ENERGY AUDIT – FINAL REPORT

METUCHEN BOARD OF EDUCATION
CAMPBELL ELEMENTARY SCHOOL
24 DURHAM AVENUE
METUCHEN, NJ 08840
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CEG PROPOSAL NO. 9C08133

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I. EXECUTIVE SUMMARY

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

Metuchen Board of Education
Campbell Elementary School
24 Durham Avenue
Metuchen, NJ 08840

Municipal Contact Person: Michael Harvier

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

The annual energy costs at this facility are as follows:

Electricity	$ 99,254
Natural Gas	$ 56,011
Total	$ 155,265

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)

ECM NO.	DESCRIPTION	COST[A]	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE RETURN ON INVESTMENT
1	Lighting Controls	$2,530	$2,101	1.2	85.2%
2	Lighting Upgrade - General	$86,471	$3,219	26.8	4.7%
3	Lighting Upgrade – Gymnasium	$9,400	$756	12.4	12.2%
4	Exit Sign Replacement	$581	$281	2.1	66.0%
5	Domestic HW Heater Replacement	$8,685	$1,268	6.8	14.1%
6	Replace Electric UV with HW Unit	$6,500	$364	17.8	(0.2%)
7	Replace UV with High-Efficiency Unit	$7,800	$683	11.4	5.6%
8	Exterior Window Replacement	$21,500	$735	26.5	10.8%

Notes: A. Cost takes into consideration applicable NJ Smart Start™ incentives and 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

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Lighting Controls	-	13,732	-
2	Lighting Upgrade - General	7.5	21,036	-
3	Lighting Upgrade – Gymnasium	1.3	4,942	-
4	Exit Sign Replacement	0.2	1,840	-
5	Domestic HW Heater Replacement	-	-	783
6	Replace Electric UV with HW Unit	-	2,430/Unit	(675/Unit)
7	Replace UV with High-Efficiency Unit	-	4,375/Unit	(487/Unit)
8	Exterior Window Replacement	-	-	440

Concord Engineering Group (CEG) strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for the Metuchen High School:

- **ECM #1:** Lighting Controls
- **ECM #4:** Exit Sign Replacement
- **ECM #5:** Domestic HW Heater Replacement

CEG also has a secondary recommendation that the Owner review the implementation of ECM #3: Lighting Upgrade – Gymnasium and also, the installation of the Photovoltaic System outlined in Section VIII of this report. These ECMs have a simple payback greater than the standard seven (7) year threshold; however both will be advantageous to the Owner over the lifetime of the facility. The lighting upgrade in the gymnasium will provide better, more even light distribution in addition to the maintenance savings. The Photovoltaic system will allow the Owner to produce electricity on-site and cut down on the kilo-watt hours expended at the facility. Through appropriate funding, the simple payback on the afore-mentioned could be lessened to within a more reasonable timeframe.

In addition to the above recommendations, based on the review of the facility's energy bills and discussions with the School District, the energy audit team recommends Retro-Commissioning of this facility to meet the following objectives:

- Bring existing HVAC equipment to its proper operational state including air and water distribution systems
- Reduce energy use and energy costs
- Improve indoor air quality
- Verify the installation and performance of identified system upgrades
- Address overall building energy use and demand and identify areas of highest energy use and demand
- Identify the location of the most comfort problems or trouble spots in the building
- Review current O&M practices

Through the implementation of a Retro-Commissioning Plan, the School District will be able to continue with their vision of reducing energy usage and operating efficient facilities.

II. INTRODUCTION

This comprehensive energy audit covers the 58,000 square foot Campbell Elementary School facility that includes classrooms, a gymnasium, fitness center, library, auditorium, cafeteria/kitchen, music rooms, administrative offices, locker rooms, computer labs, etc. The original structure was built in 1951 with a major renovation in 1998 that upgraded most existing major HVAC equipment to more energy-efficient units.

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 Index (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 municipal 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 to calculate the anticipated energy usage for the proposed energy conservation measures (ECMs). 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 ECMs.

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. 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. These costs do not include engineering, permits, measurement & verification costs or commissioning services. 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

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-08 to December-08. The Owner was able to gather the information for the above-reference period for our review and analysis. The Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under two different rates; Large Power and Lighting Secondary Service (LPLS) Rate and General Lighting and Power Service (GLP) Rate. The first rate encompasses general purpose at secondary distribution voltages where the customer's demand exceeds 150 Kilowatts in any one month. The second rate encompasses general purposes at secondary distribution voltages. 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. PSE&G still provides the electric service distribution to the facility.

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from January-08 to December-08. Campbell Elementary School receives natural gas via two means. Hess Corporation and Woodruff Energy are both Third Party Suppliers (TPS) that the Owner has contracted with to provide the commodity side of the natural gas supply; Woodruff Energy is the Owner's current TPS for this facility. Elizabethtown Gas, under their basic general delivery rate, provides delivery of the natural gas supply to the facility.

Based on the utility data provide by the Owner, the average cost for utilities at this facility is as follows:

Description	Average
Electricity	15.3¢ / kWh
Natural Gas	$1.62 / Therm

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
1/08	135,930	214	$ 17,079.94
2/08	61,290	213	$ 8,011.13
3/08	54,780	190	$ 7,093.24
4/08	49,240	158	$ 6,494.66
5/08	37,980	6	$ 6,716.39
6/08	37,150	6	$ 7,823.12
7/08	22,740	4	$ 5,499.83
8/08	32,600	5	$ 7,362.37
9/08	33,060	147	$ 7,382.92
10/08	53,980	178	$ 7,827.39
11/08	58,920	189	$ 8,113.21
12/08	71,600	213	$ 9,849.62
Totals	**649,270**	**MAX 214**	**$ 99,254**

Notes: All rates and bills are compiled from two (2) separate meters with different billing services.

Figure 1
Electricity Usage Profile

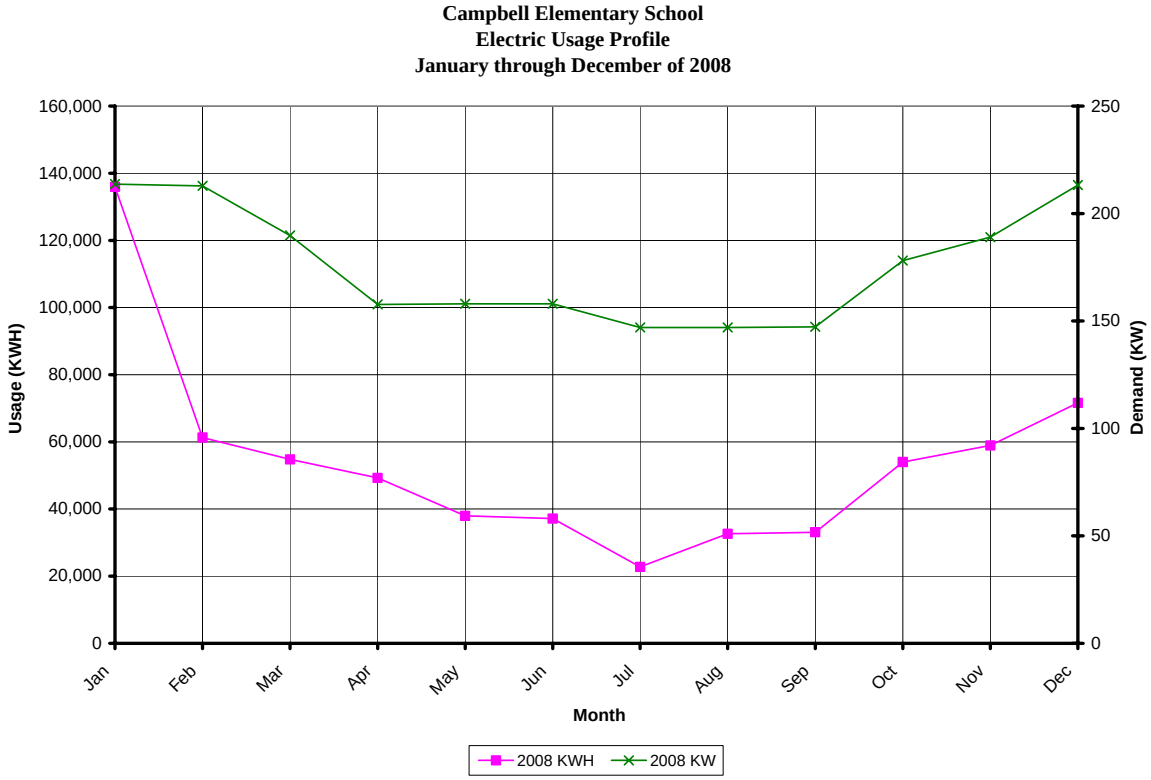
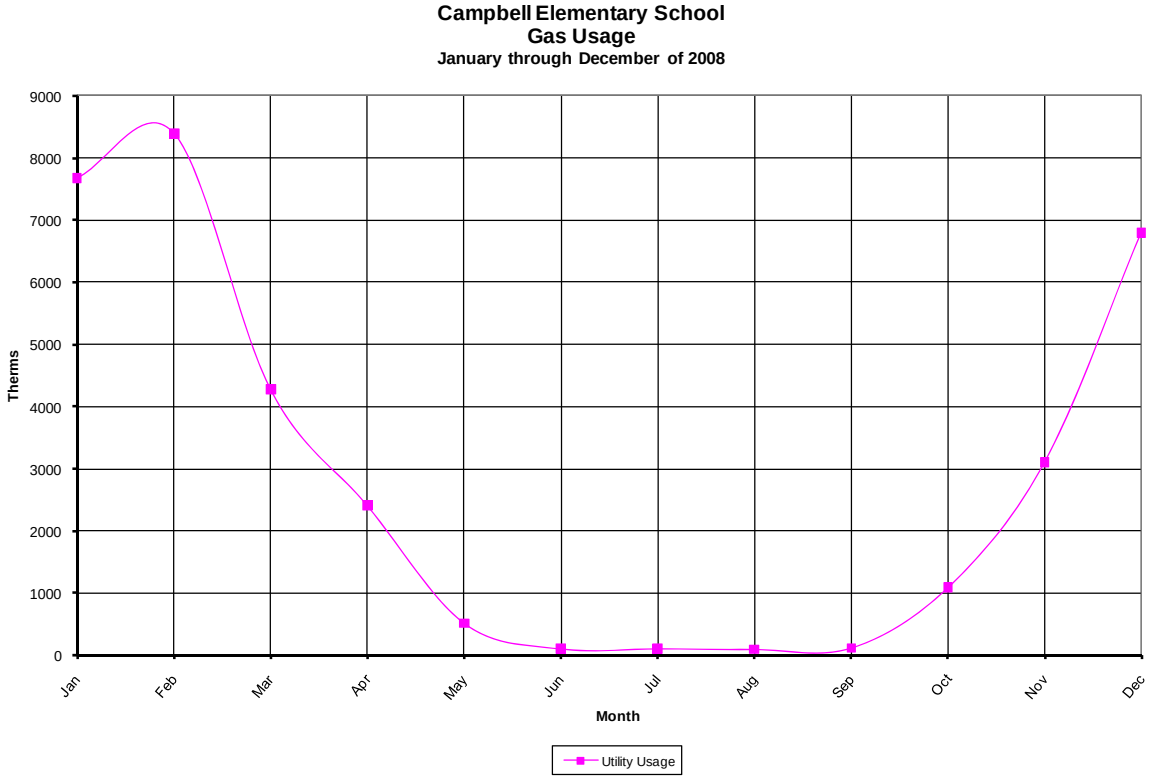


Table 4
Natural Gas Billing Data

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
1/08	7,674.6	$ 12,364
2/08	8,394.7	$ 13,501
3/08	4,273.9	$ 6,988
4/08	2,406.3	$ 4,009
5/08	514.8	$ 1,035
6/08	101.8	$ 389
7/08	103.1[A]	$ 525[A]
8/08	92.8[A]	$ 474[A]
9/08	115.1	$ 398
10/08	1,086.8	$ 1,757
11/08	3,103.7	$ 4,631
12/08	6,803.5	$ 9,937
Totals	**31,671**	**$ 56,011**

Notes: A. Utility information for 7/08 and 8/08 are estimated; utility bill was not provided by Owner for this month.

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (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. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance amongst building of similar type. 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 (EUI) compares with similar facilities throughout the U.S. and in your specific region or state. Figure 3 below depicts a national EUI grading for elementary schools. The EUI for this facility is calculated as follows:

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

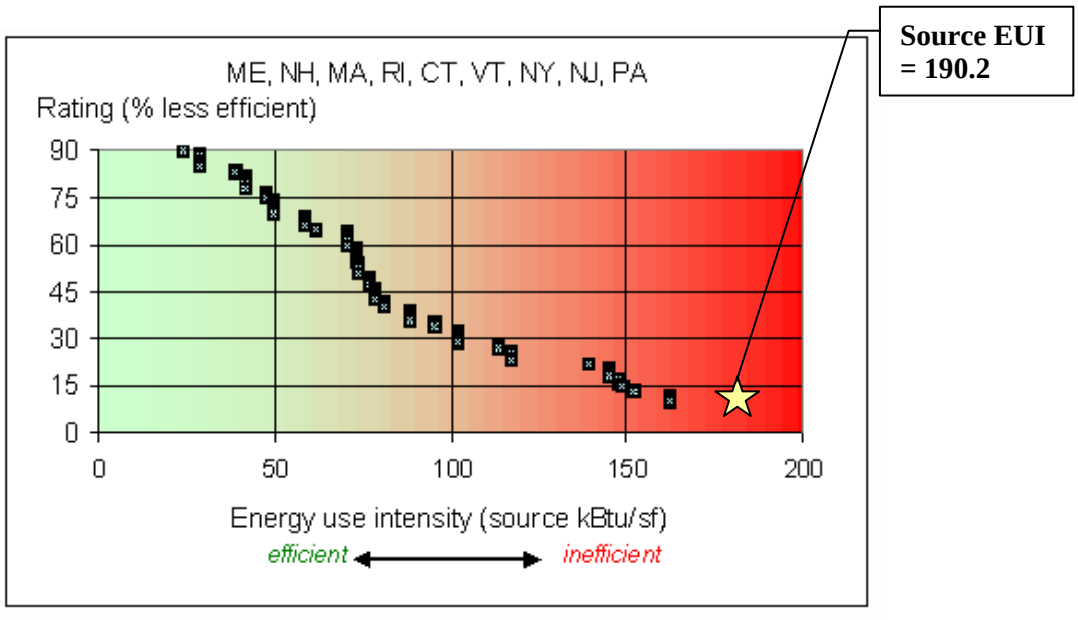
Electric = ((649,270 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 2,216,607.78 kBtu/h

Gas = ((34,671 therms) * (100,000 Btu/h / 1 W)) / (1000 Btu/h / 1 kBtu/h) = 3,467,100 kBtu/h

$$Building\ \ EUI = \frac{(2{,}216{,}607.78\ kBtu/h + 3{,}467{,}100\ kBtu/h)}{58{,}000\ SF} = \frac{5{,}683{,}707\ kBtu/h}{58{,}000\ SF}$$

Campbell Elementary School EUI = 97.9 kBtu/SF (Site Energy); 190.2 kBtu/SF (Source Energy)

Figure 3
Energy Use Intensity Distributions: Elementary School



C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows 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 priorities 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 municipal in order to allow the municipal access to monitoring their yearly energy usage as it compares to facilities of similar type. The following is the user name and password for this account:

User Name:	metuchentwp
Password:	lgeaceg2009
Security Question:	What is your birth city? metuchen

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
Campbell Elementary School	11	50

Refer to Appendix E for detailed energy benchmarking report entitled “STATEMENT OF ENERGY PERFORMANCE.”

V. FACILITY DESCRIPTION

The 58,000 SF Campbell Elementary School is comprised of classrooms, administrative offices, a faculty room, and a library. The typical hours of operation for this facility are between 7:00 am and 3:30 pm for the classrooms, and 6:30 am and 5:00 pm for the aforementioned offices. There are also numerous after school activities and community functions in the evenings and weekends. Originally built in 1951, the school has undergone one renovation. This renovation was completed in 1998 and significantly increased the square footage of the school and upgraded most of the HVAC equipment. The 1998 structure is masonry walls with brick veneer. The majority of the roofing for the facility is dark-colored, flat built-up rubber roof. There is a small a-frame section of shingled roof located in the front of the building. The windows throughout the facility vary in type and thermal value. There are portions of the facility that have not received a window upgrade as of the date of this survey. The typical windows that have not been replaced are single pane, ¼" thick, glass or plexi-glass housed in un-insulated aluminum frames. The typical replacement window utilized throughout the facility is a double pane, ¼" thick thermal panel with a 3/8" air space housed in an aluminum frame.

Heating System

The facility is heated via hot water boilers located in the basement mechanical room. The boilers are three (3) condensing, Aerco Benchmark 2.0 boilers; installed in 1999. All three (3) boilers have an input of 2,000 MBH and an output of 1,800 MBH (87% efficient at full load). Two (2) end suction pumps provide hot water flow throughout the school. The motor for each hot water pump is a 7.5 HP Baldor Motor with a rated efficiency of approximately 88.5%.

The classroom portions of the facility are heated via unit ventilators (vertical or horizontal) with hot water coils that appear to be in decent operating condition. The unit ventilators that are located in the non-renovated portion of the building appear to be approximately thirty (30) years of age which is ten (10) years longer than the expected service life as outlined in 2007 ASHRAE Applications Handbook. The unit ventilator(s) located in the renovated portion of the facility is approximately eleven (11) years of age and has an estimated nine (9) years service life remaining.

It is pertinent to note, that the unit ventilators installed in the modular annex and adjacent existing classrooms contain electric heating coils (+/- 20 kW each) with no cooling; these units are in Rooms #16, #17, #18, #19, #20, #38, #39 and #46.

The other areas of the facility are heated via forced-hot air delivered via the packaged rooftop equipment.

Corridors and entry ways are heating via cabinet unit heaters.

Cooling System

The existing portions of the facility are minimally air-conditioned via window air-conditioning units of various size and age. The standard size window air-conditioning unit observed was 12,000 Btu/h cooling capacity.

The portions of the facility that were part of the renovations are provided cooling via packaged rooftop units. These areas include the Child Study Team Suite, Library and Administrative Offices. The packaged rooftop units are manufactured by Aaon and contain R-22 DX cooling coils. The age

of the rooftop units is approximately ten (10) years and according to the 2007 ASHRAE Applications Handbook these units have about five (5) more years of remaining life. However, if equipment maintenance is kept up-to-date the Owner could see a longer equipment life.

Classrooms #21 and 22 are provided cooling via split condensing units located at grade outside the respective classrooms. A DX cooling coil is provided within each unit ventilator and piped to the split condensing unit.

Exhaust System

Exhaust air for this facility is exhausted from each space via rooftop exhaust fans of various sizes. Exhaust fans are operated based on the facility occupancy schedule.

Domestic Hot Water

Domestic hot water for the restrooms/showers is provided by one (1) gas fired, A.O. Smith Masterfit Domestic Hot Water Heater, with a 100-gallon capacity and 199 MBH input. Domestic hot water is circulated by a fractional horsepower, Bell & Gossett inline pump.

HVAC Control System

The school district has upgraded all controls to an Andover system. The building is controlled via the DDC system and is operated on a facility occupancy schedule as set by the Owner. The Owner has control of the DDC system via a computer front-end located in the Maintenance Office.

Lighting

Typical lighting throughout most of the classrooms is provided by 1'x 4' pendant-hung fixtures with T-12 lamps and magnetic ballasts. There has been a lighting retro-fit conducted in Classroom # 36 (Canter) where the District has replaced the existing fixtures with new, pendant hung, direct/indirect fixtures with T8 lamps and electronic ballasts. Also, the classrooms that were part of the renovations were provided with pendant hung, direct/indirect fixtures with T8 lamps and electronic ballasts.

Corridors and Storage Rooms are typically lit via 2' x 4' recessed or 1' x 4' surface mounted fixtures containing either T12 or T8 lamps. The areas that contain T12 fixtures should be reviewed for possible retro-fit.

The Administrative Areas are lit via T8 lighting fixtures of various sizes and mounting type. It is pertinent to note, that all fixtures in the Administrative Areas contain electronic ballasts.

The Gymnasium is lit via twenty (20) HID 250W Metal Halide light fixtures with prismatic reflectors located at approximately 22'-0" above the finished floor. Each fixture contains a 250-metal halide lamp. These fixtures should be reviewed for replacement.

Exit signs throughout the facility vary in type. There are some exit signs that contain incandescent lamps and others that are LED in type.

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 energy 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 manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. Many times this is due to the idea that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can be off for only a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is all it would take. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

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

CEG would recommend wall switches for individual rooms, ceiling mount sensors for larger rooms (classrooms), office areas or restrooms, and fixture mount box sensors for some applications as manufactured by Sensorswitch, Watt Stopper or equivalent. There are approximately 50 sensors required for this project that will control approximately 45,000 SF of space.

Energy Savings Calculations:

From Appendix F of this report, we calculated the lighting power density (Watts/ft^2) of the existing offices, conferences rooms, file rooms, copy rooms, storage rooms, equipment rooms, etc. to be 1.09 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

$$Energy\ Savings = \left(10\% \times\ Watts/SF \times Building\ SF \times Operating\ Hours \times \$/kWh\right)$$

$$Energy\ Savings = \left(10\% \times\ 1.09\ Watts/SF \times 45{,}000\ SF \times 2{,}800 hrs/yr \times \$0.153/kWh\right) = \underline{\$\ 2{,}101\ per\ year}$$

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

$$Installation\ Cost = (\#\ of\ \ sensors \times\ \$\ per\ sensor) = (46 \times \$75) = \underline{\$3{,}450}$$

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the incentive for installing a lighting control is $20 per controller.

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ controller \times\ \$\ 20) = (46 \times \$\ 20) = \underline{\$920}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,450
NJ Smart Start Equipment Incentive ($):	($920)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$2,530*
Total Energy Savings ($ / yr):	*$2,101*
Simple Payback (yrs):	*1.2*
Simple Return on Investment:	*85.2%*

ECM #2: Lighting Upgrade – General

Description:

New lighting fixtures with fluorescent lamps and electronic ballasts are available as a more energy efficient option to older T-12 lighting fixtures. A simple change from the old, T-12 light fixture to the new can provide substantial savings. A typical drop-ceiling lay in fixture with four, 4-foot T12 lamps (34 Watt lamps) has a total wattage of about 154 Watts. By replacing the T-12 fixture with a new fixture containing T8 lamps, reflector and electronic ballasts the total wattage would be reduced to about 91 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively.

CEG recommends a replacement of the existing fixtures containing T12 lamps and magnetic ballasts with fixtures containing T8 lamps and electronic ballasts. The new energy efficient, T8 fixtures will provide adequate lighting and will save the Owner on electrical costs due to the better performance of the electronic ballasts. In addition to functional cost savings, the fixture replacement will also provide operational cost savings. The operational cost savings will be realized through the lesser number of lamps that will be required to be replaced per year. The expected lamp life of a T8 lamp, approximately 30,000 burn-hours, in comparison to the existing T12 lamps, approximately 20,000 burn-hours, will provide the Owner with fewer lamps to replace per year. Based on the operating hours of this portion of the facility, approximately 2,080 hours per year, the Owner will be changing approximately 33% less lamps per year.

In addition to the replacement of the fluorescent fixtures, CEG also recommends the replacement of all incandescent lamps with compact fluorescent lamps of similar light output.

Note: The replacement fixture chosen for the Classrooms is equivalent to the fixture already installed in Classroom #36 (Canter) in Campbell ES.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in Appendix E that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = $25 per fixture; T-5 or T-8 (3-4 lamp) = $30 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ 1-2\ lamp\ \ fixtures \times\ \$\ 25) + (\#\ of\ 3-4\ lamp\ \ fixtures \times\ \$\ 30)$$

$$\text{Smart Start®}\ Incentive = (292 \times\ \$\ 25) + (13 \times\ \$\ 30) = \underline{\$7{,}690}$$

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ lamps \times \%\ reduction \times \$\ per\ lamp) + Installation\ Labor$$

$$Maintenance\ Savings\ (2\ Lamp\ Fixtures) = (584 \times 33\%\ reduction \times \$\ 2.00) + (\$20 \times 193) = \underline{\$4{,}245}$$

$$Maintenance\ Savings\ (3\ Lamp\ Fixtures) = (39 \times 33\%\ reduction \times \$\ 2.00) + (\$20 \times 13) = \underline{\$285}$$

Total Maintenance Savings = $4,245 + $285 = $4,530

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$98,691
NJ Smart Start Equipment Incentive ($):	($7,690)
Maintenance Savings ($):	($4,530)
Net Installation Cost ($):	*$86,471*
Total Energy Savings ($ / yr):	*$3,219*
Simple Payback (yrs):	*26.8*
Simple Return on Investment:	*4.7%*

ECM #3: Lighting Upgrade – Gymnasium

Description:

The Gymnasium is currently lit via twenty (20) HID, 250 W Metal Halide fixtures that are mounted approximately 22'-0" above the finished floor. The lighting system is antiquated and the space would be better served with a more efficient, fluorescent lighting system. Studies have shown that metal halide lighting systems have a steep lumen depreciation rate (rate at which light is produced from fixture) which equates to approximately a 26% to 35% reduction in lighting output at 40% of the rated lamp life. In addition, the new fluorescent system will provide a better quality of light and save the Owner many dollars on replacement of the highly expensive metal halide lamps.

CEG recommends upgrading the lighting within the Gymnasium to an energy-efficient T-5 lighting system that includes new lighting fixtures with high efficiency, electronic ballasts and T-5 high output (HO) lamps. The T-5 HO lamps are rated for 20,000 hours versus the 10,000 hours for the 250W Metal Halide lamps so there would be a savings in replacement cost and labor.

This measure replaces all the HID, 250 W Metal Halide fixtures in the Multi-Purpose Room with a well-designed T-5 lighting system. Approximately twenty (20), 4-lamp THO high bay fixtures with reflectors and high-efficiency, electronic ballasts will be required in order to meet the mandated 50 foot-candle average within the Gymnasium.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in Appendix F that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

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

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ fixtures \times\ \$50) = (20 \times \$50) = \underline{\$1{,}000}$$

Maintenance savings are calculated based on the facility operational hours as indicated by the Owner. For the Gymnasium the estimated operational hours are 3,744 hours per year. Based on the lamp life comparison, there will be two (2) complete lamp replacements required for the metal halide system at the time when one (1) complete lamp replacement would be required for the fluorescent lighting system. Based on industry pricing, the lamp cost for a 250W metal halide lamp is approximately ±$25 per lamp and a T-5 54HO fluorescent lamp is approximately ±$5 per lamp. Therefore, the maintenance savings are calculated as follows:

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

$$Maintenance\ Savings = (40\ lamps \times\ \$25\ \ per\ lamp) - (80\ lamps \times \$5\ \ per\ lamp) = \underline{\$600}$$

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

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,000
NJ Smart Start Equipment Incentive ($):	($1,000)
Maintenance Savings ($):	($600)
Net Installation Cost ($):	*$9,400*
Total Energy Savings ($ / yr):	*$756*
Simple Payback (yrs):	*12.4*
Simple Return on Investment:	*12.2%*

ECM #4: Exit Sign Replacement – LED Type

Description:

LED stands for light-emitting-diode. LED's are very small light sources that people most readily associate with electronic equipment. LED exit signs have been made in a variety of shapes and sizes and there are also retrofit kits that allow you to simply modify your existing exit signs to accommodate the LED technology. The benefits of LED are twofold. First, you are installing an exit sign that will last for 20-30 years without maintenance. This results in tremendous maintenance savings because the incandescent or fluorescent lamps that you are currently using need to be replaced at a rate of 1-5 times per year. Lamp costs ($2-$7 each) and labor costs ($8-$20 per lamp) add up rapidly. The second benefit of LED is that it only uses 5 Watts of power per fixture. In comparison, your existing signs use approximately 20 Watts per fixture. It is highly recommended that sample installations of the LED exit signs be conducted to confirm that they are compatible with your electrical system.

This measure consists of installing new LED exit sign fixtures in order to provide the Owner with a limited-maintenance, energy efficient signage system.

Energy Savings Calculations:

Existing exit sign energy costs: 14 units x 20 watts/unit x 8,760 hrs/yr x $0.153/kWh = $375

New LED exit sign energy costs: 14 units x 5 watts/unit x 8,760 hrs x $0.153/kWh = $94

Net energy savings = $589 - $147 = $281

Installed cost of new LED exit signs = $80 x 14 = $1,120

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the replacement of an incandescent exit sign warrants the following incentive: LED Exit Sign = $20 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ exit\ signs \times\ \$\ 20) = (14 \times \$20) = \$280$$

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ lamps \times \$\ \ per\ lamp) + Installation\ Labor$$

$$Maintenance\ Savings = (14 \times \$4.50) + (14 \times \$14) = \$259$$

Energy Savings Summary:

ECM #4 – ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,120
NJ Smart Start Equipment Incentive ($):	($280)
Maintenance Savings ($):	($259)
Net Installation Cost ($):	*$581*
Total Energy Savings ($ / yr):	*$281*
Simple Payback (yrs):	*2.1*
Simple Return on Investment:	*66.0%*

ECM #5: Replace Domestic Hot Water Heater

Description:

The domestic hot water heater located in the basement Mechanical Room was installed in 1999. The unit is an A.O. Smith Master Fit with 199 MBH input, 197 gph recovery and 100-gallon storage capacity. Based on the site survey and manufacturer's performance data, the efficiency of this unit is approximately 70%. Also, noted during the site survey was the condition of the hot water heater's gas heat exchanger appeared to be corroded on the exterior of the exchanger from possible water damage. The internal condition of the heat exchanger could not be verified by visual inspection. Based on the appearance of water damage and the fact that the hot water heater is approximately ten (10) years old with an estimated remaining service life of approximately two (2) years; the heater is a good candidate for replacement.

This energy conservation measure will replace the existing gas-fired, 100-gallon capacity domestic hot water heater with a 95% thermal efficient A.O. Smith Cyclone Xi; BTH-150 domestic hot water heater with 100-gallon storage capacity or equivalent. Due to the high recovery rate and thermal efficiency a smaller burner input can be utilized.

Energy Savings Calculations:

Existing Natural Gas-Fired DHW Heater

Rated Capacity = 199 MBH input; 100 gallons storage

Thermal Efficiency = 75%
Radiation Losses = 5%
Net Efficiency = 70%

Proposed Natural Gas-Fired, High-Efficiency DHW Heater

Rated Capacity = 150 MBH input; 100 gallons storage

Thermal Efficiency = 95%
Radiation Losses = 0.5%
Net Efficiency = 94.5%

Operating Data for DHW Heater

Estimated Daily DHW Load = 100 gal/h

DHW Boiler Operating Hrs/Yr. = 1,040 Hrs.

Annual fuel consumption = 780 Therms per year (Based on 90°F rise)

Average cost of natural gas = $1.62/Therm

Energy Savings = 780 Therms x ((0.945-0.70)/0.70) = 273 Therms
Cost Savings = 273 Therms x $1.62/Therm = $442 per year

In addition, to energy savings based on efficiency, there will be also savings based on the change in input Btu per hour. The existing heater has an input of 199,000 Btu/h and the proposed hot water heater has an input of 150,000 Btu/h. Utilizing the estimated 1040 hours of operation, the following savings is calculated:

Energy Savings = ((199,000 Btu/h -150,000 Btu/h) x 1040 hrs) / 100,000 Btu/h / Therm

= 510 therms

Cost Savings = 510 therms x $1.62/Therm= $826 per year

Total Cost Savings per Year = $442 + $826 = $1,268 per year

Installed Cost of A.O. Smith Cyclone Xi DHW Heater = $8,985

The SmartStart Buildings® incentive is $2 per MBH for domestic hot water heaters greater than 50 gallon storage and 85% AFUE. This equates to an incentive equal to $300.

Energy Savings Summary:

ECM #5 – ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,985
NJ Smart Start Equipment Incentive ($):	($300)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$8,685*
Total Energy Savings ($ / yr):	*$1,268*
Simple Payback (yrs):	*6.8*
Simple Return on Investment:	*14.1%*

ECM #6: Replace Electric Unit Ventilators with Hot Water Units

Description:

The electric unit ventilators that are located in Rooms 16, 17, 18, 19, 20, 38, 39, and 46 appear to be approximately thirty (30) years of age which is ten (10) years longer than the expected service life as outlined in 2007 ASHRAE Applications Handbook. These eight (8) unit ventilators are Trane, Nesbitt, and Carrier with a capacity of 1,250 CFM. Due to escalating owning and maintenance costs, these electric unit ventilators should be replaced.

This ECM would install hot water supply/return piping, replace the unit ventilators with newer hot water units that feature a face and bypass damper to allow a variable portion of the mixed return and ventilation air to flow over a hot water coil (such as AAF-Herman Nelson Model AV Unit Ventilator). This method of capacity control also allows for free cooling when the outdoor air is relatively cool and full-stream cooling is not necessary. These unit ventilators would be equipped with hot water modulating valves, hot water coils, and DDC controllers that would communicate with the room thermostats and other equipment such as the boilers indicating when to supply hot water for heating demand. The outside air intake opening would need to be enlarged to comply with the latest ventilation codes. This would require brick/block work, larger outside air louver, and reworking of the shelving. In addition, a mechanical chase would need to be built in the corner of each room to house the hot water piping, and the shelving modified to run insulated hot water piping to/from the unit ventilator.

Energy Savings Calculations:

The analysis is based on the following assumptions:

- Approximately 20kW heating coil in a 1,250 CFM electric unit heater
- Typically insulated 1,000SF classroom (UA=210 Btuh/ºF)
- 26 person occupancy
- 0.97 watt per square foot lighting load
- Newark, NJ weather station data
- Classroom occupied 7 hours per day, 180 days per year
- Thermostat setting of 70ºF occupied and night time setback
- Average of 87% efficient gas-fired Aerco Benchmark boilers
- $0.15/kWh for electrical cost
- Ventilation rate of 15cfm per person
- Unit Ventilator total air supply rate = 1,250 cfm
- Unit ventilator fan static pressure = 0.25” w.g.
- Unit Ventilator fan/motor efficiency = 80%
- Classroom exhaust system flow rate = 390 cfm
- Classroom exhaust system static pressure = 0.5” w.g.
- Classroom exhaust fan efficiency = 80%

During the occupied hours of the classroom, internal heat gains from people, lights, and computer (9,500 Btu/hr) effectively lowers the heating requirements by 17ºF. When the thermostat is set to 70ºF, the classroom does not need heat until the outside temperature drops to 53ºF (assuming no gains from solar heating). During unoccupied hours, the thermostat should be set to 55ºF, but there are no heat gains to lower the heating requirement, hence the classroom space needs heating whenever the outside temperature drops below 55ºF.

Using the assumptions listed above, the existing 1,250 CFM unit ventilator uses approximately 7,480 kWh/yr during occupied hours and 2,243 kWh/yr during unoccupied hours. This equates to a total unit ventilator electrical consumption of 9,723 kWh/yr.

By installing a hot water unit ventilator with a DDC controller, a digital thermostat and an unoccupied setpoint of 55ºF, it is estimated that the energy savings per unit ventilator would be approximately 25% of the existing electrical cost for each unit ventilator by converting to hot water heating.

Total energy savings = 25% x (9,723 kWh x $0.15) = $364/yr per unit ventilator.

The installed cost of a new 1,250 CFM hot water unit ventilator including architectural work, piping, insulation, controls, etc. = $6,500

Energy Savings Summary:

ECM #6 – ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,500
NJ Smart Start Equipment Incentive ($):	-
Maintenance Savings ($):	-
Net Installation Cost ($):	*$6,500*
Total Energy Savings ($ / yr):	*$364*
Simple Payback (yrs):	*17.8*
Simple Return on Investment:	*(0.2%)*

ECM #7: Replace Electric Unit Ventilators with High-Efficiency Units

Description:

This ECM is similar to ECM #6 but replaces the existing electric unit ventilator with a Trane hot water unit ventilator, infinite speed fan motor, upgraded DDC controls, and an energy recovery system. The air-to-air heat exchanger is designed to support two separate air streams (outside fresh air and room exhaust air) in a counter-flow direction. The thermal energy in the exhaust air is used to pre-heat the cold outside air thus saving energy. Ultra-low leak, blade-type outside air damper helps ensure low leakage of the outside air when the equipment is off. The classroom exhaust fan is no longer needed since the air is now exhausted across the unit ventilator's air-to-air heat exchanger.

Energy Savings Calculations:

Again, the existing 1,250 CFM unit ventilator uses approximately 7,480 kWh/yr during occupied hours and 2,243 kWh/yr during unoccupied hours. This equates to a total unit ventilator electrical consumption of 9,723 kWh/yr. In addition, the unit ventilator system requires an exhaust system to exhaust the classrooms. The electrical consumption for running the exhaust fan 1,260 hours per year is 178 kWh/yr.

By installing a hot water unit ventilator with a heat recovery system, a DDC controller, a digital thermostat and an unoccupied setpoint of 55ºF, it is estimated that the energy savings per unit ventilator would be approximately 45% of the existing electrical cost for each unit ventilator by converting to hot water heating plus the electrical savings from shutting off the exhaust fan.

Total energy savings = [45% x (9,723 kWh x $0.15)] + 178 kWh x $0.15 = $683

The installed cost of a new 1,250 CFM hot water unit ventilator with heat recovery system including architectural work, piping, insulation, controls, etc. = $7,800

Energy Savings Summary:

ECM #7 – ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,800
NJ Smart Start Equipment Incentive ($):	-
Maintenance Savings ($):	-
Net Installation Cost ($):	*$7,800*
Total Energy Savings ($ / yr):	*$683*
Simple Payback (yrs):	*11.4*
Simple Return on Investment:	*5.6%*

ECM #8: Exterior Window Replacement

Description:

There are ten (10) rooms (Rooms 11, 49, 13, 12, 14, 20, 46, 16, 18, and19) along with both sides of the courtyard entrance that have single pane, ¼ inch, non-insulated, glass with aluminum frame windows that are 1950's vintage and in deteriorated condition. The excessive heat loss and the cold/hot air infiltration make the HVAC system use much more energy to heat and ventilate the spaces.

This ECM would replace the single, non-insulated glass, aluminum frame, and hardware with the thermal pane, tinted windows and insulated frames that have been installed in the rest of the facility along with caulking/sealing around the new windows for substantially decreased infiltration. By installing these window upgrades, the heating energy costs along with the O&M costs of maintaining these old window systems will be reduced.

A detailed measurement of all applicable exterior perimeter windows resulted in the following:

Room No.	Window Area (SF)
11	30
49	70
Courtyard Entrance	160
13	30
12	130
14	30
20	130
46	130
16 (ISG)	212
18	212
19	212
Total:	1,346 SF

Energy Savings Calculations:

The existing glass area is single glazed, non-tinted, and installed with plexi-glass sheets in many large areas. We have assumed that the existing air filtration is 0.8 CFM/SF and the U-value of the existing glass (plexi-glass) area is 0.87. The air filtration of the new window systems is 0.15 CFM/SF and the U-value of the new glass is 0.28

Savings are based upon the increased insulation provided by double-pane windows as compared to single-pane windows as well as the reduced amount of air leaking into the spaces from the new window installation. Weather data from the Newark airport and operating set points for the facility

were used to determine the temperature difference throughout the year. The following equations were used for the purposes of energy savings calculations.

Energy savings calculations:

Heating Degree Days = 5,539°F – day/yr.

Cooling Degree Days = 918°F – day/yr.

Total window area to be retrofitted = 1,346 SF

Uexist. = 0.87 Btu/hr – ft^2 - °F

CEG would recommend replacement of the existing single pane windows with a commercial window product that meets or exceeds the following performance characteristic. U-Factor = 0.28, Solar Heat Gain Coefficient = 0.21 and Visible Transmittance = 0.49.

Unew = 0.28 Btu/hr – ft^2 - °F

Annual Energy Savings (Heating) = 10 hrs * Window Areas * (Uexist-Unew) * HDD

= 10 * 1,346 * (0.87-0.28) * 5,539 = 257.8 MMBtu = 440 Therms

Energy Savings = 440 Therms x $1.67 = $735

Upgraded Window Cost = $21,500 (Pricing from Andersen Windows Contractor)

In addition to the energy savings calculated above, CEG also believes the Owner will receive significant maintenance savings from the installation of new windows. The respective maintenance savings is estimated at approximately $2, 000. This cost includes plexi-glass replacement, caulking and sealing around windows and general maintenance to the existing windows.

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$21,500
NJ Smart Start Equipment Incentive ($):	-
Maintenance Savings ($):	($2,000)
Net Installation Cost ($):	*$19,500*
Total Energy Savings ($ / yr):	*$735*
Simple Payback (yrs):	*26.5*
Simple Return on Investment:	*10.8%*

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 Metuchen School District, and concluded that there is potential for solar and 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). 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 3,995 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in Appendix G. Using this square footage it was determined that a system size of 63 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 97,628 kWh annually, reducing the overall utility bill by approximately 15% percent. A detailed financial analysis can be found in Appendix G. 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 20 years. Direct purchase involves the local government paying for 100% of the total project cost upfront via one of the methods noted in Section X, Installation Funding Options. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

PAYMENT TYPE	SIMPLE PAYBACK	INTERNAL RATE OF RETURN
Self-Finance	11.5 Years	10.5%
Direct Purchase	11.5 Years	7.7%

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

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the Metuchen School District. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. Based on CEG's review of the applicability of wind energy for Metuchen Township it was determined that the average wind speed of approximately four (4) miles per hour is not adequate for wind energy production. Therefore, CEG has determined that wind energy is not a viable option for the Owner to implement.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to Section IV, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for January through December 2008.

Electricity:

Section IV, Figure 1 demonstrates a flat or base-load electric consumption pattern. It is evident that there is a significant increase in December 2008, more than likely due to the electric heating within the building. There is a very steady consumption pattern throughout the balance of the year indicating a year-round electrical load. The flatter (steady base-load) shaping is important because a flat consumption profile will yield more competitive pricing.

Natural Gas:

Section IV, Figure 2 demonstrates a typical heating load (November –March) profile for the Middle School. A noticeable drop-off occurs in the summer months with the non use of the hot water heating system.

Tariff Analysis:

Electricity:

This facility receives electrical service on two separate meters through Public Service Electric and Gas Company (PSE&G). Meter 226016560 is on a LPLS (Large Power and Lighting Service) rate. Meter 778012544 is on a GLP (General Lighting and Power Service) rate. The LPLS utility tariff is for delivery service for general purposes at secondary distribution voltages where the customer's measured peak demand exceeds 150 kilowatts in any month and also at primary distribution charges. The GLP utility tariff is Delivery service for general purposes at secondary distribution. These rate schedules have a Delivery 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).

While Metuchen may be on a typical rate structure with the local utility (LPL, GLP), some variations in price do cause some concern, and are worth investigating further. If Metuchen were to shop its electric load it would avoid the higher rates as demonstrated in July and August. Furthermore, Metuchen should look into the cause of the extreme consumption in January 2008.

Natural Gas:

The Campbell Elementary School receives natural gas service through Elizabethtown Gas Company on the General Delivery Service (GDS) when not receiving commodity by a Third Party Supplier. This utility tariff, GDS, is utilized where a Gas Company's facilities are suitable and the quantity of gas is available for the service desired. Service is Continuous, but the customer may purchase supply from a Third Party Supplier of from the Company's Rider A, Basic Gas Supply Service (BGSS). This rate schedule has a; Service Charge, Demand Charge, per DCQ (Daily Contract Quantity), Distribution Charge, Balancing Charge and Commodity Charge. There are special provisions for determining DCQ and for Distributive Generation. It is pertinent to note, should the TPS not deliver, Elizabethtown Gas Company may cease service or elect to put the customer on Standby Gas Service Sales Service. This rate is more than likely a penalty rate.

From review of the information provided, Metuchen is utilizing the services of a Third Party Supplier, Woodruff Energy for natural gas service. Based on review of the Third Party contract that Metuchen signed, it appears that at the time of the original contract signing Metuchen made a good decision and locked in what was the market pricing at that time. However, due to the low pricing in the current market, it appears that Metuchen is paying $4.63 / dth (unit of measure), or 37% above current market rates. It should also be noted that Metuchen used the service of another Third Party Supplier (TPS), Hess Corporation January through June 2008. During this term Metuchen paid $5.23 / dth or 40% above current market rates. The comparison against current market pricing is to be utilized as a benchmark for future energy procurement strategy by the School District.

In addition, it is pertinent to note that imbalances in billing may 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. The Elizabethtown Gas Company tariff utilized for this facility will install daily and/or monthly imbalance charges for gas not delivered.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within the Metuchen School District. CEG's primary observation is seen in the Natural Gas Commodity. The weighted average price per dth (decatherm) for all buildings is $11.26 (dth is the common unit of natural gas measure). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Metuchen 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 January through December 2008 and current natural gas rates, savings of over $65,000 per year are noticed. (Note: Savings were calculated using Metuchen's Average Annual Consumption of 19,668 dth's and a variance of $3.49 / dth and utilizing a fixed one-year commodity contract). CEG recommends aggregating the entire natural gas 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 Metuchen School District's electric costs. CEG recognized a segment of the electric cost is not competitive with current market prices. Based on the

current market rates Metuchen School District is paying approximately $.008 / kWh per unit ($22,000 annually) above market. CEG recommends further advisement on these prices.

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

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

E. Recalibrate existing temperature sensors to provide more accurate temperature control.

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

G. Clean all light fixtures to maximize light output.

H. Confirm that outside air economizers on the rooftop units are functioning properly to take advantage of free cooling.

Electric Cost Summary

PSE&G

Metuchan Campbell Elementary School **2008**

Rate - GLP

Account # 5109410216
Meter # 226016560

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0.6617234	
KWH	7,610	4,010	4,060	2,200	1,180	990	340	600	1,060	1,180	2,280	2,480	27,990	
KW	9	10	9	9	6	6	4	5	5	5	9	10	10	Max
Monthly Load Factor	115%	62%	61%	34%	27%	23%	11%	17%	8%	30%	35%	33%	38%	
Electric Delivery, $	$253	$135	$133	$90	$104	$99	$60	$75	$49	$51	$93	$107	$1,249	
Delivery $/kwh	$0.033	$0.034	$0.033	$0.041	$0.088	$0.100	$0.176	$0.125	$0.047	$0.043	$0.041	$0.043	$0.045	
Electric Supply, $	$665	$362	$355	$194	$119	$133	$61	$93	$140	$130	$223	$229	$2,705	
Supply $/kwh	$0.087	$0.090	$0.087	$0.088	$0.101	$0.134	$0.179	$0.156	$0.132	$0.110	$0.098	$0.093	$0.097	
Total Cost, $	$918	$496	$488	$284	$223	$232	$121	$168	$189	$130	$317	$336	$3,902	
$/KWH	$0.1207	$0.1238	$0.1202	$0.1291	$0.1893	$0.2341	$0.3545	$0.2808	$0.1783	$0.1098	$0.1388	$0.1356	**$0.1394**	

Estimated value; Utility information not provided by the owner.

Metuchen Campbell Elementary School **2008**

Rate - LPLS

Account # 5109410216
Meter # 778012544

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0	
KWH	128,320	57,280	50,720	47,040	36,800	36,160	22,400	32,000	32,000	52,800	56,640	69,120	621,280	
KW	205	203	181	149					142	173	180	203	205	Max
Monthly Load Factor	84%	42%	38%	44%					31%	41%	44%	46%	46%	
Electric Delivery, $	$4,527	$2,130	$1,931	$1,757	$2,580	$2,620	$1,971	$2,540	$2,540	$1,955	$2,081	$2,540	$29,172	
Delivery $/kwh	$0.035	$0.037	$0.038	$0.037	$0.070	$0.072	$0.088	$0.079	$0.079	$0.037	$0.037	$0.037	$0.047	
Electric Supply, $	$11,635	$5,385	$4,674	$4,453	$3,913	$4,971	$3,408	$4,654	$4,654	$5,691	$5,716	$6,973	$66,128	
Supply $/kwh	$0.091	$0.094	$0.092	$0.095	$0.106	$0.137	$0.152	$0.145	$0.145	$0.108	$0.101	$0.101	$0.106	
Total Cost, $	$16,162	$7,515	$6,605	$6,211	$6,493	$7,591	$5,379	$7,194	$7,194	$7,646	$7,797	$9,513	$95,300	
$/KWH	$0.1259	$0.1312	$0.1302	$0.1320	$0.1764	$0.2099	$0.2401	$0.2248	$0.2248	$0.1448	$0.1377	$0.1376	**$0.1534**	

Utility information not provided by the owner.

Total Electric Usage - Sum of ALL Meters

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0	
KWH	135,930	61,290	54,780	49,240	37,980	37,150	22,740	32,600	33,060	53,980	58,920	71,600	649,270	
KW	214	213	190	158	158	158	147	147	147	178	189	213	214	Max
Monthly Load Factor	85%	43%	39%	43%	32%	33%	21%	30%	31%	41%	43%	45%	41%	
Electric Delivery, $	$4,780	$2,264	$2,064	$1,847	$2,684	$2,719	$2,031	$2,615	$2,589	$2,006	$2,174	$2,647	$30,421	
Delivery $/kwh	$0.035	$0.037	$0.038	$0.038	$0.071	$0.073	$0.089	$0.080	$0.078	$0.037	$0.037	$0.037	$0.047	
Electric Supply, $	$12,300	$5,747	$5,029	$4,648	$4,032	$5,105	$3,469	$4,747	$4,794	$5,821	$5,939	$7,203	$68,833	
Supply $/kwh	$0.090	$0.094	$0.092	$0.094	$0.106	$0.137	$0.153	$0.146	$0.145	$0.108	$0.101	$0.101	$0.106	
Total Cost, $	$17,079.94	$8,011.13	$7,093.24	$6,494.66	$6,716.39	$7,823.12	$5,499.83	$7,362.37	$7,382.92	$7,827.39	$8,113.21	$9,849.62	$99,254	
$/KWH	$0.126	$0.131	$0.129	$0.132	$0.177	$0.211	$0.242	$0.226	$0.223	$0.145	$0.138	$0.138	**$0.1529**	

Summary of Natural Gas Cost

Elizabethtown Gas (General Delivery)

2008

Metuchan Campbell Elementary School

Account#: 6363115820	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Third Party Supplier Acct. #: 510-272	31	28	31	30	31	30	31	31	30	31	30	31	
Meter#: 09235838													
Therms (Burner Tip)	7674.6	8394.7	4273.9	2406.3	514.8	101.8	103.1	92.8	115.1	1086.8	3103.7	6803.5	34,671
Total Distribution Cost	$2,366.61	$2,567.08	$1,419.85	$874.20	$364.51	$256.60	$419.24	$379.33	$259.58	$513.79	$1,112.30	$2,193.06	12,726
Cost per Therm	$0.308	$0.306	$0.332	$0.363	$0.708	$2.521	$4.066	$4.088	$2.255	$0.473	$0.358	$0.322	$0.367
Total Commodity Cost	$9,997	$10,934	$5,568	$3,135	$671	$133	$106	$95	$138	$1,243	$3,519	$7,744	43,284
Cost per Therm	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.03	$1.03	$1.20	$1.14	$1.13	$1.14	$1.25
Total Cost	$12,364	$13,501	$6,988	$4,009	$1,035	$389	$525	$474	$398	$1,757	$4,631	$9,937	$56,011
Cost per Therm	$1.61	$1.61	$1.64	$1.67	$2.01	$3.82	$5.09	$5.11	$3.46	$1.62	$1.49	$1.46	$1.62
	HESS Account # 446637/447269						Estimate No Utility Information provided		Woodruff Energy Account # 510-272				
	Elizebethtown Gas Account # 6363115820												

CONSTRUCTION COST AND REBATES

CONCORD ENGINEERING GROUP

Campbell Elementary School

ECM 1 LIGHTING CONTROLS - OFFICE/STORAGE AREAS

	Qty	Unit Cost $	Material $	Labor $	Total $
Dual - Technology Sensor	46	$75	$3,450	$0	$3,450
Total Cost			$3,450	$0	$3,450
Utility Incentive - NJ Smart Start					($920)
Total Cost Less Incentive					$2,530

ECM 2 LIGHTING UPGRADE - GENERAL

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Fixture Replacement	LS	$98,691	$0	$0	$98,691
Total Cost			$0	$0	$98,691
Utility Incentive - NJ Smart Start					($7,690)
Total Cost Less Incentive					$91,001

ECM 3 LIGHTING UPGRADE - GYMNASIUM

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Fixture Replacement	LS	$11,000	$0	$0	$11,000
Total Cost			$0	$0	$11,000
Utility Incentive - NJ Smart Start					($1,000)
Total Cost Less Incentive					$10,000

ECM 4 EXIT SIGN REPLACEMENT

	Qty	Unit Cost $	Material $	Labor $	Total $
Exit Sign - LED Type	14	$80	$490	$630	$1,120
Total Cost			$490	$630	$1,120
Utility Incentive - NJ Smart Start					($280)
Total Cost Less Incentive					$840

ECM 5 DOMESTIC HOT WATER HEATER REPLACEMENT

	Qty	Unit Cost $	Material $	Labor $	Total $
AO Smith Cyclone Xi HW Heater	1	$8,485	$7,350	$1,135	$8,485
Venting Kit	1	$500	$150	$350	$500
Total Cost			$7,350	$1,135	$8,985
Utility Incentive - NJ Smart Start					($300)
Total Cost Less Incentive					$8,685

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

	$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

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

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

"Campbell Elementary School"

Boiler

Location	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Aerco	1	2	G-99-0616	2,000	1,800	87%	Nat. Gas	10	35	25
Boiler Room	Aerco	1	2	G-99-0618	2,000	1,800	85%	Nat. Gas	10	35	25
Boiler Room	Aerco	1	2	G-99-0619	2,000	1,800	84%	Nat. Gas	10	35	25

Boiler - Pumps

Location	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Frame Size	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Baldor	2	M3311T	-	7.5	1750	-	-	213T	208-230/460	3	10	20	10

Domestic Hot Water Heater

Location	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	A.O. Smith	1	BTR 197	MF990845227	199	197	100	-	Nat. Gas	10	12	2
Classroom #17	A.O. Smith	1	PEC-40-918	ML99-0038860	4.5 kW	-	40	-	Elect	10	12	2

Domestic Hot Water Circulating Pumps

Location	Manufacturer	Qty.	Model #	Serial #	HP	Volts	Amps	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Bell & Gosset	1	-	-	-	115	-	10	10	0
Classroom #17	Bell & Gosset	1	-	-	1/12	115	1.75	10	10	0

Air Handling Units

Location	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Heating Capacity (MBh)*	Volts	Phase	Full Load Amps	Approx. Age	ASHRAE Service Life	Remaining Life
Roof	Trane	2	WLHB200E3467C38D	-	-	-	-	HW	151.2 +/-	208	3	-	10	15	5
Roof	Aaon	1	RK-20-50-750	-	DX R-22	10.9 EER	Nominal 20 Tons	HW	330.8 +/-	208	3	89	10	15	5
Roof	Aaon	1	RK-06-2-E0-750	99JKWE10	DX R-22	10.9 EER	Nominal 6 Tons	HW	116.4 +/-	208	3	31	10	15	5
Roof	Aaon	1	RK-02-2-E0-760	-	DX R-22	11.2 SEER	Nominal 2 Tons	HW	74.8 +/-	208	3	16	10	15	5
Roof	Aaon	1	RK-04-2-00-750	-	DX R-22	11.3 SEER	Nominal 4 Tons	HW	98.6 +/-	208	3	19	10	15	5

* Estimated heating capacity based on manufacturer product data.

Unit Ventilators

Location	Manufacturer	Qty.	Model #	Serial #	Heating Coil	Capacity (Btu/h)	Fan CFM	Fan Motor	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life
Classrooms - General	Trane	15	VUV125	-	HW	-	1250	-	115	1	20	30	20	(10)
Classrooms 21 & 22	Carrier	2	40UVF3-3D2	-	Elect	-	1000	1/5 HP	208	3	40	10	20	10
Classrooms 16 to 20	Nesbitt	5	TE1000A-5A-A	-	Elect	12 kW	1000	1/12 HP	208	3	45	10	20	10
Nurse Rm 46	Nesbitt	1	TE1000A (Horiz.)	-	Elect	12 kW	1000	1/12 HP	208	3	45	10	20	10
Classroom 49	Nesbitt	1	TE1000A (Horiz.)	-	HW	-	1000	1/12 HP	115	1	20	10	20	10
Classrooms 38 & 39	Trane	1	VUV150	-	Elect	22.8 kW	1500	-	208	3	-	5	20	15
Classrooms (1998 Reno)	Trane	12	VUV150	-	HW	-	1500	(2) 1/10 HP	115	1	20	10	20	10

AC Condensers

Location	Manufacturer	Qty	Model #	Serial #	Cooling Type	Efficiency	Cooling Capacity	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Roof	Sanyo	1	C0911	142194	DX R-22	10 SEER	Nominal 3/4 Tons	115	1	10	15	5
Roof	Trane Xe 1200	2	TTP024C100A3	-	DX R-22	12 SEER	Nominal 2 Tons	208-230	1	10	15	5
Roof	Trane Xe 1200	1	TTP042C100A4	-	DX R-22	12 SEER	Nominal 3.5 Tons	208-230	1	10	15	5
Grade	Carrier	1	38HDC030-331	0805X25501	DX R-22	10.8 SEER	Nominal 2.5 Tons	208-230	1	5	15	10
Grade	Carrier	1	38HDC030-331	0805X25492	DX R-22	10.8 SEER	Nominal 2.5 Tons	208-230	1	5	15	10

STATEMENT OF ENERGY PERFORMANCE
Cambell School

Building ID: 1774183
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 16, 2009

Facility
Cambell School
24 Durham Ave
Metuchen, NJ 08840

Facility Owner
Metuchen Board of Education
16 Simpson Place
Metuchen, NJ 08840

Primary Contact for this Facility
Mike Harvier
16 Simpson Place
Metuchen, NJ 08840

Year Built: 1951
Gross Floor Area (ft²): 58,000

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

Site Energy Use Summary[3]

Natural Gas (kBtu)[4]	3,467,110
Electricity (kBtu)	2,215,309
Total Energy (kBtu)	5,682,419

Energy Intensity[5]

Site (kBtu/ft²/yr)	98
Source (kBtu/ft²/yr)	190

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	522

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

National Average Comparison

National Average Site EUI	65
National Average Source EUI	127
% Difference from National Average Source EUI	50%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Raymond Johnson
520 South Burnt Mill Rd.
Voorhees, NJ 08043

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Cambell 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	24 Durham Ave , Metuchen, NJ 08840	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		☐

Cambell ES (K-12 School)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	58,000 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	No	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	119	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	40	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

Months	10 (Optional)	Is this school in operation for at least 8 months of the year?		☐
High School?	No	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: Electric Meter - 226016560 (kWh) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh)**
12/01/2008	12/31/2008	2,480.00
11/01/2008	11/30/2008	2,280.00
10/01/2008	10/31/2008	1,180.00
09/01/2008	09/30/2008	1,060.00
08/01/2008	08/31/2008	600.00
07/01/2008	07/31/2008	340.00
06/01/2008	06/30/2008	990.00
05/01/2008	05/31/2008	1,180.00
04/01/2008	04/30/2008	2,200.00
03/01/2008	03/31/2008	4,060.00
02/01/2008	02/29/2008	4,010.00
01/01/2008	01/31/2008	7,610.00
Electric Meter - 226016560 Consumption (kWh)		**27,990.00**
Electric Meter - 226016560 Consumption (kBtu)		**95,501.88**
Meter: Electric Meter - 778012544 (kWh) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh)**
12/01/2008	12/31/2008	69,120.00
11/01/2008	11/30/2008	56,640.00
10/01/2008	10/31/2008	52,800.00
09/01/2008	09/30/2008	32,000.00
08/01/2008	08/31/2008	32,000.00
07/01/2008	07/31/2008	22,400.00
06/01/2008	06/30/2008	36,160.00
05/01/2008	05/31/2008	36,800.00
04/01/2008	04/30/2008	47,040.00
03/01/2008	03/31/2008	50,720.00
02/01/2008	02/29/2008	57,280.00
01/01/2008	01/31/2008	128,320.00
Electric Meter - 778012544 Consumption (kWh)		**621,280.00**
Electric Meter - 778012544 Consumption (kBtu)		**2,119,807.36**

Total Electricity Consumption (kBtu)	**2,215,309.24**
Is this the total Electricity consumption at this building including all Electricity meters?	☐

Fuel Type: Natural Gas		
Meter: Natural Gas Meter - 09235838 (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
12/01/2008	12/31/2008	6,803.50
11/01/2008	11/30/2008	3,103.70
10/01/2008	10/31/2008	1,086.80
09/01/2008	09/30/2008	115.10
08/01/2008	08/31/2008	92.80
07/01/2008	07/31/2008	103.10
06/01/2008	06/30/2008	101.80
05/01/2008	05/31/2008	514.80
04/01/2008	04/30/2008	2,406.30
03/01/2008	03/31/2008	4,273.90
02/01/2008	02/29/2008	8,394.70
01/01/2008	01/31/2008	7,674.60
Natural Gas Meter - 09235838 Consumption (therms)		**34,671.10**
Natural Gas Meter - 09235838 Consumption (kBtu)		**3,467,110.00**
Total Natural Gas Consumption (kBtu)		**3,467,110.00**
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
Cambell School
24 Durham Ave
Metuchen, NJ 08840

Facility Owner
Metuchen Board of Education
16 Simpson Place
Metuchen, NJ 08840

Primary Contact for this Facility
Mike Harvier
16 Simpson Place
Metuchen, NJ 08840

General Information

Cambell School	
Gross Floor Area Excluding Parking: (ft^2)	58,000
Year Built	1951
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Cambell ES	
Space Type	K-12 School
Gross Floor Area(ft^2)	58,000
Open Weekends?	No
Number of PCs	119
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	40
Percent Heated	100
Months[o]	10
High School?	No
School District[o]	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2008)	**Baseline** (Ending Date 12/31/2008)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	11	11	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	98	98	51	N/A	65
Source ($kBtu/ft^2$)	190	190	99	N/A	127
Energy Cost					
$/year	$ 155,210.00	$ 155,210.00	$ 80,955.71	N/A	$ 103,515.58
$/$ft^2$/year	$ 2.68	$ 2.68	$ 1.40	N/A	$ 1.79
Greenhouse Gas Emissions					
$MtCO_2e$/year	522	522	272	N/A	348
$kgCO_2e/ft^2$/year	9	9	5	N/A	6

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

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

CONCORD ENERGY SERVICES

CEG Job #: 9C08133
Project: Campbell Elementrary
Address: 24 Durham Ave
City: Metuchen, NJ 08840
Building SF: 58,000

"Campbell Elementary School"

DATE: 06/25/2009
KWH COST $0.153

ECM #1: LIGHTING UPGRADE - GENERAL

EXISTING LIGHTING									PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost INSTALLED	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Room #1	12	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.96	2688	$411.26	12	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	56.7	0.68	1905.12	$291.48	$340.00	$4,080.00	0.28	782.88	$119.78	34.06
2	Room #2	18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	56.7	1.02	2857.68	$437.23	$340.00	$6,120.00	0.42	1174.32	$179.67	34.06
3	Room #36 (Canter)	12	Direct/Indirect 4' 2-Lamp T-8 Electric Ballast	2800	58	0.70	1948.8	$298.17	12	No Upgrade Necessary	58	0.70	1948.8	$298.17	$0.00	$0.00	0.00	0	$0.00	0.00
4	Room #4 (Deverin)	12	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.96	2688	$411.26	12	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	0.70	1948.8	$298.17	$340.00	$4,080.00	0.26	739.2	$113.10	36.08
5	Room #5	12	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.96	2688	$411.26	12	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	0.70	1948.8	$298.17	$340.00	$4,080.00	0.26	739.2	$113.10	36.08
6	Room #6 (Donohue)	12	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.96	2688	$411.26	12	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	0.70	1948.8	$298.17	$340.00	$4,080.00	0.26	739.2	$113.10	36.08
7	Room #7	12	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.96	2688	$411.26	12	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	0.70	1948.8	$298.17	$340.00	$4,080.00	0.26	739.2	$113.10	36.08
8	Boys Toilet	2	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.16	448	$68.54	2	4' 2-Lamp T-8 32W Prism Lens; Elect Ballast Metalux or equivalent	58	0.12	324.8	$49.69	$120.00	$240.00	0.04	123.2	$18.85	12.73
9	Girls Toilet	2	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.16	448	$68.54	2	4' 2-Lamp T-8 32W Prism Lens; Elect Ballast Metalux or equivalent	58	0.12	324.8	$49.69	$120.00	$240.00	0.04	123.2	$18.85	12.73
10	Room #9 SGI	4	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.32	896	$137.09	4	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	0.23	649.6	$99.39	$340.00	$1,360.00	0.09	246.4	$37.70	36.08
11	Room #42-(IT/Library IT)	8	4' 2-Lamp T-8 Electric Ballast 32 W	2800	58	0.46	1299.2	$198.78	8	No Upgrade Necessary	58	0.46	1299.2	$198.78	$0.00	$0.00	0.00	0	$0.00	0.00
12	Room #43 (Sefranka)	24	Direct/ Indirect 4' 2-Lamp T-8 Electric Ballast	2800	58	1.39	3897.6	$596.33	24	No Upgrade Necessary	58	1.39	3897.6	$596.33	$0.00	$0.00	0.00	0	$0.00	0.00

13	Room #48	7	Direct/Indirect 4' 2-Lamp T-8 32W	2800	58	0.41	1136.8	$173.93	7	No Upgrade Necessary	58	0.41	1136.8	$173.93	$0.00	$0.00	0.00	0	$0.00	0.00
14	Room #47	6	Direct/Indirect 4' 2-Lamp T-8 32 W	2800	58	0.35	974.4	$149.08	6	No Upgrade Necessary	58	0.35	974.4	$149.08	$0.00	$0.00	0.00	0	$0.00	0.00
15	Room #22 (Sneddon)	11	4' 2-Lamp T-12 34 W	2800	80	0.88	2464	$376.99	11	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	0.64	1786.4	$273.32	$340.00	$3,740.00	0.24	677.6	$103.67	36.08
16		1	2' 4-Lamp T-8 Electronic Ballast 17 W	2800	56	0.06	156.8	$23.99	1	No Upgrade Necessary	56	0.06	156.8	$23.99	$0.00	$0.00	0.00	0	$0.00	0.00
17	Room #15	12	Direct/Indirect 4' 2-Lamp T-8 32 W	2800	58	0.70	1948.8	$298.17	12	No Upgrade Necessary	58	0.70	1948.8	$298.17	$0.00	$0.00	0.00	0	$0.00	0.00
18	Room #45	6	4' 2-Lamp T-8 Electric Ballast 32 W	2800	58	0.35	974.4	$149.08	6	No Upgrade Necessary	58	0.35	974.4	$149.08	$0.00	$0.00	0.00	0	$0.00	0.00
19	Room #44	8	4' 2-Lamp T-8 Electric Ballast 32 W	2800	58	0.46	1299.2	$198.78	8	No Upgrade Necessary	58	0.46	1299.2	$198.78	$0.00	$0.00	0.00	0	$0.00	0.00
20	Room #46	3	4' 3-Lamp T-8 Electronic Ballast 32W	2800	58	0.17	487.2	$74.54	3	No Upgrade Necessary	58	0.17	487.2	$74.54	$0.00	$0.00	0.00	0	$0.00	0.00
21		3	4' 2-Lamp T-8 Electric Ballast 32 W	2800	58	0.17	487.2	$74.54	3	No Upgrade Necessary	58	0.17	487.2	$74.54	$0.00	$0.00	0.00	0	$0.00	0.00
22		2	4' 4-Lamp T-8 Electronic Ballast 32 W	2800	109	0.22	610.4	$93.39	2	No Upgrade Necessary	109	0.22	610.4	$93.39	$0.00	$0.00	0.00	0	$0.00	0.00
23	Room #17	18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.04	2923.2	$447.25	$340.00	$6,120.00	0.40	1108.8	$169.65	36.08
24	Room #19	2	60W Incandescent	2800	60	0.12	336	$51.41	2	18 W CFL	20	0.04	112	$17.14	$3.75	$7.50	0.08	224	$34.27	0.22
25		3	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.24	672	$102.82	3	4' 2-Lamp T-8 32W Prism Lens; Elect Ballast Metalux or equivalent	58	0.17	487.2	$74.54	$120.00	$360.00	0.07	184.8	$28.27	12.73
26		18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.04	2923.2	$447.25	$340.00	$6,120.00	0.40	1108.8	$169.65	36.08
27	Room #39	15	4' 3-Lamp T-8 Electronic Ballast 32 W	2800	82	1.23	3444	$526.93	15	No Upgrade Necessary	82	1.23	3444	$526.93	$0.00	$0.00	0.00	0	$0.00	0.00
28	Room #18	1	60W Incandescent	2800	60	0.06	168	$25.70	1	18 W CFL	20	0.02	56	$8.57	$3.75	$3.75	0.04	112	$17.14	0.22
29		18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.04	2923.2	$447.25	$340.00	$6,120.00	0.40	1108.8	$169.65	36.08

30	Room #16	18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.04	2923.2	$447.25	$340.00	$6,120.00	0.40	1108.8	$169.65	36.08
31	Room #20	11	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.88	2464	$376.99	11	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	0.64	1786.4	$273.32	$340.00	$3,740.00	0.24	677.6	$103.67	36.08
32	Room #21	14	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.12	3136	$479.81	14	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	0.81	2273.6	$347.86	$340.00	$4,760.00	0.31	862.4	$131.95	36.08
33	Room #14	18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.04	2923.2	$447.25	$340.00	$6,120.00	0.40	1108.8	$169.65	36.08
34	Room #12	18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.04	2923.2	$447.25	$340.00	$6,120.00	0.40	1108.8	$169.65	36.08
35	Room #10	18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.04	2923.2	$447.25	$340.00	$6,120.00	0.40	1108.8	$169.65	36.08
36	Room #3	18	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.44	4032	$616.90	18	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.04	2923.2	$447.25	$340.00	$6,120.00	0.40	1108.8	$169.65	36.08
37	Room #11	19	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	1.52	4256	$651.17	19	Direct/Indirect Pendants 4' 2-Lamp T-8 32W 96" Module; Elect Ballast	58	1.10	3085.6	$472.10	$340.00	$6,460.00	0.42	1170.4	$179.07	36.08
38	Room #9A	2	4' 4-Lamp T-12 Magnetic Ballast 34 W	2800	160	0.32	896	$137.09	2	4' 3-Lamp T-8 32W Prism Lens; Elect Ballast Metalux or equivalent	91	0.18	509.6	$77.97	$140.00	$280.00	0.14	386.4	$59.12	4.74
39		1	4' 2-Lamp T-12 Magnetic Ballast 34 W	2800	80	0.08	224	$34.27	1	4' 2-Lamp T-8 32W Prism Lens; Elect Ballast Metalux or equivalent	58	0.06	162.4	$24.85	$120.00	$120.00	0.02	61.6	$9.42	12.73
40	Hallway #4	23	4' 2-Lamp T-8 Electric Ballast Prism Reflector 32 W	2800	58	1.33	3735.2	$571.49	23	No Upgrade Necessary	58	1.33	3735.2	$571.49	$0.00	$0.00	0.00	0	$0.00	0.00
41	Hallway #9	16	4' 2-Lamp T-8 Electric Ballast Prism Reflector 32 W	2800	58	0.93	2598.4	$397.56	16	No Upgrade Necessary	58	0.93	2598.4	$397.56	$0.00	$0.00	0.00	0	$0.00	0.00
42	Room #24	21	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.22	3410.4	$521.79	21	No Upgrade Necessary	58	1.22	3410.4	$521.79	$0.00	$0.00	0.00	0	$0.00	0.00
43	Room #25	24	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.39	3897.6	$596.33	24	No Upgrade Necessary	58	1.39	3897.6	$596.33	$0.00	$0.00	0.00	0	$0.00	0.00
44		6	4' 2-Lamp T-8 Electric Ballast Prism Reflector 32 W	2800	58	0.35	974.4	$149.08	6	No Upgrade Necessary	58	0.35	974.4	$149.08	$0.00	$0.00	0.00	0	$0.00	0.00
45	Room #26	48	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	2.78	7795.2	$1,192.67	48	No Upgrade Necessary	58	2.78	7795.2	$1,192.67	$0.00	$0.00	0.00	0	$0.00	0.00
46	Room #27	24	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.39	3897.6	$596.33	24	No Upgrade Necessary	58	1.39	3897.6	$596.33	$0.00	$0.00	0.00	0	$0.00	0.00
47	Room #28	24	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.39	3897.6	$596.33	24	No Upgrade Necessary	58	1.39	3897.6	$596.33	$0.00	$0.00	0.00	0	$0.00	0.00
48	Room #29	24	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.39	3897.6	$596.33	24	No Upgrade Necessary	58	1.39	3897.6	$596.33	$0.00	$0.00	0.00	0	$0.00	0.00
49	Room #30	21	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.22	3410.4	$521.79	21	No Upgrade Necessary	58	1.22	3410.4	$521.79	$0.00	$0.00	0.00	0	$0.00	0.00
50	Room #31	24	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.39	3897.6	$596.33	24	No Upgrade Necessary	58	1.39	3897.6	$596.33	$0.00	$0.00	0.00	0	$0.00	0.00
51	Room #32	24	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.39	3897.6	$596.33	24	No Upgrade Necessary	58	1.39	3897.6	$596.33	$0.00	$0.00	0.00	0	$0.00	0.00
52	Room #33	18	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	1.04	2923.2	$447.25	18	No Upgrade Necessary	58	1.04	2923.2	$447.25	$0.00	$0.00	0.00	0	$0.00	0.00

53	Room #34	6	4' 2-Lamp T-8 Electric Ballast Prism Reflector 32 W	2800	58	0.35	974.4	$149.08	6	No Upgrade Necessary	58	0.35	974.4	$149.08	$0.00	$0.00	0.00	0	$0.00	0.00
54	Room #35	6	2'x2' 4-Lamp T-8 Electronic Ballast Prism Reflector 32 W	2800	58	0.35	974.4	$149.08	6	No Upgrade Necessary	58	0.35	974.4	$149.08	$0.00	$0.00	0.00	0	$0.00	0.00
55	Room #37	2	4' 2-Lamp T-8 Electric Ballast Prism Reflector 32 W	2800	58	0.12	324.8	$49.69	2	No Upgrade Necessary	58	0.12	324.8	$49.69	$0.00	$0.00	0.00	0	$0.00	0.00
56		6	4' 4-Lamp T-8 Electronic Ballast Prism Reflector	2800	109	0.65	1831.2	$280.17	6	No Upgrade Necessary	109	0.65	1831.2	$280.17	$0.00	$0.00	0.00	0	$0.00	0.00
57		2	2' 4-Lamp T-8 Electronic Ballast Prism Reflector	2800	56	0.11	313.6	$47.98	2	No Upgrade Necessary	56	0.11	313.6	$47.98	$0.00	$0.00	0.00	0	$0.00	0.00
58	Room #40	12	Direct/Indirect 4' 2-Lamp T-8 Electronic Ballast	2800	58	0.70	1948.8	$298.17	12	No Upgrade Necessary	58	0.70	1948.8	$298.17	$0.00	$0.00	0.00	0	$0.00	0.00
59	Room #52	3	4' 2-Lamp T-8 Electric Ballast Prism Reflector 32 W	2800	58	0.17	487.2	$74.54	3	4' 2-Lamp T-8 32W Prism Lens; Elect Ballast Metalux or equivalent	58	0.17	487.2	$74.54	$120.00	$360.00	0.00	0	$0.00	0.00
60		19	Direct/Indirect 2-Lamp T-8 Electronic Ballast	2800	58	1.10	3085.6	$472.10	19	No Upgrade Necessary	58	1.10	3085.6	$472.10	$0.00	$0.00	0.00	0	$0.00	0.00
61	Room #30A	8	4' 2-Lamp T-8 Electric Ballast Prism Reflector 32 W	2800	58	0.46	1299.2	$198.78	8	No Upgrade Necessary	58	0.46	1299.2	$198.78	$0.00	$0.00	0.00	0	$0.00	0.00
62	Hallway #1	11	Recessed 4' 4-Lamp T-12 Magnetic Ballast 34W	2800	160	1.76	4928	$753.98	11	4' 3-Lamp T-8 32W Prism Lens; Elect Ballast Metalux or equivalent	82	0.90	2525.6	$386.42	$140.00	$1,540.00	0.86	2402.4	$367.57	4.19
63		4	Recessed 4' 3-Lamp T-8 Electronic Ballast 32 W	2800	82	0.33	918.4	$140.52	4	No Upgrade Necessary	82	0.33	918.4	$140.52	$0.00	$0.00	0.00	0	$0.00	0.00
64	Library	3	Chandeliers (Lamp information could not be verified; (6) 40W Assumed)	2800	192	0.58	1612.8	$246.76	3	No Upgrade Necessary	192	0.58	1612.8	$246.76	$0.00	$0.00	0.00	0	$0.00	0.00
65		4	Wall Sconses CFL	2800	20	0.08	224	$34.27	4	No Upgrade Necessary	20	0.08	224	$34.27	$0.00	$0.00	0.00	0	$0.00	0.00
66		3	Spots Hanging CFL	2800	20	0.06	168	$25.70	3	No Upgrade Necessary	20	0.06	168	$25.70	$0.00	$0.00	0.00	0	$0.00	0.00
67		64	4' 2-Lamp T-8 Electronic Ballast 32W	2800	58	3.71	10393.6	$1,590.22	64	No Upgrade Necessary	58	3.71	10393.6	$1,590.22	$0.00	$0.00	0.00	0	$0.00	0.00
68	Room #38	15	4' 3-Lamp T-8 Electronic Ballast 32 W	2800	82	1.23	3444	$526.93	15	No Upgrade Necessary	82	1.23	3444	$526.93	$0.00	$0.00	0.00	0	$0.00	0.00
69	Room #8	7	4' 2-Lamp T-8 32 W	2800	82	0.57	1607.2	$245.90	7	No Upgrade Necessary	82	0.57	1607.2	$245.90	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals	873				59.85	167568.8	$25,638.03	873			52.33	146532.4	$22,419.46		$98,691.25	7.51	21036.4	$3,218.57	30.66

CONCORD ENERGY SERVICES

CEG Job #: 9C08133

Project: Campbell Elementrary

Address: 24 Durham Ave

City: Metuchen, NJ 08840

Building SF: 58,000

"Campbell Elementary School"

DATE: 06/25/2009

KWH COST $0.153

ECM #3: LIGHTING UPGRADE - GYMNASIUM

EXISTING LIGHTING									PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Gymnasium	20	250 W Metal Halide Prism Reflectors	3744	295	5.90	22089.6	$3,379.71	20	2'X4' 4-Lamp 54W T-5HO Reflector/Elect Ballast; Metalux M/N F-BAY	229	4.58	17147.52	$2,623.57	$550.00	$11,000.00	1.32	4942.08	$756.14	14.55
	Totals	20				5.90	22089.6	$3,379.71	20			4.58	17147.52	$2,623.57		$11,000.00	1.32	4942.08	$756.14	14.55
	Note: Actual Lamp Wattage could not be verified. Based on Gymnasium size 250 W Metal Halide is assumed. If Owner moves forward with retrofit lighting calculations should be completed by a Professional Engineer.																			

Project Name: LGEA Solar PV Project - Campbell Elementary School
Location: Metuchen, NJ
Description: Photovoltaic System 95% Financing - 25 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 25 year
Total Construction Cost	$563,040
Annual kWh Production	97,628
Annual Energy Cost Reduction	$14,937
Annual SREC Revenue	$34,170
First Cost Premium	**$563,040**
Simple Payback:	**11.47** Years

Life Cycle Cost Analysis

Analysis Period (years): 25
Financing Term (mths): 240
Average Energy Cost ($/kWh) **$0.153**
Financing Rate: 7.00%
Financing %: 95%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
SREC Value ($/kWh) $0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$28,152	0	0	0	$0	0	0	(28,152)	0
1	$0	97,628	$14,937	$0	$34,170	$37,039	$12,725	($657)	($28,809)
2	$0	97,140	$15,385	$0	$33,999	$36,119	$13,645	($380)	($29,189)
3	$0	96,654	$15,847	$0	$33,829	$35,133	$14,631	($88)	($29,277)
4	$0	96,171	$16,322	$0	$33,660	$34,075	$15,689	$218	($29,059)
5	$0	95,690	$16,812	$986	$33,491	$32,941	$16,823	($446)	($29,505)
6	$0	95,211	$17,316	$981	$33,324	$31,725	$18,039	($104)	($29,609)
7	$0	94,735	$17,836	$976	$33,157	$30,421	$19,343	$253	($29,356)
8	$0	94,262	$18,371	$971	$32,992	$29,023	$20,741	$628	($28,728)
9	$0	93,790	$18,922	$966	$32,827	$27,523	$22,241	$1,019	($27,710)
10	$0	93,321	$19,489	$961	$32,662	$25,915	$23,848	$1,427	($26,283)
11	$0	92,855	$20,074	$956	$32,499	$24,191	$25,572	$1,853	($24,430)
12	$0	92,390	$20,676	$952	$32,337	$22,343	$27,421	$2,298	($22,132)
13	$0	91,929	$21,297	$947	$32,175	$20,361	$29,403	$2,761	($19,371)
14	$0	91,469	$21,936	$942	$32,014	$18,235	$31,529	$3,244	($16,127)
15	$0	91,012	$22,594	$937	$31,854	$15,956	$33,808	$3,746	($12,381)
16	$0	90,556	$23,271	$933	$31,695	$13,512	$36,252	$4,270	($8,111)
17	$0	90,104	$23,970	$928	$31,536	$10,891	$38,873	$4,814	($3,297)
18	$0	89,653	$24,689	$923	$31,379	$8,081	$41,683	$5,380	$2,083
19	$0	89,205	$25,429	$919	$31,222	$5,068	$44,696	$5,968	$8,051
20	$0	88,759	$26,192	$914	$31,066	$1,837	$47,927	$6,580	$14,631
21	$0	88,315	$26,978	$910	$30,910	$1,557	$44,060	$11,362	$25,993
22	$0	87,874	$27,787	$905	$30,756	$1,066	$36,257	$20,315	$46,308
23	$0	87,434	$28,621	$901	$30,602	$0	$0	$58,322	$104,630
24	$0	86,997	$29,480	$896	$30,449	$0	$0	$59,032	$163,663
25	$0	86,562	$30,364	$892	$30,297	$0	$0	$59,769	$223,432
	Totals:	1,862,533	$401,364	$15,192	$651,887	$460,387	$534,888	$615,205	$195,418
				Net Present Value (NPV)				**$24,715**	
				Internal Rate of Return (IRR)				**10.5%**	

Project Name: **LGEA Solar PV Project - Campbell Elementary School**
Location: **Metuchen, NJ**
Description: **Photovoltaic System - Direct Purchase**

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$563,040
Annual kWh Production	97,628
Annual Energy Cost Reduction	$14,937
Annual SREC Revenue	$34,170
First Cost Premium	**$563,040**
Simple Payback:	**11.47** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.153**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$563,040	0	0	0	$0	(563,040)	0
1	$0	97,628	$14,937	$0	$34,170	$49,107	($513,933)
2	$0	97,140	$15,385	$0	$33,999	$49,384	($464,549)
3	$0	96,654	$15,847	$0	$33,829	$49,676	($414,874)
4	$0	96,171	$16,322	$0	$33,660	$49,982	($364,892)
5	$0	95,690	$16,812	$986	$33,491	$49,318	($315,574)
6	$0	95,211	$17,316	$981	$33,324	$49,659	($265,915)
7	$0	94,735	$17,836	$976	$33,157	$50,017	($215,898)
8	$0	94,262	$18,371	$971	$32,992	$50,391	($165,506)
9	$0	93,790	$18,922	$966	$32,827	$50,782	($114,724)
10	$0	93,321	$19,489	$961	$32,662	$51,191	($63,533)
11	$0	92,855	$20,074	$956	$32,499	$51,617	($11,916)
12	$0	92,390	$20,676	$952	$32,337	$52,061	$40,145
13	$0	91,929	$21,297	$947	$32,175	$52,525	$92,670
14	$0	91,469	$21,936	$942	$32,014	$53,008	$145,678
15	$0	91,012	$22,594	$937	$31,854	$53,510	$199,188
16	$0	90,556	$23,271	$933	$31,695	$54,033	$253,221
17	$0	90,104	$23,970	$928	$31,536	$54,578	$307,799
18	$0	89,653	$24,689	$923	$31,379	$55,144	$362,943
19	$0	89,205	$25,429	$919	$31,222	$55,732	$418,675
20	$0	88,759	$26,192	$914	$31,066	$56,344	$475,019
21	$1	88,315	$26,978	$910	$30,910	$56,979	$531,997
22	$2	87,874	$27,787	$905	$30,756	$57,638	$589,635
23	$3	87,434	$28,621	$901	$30,602	$58,322	$647,958
24	$4	86,997	$29,480	$896	$30,449	$59,032	$706,990
25	$5	86,562	$30,364	$892	$30,297	$59,769	$766,759
	Totals:	1,862,533	$401,364	$15,192	$651,887	$1,329,799	$1,038,059
				Net Present Value (NPV)		**$766,784**	
				Internal Rate of Return (IRR)		**7.7%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Campbell Elementary School	3995	Sunpower SPR230	272	14.7	4,000	62.56	97,628	8,976	15.64

W

.= Proposed PV Layout

Notes:

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