ENERGY AUDIT – FINAL REPORT

METUCHEN BOARD OF EDUCATION
MOSS ELEMENTARY SCHOOL

16 SIMPSON PLACE
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
Moss Elementary School
16 Simpson Place
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	$ 59,878
Natural Gas	$ 47,220
Total	$ 107,098

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	$1,705	$359	4.7	21.7%
2	Multi-Purpose Room Lighting Upgrade	$12,420	$1,207	10.3	7.1%
3	Boiler Replacement with Like Kind	$102,226	$6,728	15.2	1.9%
4	Boiler Replacement - High Efficiency Upgrade	$118,400	$9,568	12.4	4.7%
5	Domestic Hot Water Heater Conversion	$4,150	$543.51	7.7	12.1%

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	-	2,218	-
2	Multi-Purpose Room Lighting Upgrade	4.97	7,452	-
3	Boiler Replacement with Like Kind	-	-	4,053
4	Boiler Replacement - High Efficiency Upgrade	-	-	5,763.9
5	Domestic Hot Water Heater Conversion	-	N/A	N/A

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 Moss Elementary School:

- **ECM #1:** Lighting Controls

CEG also recommends the Owner review the implementation of ECM #2: Gymnasium Lighting Upgrade and ECM #4: Domestic Hot Water Heater conversion. Both of these ECM's are beneficial to the future operation of Moss Elementary School even though their simple payback is longer than the standard seven (7) year threshold. If the Owner wishes to complete lighting ECM's only at this time, ECM #1 and ECM #2 can be packaged together to have a total installation cost equal to $14,107 total savings equal to $1,566 with a resultant simple payback equal to approximately 9.0 years.

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 28,000 square foot Moss Elementary School that includes classrooms, multi-purpose room, Library and the Township's Board of Education offices.

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 Jan-08 to Dec-08. The Owner was able to gather the information for the above-reference period for our review and analysis. During 2008, Public Service Electric & Gas (PSE&G) provided electricity to the facility under their General Light and Power (GLP) rate. 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.

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from Jan, 08 to Dec, 08. Woodruff Energy supplies the natural gas from the wellhead to the Elizabethtown Gas™ pipelines. Elizabethtown Gas™ charges a rate per therm for delivery of the natural gas via their pipelines to the burners.

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

Description	Average
Electricity	16.2¢ / kWh
Natural Gas	$1.66 / Therm

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
1/08	26,400	70	$3,349
2/08	29,280	74	$3,765
3/08	25,920	70	$3,304
4/08	26,160	83	$3,341
5/08	30,160	114	$4,043
6/08	35,920	123	$7,022
7/08	32,880	86	$6,262
8/08	31,440	85	$6,218
9/08	28,480	117	$5,921
10/08	55,760	98	$9,757
11/08	26,800	75	$3,886
12/08	20,960	70	$3,011
Totals	**370,160**	**123 Max**	**$59,878**

Figure 1
Electricity Usage Profile

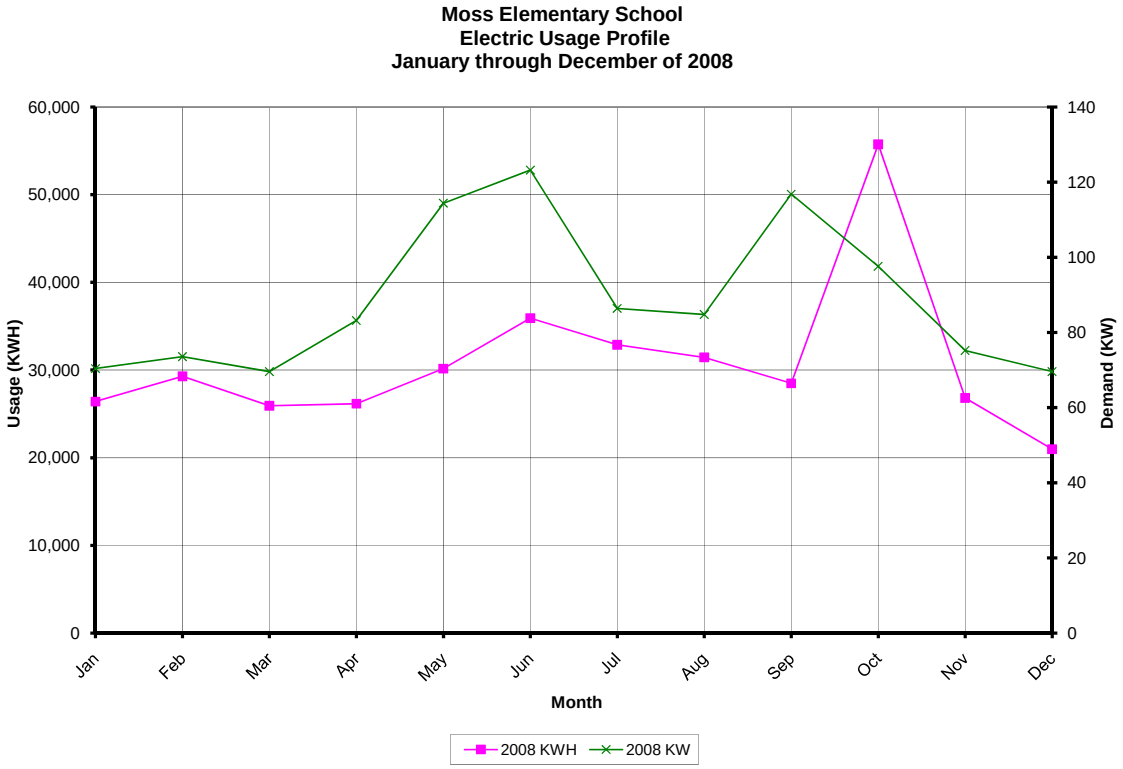
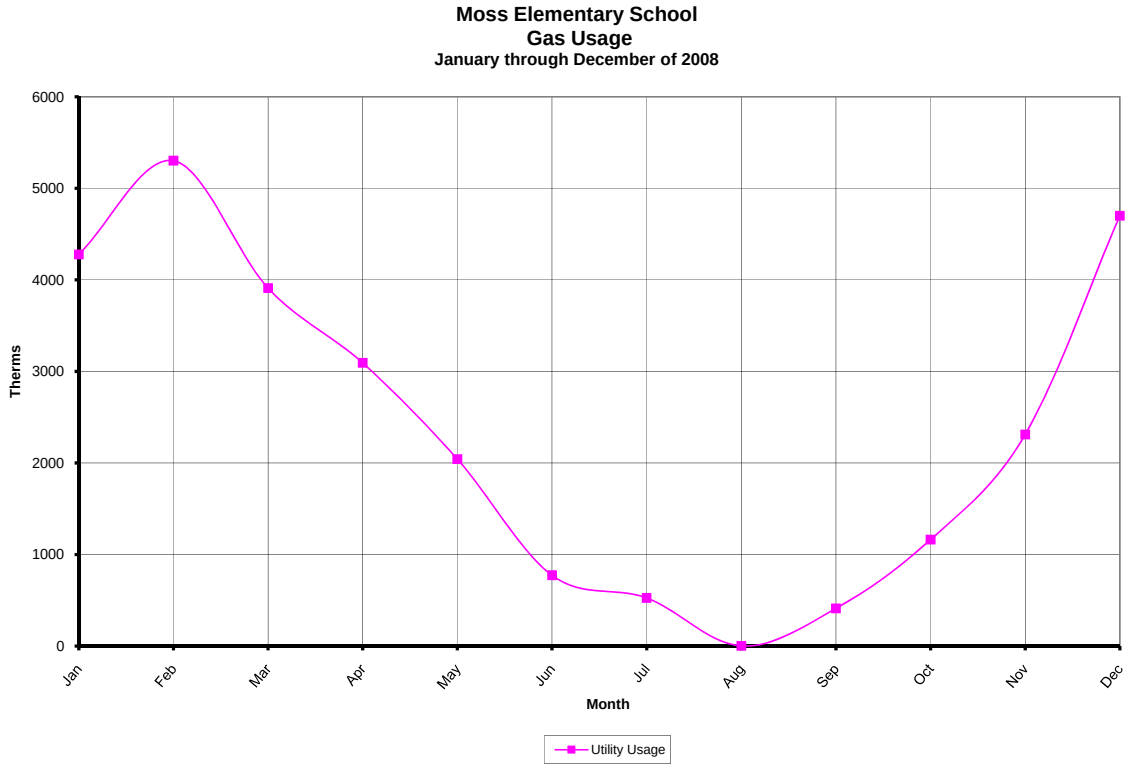


Table 4
Natural Gas Billing Data

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
1/08	4,277.6	$6,998
2/08	5,302	$8,617
3/08	3,910	$6,418
4/08	3,092.8	$5,093
5/08	2,042.5	$3,430
6/08	772.7	$1,444
7/08	525.5	$1,857
8/08	1.1	$238
9/08	411.3	$834
10/08	1,162.7	$1,869
11/08	2,310.5	$3,498
12/08	4,699.3	$6,927
Totals	**28,508**	**$47,220**

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:

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

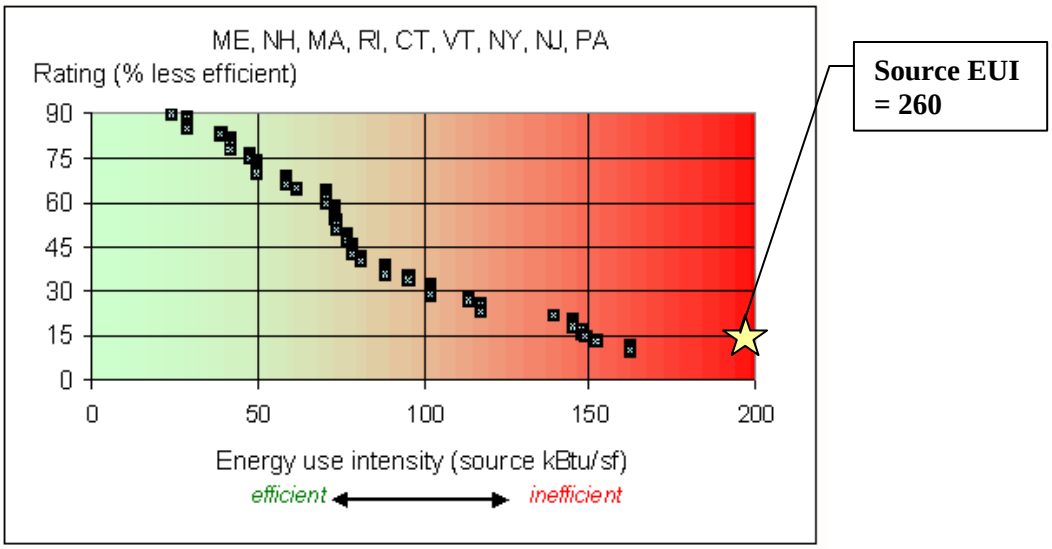
Electric = ((370,160 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 1,263,726 kBtu/h

Gas = ((28,508 therms) * (100,000 Btu/h / 1 W)) / (1000 Btu/h / 1 kBtu/h) = 2,850,800 kBtu/h

$$Building\ \ EUI = \frac{(1{,}263{,}726\ kBtu/h + 2{,}850{,}800\ kBtu/h)}{28{,}000\ SF} = \frac{4{,}114{,}526\ kBtu/h}{28{,}000\ SF}$$

Moss Elementary School EUI = 146.9 kBtu/SF (Site Energy); 260 kBtu/SF (Source Energy)

Figure 3
Energy Use Intensity Distributions: Schools



C. EPA Energy Benchmarking System

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

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. Therefore, it is vital that local government municipalities assess their energy usage, benchmark this usage utilizing Portfolio Manager, set priorities and goals to lessen their energy usage and move forward with these 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 school in order to allow the school district 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
Moss Elementary School	N/A	50

The Moss Elementary School is ineligible to receive an Energy Performance Rating. Refer to Appendix D for detailed energy benchmarking report entitled “STATEMENT OF ENERGY PERFORMANCE.”

V. FACILITY DESCRIPTION

The 28,000 SF Moss Elementary School is comprised of classrooms, multi-purpose room, Library and the Township's Board of Education offices. The typical hours of operation for this facility are between 8:00 am and 3:00 pm for the classrooms, and 6:30 am and 5:00 pm for the aforementioned offices. The building construction is typical throughout. Exterior walls are of typical brick and block construction. The windows throughout the facility are in good shape and appear to be maintained by the owner. Typical windows throughout the facility are double pane, ¼" thick thermal panels with a 3/8" air space housed in aluminum frames with external blinds. The external blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat gain in the summer. The roof consists of EPDM rubber. The amount of insulation below the roofing is unknown. Originally built in the 1920's, the school has undergone one major renovation in 1998. During the renovation all lighting and windows were upgraded.

Heating Plant

The facility is heated via a boiler plant located in the first floor boiler room. The boiler plant consists of two (2) natural gas-fired, Smith sectional boilers; these boilers are approximately 15 years old and have a 35 year service life. Each boiler has an output capacity of 2,353 MBh for a total capacity of 4,706 MBh. Two (2) Taco hot water pumps with five (5) HP motors having an efficiency of 87.5% provide hot water to various hot water coils throughout the school. The heating system operates as a constant volume system.

Cooling System

Cooling is only provided to the Board of Education offices, as well as a few window air conditioning units throughout the classrooms of the facility. Conditioned air is delivered to the Board of Education offices via two (2) AAON packaged roof top units. The phone/data room is cooled by a Fedders portable air conditioning 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 is provided by a Rheem electric hot water heater, 80-gallon capacity and 4,500W input.

HVAC Control System

HVAC systems within the facility are controlled via electronic thermostats linked to the direct digital control system.

Lighting

Typical lighting throughout most of the classrooms is provided by 1'x 4' pendant-hung, direct/indirect fixtures with T8 lamps and electronic ballasts. Corridors, mechanical rooms, janitor closets, storage rooms, file rooms and the multi-purpose room are lit by 1'x 4', 2'x 2', and 2'x 4' T8 and T12 lighting fixtures.

The Multi-Purpose Room is lit via twenty (20) incandescent light fixtures located at approximately 20'-0" above the finished floor. Each fixture contains a 500 watt incandescent lamp.

All exit signs are of the latest LED lamp design.

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 E for the Major Equipment List for this facility.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Controls

Description:

During the survey it was noted that 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, restrooms, lunch rooms, storage rooms, locker rooms, file rooms, etc.

CEG would recommend wall switches for individual rooms, ceiling mount sensors for larger rooms, office areas or restrooms, and fixture mount box sensors for some applications as manufactured by Sensorswitch, Watt Stopper or equivalent. There are approximately thirty-one (31) sensors required for this project (17,000 SF).

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 0.87 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

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

$$Energy\ Savings = \left(10\% \times\ 0.87\ Watts/SF \times 17{,}000\ SF \times 1{,}500 \times \$0.162/kWh\right) = \underline{\$\ 359\ per\ year}$$

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

$$Installation\ Cost = (\#\ of\ \ sensors \times\ \$\ per\ sensor) = (31 \times \$75) = \$2{,}325$$

NJ Smart Start® Program Incentives are calculated as follows:

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

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ controller \times\ \$\ 20) = (31 \times \$\ 20) = \underline{\$620}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,325
NJ Smart Start Equipment Incentive ($):	($620)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$1,705*
Total Energy Savings ($ / yr):	*$359*
Simple Payback (yrs):	*4.7*
Simple Return on Investment:	*21.7%*

ECM #2: Multi-Purpose Room Lighting Upgrade

Description:

The existing Multi-Purpose Room lighting system uses twenty three (23) 500-Watt Incandescent fixtures. This is an antiquated, inefficient technology that delivers poor lighting intensity and quality. This ECM would replace the existing fixtures with VISA Lighting Midbay fixtures or equivalent. This fixture contains compact fluorescent lamps and uses a little more than half the electricity of the 500-Watt incandescent fixture.

Energy Savings Calculations:

The existing incandescent lighting uses 500 Watts per fixture and the new three-lamp compact fluorescents use 284 Watts per fixture.

The annual energy savings = 23 Fixtures x (500W – 284W) x 1,500 hours = 7,452 kWh

Energy Cost Savings = 7,452 kWh x $0.162/kWh = $1,207

The cost of the VISA Midbay Fixture is $640 installed.

Total Cost = 23 Fixtures x $640 /Fixture = $14,720.

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the replacement of a High- Bay fixture to a T-5 or T-8 fixture warrants the following incentive: $100 per fixture.

$$\text{Smart Start® } Incentive = (\#\ of\ \ fixtures \times\ \$100) = (23 \times \$100) = \$2{,}300$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$14,720
NJ Smart Start Equipment Incentive ($):	($2,300)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$12,420*
Total Energy Savings ($ / yr):	*$1,207*
Simple Payback (yrs):	*10.3*
Simple Return on Investment:	*7.1%*

ECM #3: Boiler Replacement with Like Kind

Description:

Moss Elementary School is heated by two (2) H. B. Smith Gas-fired, sectional, 3,046 MBh hot water boilers which presently are about 77% efficient. As an energy conservation measure, the Concord team recommends these boilers be replaced by two (2) Weil – McLain sectional boilers or equivalent with an efficiency of 85.6%.

Existing Heating Hot Water Boiler:

Rated Capacity = 3,046 MBh (Natural Gas)

Combustion Efficiency = 77%
Age & Radiation Losses = 5%
Thermal Efficiency = 73%

Replacement Boiler:

High-Efficiency Condensing Boiler (with O/A HW Reset)

Rated Capacity = 2,887 MBh (Natural Gas)

Combustion Efficiency = 85.6%
Radiation Losses = 0.5%
Thermal Efficiency = 85.1%

Operating Data:

Heating Season Fuel Consumption = 28,508 Therms (based on Natural. Gas billing data)
Average Cost of Natural Gas = $1.66/Therm

Energy Savings Calculations:

Energy Savings = Old Boiler Energy Input x ((New Boiler Efficiency – Old Boiler) / New Boiler Efficiency))

$$\text{Energy Savings} = 28{,}508 \text{ Therms} \times \frac{85.1\% - 73\%}{(85.1\%)} = 4{,}053 \text{ Therms}$$

Cost Savings = Annual Energy Savings x $/Gallon

= 4,053 Therms x $1.66/Therm = $6,728/ yr.

Installed cost of an Weil – McLain sectional boiler including removal of existing unit, all piping changes and controls = $54,000 x 2 (Qty. Boilers) = $108,000.

Smart Start Incentive = $1.00/MBh x 5,774/installed MBh = $5,774

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$108,000
NJ Smart Start Equipment Incentive ($):	($5,774)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$102,226*
Total Energy Savings ($ / yr):	*$6,728*
Simple Payback (yrs):	*15.2*
Simple Return on Investment:	*1.9%*

ECM #4: Boiler Replacement – High Efficiency Upgrade

Description:

Moss Elementary School is heated by two (2) H. B. Smith Gas-fired, sectional, 3,046 MBh hot water boilers which presently are about 77% efficient. As an energy conservation measure, the Concord team recommends these boilers be replaced by three (3) Aerco Benchmark 2.0 condensing boilers or equivalent with an efficiency of 92%.

Existing Heating Hot Water Boiler:

Rated Capacity = 3,046 MBh (Natural Gas)

Combustion Efficiency = 77%
Age & Radiation Losses = 5%
Thermal Efficiency = 73%

Replacement Boiler:

High-Efficiency Condensing Boiler (with O/A HW Reset)

Rated Capacity = 2,000 MBh (Natural Gas)

Combustion Efficiency = 92%
Radiation Losses = 0.5%
Thermal Efficiency = 91.5%

Operating Data:

Heating Season Fuel Consumption = 28,508 Therms (based on Natural. Gas billing data)
Average Cost of Natural Gas = $1.66/Therm

Energy Savings Calculations:

Energy Savings = Old Boiler Energy Input x ((New Boiler Efficiency – Old Boiler) / New Boiler Efficiency))

$$\text{Energy Savings} = 28{,}508 \text{ Therms} \times \frac{91.5\% - 73\%}{(91.5\%)} = 5{,}763.9 \text{ Therms}$$

Cost Savings = Annual Energy Savings x $/Gallon

= 5,763.9 Therms x $1.66/Therm = $9,568/ yr.

Installed cost of an Aerco Benchmark 2.0 Condensing Boiler including removal of existing unit, all piping changes and controls = $41,400 x 3 (Qty. Boilers) = $124,200.

Smart Start Incentive = $1.00/MBh x 6,000/installed MBh = $6,000

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$124,200
NJ Smart Start Equipment Incentive ($):	($6,000)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$118,200*
Total Energy Savings ($ / yr):	*$9,568*
Simple Payback (yrs):	*12.37*
Simple Return on Investment:	*4.7%*

ECM #5: Domestic Hot Water Heater Conversion

The existing domestic hot water heater serving the facility is powered by a 4,500W electric heating element. This style of hot water heating, although 100% efficient (100% of Btu's from electricity transferred into heating the water), is very expensive due to the high cost of electricity.

This energy conservation measure will replace the existing electric, 80-gallon capacity domestic hot water heater with a 90% thermal efficient A.O. Smith Cyclone HE domestic hot water heater with 50-gallon storage capacity or equivalent. Due to the high recovery rate and thermal efficiency a smaller storage capacity can be utilized.

Existing Electric DHW Heater

Rated Capacity = 4,500 Watt (154 MBH) input; 80 gallons storage

Proposed Natural Gas-Fired, High-Efficiency DHW Heater

Rated Capacity = 76 MBH input; 50 gallons storage

Thermal Efficiency = 90%
Radiation Losses = 0.5%
Net Efficiency = 89.5%

Operating Data for DHW Heater

Estimated Daily DHW Load = 80 gal/h

DHW Boiler Operating Hrs/Day. = 7.5 Hrs.

DHW Boiler Operating Hrs/Yr. = 1,260 Hrs.

Electric Heating Consumption = 5,054 kWh = $818.78/year

Natural Gas Heating Consumption = 165 Therms = $275.27/year

Yearly Savings = $818.78/year - $275.27/year = $543.51/year

Cost of Domestic Hot Water Heater and Installation = $4,200

Simple Payback = $4,200 / $543.51 = 7.7 years

Refer to Appendix G for a detailed domestic hot water calculation.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,200
NJ Smart Start Equipment Incentive ($):	($50)
Maintenance Savings ($):	-
Net Installation Cost ($):	*$4,150*
Total Energy Savings ($ / yr):	*$543.51*
Simple Payback (yrs):	*7.7*
Simple Return on Investment:	*12.1%*

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 1,350 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in Appendix H. Using this square footage it was determined that a system size of 21.16 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 33,021KWh annually, reducing the overall utility bill by approximately 9% percent. A detailed financial analysis can be found in Appendix H. 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	11.26 Years	12.3%
Direct Purchase	11.26 Years	8.0%

The resultant Internal Rate of Return indicates that if the Owner was able to "self-finance" the solar project, the project would be slightly more 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) mile 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 the On Peak Load October 2008, more than likely due to increased air conditioning. 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. Demand (kW) seems to have some increased spikes in June and September. Metuchen may look into these peaks further with their PSE&G Account Manager.

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 through Public Service Electric and Gas Company (PSE&G) on a GLP (General Lighting and Power Service) rate. 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 (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 through October. Furthermore, Metuchen should contact their PSE&G Account Manager and look into the cause of the extreme consumption in October 2008.

Natural Gas:

The Moss 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 where 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. Maintain all weather stripping on windows and doors.

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

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

D. Recalibrate existing temperature sensors serving the HVAC control system.

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

F. Clean all light fixtures to maximize light output.

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

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

Electric Cost Summary

PSE&G - Electric (Rate - GLP)

Metuchen Moss Elementary School **2008**

Account # 5194608101

Meter # 728007692

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	26,400	29,280	25,920	26,160	30,160	35,920	32,880	31,440	28,480	55,760	26,800	20,960	370,160	
KW	70	74	70	83	114	123	86	85	117	98	75	70	123	Max
Monthly Load Factor	50%	59%	50%	44%	35%	40%	51%	50%	34%	77%	49%	40%	48%	
Electric Delivery, $	$888	$968	$874	$933	$1,147	$2,417	$1,920	$1,860	$2,130	$2,901	$933	$808	$17,780	
Delivery $/kwh	$0.034	$0.033	$0.034	$0.036	$0.038	$0.067	$0.058	$0.059	$0.075	$0.052	$0.035	$0.039	$0.048	
Electric Supply, $	$2,460	$2,797	$2,430	$2,408	$2,896	$4,605	$4,342	$4,358	$3,791	$6,857	$2,952	$2,203	$42,098	
Supply $/kwh	$0.093	$0.096	$0.094	$0.092	$0.096	$0.128	$0.132	$0.139	$0.133	$0.123	$0.110	$0.105	$0.114	
Total Cost, $	$3,349	$3,765	$3,304	$3,341	$4,043	$7,022	$6,262	$6,218	$5,921	$9,757	$3,886	$3,011	$59,878	
$/KWH	$0.1268	$0.1286	$0.1275	$0.1277	$0.1340	$0.1955	$0.1904	$0.1978	$0.2079	$0.1750	$0.1450	$0.1436	**$0.1618**	

Estimate value, no utility information provided.

Summary of Natural Gas Cost

Elizabethtown Gas (General Delivery)

2008

Metuchen Moss Elementary School

	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
Account# 1198349700	31	28	31	30	31	30	31	31	30	31	30	31	
Meter# 00035988													
Therms (Burner Tip)	4277.6	5302	3,910	3092.8	2042.5	772.7	525.5	1.1	411.3	1162.7	2310.5	4699.3	28,508
Total Distribution Cost	$1,425.74	$1,710.92	$1,323.37	$1,062.83	$768.56	$436.76	$1,199.44	$236.63	$340.61	$538.40	$877.83	$1,577.91	$11,499
Cost per Therm	$0.333	$0.323	$0.338	$0.344	$0.376	$0.565	$2.282	$215.118	$0.828	$0.463	$0.380	$0.336	$0.403
Total Commodity Cost	$5,572.24	$6,905.76	$5,094.21	$4,029.74	$2,661.30	$1,006.75	$657.40	$1.38	$493.09	$1,330.28	$2,619.80	$5,348.89	$35,721
Cost per Therm	$1.303	$1.302	$1.303	$1.303	$1.303	$1.303	$1.251	$1.251	$1.199	$1.144	$1.134	$1.138	$1.25
Total Cost	$6,997.98	$8,616.68	$6,417.58	$5,092.57	$3,429.86	$1,443.51	$1,856.84	$238.01	$833.70	$1,868.68	$3,497.63	$6,926.80	$47,220
Cost per Therm	$1.636	$1.625	$1.641	$1.647	$1.679	$1.868	$3.533	$216.369	$2.027	$1.607	$1.514	$1.474	**$1.66**
	HESS Account # 051-0180397-011						Estimate No Utility Information provided		Woodruff Energy Account # 511-416				
	Elizabethtown Gas												

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Moss Elementary School

ECM 1 Lighting Controls

	Qty	Unit Cost $	Material $	Labor $	Total $
Dual - Technology Sensor	31	$75	$930	$1,395	$2,325
Total Cost			$930	$1,395	$2,325
Utility Incentive - NJ Smart Start ($20 per Sensor)					($620)
Total Cost Less Incentive					$1,705

ECM 2 Gymnasium Lighting Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
New Gym Lights	23	$640	$490	$150	$14,720
Total Cost			$490	$150	$14,720
Utility Incentive - NJ Smart Start ($100 per Fixture)					($2,300)
Total Cost Less Incentive					$12,420

ECM 3 Boiler Replacement With Like Kind

	Qty	Unit Cost $	Material $	Labor $	Total $
New Weil McLain	2	$54,000	$27,000	$27,000	$108,000
Total Cost			$27,000	$27,000	$108,000
Utility Incentive - NJ Smart Start ($1/MBh)					($5,774)
Total Cost Less Incentive					$102,226

ECM 4 Boiler Replacement - High Efficiency Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
New Aerco Boilers	3	$41,400	$36,400	$5,000	$124,200
Total Cost			$36,400	$5,000	$124,200
Utility Incentive - NJ Smart Start ($1/MBh)					($6,000)
Total Cost Less Incentive					$118,200

ECM 5 Domestic Hot Water Heater Conversion

	Qty	Unit Cost $	Material $	Labor $	Total $
New High Efficiency Nat. Gas Water Heater	1	$4,200	$3,000	$1,200	$4,200
Total Cost			$3,000	$1,200	$4,200
Utility Incentive - NJ Smart Start ($50 ≤ 50 Gallons)					($50)
Total Cost Less Incentive					$4,150

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

STATEMENT OF ENERGY PERFORMANCE
Moss School

Building ID: 1773602
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 16, 2009

Facility
Moss School
16 Simpson Place
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: 1925
Gross Floor Area (ft²): 28,000

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]

Electricity (kBtu)	1,262,986
Natural Gas (kBtu)[4]	2,850,800
Total Energy (kBtu)	4,113,786

Energy Intensity[5]

Site (kBtu/ft²/yr)	147
Source (kBtu/ft²/yr)	257

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	344

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

National Average Comparison

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

Stamp of Certifying Professional

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

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

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Moss 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	16 Simpson Place, 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		☐

Moss School (K-12 School)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	23,800 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	41	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	No	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	100	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

Months	12 (Optional)	Is this school in operation for at least 8 months of the year?		☐
High School?	No	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.		☐
BOE Offices (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	4,200 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.		☐
Weekly operating hours	50 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	13	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	12	Is this the number of personal computers in the Office?		☐
Percent Cooled	Less than 50%	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

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 (kWh) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh)**
12/01/2008	12/31/2008	20,960.00
11/01/2008	11/30/2008	26,800.00
10/01/2008	10/31/2008	55,760.00
09/01/2008	09/30/2008	28,480.00
08/01/2008	08/31/2008	31,440.00
07/01/2008	07/31/2008	32,880.00
06/01/2008	06/30/2008	35,920.00
05/01/2008	05/31/2008	30,160.00
04/01/2008	04/30/2008	26,160.00
03/01/2008	03/31/2008	25,920.00
02/01/2008	02/29/2008	29,280.00
01/01/2008	01/31/2008	26,400.00
Electric Meter Consumption (kWh)		**370,160.00**
Electric Meter Consumption (kBtu)		**1,262,985.92**
Total Electricity Consumption (kBtu)		**1,262,985.92**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Natural Gas Meter (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
12/01/2008	12/31/2008	4,699.30
11/01/2008	11/30/2008	2,310.50
10/01/2008	10/31/2008	1,162.70
09/01/2008	09/30/2008	411.30
08/01/2008	08/31/2008	1.10
07/01/2008	07/31/2008	525.50
06/01/2008	06/30/2008	772.70
05/01/2008	05/31/2008	2,042.50
04/01/2008	04/30/2008	3,092.80

03/01/2008	03/31/2008	3,910.00
02/01/2008	02/29/2008	5,302.00
01/01/2008	01/31/2008	4,277.60
Natural Gas Meter Consumption (therms)		**28,508.00**
Natural Gas Meter Consumption (kBtu)		**2,850,800.00**
Total Natural Gas Consumption (kBtu)		**2,850,800.00**
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
Moss School
16 Simpson Place
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

Moss School	
Gross Floor Area Excluding Parking: (ft^2)	28,000
Year Built	1925
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Moss School	
Space Type	K-12 School
Gross Floor Area(ft^2)	23,800
Open Weekends?	Yes
Number of PCs	41
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	No
Percent Cooled	100
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	Metuchen board of Education

BOE Offices	
Space Type	Office
Gross Floor Area(ft^2)	4,200
Weekly operating hours	50
Workers on Main Shift	13
Number of PCs	12
Percent Cooled	Less than 50%
Percent Heated	50% or more

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	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft^2)	147	147	70	N/A	N/A
Source (kBtu/ft^2)	257	257	123	N/A	N/A
Energy Cost					
$/year	$ 107,091.00	$ 107,091.00	$ 51,089.08	N/A	N/A
$/$ft^2$/year	$ 3.82	$ 3.82	$ 1.82	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	344	344	164	N/A	N/A
$kgCO_2e/ft^2$/year	12	12	6	N/A	N/A

More than 50% of your building is defined as K-12 School. This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for K-12 School. This building uses X% less energy per square foot than the CBECS national average for K-12 School.

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

"Moss Elementary School"

Boiler

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room	Entire School	H.B. Smith	2	28A-12	-	3,046	2,353	73%*	Nat. Gas	15	35	20	Burner capacity 3,844 MBh.

* 5% efficiency degradation from manufacture data assumed in calculation.

Boiler - Pumps

Location	Area Served	Manufacturer	Qty	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Frame Size	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	Taco	2	FE-2008E2E1F2L0	-	5	1750	-	-	184T	1	20	19

Boiler - Pump Motors

Location	Area Served	Manufacturer	Qty	Model #	Serial #	HP	RPM	Eff	Frame Size	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	Baldor	2	M3218T	36B101Y697H1	5	1750	87.5	184T	208-230/460	2	1	20	19

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (W)	Recovery (gal/h)	Capacity (gal)	Energy Factor	Fuel	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Restrooms	Rheem	1	81V-80D	-	4500	88	80	0.86	Electric	240	1	11	12	1

Roof Top Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Heating Capacity	Heating Eff. (%)	Fuel	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Roof	Nurse, Library, Main Office	AAON	1	RK-10-2-E0-750	99JKWJ19	DX	11.0	10 Ton	Hot Water	191.5 MHz*	-	-	208	3	60	11	15	4
Roof	Board of Ed.	AAON	1	RK-13-2-E0-350		DX	10.5	13 Ton	Hot Water	2029.7 MHz*	-	-	208	3	60	11	15	4
Gym Stage	Gymnasium	Nesbitt	1	125513	LP85	-	-	-	Hot Water	-	-	-	115/230	-	-	30	15	-15

* Capacity derived from manufacturers product data.

AC Condensers and Window Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Room 101	Room 101	Fredrick	1	CP24N30	-	2 Ton	8.5 EER	R-22	208-230	1	2	20	18
Server Room	Server Room	Fedders	1	A6P0952A	-	9,000 bTu	7.9 EER	R-22	115	1	2	20	18
Room 200	Room 200	Frigidaire	1	Electrolux	-	-	-	R-22	-	1	4	20	16
Faculty Parking	Faculty Room	Trane	1	TTP036D100A0	-	3 Ton	10 EER	R-22	200-230	1	2	20	18
Faculty Parking	Special Services	Trane	1	TTP036D100A0	-	3 Ton	10 EER	R-22	200-230	1	2	20	18

Unit Ventilators

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Heating Type	Heating Capacity	CFM	RPM / HP	GPM	Approx. Age	ASHRAE Service Life	Remaining Life
Classrooms	Classroom	Trane	17	VUVC12511A0FAC	W00H41474	Hot Water	-	1250	-	-	9	20	11

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: 9C08133
Project: Moss Elementary School
Address: 16 Simpson Place
City: Metuchen, NJ
Building SF: 28,000

"Moss Elementary School"

DATE: 7/16/2009
KWH COST: $0.162

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		Gym	2	8' 2L T12 60W No Lens Magnetic Ballast	1500	126	0.25	378	$61.24	2	4' 2L T8 32W No Lens Electronic Ballast	58	0.12	174	$28.19	$60.00	$120.00	0.14	204	$33.05	3.63
2			1	4' 2L T12 34W No Lens Magnetic Ballast	1500	80	0.08	120	$19.44	1	4' 2L T8 32W No Lens Electronic Ballast	58	0.06	87	$14.09	$60.00	$60.00	0.02	33	$5.35	11.22
3			23	500 Watt incandescent highbay fixtures	1500	500	11.50	17250	$2,794.50	23	VISA Lighting Midbay Fixture	284	6.53	9798	$1,587.28	$640.00	$14,720.00	4.97	7452	$1,207.22	12.19
4		Classroom 101	19	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.10	1653	$267.79	19	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.10	1653	$267.79	0.00
5			1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
6		Classroom 103	13	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	0.75	1131	$183.22	13	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.75	1131	$183.22	0.00
7			1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
8		Boys Bathroom	3	4' 2L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	1500	58	0.17	261	$42.28	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.17	261	$42.28	0.00
9		Stairwell	1	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	1500	58	0.06	87	$14.09	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.06	87	$14.09	0.00
10		Girls Bathroom	3	4' 2L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	1500	58	0.17	261	$42.28	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.17	261	$42.28	0.00
11		Classroom 105	10	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.73	1095	$177.39	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.73	1095	$177.39	0.00
12			1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00

13		Special Services 106	2	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	2625	73	0.15	383.25	$62.09	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.15	383.25	$62.09	0.00
14			8	4' 3L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	2625	82	0.66	1722	$278.96	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.66	1722	$278.96	0.00
15			10	4' 2L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	2625	58	0.58	1522.5	$246.65	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.58	1522.5	$246.65	0.00
16		Boiler Room	4	100 Watt Incandescent	600	100	0.40	240	$38.88	4	23 Watt Compact	23	0.09	55.2	$8.94	$4.00	$16.00	0.31	184.8	$29.94	0.53
17		B.A.S.C. 111	8	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.46	1218	$197.32	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.46	1218	$197.32	0.00
18		Copy Room	2	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	2625	58	0.12	304.5	$49.33	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.12	304.5	$49.33	0.00
19		Conference Room	9	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.52	1370.25	$221.98	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.52	1370.25	$221.98	0.00
20		Server Room	1	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	2625	58	0.06	152.25	$24.66	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.06	152.25	$24.66	0.00
21		BOE Office	9	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.52	1370.25	$221.98	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.52	1370.25	$221.98	0.00
22		BOE Office	9	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.52	1370.25	$221.98	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.52	1370.25	$221.98	0.00
23		BOE Office	9	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.52	1370.25	$221.98	9	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.52	1370.25	$221.98	0.00
24		Stairwell	4	4' 3L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	8760	82	0.33	2873.28	$465.47	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.33	2873.28	$465.47	0.00
25		Conference Room	8	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.46	1218	$197.32	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.46	1218	$197.32	0.00
26		BOE Office	10	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.58	1522.5	$246.65	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.58	1522.5	$246.65	0.00
27		BOE Office	21	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	1.22	3197.25	$517.95	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	3197.25	$517.95	0.00
28		BOE Office	12	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.70	1827	$295.97	12	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.70	1827	$295.97	0.00
29		Storage	4	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	600	58	0.23	139.2	$22.55	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.23	139.2	$22.55	0.00
30		1st Flr Corridor	24	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	8760	58	1.39	12193.92	$1,975.42	24	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.39	12193.92	$1,975.42	0.00
31		Classroom 200	21	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.22	1827	$295.97	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	1827	$295.97	0.00
32			1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00

33	Classroom 202	21	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.22	1827	$295.97	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	1827	$295.97	0.00
34		1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
35	Classroom 203	28	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.62	2436	$394.63	28	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.62	2436	$394.63	0.00
36		1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
37	Nurse 208	7	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	1500	58	0.41	609	$98.66	7	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.41	609	$98.66	0.00
38	Admin 209	5	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.29	761.25	$123.32	5	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.29	761.25	$123.32	0.00
39	Office 210	10	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	2625	58	0.58	1522.5	$246.65	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.58	1522.5	$246.65	0.00
40		1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	2625	73	0.07	191.625	$31.04	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	191.625	$31.04	0.00
41	Library 212	21	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.22	1827	$295.97	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	1827	$295.97	0.00
42	Classroom 215	21	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.22	1827	$295.97	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	1827	$295.97	0.00
43		1	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	1500	58	0.06	87	$14.09	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.06	87	$14.09	0.00
44	Classroom 217	21	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.22	1827	$295.97	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	1827	$295.97	0.00
45		1	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	1500	58	0.06	87	$14.09	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.06	87	$14.09	0.00
46	Classroom 218	16	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	0.93	1392	$225.50	16	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.93	1392	$225.50	0.00
47		1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
48	Classroom 220	21	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.22	1827	$295.97	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	1827	$295.97	0.00
49		1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
50	Classroom 221	24	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.39	2088	$338.26	24	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.39	2088	$338.26	0.00
51		1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
52	Classroom 223	14	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	0.81	1218	$197.32	14	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.81	1218	$197.32	0.00

MAJOR EQUIPMENT LIST

Concord Engineering Group

"Moss Elementary School"

Boiler

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room	Entire School	H.B. Smith	2	28A-12	-	3,046	2,353	73%*	Nat. Gas	15	35	20	Burner capacity 3,844 MBh.

* 5% efficiency degradation from manufacture data assumed in calculation.

Boiler - Pumps

Location	Area Served	Manufacturer	Qty	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Frame Size	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	Taco	2	FE-2008E2E1F2L0	-	5	1750	-	-	184T	1	20	19

Boiler - Pump Motors

Location	Area Served	Manufacturer	Qty	Model #	Serial #	HP	RPM	Eff	Frame Size	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	Baldor	2	M3218T	36B101Y697H1	5	1750	87.5	184T	208-230/460	2	1	20	19

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (W)	Recovery (gal/h)	Capacity (gal)	Energy Factor	Fuel	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Restrooms	Rheem	1	81V-80D	-	4500	88	80	0.86	Electric	240	1	11	12	1

Roof Top Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Heating Capacity	Heating Eff. (%)	Fuel	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Roof	Nurse, Library, Main Office	AAON	1	RK-10-2-E0-750	99JKWJ19	DX	11.0	10 Ton	Hot Water	191.5 MHz*	-	-	208	3	60	11	15	4
Roof	Board of Ed.	AAON	1	RK-13-2-E0-350		DX	10.5	13 Ton	Hot Water	2029.7 MHz*	-	-	208	3	60	11	15	4
Gym Stage	Gymnasium	Nesbitt	1	125513	LP85	-	-	-	Hot Water	-	-	-	115/230	-	-	30	15	-15

* Capacity derived from manufacturers product data.

AC Condensers and Window Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Room 101	Room 101	Fredrick	1	CP24N30	-	2 Ton	8.5 EER	R-22	208-230	1	2	20	18
Server Room	Server Room	Fedders	1	A6P0952A	-	9,000 bTu	7.9 EER	R-22	115	1	2	20	18
Room 200	Room 200	Frigidaire	1	Electrolux	-	-	-	R-22	-	1	4	20	16
Faculty Parking	Faculty Room	Trane	1	TTP036D100A0	-	3 Ton	10 EER	R-22	200-230	1	2	20	18
Faculty Parking	Special Services	Trane	1	TTP036D100A0	-	3 Ton	10 EER	R-22	200-230	1	2	20	18

Unit Ventilators

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Heating Type	Heating Capacity	CFM	RPM / HP	GPM	Approx. Age	ASHRAE Service Life	Remaining Life
Classrooms	Classroom	Trane	17	VUVC12511A0FAC	W00H41474	Hot Water	-	1250	-	-	9	20	11

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: 9C08133
Project: Moss Elementary School
Address: 16 Simpson Place
City: Metuchen, NJ
Building SF: 28,000

"Moss Elementary School"

DATE: 7/16/2009
KWH COST: $0.162

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		Gym	2	8' 2L T12 60W No Lens Magnetic Ballast	1500	126	0.25	378	$61.24	2	4' 2L T8 32W No Lens Electronic Ballast	58	0.12	174	$28.19	$60.00	$120.00	0.14	204	$33.05	3.63
2			1	4' 2L T12 34W No Lens Magnetic Ballast	1500	80	0.08	120	$19.44	1	4' 2L T8 32W No Lens Electronic Ballast	58	0.06	87	$14.09	$60.00	$60.00	0.02	33	$5.35	11.22
3			23	500 Watt incandescent highbay fixtures	1500	500	11.50	17250	$2,794.50	23	VISA Lighting Midbay Fixture	284	6.53	9798	$1,587.28	$640.00	$14,720.00	4.97	7452	$1,207.22	12.19
4		Classroom 101	19	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	1.10	1653	$267.79	19	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.10	1653	$267.79	0.00
5			1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
6		Classroom 103	13	4' 2L T8 32W Electronic Ballast Direct Indirect Fixture	1500	58	0.75	1131	$183.22	13	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.75	1131	$183.22	0.00
7			1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
8		Boys Bathroom	3	4' 2L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	1500	58	0.17	261	$42.28	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.17	261	$42.28	0.00
9		Stairwell	1	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	1500	58	0.06	87	$14.09	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.06	87	$14.09	0.00
10		Girls Bathroom	3	4' 2L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	1500	58	0.17	261	$42.28	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.17	261	$42.28	0.00
11		Classroom 105	10	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.73	1095	$177.39	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.73	1095	$177.39	0.00
12			1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00

53		Classroom 225	1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
54		2nd Flr Corridor	21	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	8760	58	1.22	10669.68	$1,728.49	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	10669.68	$1,728.49	0.00
55		Stairwell	4	4' 3L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	8760	82	0.33	2873.28	$465.47	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.33	2873.28	$465.47	0.00
		Totals	497				40.05	92222.99	$14,940.12	497			6.80	10114.2	$1,638.50		$14,916.00	33.25	82108.79	$13,301.62	1.12

53		Classroom 225	1	2'x2' 2L T8 32W U-Tube Prismatic Lens Electronic Ballast	1500	73	0.07	109.5	$17.74	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	109.5	$17.74	0.00
54		2nd Flr Corridor	21	2'x4' 2L T8 32W Prismatic Lens Electronic Ballast	8760	58	1.22	10669.68	$1,728.49	21	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	1.22	10669.68	$1,728.49	0.00
55		Stairwell	4	4' 3L T8 32W Prismatic Reflector Electronic Ballast Below Ceiling Mount	8760	82	0.33	2873.28	$465.47	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.33	2873.28	$465.47	0.00
		Totals	497				40.05	92222.99	$14,940.12	497			6.80	10114.2	$1,638.50		$14,916.00	33.25	82108.79	$13,301.62	1.12

Domestic Hot Water Calculator

About

Water Heater Characteristics

Physical		Thermal	
? Diameter (feet)	1.5	? Water Inlet Temperature (Degrees F)	58
? Capacity (gallons)	80	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	32.05	? Hot Water Temperature (Degrees F)	135
? Effective R-value	8.812	? Hot Water Usage (Gallons per Day)	64.3

Energy Use

1694	? Heat Delivered in Hot Water (BTU/hr)
236.4	? Heat loss through insulation (BTU/hr)

Gas vs. Electric Water Heating

Gas		Electric
0.8951	? Overall Efficiency	0.86
1.02	? Conversion Efficiency	0.98
1893 BTU/hr	? Power Into Water Heater	1970 BTU/hr

Cost

$ 1.66 /Therm	? Utility Rates	$ 0.162 /kWh
$ 275.272488	? Yearly Water Heating Cost	$ 818.7807969

Project Name: LGEA Solar PV Project - Moss Elementary School
Location: Metuchen, NJ
Description: Photovoltaic System 95% Financing - 20 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 20 year
Total Construction Cost	$190,440
Annual kWh Production	33,021
Annual Energy Cost Reduction	$5,349
Annual SREC Revenue	$11,557
First Cost Premium	**$190,440**
Simple Payback:	**11.26** Years

Life Cycle Cost Analysis

Analysis Period (years): 25
Financing Term (mths): 240
Average Energy Cost ($/kWh) **$0.162**
Financing Rate: 7.00%
Financing %: 95%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
SREC Value ($/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	$9,522	0	0	0	$0	0	0	(9,522)	0
1	$0	33,021	$5,349	$0	$11,557	$12,528	$4,304	$75	($9,447)
2	$0	32,856	$5,510	$0	$11,500	$12,217	$4,615	$178	($9,269)
3	$0	32,692	$5,675	$0	$11,442	$11,883	$4,949	$285	($8,984)
4	$0	32,528	$5,845	$0	$11,385	$11,525	$5,306	$399	($8,585)
5	$0	32,366	$6,021	$333	$11,328	$11,142	$5,690	$184	($8,402)
6	$0	32,204	$6,201	$332	$11,271	$10,730	$6,101	$309	($8,093)
7	$0	32,043	$6,387	$330	$11,215	$10,289	$6,542	$441	($7,652)
8	$0	31,883	$6,579	$328	$11,159	$9,816	$7,015	$578	($7,074)
9	$0	31,723	$6,776	$327	$11,103	$9,309	$7,523	$721	($6,353)
10	$0	31,565	$6,980	$325	$11,048	$8,766	$8,066	$870	($5,483)
11	$0	31,407	$7,189	$323	$10,992	$8,182	$8,649	$1,026	($4,457)
12	$0	31,250	$7,405	$322	$10,937	$7,557	$9,275	$1,189	($3,268)
13	$0	31,093	$7,627	$320	$10,883	$6,887	$9,945	$1,358	($1,911)
14	$0	30,938	$7,856	$319	$10,828	$6,168	$10,664	$1,534	($377)
15	$0	30,783	$8,091	$317	$10,774	$5,397	$11,435	$1,717	$1,340
16	$0	30,629	$8,334	$315	$10,720	$4,570	$12,262	$1,907	$3,247
17	$0	30,476	$8,584	$314	$10,667	$3,684	$13,148	$2,105	$5,352
18	$0	30,324	$8,842	$312	$10,613	$2,733	$14,099	$2,311	$7,663
19	$0	30,172	$9,107	$311	$10,560	$1,714	$15,118	$2,525	$10,188
20	$0	30,021	$9,380	$309	$10,507	$621	$16,211	$2,747	$12,934
21	$0	29,871	$9,662	$308	$10,455	$527	$14,903	$4,380	$17,314
22	$0	29,722	$9,952	$306	$10,403	$360	$12,263	$7,424	$24,738
23	$0	29,573	$10,250	$305	$10,351	$0	$0	$20,296	$45,034
24	$0	29,425	$10,558	$303	$10,299	$0	$0	$20,553	$65,588
25	$0	29,278	$10,874	$302	$10,247	$0	$0	$20,820	$86,408
	Totals:	629,974	$143,741	$5,138	$220,491	$155,719	$180,918	$208,084	$190,452
					Net Present Value (NPV)			**$12,361**	
					Internal Rate of Return (IRR)			**12.3%**	

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

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$190,440
Annual kWh Production	33,021
Annual Energy Cost Reduction	$5,349
Annual SREC Revenue	$11,557
First Cost Premium	**$190,440**
Simple Payback:	**11.26** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.162**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$190,440	0	0	0	$0	(190,440)	0
1	$0	33,021	$5,349	$0	$11,557	$16,907	($173,533)
2	$0	32,856	$5,510	$0	$11,500	$17,010	($156,524)
3	$0	32,692	$5,675	$0	$11,442	$17,117	($139,406)
4	$0	32,528	$5,845	$0	$11,385	$17,230	($122,176)
5	$0	32,366	$6,021	$333	$11,328	$17,015	($105,161)
6	$0	32,204	$6,201	$332	$11,271	$17,141	($88,019)
7	$0	32,043	$6,387	$330	$11,215	$17,272	($70,747)
8	$0	31,883	$6,579	$328	$11,159	$17,410	($53,337)
9	$0	31,723	$6,776	$327	$11,103	$17,553	($35,784)
10	$0	31,565	$6,980	$325	$11,048	$17,702	($18,082)
11	$0	31,407	$7,189	$323	$10,992	$17,858	($224)
12	$0	31,250	$7,405	$322	$10,937	$18,020	$17,796
13	$0	31,093	$7,627	$320	$10,883	$18,189	$35,986
14	$0	30,938	$7,856	$319	$10,828	$18,365	$54,351
15	$0	30,783	$8,091	$317	$10,774	$18,549	$72,900
16	$0	30,629	$8,334	$315	$10,720	$18,739	$91,639
17	$0	30,476	$8,584	$314	$10,667	$18,937	$110,576
18	$0	30,324	$8,842	$312	$10,613	$19,143	$129,719
19	$0	30,172	$9,107	$311	$10,560	$19,357	$149,075
20	$0	30,021	$9,380	$309	$10,507	$19,579	$168,654
21	$1	29,871	$9,662	$308	$10,455	$19,809	$188,463
22	$2	29,722	$9,952	$306	$10,403	$20,048	$208,511
23	$3	29,573	$10,250	$305	$10,351	$20,296	$228,807
24	$4	29,425	$10,558	$303	$10,299	$20,553	$249,360
25	$5	29,278	$10,874	$302	$10,247	$20,820	$270,180
Totals:		629,974	$143,741	$5,138	$220,491	$460,620	$359,094
				Net Present Value (NPV)		**$270,205**	
				Internal Rate of Return (IRR)		**8.0%**	

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
Moss Elementary School	1350	Sunpower SPR230	92	14.7	1,353	21.16	33,021	3,036	15.64

.= 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.