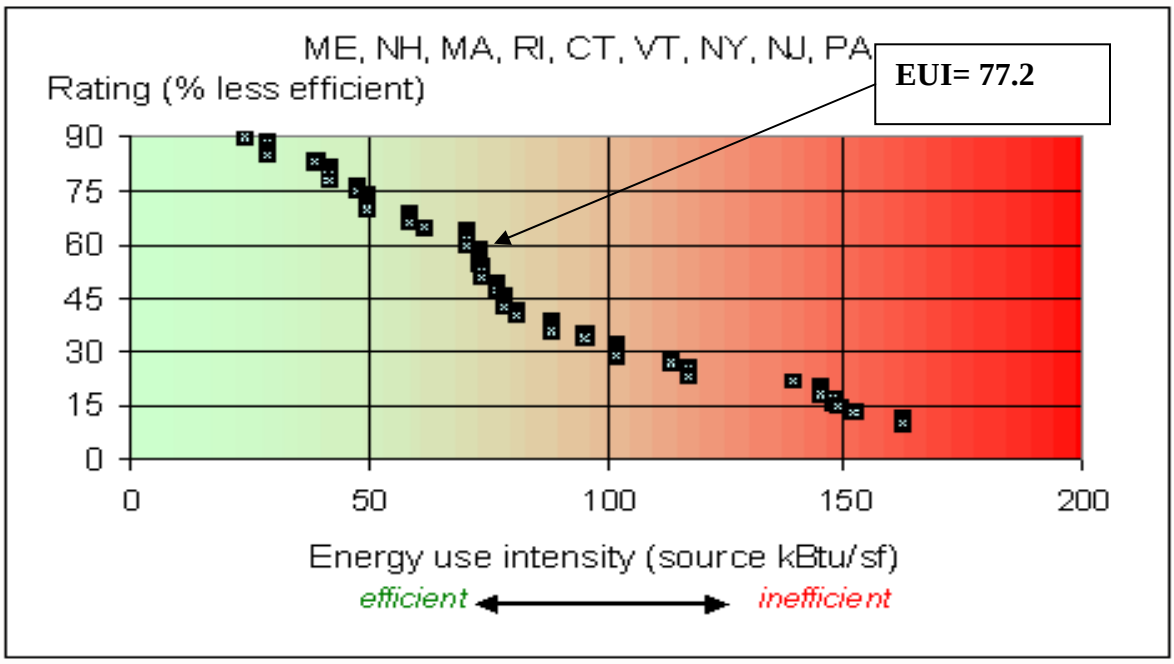
Electric = ((690,864 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu / 1 kBtu)
= 2,358,609.7 kBtu

Gas =((22,370 therms) * (100,000 Btu/h / 1 therm)) / (1000 Btu/h / 1 kBtu/h) = 2,237,000 kBtu/h

$$\text{Building EUI} = \frac{\text{(2,358,609 kBTU/h + 2,237,000 kBtu/h)}}{\text{59,500 SF}} = \frac{\text{4,595,609 kBtu/h}}{\text{59,500 SF}} = 77.24 \text{ kBtu/SF}$$

Cambridge Elementary EUI = 77.24 kBtu/SF

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

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
Cambridge Elementary	52	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 Cambridge Elementary School, in addition to the Energy Star Performance Rating.

The EUI distribution, Figure 3, is specific for Schools. The Cambridge Elementary School has an EUI of 77.2 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 Cambridge Elementary School is approximately 59,500 sq. ft. on six (6) acres built in 1957 with additions in 1964, 1974 and the mostrecent and largest addition in 2006. The facility primarily consists of a single story building, slab on grade with a gymnasium, cafeteria, media center, and classrooms. The complex also includes a pre-school building at the southeast corner 30 feet from the main school building.

Heating System

The primary heating system for the building consists of unit vetilators with hot water coils, hot water institutional wall fin radiation and gas fired combination heating and cooling roof mounted packaged units.

Domestic Hot Water

An electric Domestic Hot Water Heater, located in the kitchen utility room provides hot what to the kitchen, while a gas fired hot water heater provides hot water for Men's and Women's toilet rooms throughout the building.

Cooling System

Cooling for the building is provided by several independent air conditioning systems. Rooftop packaged combination heating and cooling units, widow units, and an air-cooled chiller that provides chilled water to an air handling unit for the media center, and classroom unit ventilators. A variable air volume system provides tempered air for independent zone cooling and heating.

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 upgrade and this was confirmed during the field survey. The light fixtures 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 Replace Air Cooled Chiller

Description:

The existing Trane, 100 Ton air-cooled chiller is from 1987 and is past its life expectancy of 20 years. The Trace 700 building simulation software indicated approximately 55 to 60 ton cooling load. Even though the simple payback is 14.5 years, we are recommending replacing the Trane unit with a new high efficient 65 Ton air-cooled chiller as a replacement and adding the six (6) additional classrooms which presently use window units for air conditioning.

The calculations for this ECM were performed using Trane Trace 700™ building simulation software and the estimated payback is approximately 4.9 years. Outputs from the simulation software are located in Appendix G. A summary of the calculations is shown below.

Energy Savings Calculations:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$79,900
NJ Smart Start Equipment Incentive ($):	$8,250
Net Installation Cost ($):	$71,650
Maintenance Savings ($/Yr):	$1,000
Energy Savings ($/Yr):	$3,956
Total Yearly Savings ($/Yr):	$4,956
Estimated ECM Lifetime (Yr):	20
Simple Payback	14.5
Simple Lifetime ROI	10.4%
Simple Lifetime Maintenance Savings	$20,000
Simple Lifetime Savings	$79,120
Internal Rate of Return (IRR)	3%
Net Present Value (NPV)	$2,082.77

ECM #2 Office Rooftop Unit Replacement

Description:

Replace the existing 5 Ton packaged rooftop unit for the front offices with a new high efficient gas heating / electric cooling unit. The unit is at the end of its useful life and inefficient.

The calculations for this ECM were performed using Trane Trace 700™ building simulation software and the estimated payback is approximately 4.9 years. Outputs from the simulation software are located in Appendix G. A summary of the calculations is shown below.

Energy Savings Calculations:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,300
NJ Smart Start Equipment Incentive ($):	$460
Net Installation Cost ($):	$5,840
Maintenance Savings ($/Yr):	$500
Energy Savings ($/Yr):	$2,226
Total Yearly Savings ($/Yr):	$2,726
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.1
Simple Lifetime ROI	471.7%
Simple Lifetime Maintenance Savings	$7,500
Simple Lifetime Savings	$33,390
Internal Rate of Return (IRR)	47%
Net Present Value (NPV)	$26,702.81

ECM #3 Variable Speed Pumps

Description:

Replace existing constant speed hot water pumps. 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 4.9 years. Outputs from the simulation software are located in Appendix G. A summary of the calculations is shown below.

NJ Smart Start® Program Incentives:

Please refer to Appendix B for rebate incentives.

Energy Savings Calculations:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$24,475
NJ Smart Start Equipment Incentive ($):	$1,670
Net Installation Cost ($):	$22,805
Maintenance Savings ($/Yr):	$500
Energy Savings ($/Yr):	$3,616
Total Yearly Savings ($/Yr):	$4,116
Estimated ECM Lifetime (Yr):	20
Simple Payback	5.5
Simple Lifetime ROI	217.1%
Simple Lifetime Maintenance Savings	$10,000
Simple Lifetime Savings	$72,320
Internal Rate of Return (IRR)	17%
Net Present Value (NPV)	$38,430.69

ECM #4 Addition of Six (6) Unit Ventilators to Classrooms

Description:

Replace the window air conditioning units in Classrooms A102, A104, A106, A108, A110, & A112, with classroom Unit Ventilators. These units will have a chilled water coil and hot water coil. Piped to the air cooled chiller and boiler respectively. The Unit Ventilators will provide more comfort and more efficient cooling and heating. The additional cooling load will be handled adequately by the existing chiller.

The calculations for this ECM were performed using Trane Trace 700™ building simulation software and the estimated payback is approximately 4.9 years. Outputs from the simulation software are located in Appendix G. A summary of the calculations is shown below.

Energy Savings Calculations:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$28,350
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$28,350
Maintenance Savings ($/Yr):	$1,200
Energy Savings ($/Yr):	$1,643
Total Yearly Savings ($/Yr):	$2,843
Estimated ECM Lifetime (Yr):	20
Simple Payback	10.0
Simple Lifetime ROI	15.9%
Simple Lifetime Maintenance Savings	$24,000
Simple Lifetime Savings	$32,860
Internal Rate of Return (IRR)	8%
Net Present Value (NPV)	$13,946.66

ECM #5 Domestic HWH Replacement

Description:

This energy conservation measure will replace the existing electric, 9,000 Watt, 50-gallon capacity domestic hot water heater in the kitchen, with a gas-fired, High Efficiency water heater.

Energy Savings Calculations:

The calculations for this ECM were performed using Trane Trace 700™ building simulation software and the estimated payback is approximately 3.5 years. Outputs from the simulation software are located in Appendix G. A summary of the calculations is shown below.

NJ Smart Start® Program Incentives:

From Appendix B, a natural gas-fired domestic hot water heater less than 300 MBH warrants the following incentive:

$$\text{Smart Start®}\ Incentive = (\$2.00\ per\ MBH) = \$120$$

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,500
NJ Smart Start Equipment Incentive ($):	$120
Net Installation Cost ($):	$2,380
Maintenance Savings ($/Yr):	$50
Energy Savings ($/Yr):	$636
Total Yearly Savings ($/Yr):	$686
Estimated ECM Lifetime (Yr):	10
Simple Payback	3.5
Simple Lifetime ROI	167.2%
Simple Lifetime Maintenance Savings	$500
Simple Lifetime Savings	$6,360
Internal Rate of Return (IRR)	26%
Net Present Value (NPV)	$3,471.72

ECM #6 Install Lighting Controls

Description:

Install Lighting Controls to Reduce the Lighting Use

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

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

ASHRAE Standard 90.1-2004, Appendix G is a reference standard for modeling building efficiency. The standard estimates that lighting controls provide a 10% reduction in lighting power usage for daytime occupancies in buildings over 5,000 SF, and 15% reduction in buildings under 5,000 SF.

CEG would recommend the replacement of standard wall switches with sensor wall switches for individual rooms, ceiling mount sensors for large office areas or restrooms, and fixture mount box sensors for some applications. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent.

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

Energy Savings Calculations:

Energy Savings = *Total kilowatt Hours per year (kWh/yr) of Occupancy Sensor Controlled Area x Average Electric Cost ($/kWh) x 10% Energy Savings:*

= 32,690 kwh/yr. x $0.155/kWh x 10%

Annual Savings = $507 / yr

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

Installation Cost = $75 x 15 motion sensors = $1,125

NJ Smart Start® Program Incentives are calculated as follows:

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

Smart Start Incentive = *(# of Occupancy Sensors x $20)*

Smart Start Incentive = *(15 x $20) = $300*

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	**$1,125**
NJ Smart Start Equipment Incentive ($):	**$300**
Net Installation Cost ($):	**$825**
Maintenance Savings ($/Yr):	**$0**
Energy Savings ($/Yr):	**$507**
Total Yearly Savings ($/Yr):	**$507**
Estimated ECM Lifetime (Yr):	**15**
Simple Payback	**1.6**
Simple Lifetime ROI	**821.8%**
Simple Lifetime Maintenance Savings	**$0**
Simple Lifetime Savings	**$7,605**
Internal Rate of Return (IRR)	**61%**
Net Present Value (NPV)	**$5,227.53**

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 Cambridge 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 13,100 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 204.7 kilowatts could be installed to help reduce the maximum peak monthly demand. The required square footage for a system of this size is approximately 13,000 S.F. and has an estimated kilowatt hour production of 319,444 KWh annually, reducing the overall electric consumption by approximately 46.2%. 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	11.4 Years	11.1 %
Direct Purchase	11.4 Years	7.8 %

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. Refer to Section IV, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for June 2007 through May 2008.

Electricity:

Section IV, Figure 1 demonstrates a typical cooling profile, (April –October), complimenting the heating load. It is evident that there is a significant reduction in the On Peak Load from October 2007 to November 2007 and a substantial increase from March 2007 to April 2007. The Off Peak load is typical, with some expected increased consumption in the June-September period. The base-load shaping is important because a flat consumption profiles will yield more competitive pricing.

Natural Gas:

Section IV, Figure 2 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.

Tariff Analysis:

Electricity:

South Brunswick – Cambridge Elementary receives electrical service through Public Service Electric and Gas Company (PSE&G) on a LPLS (Large Power and 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 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).

Natural Gas:

South Brunswick – Cambridge Elementary 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 25%-50% 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.

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" per kWh (kilowatt hour) for all buildings is $.1614/kWh (kWh is the common unit of electric measure). The average price per deka-therm 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 savings of over $500,000 per year (Note: Savings were calculated using South Brunswick High School's Average Annual Consumption of 8,520,053 kWh and a variance of $.06/kWh 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 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 $17,618 in the Pay for Performance Program. If natural gas consumption could be reduced by 15% the resultant incentive would be approximately $6,432. This would equate to a total incentive equal to approximately $24,050. 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

Crossroads South Middle School

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	REPLACE AIR-COOLED CHILLER	$31,200	$48,700	$8,250	$71,650	$3,956	$1,000	$4,956	20	$79,120	$20,000	10.4%	14.5	3.31%	$2,082.77
ECM #2	OFFICE ROOFTOP UNIT REPLACEMENT	$2,150	$4,150	$460	$5,840	$2,226	$500	$2,726	15	$33,390	$7,500	471.7%	2.1	46.53%	$26,702.81
ECM #3	VFD'S ON HW PUMPS	$10,140	$14,335	$1,670	$22,805	$3,616	$500	$4,116	20	$72,320	$10,000	217.1%	5.5	17.31%	$38,430.69
ECM #4	ADD (6) UNIT VENTILATORS TO AIR COOLED CHILLER	$10,800	$17,550	$0	$28,350	$1,643	$1,200	$2,843	20	$32,860	$24,000	15.9%	10.0	7.79%	$13,946.66
ECM #5	REPLACE ELECTRIC DHW WITH GAS HW HEATER- KITCHEN	$800	$1,700	$120	$2,380	$636	$50	$686	10	$6,360	$500	167.2%	3.5	0.00%	$0.00
ECM #6	INSTALL LIGHTING CONTROLS	$1,125	$0	$300	$825	$507	$0	$507	15	$7,605	$0	821.8%	1.6	0.00%	$0.00
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	204 KW SOLAR PV	$1,357,250	$485,050	$0	$1,842,300	$49,833	$111,805	$161,638	25	$1,245,825	$2,795,125	-32.4%	11.4	7.25%	$972,326.37

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

CONSTRUCTION COST AND REBATES

ECM # 1 - REPLACE 100 TON AIR COOLED CHILLER W/ 65 TON HI-EFF.	Qty	Unit Cost $	Material $	Labor $	Total $
65 Ton Air Cooled Chiller	1	$30,000	$30,000	$45,000	$75,000
Demo Old Chiller	1			$2,500	$2,500
Controls	1		$1,200	$1,200	$2,400
Chiller Rebate ($50/Ton) & Scrap Value					$8,250
Total after Rebate					**$71,650**

ECM # 2 - OFFICE ROOF TOP UNIT REPLACEMENT	Qty	Unit Cost $	Material $	Labor $	Total $
5 Ton Packaged Roof Top Unit	1	$2,000	$2,000	$3,000	$5,000
Demo Old Roof Top Unit	1			$1,000	$1,000
Controls	1		$150	$150	$300
Roof Top Unit Rebate ($92/Ton)					$460
Total after Rebate					**$5,840**

ECM # 3 - VARIABLE SPEED PUMPING	Qty	Unit Cost $	Material $	Labor $	Total $
Hot Water Pump (5 HP)	2	$2,820	$5,640	$8,460	$14,100
Variable Frequency Drive < 5HP	2	$1,500	$3,000	$3,750	$6,750
Controls	2	$250	$500	$875	$1,375
Piping			$1,000	$1,250	$2,250
VFD Rebate ($155/HP 5HP)					$1,550
Premium Eff Motor Rebate					$120
Total after Rebate					**$22,805**

ECM # 4 - (6) UNIT VENTILATORS - CLASSROOMS A102, 4, 6, 8, 10, 12	Qty	Unit Cost $	Material $	Labor $	Total $
Six (6) Unit Ventilators (CW & HW Coils)	6	$1,250	$7,500	$13,125	$20,625
Piping			$1,500	$2,625	$4,125
Controls	6	$300	$1,800	$1,800	$3,600
Total					**$28,350**

ECM # 5 - REPLACE ELECTRIC DHW - KITCHEN	Qty	Unit Cost $	Material $	Labor $	Total $
50 GAL. B&W HW HEATER	1	$650	$650	$1,300	$1,950
Controls / Flue Vent / Piping	1	$100	$150	$300	$450
Demo	1			$100	$100
Utility Rebate	1				$120
Total after Rebate					**$2,380**

ECM # 5 - LIGHTING RETROFIT	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Occupancy Sensors	1	$1,125	$1,125	$0	$1,125
Utility Rebate	1				$300
Total after Rebate					**$825**

REM # 7 - PV SOLAR	Qty	Unit Cost $	Material $	Labor $	Total $
204 KW PV Solar System	890	$1,525	$1,357,250	$485,050	$1,842,300
Total					**$1,842,300**

Annual Maintenance Cost

ECM	Base	Additional	Solar PV	Total
BASE CASE - EXISTING EQUIPMENT	$17,850	$0	$0	$17,850
ECM # 1 - REPLACE 100 TON AIR COOLED CHILLER W/ 75 TON HI-EFF.	$17,850	-$1,000	$0	$16,850
ECM # 2 - OFFICE ROOF TOP UNIT REPLACEMENT	$17,850	-$500	$0	$17,350
ECM # 3 - VARIABLE SPEED PUMPING - HW PUMPS	$17,850	-$500	$0	$17,350
ECM # 4 - (6) UNIT VENTILATORS - CLASSROOMS A102, 4, 6, 8, 10, 12	$17,850	-$1,200	$0	$16,650
ECM # 5 - REPLACE ELECTRIC DHW - KITCHEN	$17,850	$50	$0	$17,900
ECM # 6 - LIGHTING RETROFIT	$17,850	-$1,785	$0	$16,065
REM # 1 - SOLAR PV SYSTEM	$17,850	$0	$1,500	$19,350

EQUIPMENT REPLACEMENT COST FOR EACH ALTERNATE

BASE CASE - EXISTING EQUIPMENT

	$	Life	Yr Incurred
Existing 100 Ton Air Cooled Packaged Chiller	$42,000	20	1
Existing Office Roof Top Unit	$2,500	15	1
Existing Constant Speed Pumps	$5,600	20	5
Existing (6) PTAC w/ Baseboard	$4,500	10	5
Existing DHW Kitchen	$650	10	5
New 65 Ton AC Chiller	$0	20	20
New 5 Ton Roof Top Unit	$0	15	15
New VFD Pumps & Premium Efficient Motors	$0	16	16
New (6) Classroom Unit Ventilators	$0	20	20
New Kitchen DHW Heater	$0	10	10
New 204 KW PV Solar System	$0	25	25

ECM # 1 - REPLACE 100 TON AIR COOLED CHILLER W/ 65 TON HI-EFF.

Existing 100 Ton Air Cooled Packaged Chiller	$42,000	20	1
Existing Office Roof Top Unit	$2,500	15	1
Existing Constant Speed Pumps	$5,600	20	5
Existing (6) PTAC w/ Baseboard	$4,500	10	5
Existing DHW Kitchen	$650	10	5
New 65 Ton AC Chiller	$71,650	20	20
New 5 Ton Roof Top Unit	$0	15	15
New VFD Pumps & Premium Efficient Motors	$0	16	16
New (6) Classroom Unit Ventilators	$0	20	20
New Kitchen DHW Heater	$0	10	10
New 204 KW PV Solar System	$0	25	25

ECM # 2 - OFFICE ROOF TOP UNIT REPLACEMENT

Existing 100 Ton Air Cooled Packaged Chiller	$42,000	20	1
Existing Office Roof Top Unit	$2,500	15	1
Existing Constant Speed Pumps	$5,600	20	5
Existing (6) PTAC w/ Baseboard	$4,500	10	5
Existing DHW Kitchen	$650	10	5
New 65 Ton AC Chiller	$0	20	20
New 5 Ton Roof Top Unit	$5,840	15	15
New VFD Pumps & Premium Efficient Motors	$0	16	16
New (6) Classroom Unit Ventilators	$0	20	20
New Kitchen DHW Heater	$0	10	10
New 204 KW PV Solar System	$0	25	25

ECM # 3 - VARIABLE SPEED PUMPING - HW PUMPS

	$	Life	Yr Incurred
Existing 100 Ton Air Cooled Packaged Chiller	$42,000	20	1
Existing Office Roof Top Unit	$2,500	15	1
Existing Constant Speed Pumps	$5,600	20	5
Existing (6) PTAC w/ Baseboard	$4,500	10	5
Existing DHW Kitchen	$650	10	5
New 65 Ton AC Chiller	$0	20	20
New 5 Ton Roof Top Unit	$0	15	15
New VFD Pumps & Premium Efficient Motors	$22,805	16	16
New (6) Classroom Unit Ventilators	$0	20	20
New Kitchen DHW Heater	$0	10	10
New 204 KW PV Solar System	$0	25	25

ECM # 4 - (6) UNIT VENTILATORS - CLASSROOMS A102, 4, 6, 8, 10, 12			
	$	Life	Yr Incurred
Existing 100 Ton Air Cooled Packaged Chiller	$42,000	20	1
Existing Office Roof Top Unit	$2,500	15	1
Existing Constant Speed Pumps	$5,600	20	5
Existing (6) PTAC w/ Baseboard	$4,500	10	5
Existing DHW Kitchen	$650	10	5
New 65 Ton AC Chiller	$0	20	20
New 5 Ton Roof Top Unit	$0	15	15
New VFD Pumps & Premium Efficient Motors	$0	16	16
New (6) Classroom Unit Ventilators	$28,350	20	20
New Kitchen DHW Heater	$0	10	10
New 204 KW PV Solar System	$0	25	25

ECM # 5 - REPLACE ELECTRIC DHW - KITCHEN			
	$	Life	Yr Incurred
Existing 100 Ton Air Cooled Packaged Chiller	$42,000	20	1
Existing Office Roof Top Unit	$2,500	15	1
Existing Constant Speed Pumps	$5,600	20	5
Existing (6) PTAC w/ Baseboard	$4,500	10	5
Existing DHW Kitchen	$650	10	5
New 65 Ton AC Chiller	$0	20	20
New 5 Ton Roof Top Unit	$0	15	15
New VFD Pumps & Premium Efficient Motors	$0	16	16
New (6) Classroom Unit Ventilators	$0	20	20
New Kitchen DHW Heater	$2,380	10	10
New 204 KW PV Solar System	$0	25	25

ECM # 6 - LIGHTING CONTROLS RETROFIT			
	$	Life	Yr Incurred
Existing 100 Ton Air Cooled Packaged Chiller	$42,000	20	1
Existing Office Roof Top Unit	$2,500	15	1
Existing Constant Speed Pumps	$5,600	20	5
Existing (6) PTAC w/ Baseboard	$4,500	10	5
Existing DHW Kitchen	$650	10	5
New 65 Ton AC Chiller	$0	20	20
New 5 Ton Roof Top Unit	$0	15	15
New VFD Pumps & Premium Efficient Motors	$0	16	16
New (6) Classroom Unit Ventilators	$0	20	20
New Kitchen DHW Heater	$0	10	10
New 204 KW PV Solar System	$0	25	25

REM # 1 - PV SOLAR			
	$	Life	Yr Incurred
Existing 100 Ton Air Cooled Packaged Chiller	$42,000	20	1
Existing Office Roof Top Unit	$2,500	15	1
Existing Constant Speed Pumps	$5,600	20	5
Existing (6) PTAC w/ Baseboard	$4,500	10	5
Existing DHW Kitchen	$650	10	5
New 65 Ton AC Chiller	$0	20	20
New 5 Ton Roof Top Unit	$0	15	15
New VFD Pumps & Premium Efficient Motors	$0	16	16
New (6) Classroom Unit Ventilators	$0	20	20
New Kitchen DHW Heater	$0	10	10
New 204 KW PV Solar System	$1,842,300	25	25

Concord Engineering Group, Inc.

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

Cambridge Elementary School

TAG	MAKE	MODEL	TYPE	CAPACITY	EFFICIENCY	SERVES	LOCATION	REMAINING USEFUL LIFE	NOTES
CH-1	TRANE	CGACD101-RAUKK60AF GHPW	AIR COOLED PACKAGED WATER CHILLER	100 TONS	9 EER	LIBRARY AHU, CLASSROOMS B WING	PAD MOUNTED OUTSIDE BOILER ROOM	0 YEARS	INSTALLED 1987, 20 YEAR LIFE EXPECTANCY, UNLESS REHAB ON AIR COOLED CONDENSER & COMPRESSORS.
RTU-1	LENNOX	LGC060-H4DT1G	DX / GAS FIRED PACKAGED UNIT	5 TONS, 125 MBH IN, 100 MBH OUT.	12.5 EER, 80 %	CORRIDOR, TOILETS	ROOF OVER TOILET ROOM, RIGHT REAR D-WING	11 YEARS	BYPASS VAV SYSTEM , ECONOMIZER, POWER EXHAUST, VAV W/HW REHEAT COIL.
RTU-2	LENNOX	LGC072-H4BS1G	DX / GAS FIRED PACKAGED UNIT	6 TONS, 78 MBH IN, 62.4 OUT.	10.5 EER, 80%	CLASSROOMS D411, D413	ROOF OVER CLASSROOM, RIGHT REAR D-WING	11 YEARS	BYPASS VAV SYSTEM , ECONOMIZER, POWER EXHAUST, VAV W/HW REHEAT COIL.
RTU-3	LENNOX	LGC060-H4DT1G	DX / GAS FIRED PACKAGED UNIT	5 TONS, 78 MBH IN, 62.4 OUT.	12.5 EER, 80 %	CLASSROOM D410, D412	ROOF OVER CLASSROOM, RIGHT REAR D-WING	11 YEARS	BYPASS VAV SYSTEM , ECONOMIZER, POWER EXHAUST, VAV W/HW REHEAT COIL.
RTU-4	LENNOX	LGC072-H4BS1G	DX / GAS FIRED PACKAGED UNIT	6 TONS, 78 MBH IN, 62.4 OUT.	10.5 EER, 80%	CLASSROOMS D407, D409	ROOF OVER CLASSROOM, CENTER REAR D-WING	11 YEARS	BYPASS VAV SYSTEM , ECONOMIZER, POWER EXHAUST, VAV W/HW REHEAT COIL.
RTU-5	LENNOX	LGC072-H4BS1G	DX / GAS FIRED PACKAGED UNIT	6 TONS, 78 MBH IN, 62.4 OUT.	10.5 EER, 80%	CLASSROOMS D406, D408	ROOF OVER CLASSROOM, CENTER REAR D-WING	11 YEARS	BYPASS VAV SYSTEM , ECONOMIZER, POWER EXHAUST, VAV W/HW REHEAT COIL.
RTU-6	LENNOX	LGC060-H4DT1G	DX / GAS FIRED PACKAGED UNIT	5 TONS, 125 MBH IN, 100 OUT.	12.5 EER, 80 %	ART CLASSROOM D404	ROOF OVER CLASSROOM, LEFT REAR D-WING	11 YEARS	CONSTANT VOLUME, SINGLE ZONE, ECONOMIZER, POWER EXHAUST W/HW REHEAT
RTU-7	LENNOX	LGC060-H4DT1G	DX / GAS FIRED PACKAGED UNIT	5 TONS, 125 MBH IN, 100 OUT.	12.5 EER, 80 %	CLASSROOM D405, STORAGE, CORR.	ROOF OVER CLASSROOM, LEFT REAR D-WING	11 YEARS	CONSTANT VOLUME, SINGLE ZONE, ECONOMIZER, POWER EXHAUST.
RTU-8	LENNOX	LGC048-H4DT3G	DX / GAS FIRED PACKAGED UNIT	4 TONS, 125 MBH IN, 100 OUT.	12.5 EER, 80 %	MUSIC C303	ROOF OVER C303	11 YEARS	CONSTANT VOLUME, SINGLE ZONE, ECONOMIZER, POWER EXHAUST.
RTU-9	MCQUAY	RPS018CSA	DX / GAS FIRED PACKAGED UNIT	20 TONS, 320 MBH IN, 256 OUT.	11.3 EER, 80%	CAFETERIA & HALLWAY ENTRY	ROOF OVER HALLWAY	11 YEARS	CONSTANT VOLUME, SINGLE ZONE, ECONOMIZER, POWER EXHAUST.
RTU-10	MCQUAY	RPS036CLA	DX / GAS FIRED PACKAGED UNIT	40 TONS, 640 MBH IN, 512 MBH OUT.	10.9 EER, 80%	GYM C302, C305, C15, C16, STAGE C304	ROOF OVER STAGE	11 YEARS	CONSTANT VOLUME, SINGLE ZONE, ECONOMIZER, POWER EXHAUST.
AC-1	INTERNATIONAL	PAF060-L000E	DX / ELECTRIC HEAT PUMP PACKAGED UNIT	5 TONS, 14.4 MBH HEATING	12 EER	FRONT OF BUILDING	OLD ROOF - FRONT	11 YEARS	CONSTANT VOLUME, SINGLE ZONE, ECONOMIZER, ELECTRIC HEAT PUMP.
AC-2	INTERNATIONAL	PAF060-L000E	DX / ELECTRIC HEAT PUMP PACKAGED UNIT	5 TONS, 14.4 MBH HEATING	12 EER	FRONT OF BUILDING	OLD ROOF - FRONT	11 YEARS	CONSTANT VOLUME, SINGLE ZONE, ECONOMIZER, ELECTRIC HEAT PUMP.
AC-3	BORG WARNER	DDUT-T060AA	DX ROOFTOP COOLING	5 TONS	10 EER	FRONT OFFICES	FRONT OF BUILDING	1 YEAR	VERY OLD UNIT BUT STILL WORKING
AHU-1	TRANE	L-14	AIR HANDLING UNIT w/HW & CW COIL	14 TONS	N/A	MEDIA CENTER	CEILING ABOVE MEDIA CENTER	1 YEAR	VERY OLD UNIT BUT STILL WORKING
B-1	PATTERSON KELLY	CK14-99-10500	HOT WATER BOILER	1900 MBH INPUT, 1615 MBH OUTPUT	85%	ENTIRE BUILDING	BOILER ROOM OLD SECTION	15 YEARS	THERMIFIC HIGH EFFICIENCY, NON-CONDENSING, INSTALLED JULY 29, 1999, B-1 & B-2, SEQUENCED FOR EQUAL OPERATING TIME.
B-2	PATTERSON KELLY	CK14-99-10500	HOT WATER BOILER	1900 MBH INPUT, 1615 MBH OUTPUT	85%	ENTIRE BUILDING	BOILER ROOM OLD SECTION	15 YEARS	THERMIFIC HIGH EFFICIENCY, NON-CONDENSING, INSTALLED JULY 29, 1999, B-1 & B-2, SEQUENCED FOR EQUAL OPERATING TIME.
P-1	ARMSTRONG	*	IN-LINE CENTRIFUGAL, CONSTANT SPEED	5 HP	N/A	ENTIRE BUILDING	BOILER ROOM OLD SECTION	5 YEARS	LEAD-LAG WITH BOILERS B-1 & B-2
P-2	ARMSTRONG	*	IN-LINE CENTRIFUGAL, CONSTANT SPEED	5 HP	N/A	ENTIRE BUILDING	BOILER ROOM OLD SECTION	5 YEARS	LEAD-LAG WITH BOILERS B-1 & B-2
DHW-1	AO SMITH	BTH120-966	DOMESTIC WATER HEATER & STORAGE TANK	125 MBH, 60 GAL.	94%	TOILET ROOMS OLD SECTION	OLD BOILER ROOM	13 YEARS	NATURAL GAS
DHW-2	RHEEM	ES50-9-G-1	ELECTRIC WATER HEATER & STORAGE TANK	9 KW (30,709 BTU), 50 GALLON	98% RECOVERY EFFICIENCY	KITCHEN	KITCHEN UTILITY	12 YEARS	HEAVY DUTY COMMERCIAL, ELECTRIC, 480/60/3, 11 AMPS. 2003.

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Cambridge Elementary School

Building ID: 1819381
For 12-month Period Ending: May 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: August 13, 2009

Facility
Cambridge Elementary School
35 Cambridge Road
Kendall Park, NJ 08824

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1957
Gross Floor Area (ft²): 59,500

Energy Performance Rating[2] (1-100) 52

Site Energy Use Summary[3]

Natural Gas (kBtu)[4]	2,231,032
Electricity (kBtu)	2,335,699
Total Energy (kBtu)	4,566,731

Energy Intensity[5]

Site (kBtu/ft²/yr)	78
Source (kBtu/ft²/yr)	172

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	474

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

National Average Comparison

National Average Site EUI	80
National Average Source EUI	177
% 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	Cambridge 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	35 Cambridge Road, 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		☐

Cambridge Elementary (K-12 School)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	59,500 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	104 (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	70,080.00
03/06/2008	04/05/2008	58,320.00
02/06/2008	03/05/2008	57,240.00
01/06/2008	02/05/2008	55,920.00
12/06/2007	01/05/2008	56,160.00
11/06/2007	12/05/2007	56,880.00
10/06/2007	11/05/2007	59,160.00
09/06/2007	10/05/2007	60,600.00
08/06/2007	09/05/2007	56,520.00
07/06/2007	08/05/2007	58,027.00
06/06/2007	07/05/2007	62,837.00
Electricity Consumption (kWh (thousand Watt-hours))		**651,744.00**
Electricity Consumption (kBtu)		**2,223,750.53**
Total Electricity Consumption (kBtu)		**2,223,750.53**
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	810.00
03/06/2008	04/05/2008	3,500.00
02/06/2008	03/05/2008	4,460.00
01/06/2008	02/05/2008	4,260.00
12/06/2007	01/05/2008	5,120.00
11/06/2007	12/05/2007	3,280.00
10/06/2007	11/05/2007	360.00
09/06/2007	10/05/2007	60.00
08/06/2007	09/05/2007	70.00
07/06/2007	08/05/2007	30.00

06/06/2007	07/05/2007	50.00
Gas Consumption (therms)		**22,000.00**
Gas Consumption (kBtu)		**2,200,000.00**
Total Natural Gas Consumption (kBtu)		**2,200,000.00**
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
Cambridge Elementary School
35 Cambridge Road
Kendall Park, NJ 08824

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Cambridge Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	59,500
Year Built	1957
For 12-month Evaluation Period Ending Date:	May 31, 2008

Facility Space Use Summary

Cambridge Elementary	
Space Type	K-12 School
Gross Floor Area(ft^2)	59,500
Open Weekends?	Yes
Number of PCs[d]	104
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	52	52	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	78	78	62	N/A	80
Source (kBtu/ft^2)	172	172	138	N/A	177
Energy Cost					
$/year	$ 146,429.49	$ 146,429.49	$ 117,577.60	N/A	$ 150,354.40
$/$ft^2$/year	$ 2.46	$ 2.46	$ 1.98	N/A	$ 2.53
Greenhouse Gas Emissions					
$MtCO_2e$/year	474	474	381	N/A	487
$kgCO_2e/ft^2$/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.

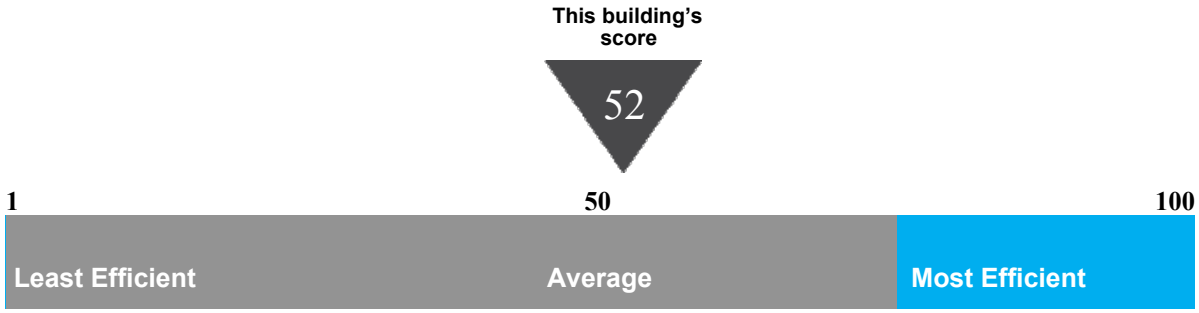
Statement of Energy Performance

2008

Cambridge Elementary School
35 Cambridge Road
Kendall Park, NJ 08824

Portfolio Manager Building ID: 1819381

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 172 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: 08/13/2009

ECM #6: Install Lighting Controls

Appendix E

Cambridge Elementary School

CEG Project #: 9C08134
Project Name : South Brunswick Schools Energy Audit
Address: 35 Cambridge Road
City, State: Kendall Park, NJ

Date 10/17/09
kWh Cost $0.155

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost			Proposed Ltg Control Annual Savings				
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**	**Ltg Control Description**	***Energy Savings kWh/Yr**	**Savings/ Yr $**	****Unit Cost, Total**	**Simple Payback, Yrs**
First Floor - Existing Building																				
Existing Classroom	1620	24	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1320	$331.45	24	Existing to Remain	1320	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	213.8	$33.15	$ 55.00	1.7
Existing Classroom	1620	24	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1320	$331.45	24	Existing to Remain	1320	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	24	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1320	$331.45	24	Existing to Remain	1320	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	213.8	$33.15	$ 55.00	1.7
Existing Classroom	1620	24	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1320	$331.45	24	Existing to Remain	1320	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	24	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1320	$331.45	24	Existing to Remain	1320	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	213.8	$33.15	$ 55.00	1.7
Existing Classroom	1620	24	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1320	$331.45	24	Existing to Remain	1320	0	0	$0.00		$0.00	$0.00	$0.00					
Original Corridor & Lobby	1800	20	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1100	$306.90	20	Existing to Remain	1100	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	198.0	$30.69	$ 55.00	1.8
Lobby Toilets	300	1	(3)13w CF Lamps. Surface Square' Fixture - 128w	128	$5.95	1	Existing to Remain	128	0	0	$0.00		$0.00	$0.00	$0.00					
Lobby Janitor Closet	400	1	(1)20w Spiral FLE Lamp. Fixture - 18w	18	$1.12	1	Existing to Remain	18	0	0	$0.00		$0.00	$0.00	$0.00					
Lobby Toilets	300	1	(3)13w CF Lamps. Surface Square' Fixture - 128w	128	$5.95	1	Existing to Remain	128	0	0	$0.00		$0.00	$0.00	$0.00					
Office Toilet	550	1	(3)13w CF Lamps. Surface Square' Fixture - 128w	128	$10.91	1	Existing to Remain	128	0	0	$0.00		$0.00	$0.00	$0.00					
Custoral Office	400	4	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	432	$26.78	4	Existing to Remain	432	0	0	$0.00		$0.00	$0.00	$0.00					
Principal's Office	1500	5	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	540	$125.55	5	Existing to Remain	540	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	81.0	$12.56	$ 55.00	4.4
General Office	2000	12	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1296	$401.76	12	Existing to Remain	1296	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Nurse's Office	1450	5	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	540	$121.37	5	Existing to Remain	540	0	0	$0.00		$0.00	$0.00	$0.00					
Nurse's Office Toilet	300	1	(2)32w T8 Lamps. Plastic Fixture w/Elec. Ballast - 55w	55	$2.56	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00					
Nurse's Office Toilet	300	1	(3)13w CF Lamps. Surface Square' Fixture - 128w	128	$5.95	1	Existing to Remain	128	0	0	$0.00		$0.00	$0.00	$0.00					
Nurse's Office Toilet	300	1	(2)w "U" Lamps. Surface Fixture w/Elec. Ballast - 55w	55	$2.56	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00					

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost			Proposed Ltg Control Annual Savings				
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**	**Ltg Control Description**	***Energy Savings kWh/Yr**	**Savings/ Yr $**	****Unit Cost, Total**	**Simple Payback, Yrs**
Nurse's Work Room	800	5	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	540	$66.96	5	Existing to Remain	540	0	0	$0.00		$0.00	$0.00	$0.00					
Office	1500	5	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	435	$101.14	5	Existing to Remain	435	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	65.3	$10.11	$ 55.00	5.4
Existing Classroom	1620	15	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	1305	$327.69	15	Existing to Remain	1305	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Mechanical Room	900	1	(2)32w T8 Lamps. Plastic Fixture w/Elec. Ballast - 55w	55	$7.67	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Toilet Room	300	1	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	55	$2.56	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Storage Room	500	2	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	110	$8.53	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Small Group Classroom	1800	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$60.26	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Corridor	1800	3	(1)32w Triple Tube CF Lamp. Hi Hat Fixture - 32w	96	$26.78	3	Existing to Remain	96	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Toilet Room	300	1	(2)32w T8 Lamps. Plastic Fixture w/Elec. Ballast - 55w	55	$2.56	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Corridor to New Building	1800	6	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	648	$180.79	6	Existing to Remain	648	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Girls Toilet	300	4	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	220	$10.23	4	Existing to Remain	220	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Boys Toilet	300	4	(2)32w T8 Lamps. Pendant Fixture w/Elec. Ballast - 55w	220	$10.23	4	Existing to Remain	220	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Faculty Room	600	25	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1375	$127.88	25	Existing to Remain	1375	0	0	$0.00		$0.00	$0.00	$0.00					
Exiting Work Room	900	6	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	330	$46.04	6	Existing to Remain	330	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	29.7	$4.60	$ 55.00	11.9
Existing Toilet Room	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Work Room	900	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$24.27	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Office	1000	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$26.97	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Conference Room	720	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$9.71	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Storage Room	500	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$6.74	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Small Group Classroom	1450	4	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	348	$78.21	4	Existing to Remain	348	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	33	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	1815	$455.75	33	Existing to Remain	1815	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	294.0	$45.57	$ 55.00	1.2
Existing Corridor	1800	3	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	261	$72.82	3	Existing to Remain	261	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	279.9	$43.39	$ 55.00	1.3
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00					

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost			Proposed Ltg Control Annual Savings				
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**	**Ltg Control Description**	***Energy Savings kWh/Yr**	**Savings/ Yr $**	****Unit Cost, Total**	**Simple Payback, Yrs**
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	279.9	$43.39	$ 55.00	1.3
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	279.9	$43.39	$ 55.00	1.3
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	279.9	$43.39	$ 55.00	1.3
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	279.9	$43.39	$ 55.00	1.3
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	279.9	$43.39	$ 55.00	1.3
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Classroom	1620	16	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1728	$433.90	16	Existing to Remain	1728	0	0	$0.00		$0.00	$0.00	$0.00	Dual Technology Occupancy Sensor	279.9	$43.39	$ 55.00	1.3
Existing Corridor	1800	12	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1296	$361.58	12	Existing to Remain	1296	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Corridor	1800	12	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1296	$361.58	12	Existing to Remain	1296	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Media Center	1800	76	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	8208	$2,290.03	76	Existing to Remain	8208	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Men's Room	300	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$10.04	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Ladies	300	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$10.04	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Corridor	1800	14	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1512	$421.85	14	Existing to Remain	1512	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Corridor	1800	3	(4)32w T8 Lamps. 4' x 4' Fixture w/Elec. Ballast - 108w	324	$90.40	3	Existing to Remain	324	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Boys Toilet	300	5	(1)150w Inc. Lamp. Recessed Square Fixture -150w	750	$34.88	5	Existing to Remain	750	0	0	$0.00		$0.00	$0.00	$0.00					

	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost			Proposed Ltg Control Annual Savings				
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**	**Ltg Control Description**	***Energy Savings kWh/Yr**	**Savings/ Yr $**	****Unit Cost, Total**	**Simple Payback, Yrs**
Existing Girls Toilet	300	6	(1)150w Inc. Lamp. Recessed Square Fixture -150w	900	$41.85	6	Existing to Remain	900	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Gymnasium	900	12	(8)42w T42 Lamps. Hi-hat Fixture - 318w	3816	$532.33	12	Existing to Remain	3816	0	0	$0.00		$0.00	$0.00	$0.00					
New & Existing Cafeteria	1080	33	(2)55w Lamp. Fixture -52w	1716	$287.26	33	Existing to Remain	1716	0	0	$0.00		$0.00	$0.00	$0.00					
First Floor - Existing Building Summary		**725**		**65603**	**$15,180**	**725**		**65603**	**0**	**0**	**$0**			**$0**	**$0**		**3269**	**$507**	**$825**	**1.6**
First Floor - New Building																				
New Office	1450	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$48.55	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00					
New Corridor	1800	2	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	216	$60.26	2	Existing to Remain	216	0	0	$0.00		$0.00	$0.00	$0.00					
New Storage Room	500	5	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	275	$21.31	5	Existing to Remain	275	0	0	$0.00		$0.00	$0.00	$0.00					
New Music Room	800	17	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	1836	$227.66	17	Existing to Remain	1836	0	0	$0.00		$0.00	$0.00	$0.00					
New Storage Room	500	2	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	174	$13.49	2	Existing to Remain	174	0	0	$0.00		$0.00	$0.00	$0.00					
Existing Kitchen & Storage Room	500	8	(4)32w T8 Lamps. Recessed Fixture w/Elec. Ballast - 108w	864	$66.96	8	Existing to Remain	864	0	0	$0.00		$0.00	$0.00	$0.00					
New Corridor	1800	24	(4)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 108w	2592	$723.17	24	Existing to Remain	2592	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	$262.15	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00					
New Classroom Closet	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
New Storage Room	300	2	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	110	$5.12	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00					
New Storage Room	300	2	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	110	$5.12	2	Existing to Remain	110	0	0	$0.00		$0.00	$0.00	$0.00					
New Toilet Room	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
New Toilet Room	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
New Kindergarten	1450	11	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	957	$215.09	11	Existing to Remain	957	0	0	$0.00		$0.00	$0.00	$0.00					
New Kindergarten	1450	11	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	957	$215.09	11	Existing to Remain	957	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	$262.15	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00					
New Classroom Closet	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
New Classroom Closet	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	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	$262.15	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00					
New Storage Room	500	4	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	220	$17.05	4	Existing to Remain	220	0	0	$0.00		$0.00	$0.00	$0.00					
New Electrical Room	300	4	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	220	$10.23	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			Proposed Ltg Control Annual Savings				
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**	**Ltg Control Description**	***Energy Savings kWh/Yr**	**Savings/ Yr $**	****Unit Cost, Total**	**Simple Payback, Yrs**
New Boys Room	300	3	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	261	$12.14	3	Existing to Remain	261	0	0	$0.00		$0.00	$0.00	$0.00					
New Girls Room	300	3	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	261	$12.14	3	Existing to Remain	261	0	0	$0.00		$0.00	$0.00	$0.00					
New Janitor Closet	500	1	(2)32w T8 Lamps. 1' x 4' Fixture w/Elec. Ballast - 55w	55	$4.26	1	Existing to Remain	55	0	0	$0.00		$0.00	$0.00	$0.00					
New Small Group Instruction	1400	4	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	348	$75.52	4	Existing to Remain	348	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	$262.15	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00					
New Classroom Closet	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
New Classroom Closet	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	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	$262.15	12	Existing to Remain	1044	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	$262.15	12	Existing to Remain	1044	0	0	$0.00		$0.00	$0.00	$0.00					
New Classroom Closet	300	1	(3)32w T8 Lamps. 2' x 4' Fixture w/Elec. Ballast - 87w	87	$4.05	1	Existing to Remain	87	0	0	$0.00		$0.00	$0.00	$0.00					
First Floor - New Building Summary		**185**		**16632**	**$3,338**	**185**		**16632**	**0**	**0**	**$0**			**$0**	**$0**		**0**	**$0**	**$0**	
	Totals:	**910**		**82235**	**$18,519**	**910**		**82235**	**0**	**0**	**$0**			**$0**	**$0**		**3269**	**$507**	**$825**	**1.6**

COMMENTS:

*Based on ASHRAE Standard 90.1-2004, Appendix G.

**Occupancy Sensor unit cost includes a $20 NJ Smart Start incentive per unit.

Project Name: Cambridge 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	$1,842,300
Annual kWh Production	319,444
Annual Energy Cost Reduction	$49,833
Annual SREC Revenue	$111,805
First Cost Premium	**$1,842,300**
Simple Payback:	**11.40** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	240	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.156**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$92,115	0	0	0	$0	0	0	(92,115)	0
1	$0	319,444	$49,833	$0	$111,805	$121,194	$41,636	($1,191)	($93,306)
2	$0	317,847	$51,328	$0	$111,246	$118,184	$44,646	($255)	($93,562)
3	$0	316,257	$52,868	$0	$110,690	$114,957	$47,873	$728	($92,834)
4	$0	314,676	$54,454	$0	$110,137	$111,496	$51,334	$1,761	($91,073)
5	$0	313,103	$56,088	$3,225	$109,586	$107,785	$55,045	($381)	($91,454)
6	$0	311,537	$57,770	$3,209	$109,038	$103,806	$59,024	$770	($90,685)
7	$0	309,979	$59,503	$3,193	$108,493	$99,539	$63,291	$1,974	($88,711)
8	$0	308,430	$61,289	$3,177	$107,950	$94,964	$67,866	$3,232	($85,479)
9	$0	306,887	$63,127	$3,161	$107,411	$90,057	$72,773	$4,547	($80,932)
10	$0	305,353	$65,021	$3,145	$106,874	$84,797	$78,033	$5,919	($75,013)
11	$0	303,826	$66,972	$3,129	$106,339	$79,156	$83,674	$7,351	($67,661)
12	$0	302,307	$68,981	$3,114	$105,807	$73,107	$89,723	$8,845	($58,817)
13	$0	300,796	$71,050	$3,098	$105,278	$66,621	$96,209	$10,401	($48,416)
14	$0	299,292	$73,182	$3,083	$104,752	$59,666	$103,164	$12,021	($36,395)
15	$0	297,795	$75,377	$3,067	$104,228	$52,208	$110,622	$13,708	($22,687)
16	$0	296,306	$77,639	$3,052	$103,707	$44,211	$118,619	$15,464	($7,223)
17	$0	294,825	$79,968	$3,037	$103,189	$35,636	$127,194	$17,290	$10,067
18	$0	293,350	$82,367	$3,022	$102,673	$26,441	$136,389	$19,188	$29,254
19	$0	291,884	$84,838	$3,006	$102,159	$16,582	$146,248	$21,161	$50,415
20	$0	290,424	$87,383	$2,991	$101,649	$6,010	$156,820	$23,210	$73,625
21	$0	288,972	$90,004	$2,976	$101,140	$5,095	$144,166	$38,907	$112,532
22	$0	287,527	$92,704	$2,962	$100,635	$3,487	$118,635	$68,255	$180,787
23	$0	286,090	$95,486	$2,947	$100,131	$0	$0	$192,670	$373,458
24	$0	284,659	$98,350	$2,932	$99,631	$0	$0	$195,049	$568,507
25	$0	283,236	$101,301	$2,917	$99,133	$0	$0	$197,516	$766,023
	Totals:	6,094,317	$1,339,037	$49,709	$2,133,011	$1,506,415	$1,750,185	$2,012,987	$1,040,419
				Net Present Value (NPV)			**$93,669**		
				Internal Rate of Return (IRR)			**11.1%**		

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

Simple Payback Analysis

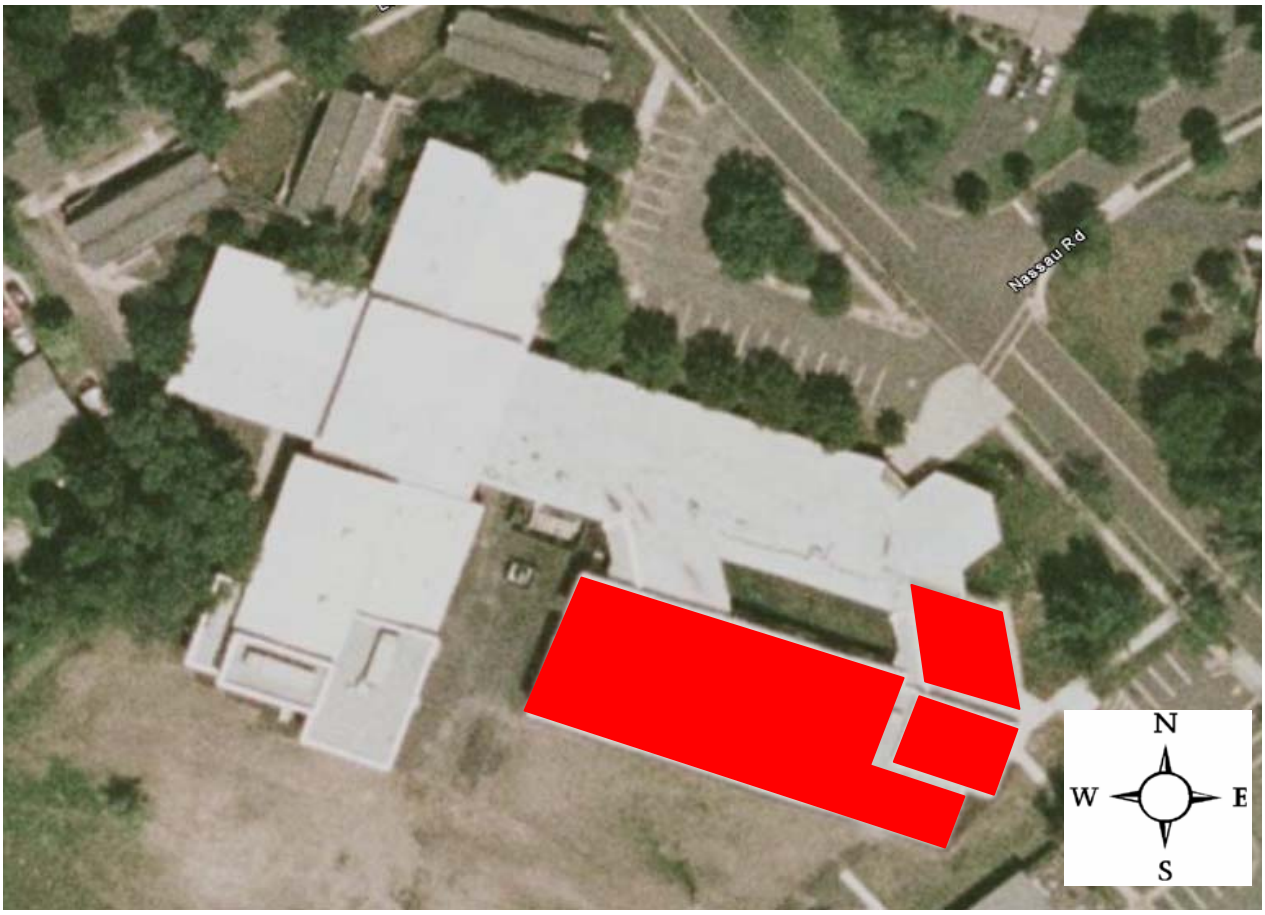
	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,842,300
Annual kWh Production	319,444
Annual Energy Cost Reduction	$49,833
Annual SREC Revenue	$111,805
First Cost Premium	**$1,842,300**
Simple Payback:	**11.40** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.156**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$1,842,300	0	0	0	$0	(1,842,300)	0
1	$0	319,444	$49,833	$0	$111,805	$161,639	($1,680,661)
2	$0	317,847	$51,328	$0	$111,246	$162,575	($1,518,087)
3	$0	316,257	$52,868	$0	$110,690	$163,558	($1,354,529)
4	$0	314,676	$54,454	$0	$110,137	$164,591	($1,189,938)
5	$0	313,103	$56,088	$3,225	$109,586	$162,449	($1,027,489)
6	$0	311,537	$57,770	$3,209	$109,038	$163,600	($863,890)
7	$0	309,979	$59,503	$3,193	$108,493	$164,803	($699,086)
8	$0	308,430	$61,289	$3,177	$107,950	$166,062	($533,024)
9	$0	306,887	$63,127	$3,161	$107,411	$167,377	($365,647)
10	$0	305,353	$65,021	$3,145	$106,874	$168,749	($196,898)
11	$0	303,826	$66,972	$3,129	$106,339	$170,181	($26,716)
12	$0	302,307	$68,981	$3,114	$105,807	$171,675	$144,958
13	$0	300,796	$71,050	$3,098	$105,278	$173,231	$318,189
14	$0	299,292	$73,182	$3,083	$104,752	$174,851	$493,040
15	$0	297,795	$75,377	$3,067	$104,228	$176,538	$669,578
16	$0	296,306	$77,639	$3,052	$103,707	$178,294	$847,872
17	$0	294,825	$79,968	$3,037	$103,189	$180,120	$1,027,991
18	$0	293,350	$82,367	$3,022	$102,673	$182,018	$1,210,009
19	$0	291,884	$84,838	$3,006	$102,159	$183,991	$1,394,000
20	$0	290,424	$87,383	$2,991	$101,649	$186,040	$1,580,040
21	$1	288,972	$90,004	$2,976	$101,140	$188,168	$1,768,208
22	$2	287,527	$92,704	$2,962	$100,635	$190,378	$1,958,586
23	$3	286,090	$95,486	$2,947	$100,131	$192,670	$2,151,256
24	$4	284,659	$98,350	$2,932	$99,631	$195,049	$2,346,305
25	$5	283,236	$101,301	$2,917	$99,133	$197,516	$2,543,821
	Totals:	6,094,317	$1,339,037	$49,709	$2,133,011	$4,386,121	$3,422,340
				Net Present Value (NPV)		**$2,543,846**	
				Internal Rate of Return (IRR)		**7.8%**	

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
Cambridge Elementary	13,100	Sunpower SPR230	890	14.7	13,087	204.70	319,444	29,370	15.64



.= Proposed PV Layout

Roof Area	2,020	82%	1,656 S.F.	112 Panels	25.76 Kw
Roof Area	11,877	85%	10,095 S.F.	686 Panels	157.78 Kw
Roof Area	1,586	85%	1,348 S.F.	92 Panels	21.16 Kw
Total Roof Area			13,100 S.F.	890 Panels	204.7 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.

MONTHLY UTILITY COSTS

By CAE

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Utility Costs -------												
Alternative 1 BASE CASE - EXISTING EQUIPMENT													
Electric													
On-Pk Cons. ($)	10,026	8,961	10,024	9,500	9,125	6,671	7,382	6,496	4,183	9,856	9,385	9,609	101,217
Gas													
On-Pk Cons. ($)	11,361	7,518	5,263	2,593	872	148	130	150	462	1,466	2,560	7,104	39,628
Monthly Total ($):	21,387	16,479	15,287	12,093	9,997	6,819	7,512	6,646	4,645	11,321	11,945	16,713	140,845

Building Area = 59,500 ft²
Utility Cost Per Area = 2.37 $/ft²

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative 2 ECM #1 - REPLACE AIR COOLED CHILLER													
Electric													
On-Pk Cons. ($)	9,937	8,881	9,934	9,414	9,035	6,240	7,011	6,075	4,172	9,766	9,299	9,521	99,283
Gas													
On-Pk Cons. ($)	11,159	7,335	5,042	2,401	660	76	65	75	270	1,254	2,358	6,911	37,606
Monthly Total ($):	21,096	16,215	14,975	11,814	9,695	6,317	7,076	6,150	4,441	11,020	11,656	16,432	136,889

Building Area = 59,500 ft²
Utility Cost Per Area = 2.30 $/ft²

MONTHLY UTILITY COSTS

By CAE

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Utility Costs -------												
Alternative 3 ECM #2 - REPLACE ROOFTOP UNIT													
Electric													
On-Pk Cons. ($)	9,937	8,881	9,933	9,413	9,030	6,918	7,616	6,526	4,174	9,766	9,299	9,521	101,013
Gas													
On-Pk Cons. ($)	11,159	7,335	5,042	2,401	660	76	65	75	270	1,254	2,358	6,911	37,606
Monthly Total ($):	21,096	16,215	14,975	11,814	9,691	6,994	7,681	6,601	4,444	11,020	11,656	16,432	138,619

Building Area = 59,500 ft²
Utility Cost Per Area = 2.33 $/ft²

Alternative 4 ECM #3 - VARIABLE SPEED PUMPS													
Electric													
On-Pk Cons. ($)	9,813	8,747	9,765	9,231	8,889	6,897	7,611	6,522	4,094	9,569	9,116	9,369	99,623
Gas													
On-Pk Cons. ($)	11,159	7,335	5,042	2,401	660	76	65	75	270	1,254	2,358	6,911	37,606
Monthly Total ($):	20,972	16,082	14,807	11,632	9,550	6,973	7,676	6,597	4,364	10,823	11,474	16,280	137,229

Building Area = 59,500 ft²
Utility Cost Per Area = 2.31 $/ft²

MONTHLY UTILITY COSTS

By CAE

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Utility Costs -------												
Alternative 1 BASE CASE - EXISTING EQUIPMENT													
Electric													
On-Pk Cons. ($)	10,026	8,961	10,024	9,500	9,125	6,671	7,382	6,496	4,183	9,856	9,385	9,609	101,217
Gas													
On-Pk Cons. ($)	11,361	7,518	5,263	2,593	872	148	130	150	462	1,466	2,560	7,104	39,628
Monthly Total ($):	21,387	16,479	15,287	12,093	9,997	6,819	7,512	6,646	4,645	11,321	11,945	16,713	140,845

Building Area = 59,500 ft²
Utility Cost Per Area = 2.37 $/ft²

Alternative 2 ECM #4 Install (6) Unit Ventilators in Classrooms													
Electric													
On-Pk Cons. ($)	10,021	8,957	10,008	9,491	9,231	6,412	6,780	6,205	4,048	9,871	9,375	9,593	99,991
Gas													
On-Pk Cons. ($)	11,220	7,427	5,211	2,569	871	148	130	150	462	1,462	2,540	7,022	39,211
Monthly Total ($):	21,241	16,384	15,218	12,060	10,102	6,560	6,910	6,355	4,510	11,333	11,915	16,615	139,202

Building Area = 59,500 ft²
Utility Cost Per Area = 2.34 $/ft²

MONTHLY UTILITY COSTS

By CAE

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Utility Costs -------												
Alternative 3 ECM #5 Replace Electric DHW Heater													
Electric													
On-Pk Cons. ($)	9,948	8,890	9,938	9,423	9,040	6,642	7,355	6,466	4,106	9,771	9,307	9,535	100,423
Gas													
On-Pk Cons. ($)	11,392	7,546	5,297	2,596	872	148	130	150	462	1,468	2,591	7,133	39,786
Monthly Total ($):	21,340	16,436	15,236	12,019	9,913	6,790	7,486	6,616	4,568	11,240	11,898	16,668	140,209

Building Area = 59,500 ft²

Utility Cost Per Area = 2.36 $/ft²