CLIFTON PUBLIC SCHOOLS
PUBLIC SCHOOL #16

755 GROVE STREET
CLIFTON, NEW JERSEY 07013

FACILITY ENERGY REPORT

TABLE OF CONTENTS

I. HISTORIC ENERGY CONSUMPTION/COST

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

Electric Utility Provider:	Public Service Electric & Gas
Electric Utility Rate Structure:	General Lighting & Power Service (GLP)
Third Party Supplier:	Champion Energy Services LLC

Natural Gas Utility Provider:	Public Service Electric & Gas
Utility Rate Structure:	Large Volume Gas (LVG)
Third Party Supplier:	Hess

The electric usage profile represents the actual electrical usage for the facility. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile within each facility report shows the actual natural gas energy usage for the facility. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: PSE&G
Rate: GLP
Meter No: 1437511
Account No: 66 518 997 01
Third Party Utility Provider: Champion Energy Services LLC
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-12	11,100	46.5	$557
Apr-12	11,325	55.8	$604
May-12	13,020	67.4	$2,260
Jun-12	11,025	73.7	$2,130
Jul-12	6,705	25.5	$1,063
Aug-12	8,340	68.1	$1,762
Sep-12	9,495	55.5	$1,241
Oct-12	9,075	42.0	$1,138
Nov-12	9,090	42.0	$1,138
Dec-12	9,885	42.5	$1,226
Jan-13	11,085	41.9	$1,410
Feb-13	10,455	42.5	$1,321
Totals	**120,600**	**73.7 Max**	**$15,850**

AVERAGE DEMAND **50.3 KW average**
AVERAGE RATE **$0.131** **$/kWh**

Figure 1
Electricity Usage Profile

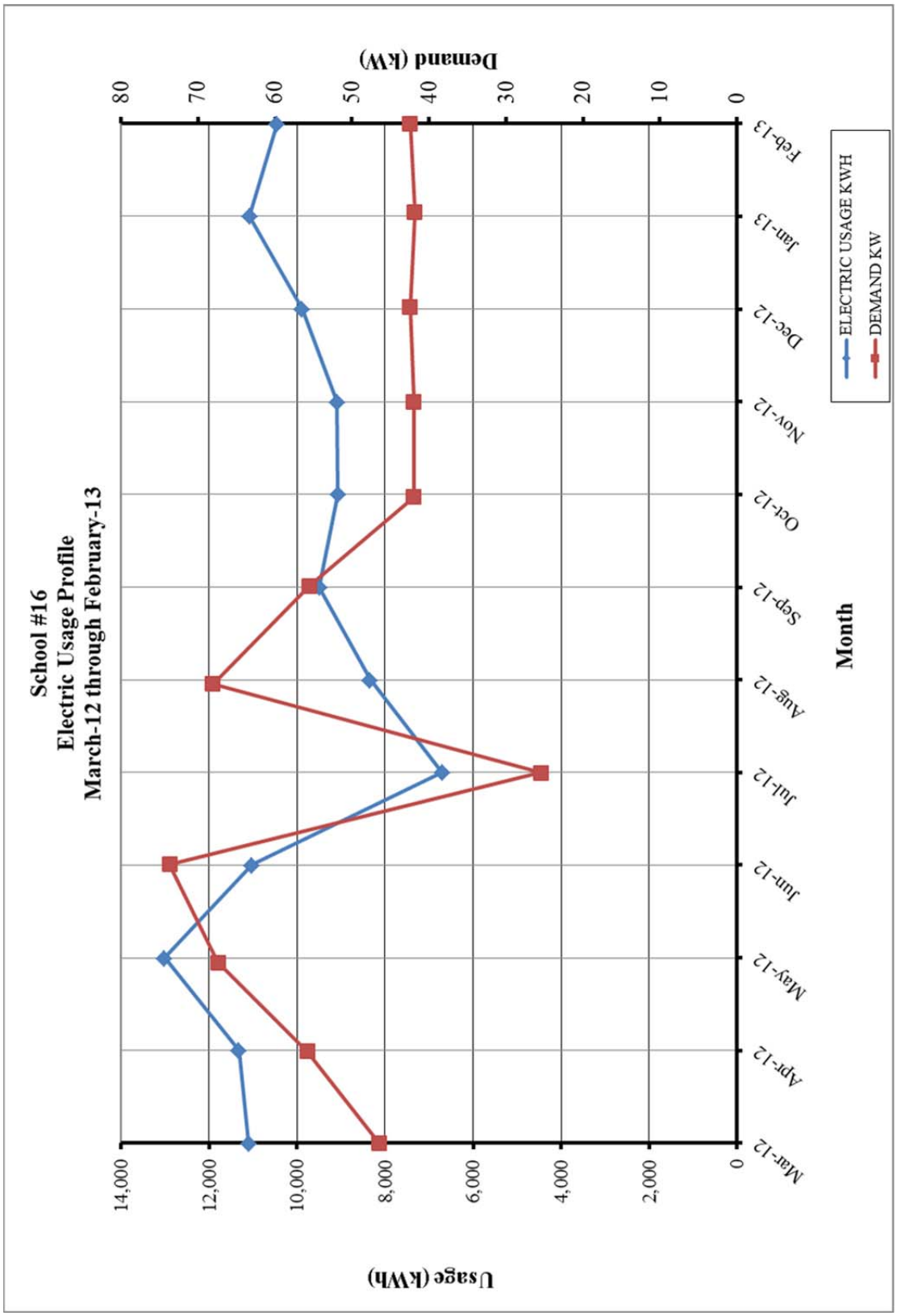
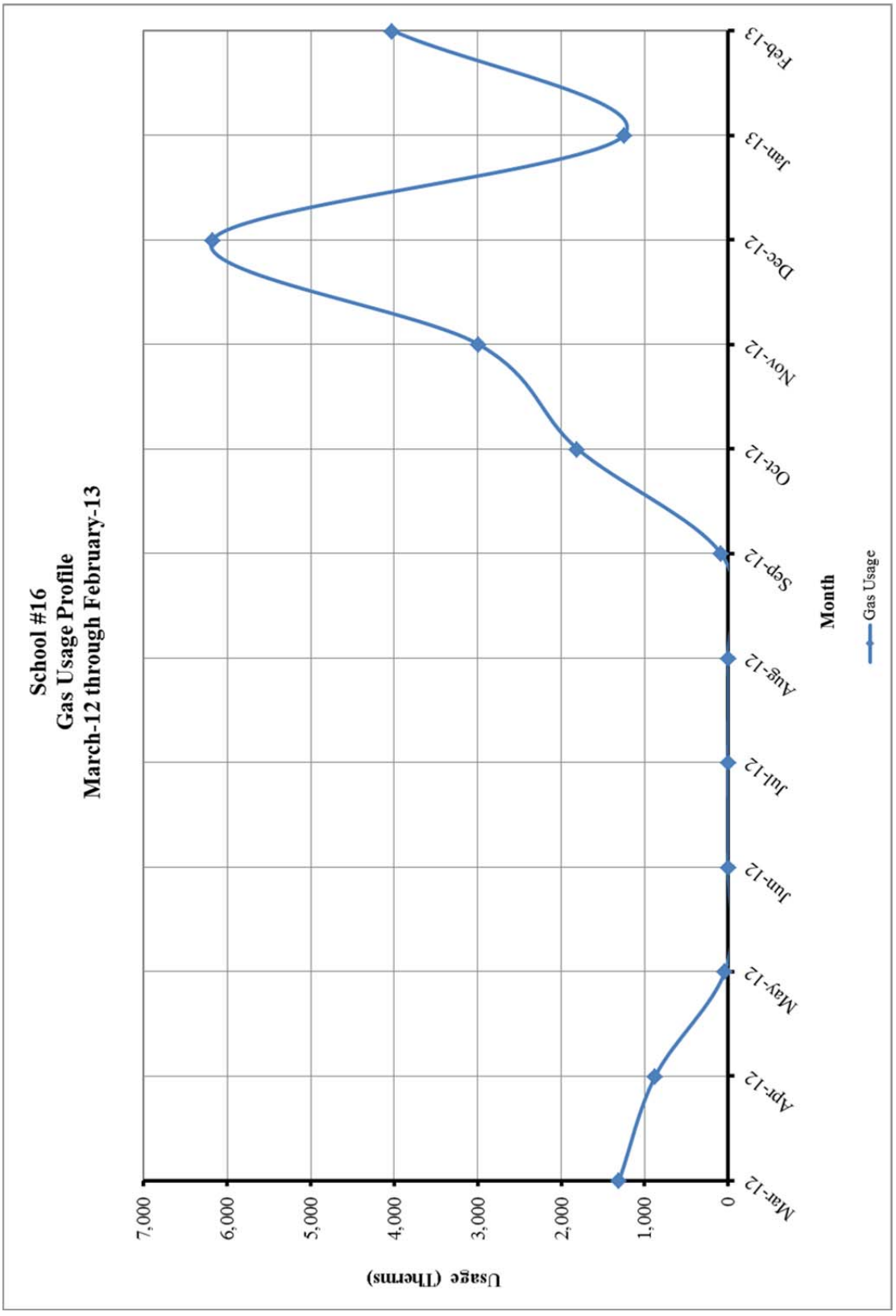


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: LVG		
Meter No: 2415401		
Account No: 66 518 997 01		
Third Party Utility Provider: Hess		
TPS Meter No: 446575/446935		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Mar-12	1,306.16	$879.24
Apr-12	871.98	$532.27
May-12	38.58	$118.99
Jun-12	0.00	$99.50
Jul-12	0.00	$99.50
Aug-12	0.00	$99.50
Sep-12	92.12	$152.60
Oct-12	1,811.09	$1,731.61
Nov-12	2,997.18	$2,947.69
Dec-12	6,175.64	$5,476.62
Jan-13	1,249.97	$1,841.96
Feb-13	4,022.62	$3,897.62
TOTALS	**18,565.34**	**$17,877.10**
AVERAGE RATE:	**$0.96**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

School #16 is located at 755 Grove Street in Clifton, New Jersey. This 37,695 SF school was built in 1957 with an addition in 1964. The building is a one-story facility comprised of administration offices, community room, general classrooms, music/art room, nurse's office, kitchen serving area, all-purpose room/gym, locker rooms, stage, cafeteria room, teacher's room, storage rooms, and mechanical/electrical rooms.

Occupancy Profile

The typical hours of operation for School #16 are Monday through Friday between 7:00 am and 4:00 pm. Maintenance staff is present in the building as early as 6:00 am, and nighttime cleaning staff present until 10:00 pm. The school's enrollment is approximately 214 students and has 57 teachers, support staff, and administrative personnel.

Building Envelope

Exterior walls for this school are brick faced with a concrete block construction. The amount of insulation within the walls is unknown. The windows throughout the school are in good condition and appear to be well maintained. Typical windows throughout the school are double-section, double pane, operable, ¼" clear glass with aluminum frames. The building roof is built-up Bitchumen roof with asphalt cap sheet rigid roof insulation and deck surface.

HVAC Systems

School #16 HVAC systems consists of two (2) fire-tube steam boilers, classroom heating and ventilating units with steam coils, floor-mounted steam radiators, and approximately 22 window air conditioning units.

The steam boilers are gas-fired, fire-tube units that are approximately 21 years old with an input of 5,103 MBH and an output of 4,313 lbs. /hr. at 212°F. Manufactured by Rockmills Steel Products and having an existing efficiency of approximately 75%, these boilers feed steam radiators and steam coils throughout the facility. Steam condensate is returned to a pump and receiver unit that then pumps the hot water to the boilers.

Fresh air is supplied to the classrooms via the unit ventilators, outside air intake louvers for the storage and mechanical rooms and operable windows.

Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters. There are also several roof exhausters for the offices, storage rooms, mechanical rooms, and corridors. Air is exhausted from the classrooms by the unit ventilators.

HVAC System Controls

The steam boilers are controlled by a Heat-Timer Model MULTI-MOD with full modulation sequencing controls and an outside temperature reset controller also by Heat-Timer (Model MPC). The various steam valves in the boiler plant are controlled by 1957 vintage Powers pneumatic valve actuators and on/off switches. Some of the controls have proportional band logic but the sensors/controls are far out of calibration. Each unit ventilator in the classrooms is controlled by a Powers thermostat on the opposite wall with a temperature control dial that allows the occupant local temperature control. The steam radiators are controlled by a manual thermostatic valve.

Domestic Hot Water

Domestic hot water for the facility is supplied by an A. O. Smith Model GCV 50 2000 gas-fired, hot water heater with a capacity of 50 gallons and an input of 40 MBH (gas). A 1/40 HP Bell & Gossett Model NBF-12 FLW pump circulates the domestic hot water throughout the facility.

Lighting

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed list of the lighting throughout the facility and estimated operating hours per space.

Miscellaneous

The kitchen is equipped with TurboAir Deluxe Energy Star freezer and refrigerator units along with two portable heated rack cabinets and two milk refrigerators owned by the vendor.

III. MAJOR EQUIPMENT LIST

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

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

IV. ENERGY CONSERVATION MEASURES

Energy Conservation Measures are developed specifically for this facility. The energy savings and calculations are highly dependent on the information received from the site survey and interviews with operations personnel. The assumptions and calculations should be reviewed by the owner to ensure accurate representation of this facility. The following ECMs were analyzed:

Table 1
ECM Financial Summary

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade - General	$4,602	$633	7.3	106.3%
ECM #2	Lighting Upgrade - MPR	$5,000	$150	33.3	-55.0%
ECM #3	Lighting Controls Upgrade	$7,030	$1,700	4.1	262.7%
ECM #4	Valve Blanket Insulation	$11,363	$829	13.7	82.4%
ECM #5	Burner Controls Upgrade	$60,000	$814	73.7	-71.5%
ECM #6	Energy Star Refrigerator	$2,000	$222	9.0	66.5%
ECM #7	Replace Steam Condensate Receiver	$36,750	$250	147.0	-89.8%
ECM #8	Steam Trap Replacement	$21,990	$1,281	17.2	-41.7%
ECM #9	Window AC Replacements	$3,500	$529	6.6	51.1%
ECM #10	DDC Controls Upgrade	$218,200	$1,644	132.7	-88.7%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	69.56 KW PV System	$462,312	$25,589	18.1	-17.0%

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

Table 2
ECM Energy Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Lighting Upgrade - General	2.0	4,829	-
ECM #2	Lighting Upgrade - MPR	0.4	1,144	-
ECM #3	Lighting Controls Upgrade	-	12,975	-
ECM #4	Valve Blanket Insulation	-	-	864
ECM #5	Burner Controls Upgrade	-	-	798
ECM #6	Energy Star Refrigerator	-	1,693	-
ECM #7	Replace Steam Condensate Receiver	-	69	251
ECM #8	Steam Trap Replacement	-	-	2,996
ECM #9	Window AC Replacements	3.9	3,111	-
ECM #10	DDC Controls Upgrade	-	862	1,595
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	69.56 KW PV System	69.6	79,449	0

Table 3
Facility Project Summary

ENERGY SAVINGS IMPROVEMENT PROGRAM - POTENTIAL PROJECT					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
Lighting Upgrade - General	$633	$5,042	$440	$4,602	7.3
Lighting Upgrade - MPR	$150	$5,400	$400	$5,000	33.3
Lighting Controls Upgrade	$1,700	$7,800	$770	$7,030	4.1
Valve Blanket Insulation	$829	$11,363	$0	$11,363	13.7
~~Burner Controls Upgrade~~	~~$814~~	~~$60,000~~	~~$0~~	~~$60,000~~	~~73.7~~
Energy Star Refrigerator	$222	$2,000	$0	$2,000	9.0
~~Replace Steam Condensate Receiver~~	~~$250~~	~~$36,750~~	~~$0~~	~~$36,750~~	~~147.0~~
Steam Trap Replacement	$1,281	$21,990	$0	$21,990	17.2
Window AC Replacements	$529	$3,500	$0	$3,500	6.6
~~DDC Controls Upgrade~~	~~$1,644~~	~~$218,200~~	~~$0~~	~~$218,200~~	~~132.7~~
Design / Construction Extras (15%)		$8,564		*$8,564*	
Total Project	**$5,344**	**$65,659**	**$1,610**	**$64,049**	**12.0**

Note: ECM's with the strike-through font are not included in the ESIP.

Design / Construction Extras is shown as an additional cost for the facility project summary. This cost is included to estimate the costs associated with construction management fees for a larger combined project.

ECM #1: Lighting Upgrade – General

Description:

The majority of the interior lighting throughout Clifton Elementary School #16 is provided with fluorescent fixtures with older generation, 700 series and 741/ECO 32W T8 lamps and electronic ballasts. Although these T8 lamps are considered fairly efficient, further energy savings can be achieved by replacing the existing T8 lamps with new generation, 800 series 28W T8 lamps without compromising light output. Concord Engineering recommends that most of these fixtures remain unmodified due to the extensive costs which will be incurred if these fixtures are to be re-lamped and re-ballasted which results in a long payback period. For other areas that are over lit, Concord Engineering recommends that the fixture be retrofitted with new Super T-8 lamps/reflector, de-lamped to the appropriate light levels, and a new high-efficiency electronic ballast be installed. Finally, there are some fixtures that can be retrofitted to the Super T-8 lamp and Ballast system along with a reflector that would produce an economical payback period.

This ECM also includes replacement of any incandescent lamps with compact fluorescent lamps. Compact fluorescent lamps (CFL's) were designed to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. Typical replacements are: a 13-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 26-Watt CFL for a 100-Watt incandescent lamp. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures. Where the existing fixture is controlled by a dimmer switch, the CFL bulb must be compatible with a dimmer switch. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours. However, the maintenance savings due to reduced lamp replacement is offset by the higher cost of the CFL's compared to the incandescent lamps.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,042
NJ Smart Start Equipment Incentive ($):	$440
Net Installation Cost ($):	$4,602
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$633
Total Yearly Savings ($/Yr):	$633
Estimated ECM Lifetime (Yr):	15
Simple Payback	7.3
Simple Lifetime ROI	106.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$9,495
Internal Rate of Return (IRR)	11%
Net Present Value (NPV)	$2,954.71

ECM #2: Lighting Upgrade – Multi-Purpose Room

Description:

The Multi-Purpose Room at Clifton Elementary School #16 is currently lit via 250 watt Metal Halide HID fixtures. The space would be better served with a more efficient, fluorescent lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient T5 high output system that includes new four lamp, 54 watt high output fixtures.

This measure replaces all the HID, 250 watt HID MH fixtures with a well-designed T5 high output (HO) system. T5 High output fixtures with reflectors and wire guards will be required in order to meet the mandated 50 foot-candle average within the spaces.

Energy Savings Calculations:

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

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,400
NJ Smart Start Equipment Incentive ($):	$400
Net Installation Cost ($):	$5,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$150
Total Yearly Savings ($/Yr):	$150
Estimated ECM Lifetime (Yr):	15
Simple Payback	33.3
Simple Lifetime ROI	-55.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,250
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($3,209.31)

ECM #3: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Clifton Elementary School #16 are left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas.

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

- Occupancy Sensors for Lighting Control 20% - 28% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 20% of the total light energy controlled by occupancy sensors (The majority of the savings is expected to be after school hours when rooms are left with lights on)

This ECM includes installation of ceiling or switch mount sensors for individual offices, classrooms, large bathrooms, and Media Centers. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

$$\text{Energy Savings} = \left(\%\ \text{Savings} \times \text{Controlled Light Energy}\ \left(\text{kWh/Yr}\right)\right)$$

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

Rebates and Incentives:

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Smart Start Incentive
= (# Wall mount sensors × $20 per sensor)
+ (# Ceiling mount sensors × $35 per sensor)

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,800
NJ Smart Start Equipment Incentive ($):	$770
Net Installation Cost ($):	$7,030
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,700
Total Yearly Savings ($/Yr):	$1,700
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.1
Simple Lifetime ROI	262.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$25,500
Internal Rate of Return (IRR)	23%
Net Present Value (NPV)	$13,264.49

ECM #4: Valve Blanket Insulation

Description:

The boiler plant at Clifton Elementary School #16, supplies steam to the steam unit ventilators throughout the system. The piping remains heated at around 212°F continuously during this period (approximately 6 months). Un-insulated valves have significant heat losses due to the exposure of the steel and copper piping to the surrounding air. Insulated valves have a heat loss which is a small fraction of the heat loss from un-insulated valves. It was identified that insulation for the large steam valves in the boiler room were missing.

Based on the site survey the following valves were identified for insulation:

Qty.	Size	Description	Surface Temp.	Area (Ea.) (Sq.ft.)	Bare Heat Loss (BTU/Hr/SF)	Bare Heat Loss (BTU/Hr)	Bare Heat Loss mmBtu	Insulated Heat Loss (BTU/Hr/SF)	Insulated Heat Loss (BTU/Hr)	Insulated Heat Loss mmBtu	Fuel Savings mmBtu/yr	Fuel Savings $/yr
		Mechical Room										
2	6"	Gate Valve	220	4.30	448.00	3,852.80	15.41	36.40	313.07	1.25	14.16	$135.93
1	3"	Return Plug Valve	220	2.40	448.00	1,075.20	4.30	36.40	87.37	0.35	3.95	$37.93
2	2"	Control Valve	220	3.40	448.00	3,046.40	12.19	36.40	247.54	0.99	11.20	$107.48
2	3"	Strainer	220	4.80	448.00	4,300.80	17.20	36.40	349.47	1.40	15.81	$151.73
2	4"	Gate Valve	220	4.10	448.00	3,673.60	14.69	36.40	298.51	1.19	13.50	$129.60
2	4"	x 3" Reducer	220	0.59	448.00	528.64	2.11	36.40	42.96	0.17	1.94	$18.65
1	6"	Control Valve	220	6.10	448.00	2,732.80	10.93	36.40	222.06	0.89	10.04	$96.41
2	4"	Steam Trap	220	4.80	448.00	4,300.80	17.20	36.40	349.47	1.40	15.81	$151.73
14		**TOTAL**					**94.0**			**7.6**	**86.4**	**$829**

Valve blankets are designed to provide insulation value over large valves that must remain accessible. This ECM includes installation of valve blankets on all exposed boiler system valves.

Energy Savings Calculations:

Heat Loss for un-insulated steel piping is based on ASHRAE 2009 Fundamentals – "Insulation for Mechanical Systems".

$$\text{Heat Loss}\,\frac{\text{BTU}}{\text{HR}}\,\text{per Linear FT} = \frac{1}{\text{R} - \text{Value}} \times \text{Pipe Dia (FT)} \times 3.14 \times (\text{Pipe Temp (°F)} - \text{Ambient Temp(°F)})$$

$$\text{Heat Loss}\,\frac{\text{BTU}}{\text{HR}} = \text{Heat Loss}\,\frac{\text{BTU}}{\text{HR}}\,\text{per Linear FT} \times \text{Length of Uninsulated Pipe}$$

$$\text{Energy Use, Therms} = \frac{\text{Heat Loss}\,\frac{\text{BTU}}{\text{HR}} \times \text{Operating Hrs}}{\text{Heating System Eff. (\%)} \times \text{Fuel Heat Value}\,\frac{\text{BTU}}{\text{Therm}}}$$

$$\text{Heating Energy Cost Savings} = \text{Energy Use, Therms} \times \text{Cost of Nat Gas}\left(\frac{\$}{\text{Therm}}\right)$$

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,363
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$11,363
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$829
Total Yearly Savings ($/Yr):	$829
Estimated ECM Lifetime (Yr):	25
Simple Payback	13.7
Simple Lifetime ROI	82.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$20,725
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$3,072.50

ECM #5: Steam Boiler and Burner Controls Upgrade

Description:

The majority of the heating is provided to the Clifton Elementary School #16 facility by Rockmills 125 Boiler Horsepower (BHP) natural gas-fired boilers that produces steam for the heating season. The boilers are 1992 vintage and are well maintained and currently should be capable of achieving an efficiency rating of 70 to 75 percent while operating. Given the limitations of the current system burner and controls and the vast improvement in boiler controls today over what was available then, it is recommended that a burner and new controls upgrade be performed.

This ECM will install new Cleaver Brooks Profire burner with Honeywell controls on each of these boilers with separate motors that will control fuel flow, excess air oxygen trim and variable speed on the blower. Installation of this system will result in improved operating efficiency of the boilers and less cycling of boilers since the boilers can operate closer to the demanded load requirement. These burners can also be equipped with parallel positioning for further control.

Energy Savings Using Hand Calculations:

Annual Heating Energy Savings = Existing Fuel Consumption **x** 5% Efficiency Increase

Heating Cost Savings = Annual Heating Energy **x** Fuel Cost $/Unit

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$60,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$60,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$814
Total Yearly Savings ($/Yr):	$814
Estimated ECM Lifetime (Yr):	21
Simple Payback	73.7
Simple Lifetime ROI	-71.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$17,094
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($47,452.17)

ECM #6: Refrigerator Replacement

Description:

The Clifton Elementary School #16 has two residential style refrigerators in the faculty dining area. These units are older top freezer models that could be replaced with a new Energy Star rated models.

The proposed replacement is a one-for-one with a unit of similar size and dimensions that has the most up-to-date Energy Star Rating. The models selected are 2013 models manufactured by Frigidaire refrigerator unit

Energy Savings Calculations:

ENERGY STAR REFRIGERATOR CALCULATION					
ECM INPUTS	**EXISTING 1**	**PROPOSED 1**	**EXISTING 2**	**PROPOSED 2**	**SAVINGS**
Quantity	1	1	1	1	
Manufacturer	HotPoint	Frigidaire	GE	Frigidaire	
Type	Top/Bottom	Top / Bottom	Top/Bottom	Top/Bottom	
Model	CTX14CYXKLWH	FFTR1513LQ	TRX18LF	FFTR1814LW	
Size (Cu-Ft)	14.4	14.8	17.7	18	
Per Unit Electric Usage (kWh)	778	288	1,590	387	1,693
Electric Rate ($/kWh)	$0.131	$0.131	$0.131	$0.131	
ENERGY SAVINGS CALCULATIONS					
Electric Usage (kWh)	778	288	1,590	387	1,693
Energy Cost ($)	$102	$38	$208	$51	$222
COMMENTS:	Calculations based Energy Star Website http://www.energystar.gov/index.cfm?fuseaction=refrig.calculator				

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$222
Total Yearly Savings ($/Yr):	$222
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.0
Simple Lifetime ROI	66.5%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$3,330
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	$650.22

ECM #7: Condensate Pump and Receiver Replacement

Description:

The condensate pump and receiver set in the boiler room is in very poor condition and leaking condensate from the receiver and pump seals. The lost condensate is a loss of water which is costly and a loss of 200° F water that does not return to the receiver and steam boilers. The make-up water has to be heated from 55° F resulting in a loss of energy.

Energy Savings Calculations:

The losses of condensate were estimated and the energy required to heat the make-up water from 60°F to 200°F was calculated. The existing condensate pumps have older less efficient motors and the efficiency gained by installing premium efficiency motors was also calculated.

See **Appendix G** for detailed energy savings calculations.

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$36,750
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$36,750
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$250
Total Yearly Savings ($/Yr):	$250
Estimated ECM Lifetime (Yr):	15
Simple Payback	147.0
Simple Lifetime ROI	-89.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,750
Internal Rate of Return (IRR)	-20%
Net Present Value (NPV)	($33,765.52)

ECM # 8: Steam Trap Replacement Program

Description:

Steam traps are required for the proper operation of steam distributions systems. Traps are mechanical devices installed on steam pipes to remove condensate from steam flow. A typical school can have well over one hundred steam traps. Unfortunately steam traps have a tendency to leak. On average 20% of steam traps are leaking in existing installations. Steam traps only have an average life of five (5) years.

This ECM would replace approximately six (6) steam traps. All non-thermostatic traps will be replaced with either bucket or float & thermostatic traps. Thermostatic traps will be repaired with cage units and new covers. Where repairing is not feasible, the thermostatic traps will be replaced. Schedule 80 piping and extra heavy fittings will be used, and all piping and fittings between the unions will be replaced along with the steam traps. In addition, a complete steam trap survey will be performed along with tagging and implementing a 3-year, revolving, steam trap maintenance program.

Energy Savings Calculations:

See **Appendix H** for a detailed analysis.

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$21,990
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$21,990
Maintenance Savings ($/Yr):	($1,435)
Energy Savings ($/Yr):	$2,716
Total Yearly Savings ($/Yr):	$1,281
Estimated ECM Lifetime (Yr):	10
Simple Payback	17.2
Simple Lifetime ROI	-41.7%
Simple Lifetime Maintenance Savings	($14,350)
Simple Lifetime Savings	$12,810
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($11,062.81)

ECM #9: Window AC Unit Replacement

Description:

Cooling is provided to several classrooms, offices and other areas via window air conditioning units. These units vary in size, capacity and efficiency. The units have been fixed or replaced on an "as needed" basis throughout the building. These window AC units are old and inefficient.

It is recommended to utilize the energy star ratings as a minimum standard for replacing any window unit that is in need of replacement. Existing units that are old but still working should be considered for replacement if the efficiency is below 8.0 to 8.5 EER. Window AC units that are over 10 years old are very likely to fall in this efficiency range.

This ECM shows the savings and payback for replacing inefficient window air conditioners with new, Energy Star rated units. Qualifying product list can be found at Energy Star website at: www.energystar.gov/products. Although energy star rated products provide a valuable benchmark, it is recommended to consider even higher EER ratings for potential AC unit replacements where available.

Energy Savings Calculations:

Average Summer Electric Cost: $0.17/kWh (June through September)
Typical AC Unit Size: 12,000 BTU/HR

Estimated Full Load Hours of Unit: 800/Year

$$\text{Energy Savings, kWh} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{EER}_{\text{Old}}} - \frac{1}{\text{EER}_{\text{New}}}\right) \times \frac{\text{Full Load Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings (kWh)} \times \text{Average Summer Elec. Cost} \left(\frac{\$}{\text{kWh}}\right)$$

The following table depicts the replacement plan for the window air conditioning units:

ENERGY SAVINGS CALCULATIONS									
Capacity BTU/H	**Amount of Units**	**Full Load Hrs**	**Typical Eff. (10 Yrs & Older) EER**	**New Eff. EER**	**Energy Savings kWh**	**Demand Savings kW**	**Cooling Cost Savings**	**Net Installed Cost**	**Simple Payback**
12,000	10	800	8	10.8	3111	3.89	$529	$3,500	6.6

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,500
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$3,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$529
Total Yearly Savings ($/Yr):	$529
Estimated ECM Lifetime (Yr):	10
Simple Payback	6.6
Simple Lifetime ROI	51.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$5,290
Internal Rate of Return (IRR)	8%
Net Present Value (NPV)	$1,012.48

ECM #10: Digital Energy Management System (DDC EMS)

Description:

Currently, Clifton Elementary School #16 uses a pneumatic control system with manual boiler start-up controls. This system is very old and offers little more than an on/off cycling control of the heating system.

Concord Engineering recommends installing a DDC system throughout the school to control all of the HVAC systems including the boilers, indoor air handling units, and roof exhaust fans.

The system will include new temperature sensors and new local thermostats with limited over-ride capability, a front end computer and main controller. With the communication between the control devices and the front end computer interface, the facility manager will be able to take advantage of scheduling for occupied and unoccupied periods based on the actual occupancy of each space in the facility. Due to the fact that the building may have diverse hours of occupancy, including evening and weekend activities, having supervisory control over all of the equipment makes sense. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours.

The new DDC system has the potential to provide significant savings by controlling the HVAC systems as a whole and provide operating schedules and features such as space averaging, night set-back, temperature override control, etc. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the referenced report:

- Energy Management and Control System Savings: 5%-15%.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 5% of the electricity and 10% for natural gas in these buildings.

The basis for the DDC system expansion is the Automated Logic Energy Management System or similar.

Energy Savings Calculations:

Energy savings for each utility is calculated with the equation below.

$$\text{Energy Savings (Utility)} = \text{Current Energy Consumption} \times \text{Estimated Savings, \%}$$

Following table summarizes energy savings for this facility via implementation of an Energy Management System:

DDC ENERGY MANAGEMENT SYSYEM CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Controls w/ Local Thermostats	DDC Controls	
Existing Nat Gas Usage (Therms)	15,951	-	
Existing Electricity Usage (kWh)	17,234	-	
Energy Savings, Nat Gas	-	10%	
Energy Savings, Electricity	-	5%	
Gas Cost ($/Therm)	*$0.96*	$0.96	
Electricity Cost ($/kWh)	*$0.131*	$0.131	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Nat Gas Usage (Therms)	15,951	14,356	1,595
Electricity Usage (kWh)	17,234	16,372	862
Nat Gas Cost ($)	$15,313	$13,782	$1,531
Electricity Cost ($)	$2,258	$2,145	$113
Energy Cost ($)	$17,571	$15,927	$1,644
COMMENTS:			

Demand savings due to implementation of this ECM is minimal.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $5.79 per SF in accordance with recent Contractor pricing for systems of this magnitude. Savings from the implementation of this ECM will be from the reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Energy Savings Summary:

ECM #10 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$218,200
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$218,200
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,644
Total Yearly Savings ($/Yr):	$1,644
Estimated ECM Lifetime (Yr):	15
Simple Payback	132.7
Simple Lifetime ROI	-88.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$24,660
Internal Rate of Return (IRR)	-20%
Net Present Value (NPV)	($198,574.03)

REM #1: 69.56 kW Solar System

Description:

The Clifton Elementary School #16 has available roof and parking lot space that could accommodate a significant amount of solar generation. Based on the available areas a 69.56 kilowatt solar array could be installed. The array will produce approximately 74,449 kilowatt-hours annually that will reduce the overall electric usage of the facility by 65.88%.

Energy Savings Calculations:

See **Renewable / Distributed Energy Measures Calculations Appendix** for detailed financial summary and proposed solar layout areas. Financial results in table below are based on 100% financing of the system over a fifteen year period.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
System Size (KW_{DC}):	69.56
Electric Generation (KWH/Yr):	79,449
Installation Cost ($):	$462,312
SREC Revenue ($/Yr):	$15,181
Energy Savings ($/Yr):	$10,408
Total Yearly Savings ($/Yr):	$25,589
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	18.1
Analysis Period Electric Savings ($):	$193,574
Analysis Period SREC Revenue ($):	$219,922
Net Present Value (NPV)	($219,085.35)

V. 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. While the District is already performing many of these functions through routine maintenance it is important to continue to address these items as they provide an energy savings benefit.

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

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

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

E. Turn off computers when not in use. Ensure computers are not running in screen saver mode.

F. Replace older style CRT monitors with newer energy efficient LCD/LED monitors.

G. Ensure classroom televisions are turned off at the end of the day and while not in use.

H. Ensure outside air dampers are functioning properly and only open during occupied mode.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Clifton Public Schools – School #16

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^{n_i}}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^{n_i}}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - General	$2,292	$2,750	$440	$4,602	$633	$0	$633	15	$9,495	$0	106.3%	7.3	10.80%	$2,954.71
ECM #2	Lighting Upgrade - MPR	$1,800	$3,600	$400	$5,000	$150	$0	$150	15	$2,250	$0	-55.0%	33.3	-8.65%	($3,209.31)
ECM #3	Lighting Controls Upgrade	$5,200	$2,600	$770	$7,030	$1,700	$0	$1,700	15	$25,500	$0	262.7%	4.1	23.11%	$13,264.49
ECM #4	Valve Blanket Insulation	$4,021	$7,342	$0	$11,363	$829	$0	$829	25	$20,725	$0	82.4%	13.7	5.28%	$3,072.50
ECM #5	Burner Controls Upgrade	$35,000	$25,000	$0	$60,000	$814	$0	$814	21	$17,094	$0	-71.5%	73.7	-9.38%	($47,452.17)
ECM #6	Energy Star Refrigerator	$1,500	$500	$0	$2,000	$222	$0	$222	15	$3,330	$0	66.5%	9.0	7.17%	$650.22
ECM #7	Replace Steam Condensate Receiver	$15,000	$21,750	$0	$36,750	$250	$0	$250	15	$3,750	$0	-89.8%	147.0	-20.48%	($33,765.52)
ECM #8	Steam Trap Replacement	$5,790	$16,200	$0	$21,990	$2,716	($1,435)	$1,281	10	$12,810	-$14,350	-41.7%	17.2	-8.79%	($11,062.81)
ECM #9	Window AC Replacements	$3,500	$0	$0	$3,500	$529	$0	$529	10	$5,290	$0	51.1%	6.6	8.31%	$1,012.48
ECM #10	DDC Controls Upgrade	$218,200	$0	$0	$218,200	$1,644	$0	$1,644	15	$24,660	$0	-88.7%	132.7	-19.77%	($198,574.03)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	69.56 KW PV System	$462,312	$0	$0	$462,312	$10,408	$15,181	$25,589	15	$383,835	$227,715	-17.0%	18.1	-2.24%	($156,832.18)

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

APPENDIX B

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February 11, 2013:

Electric Chillers

Water-Cooled Chillers	$16 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Energy Efficiency must comply with ASHRAE 90.1-2007

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 - $92 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat
A/C Economizing Controls	≤ 5 tons $85/unit; >5 tons $170/unit

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Heating

Gas Fired Boilers < 300 MBH	$2.00 per MBH, but not less than $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	$400 per unit, AFUE ≥ 95%
Boiler Economizing Controls	$1,200 - $2,700
Low Intensity Infrared Heating	$300 - $500 per unit

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per VFD rated hp
Compressors	$5,250 to $12,500 per drive
Cooling Towers ≥ 10 hp	$60 per VFD rated hp
Boiler Fans ≥ 5 HP	$65 to $155 per hp
Boiler Feed Water Pumps ≥ 5 HP	$60 to $155 per hp
Commercial Kitchen Hood up to 50 HP	Retrofit $55 – $300 per hp New Hood $55 - $250 per hp

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons, 0.67 energy factor or better	$50 per unit
Gas-Fired Water Heaters > 50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH
Gas Fired Tankless Water Heaters	$300 per unit

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities (Expires 3/1/2013)	$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities (Expires 3/1/2013)	$25 per fixture (1-4 lamps)
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
For retrofit of T-8 fixtures by permanent de-lamping & new reflectors (Electronic ballast replacement required)	$15 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $200 per fixture
Metal Halide w/Pulse Start Including Parking Lot	$25 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture

Prescriptive Lighting - LED

LED Display Case Lighting	$30 per display case
LED Shelf-Mtd. Display & Task Lights	$15 per linear foot
LED Portable Desk Lamp	$20 per fixture
LED Wall-wash Lights	$30 per fixture
LED Recessed Down Lights	$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Bollard Fixtures	$50 per fixture
LED Linear Panels (1x4, 2x2, 2x4 Troffers only)	$100 per fixture
LED Fuel Pump Canopy	$100 per fixture
LED Screw-based & Pin-based (PAR, MR, BR, R) Standards (A-Style) and Decorative Lamps	$20 per lamp
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$30 per 4 foot $42 per 5 foot $65 per 6 foot
LED Retrofit Kits	To be evaluated through the customer measure path

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25-$50 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

Premium Motors

Three-Phase Motors (Expires 3/1/2013)	$45 - $700 per motor
Fractional HP Motors Electronic Commutated Motors (replacing shaded pole motors in refrigerator/freezer cases)	$40 per electronic commutated motor

Refrigeration Doors/Covers

Energy-Efficient Doors/Covers for Installation on Open Refrigerated Cases	$100 per door
Aluminum Night Curtains for Installation on Open Refrigerated Cases	$3.50 per linear foot

Refrigeration Controls

Door Heater Controls	$50 per control
Electric Defrost Controls	$50 per control
Evaporator Fan Controls	$75 per control
Novelty Cooler Shutoff	$50 per control

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and an IRR of at least 10%.

APPENDIX C

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
13-Clifton BOE - PS 16

Building ID: 3477597
For 12-month Period Ending: February 28, 2013[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: April 11, 2013

Facility
13-Clifton BOE - PS 16
755 Grove Street
Clifton, NJ 07013

Facility Owner
Clifton BOE
745 Clifton Avenue
Clifton, NJ 07013

Primary Contact for this Facility
Karen Perkins
745 Clifton Avenue
Clifton, NJ 07013

Year Built: 1957
Gross Floor Area (ft²): 37,695

Energy Performance Rating[2] (1-100) 78

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	409,668
Natural Gas (kBtu)[4]	1,741,387
Total Energy (kBtu)	2,151,055

Energy Intensity[4]

Site (kBtu/ft²/yr)	57
Source (kBtu/ft²/yr)	85

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	151

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	76
National Median Source EUI	113
% Difference from National Median Source EUI	-25%
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[5] **for Indoor Environmental Conditions:**

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

Certifying Professional
Michael Fischette
520 South Burnt Mill Road
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. Values represent energy intensity, annualized to a 12-month period.
5. 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) or a Registered Architect (RA) 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 or RA 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	13-Clifton BOE - PS 16	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	755 Grove Street, Clifton, NJ 07013	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 a hospital, k-12 school, hotel and senior care facility) nor can they be submitted as representing only a portion of a building.		☐
Elementary School 16 (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	37,695 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	66 (Default)	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	50 %	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: Public Service Electric & Gas Co

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
01/13/2013	02/12/2013	11,085.00
12/13/2012	01/12/2013	9,885.00
11/13/2012	12/12/2012	9,090.00
10/13/2012	11/12/2012	9,075.00
09/13/2012	10/12/2012	9,495.00
08/13/2012	09/12/2012	8,340.00
07/13/2012	08/12/2012	6,705.00
06/13/2012	07/12/2012	11,025.00
05/13/2012	06/12/2012	13,020.00
04/13/2012	05/12/2012	11,325.00
03/13/2012	04/12/2012	11,100.00
Electric Consumption (kWh (thousand Watt-hours))		**110,145.00**
Electric Consumption (kBtu (thousand Btu))		**375,814.74**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**375,814.74**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
01/13/2013	02/12/2013	1,249.97
12/13/2012	01/12/2013	6,175.64
11/13/2012	12/12/2012	2,997.18
10/13/2012	11/12/2012	1,811.09
09/13/2012	10/12/2012	92.12
08/13/2012	09/12/2012	0.00
07/13/2012	08/12/2012	0.00
06/13/2012	07/12/2012	0.00
05/13/2012	06/12/2012	38.58
04/13/2012	05/12/2012	871.98
03/13/2012	04/12/2012	1,306.16

gas Consumption (therms)	**14,542.72**
gas Consumption (kBtu (thousand Btu))	**1,454,272.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**1,454,272.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same PE or RA 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
13-Clifton BOE - PS 16
755 Grove Street
Clifton, NJ 07013

Facility Owner
Clifton BOE
745 Clifton Avenue
Clifton, NJ 07013

Primary Contact for this Facility
Karen Perkins
745 Clifton Avenue
Clifton, NJ 07013

General Information

13-Clifton BOE - PS 16	
Gross Floor Area Excluding Parking: (ft^2)	37,695
Year Built	1957
For 12-month Evaluation Period Ending Date:	February 28, 2013

Facility Space Use Summary

Elementary School 16	
Space Type	K-12 School
Gross Floor Area (ft^2)	37,695
Open Weekends?	No
Number of PCs [d]	66
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	No
Percent Cooled	50
Percent Heated	100
Months [o]	10
High School?	No
School District [o]	clifton

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 02/28/2013)	**Baseline** (Ending Date 02/28/2013)	**Rating of 75**	**Target**	**National Median**
Energy Performance Rating	78	78	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	57	57	59	N/A	76
Source ($kBtu/ft^2$)	85	85	88	N/A	113
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/$ft^2$/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	151	151	157	N/A	201
$kgCO_2e/ft^2$/year	4	4	4	N/A	5

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 Median column presents energy performance data your building would have if your building had a median rating of 50.

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

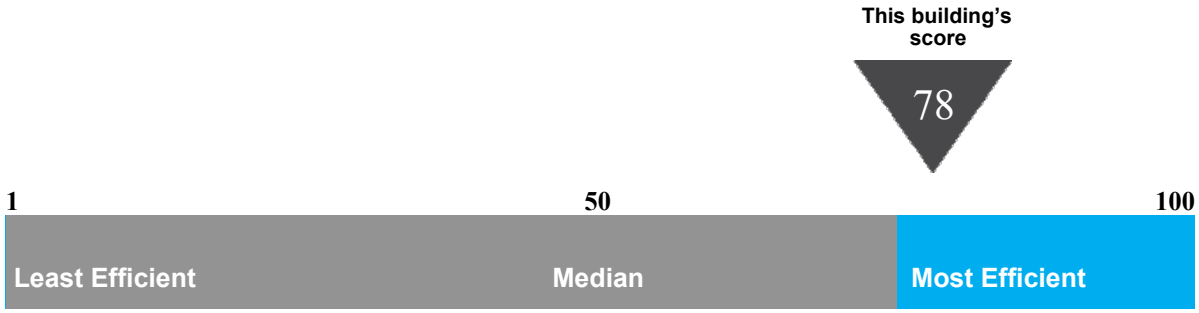
Statement of Energy Performance

2013

13-Clifton BOE - PS 16
755 Grove Street
Clifton, NJ 07013

Portfolio Manager Building ID: 3477597

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 85 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending February 2013

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 04/11/2013

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

SCHOOL # 16

AC Units

Tag			
Unit Type	Window AC Unit		
Qty	22		
Location	Classrooms and Offices		
Area Served	Classrooms and Offices		
Manufacturer	Frigidaire, Electrolux, etc.		
Model #	Various		
Serial #	Various		
Cooling Type	DX Coil		
Cooling Capacity (Tons)	9,000 to 18,000 BTUH		
Cooling Efficiency (SEER/EER)	SEER=8.6 to 10.7		
Heating Type	N/A		
Heating Input (MBH)	N/A		
Efficiency	N/A		
Fuel	Electric		
Approx Age	10 to 15 years		
ASHRAE Service Life	10		
Remaining Life	zero to -5		
Comments	Some Units in Poor Condition		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

SCHOOL # 16

Boilers

Tag	B-1 & B-2	
Unit Type	Fire-Tube Steam Boilers	
Qty	2	
Location	Boiler Room	
Area Served	Entire Facility	
Manufacturer	Rockmills Steel Products	
Model #	MP-125	
Serial #	29174 & 29173	
Input Capacity (Btu/Hr)	5102.9 MBH (Gas)	
Rated Output Capacity (Lbs/Hr)	4,312.5 PPH at 212 degrees F	
Approx. Efficiency %	75.0%	
Fuel	Gas-Fired	
Approx Age	21	
ASHRAE Service Life	25	
Remaining Life	4	
Comments	3HP Blower Motor with IC MPLG-54 Burner	

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

SCHOOL # 16

Domestic Water Heaters

Tag	DHW-1	
Unit Type	Automatic Storage Water Heater	
Qty	1	
Location	Boiler Room	
Area Served	Entire Facility	
Manufacturer	A. O. Smith	
Model #	GCV 50 200	
Serial #	9211904000	
Size (Gallons)	50 Gallons	
Input Capacity (MBH/KW)	40 MBH	
Recovery (Gal/Hr)	40.94	
Efficiency %	80%	
Fuel	Gas-Fired	
Approx Age	3	
ASHRAE Service Life	15	
Remaining Life	12	
Comments		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

SCHOOL # 16

Pumps

Tag		
Unit Type	Condensate Pump/Receiver	DHW Circulation Pump
Qty	1	1
Location	Boiler Room	Boiler Room
Area Served	Steam System	Entire Facility
Manufacturer	-	Bell & Gossett
Model #	-	NBF-12FLW
Serial #		-
Horse Power	2 at 0.75	1/40
Flow	-	17 GPM
Motor Info	Century Motors	
Electrical Power	208V 3-Phase	115V 1-Phase
RPM	3,450	2,800
Motor Efficiency %	N/A	N/A
Approx Age	21	4
ASHRAE Service Life	15	15
Remaining Life	(6)	11
Comments		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

APPENDIX E

CEG Project #: 9C12066
Facility Name: School #16
Address: 755 Grove Street
City, State, Zip Clifton, NJ 07013

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
221.11	Classroom 1	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	15	0.93	2,418	Existing to Remain	Existing to Remain	2	62	0	0.93	2,418	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$63
221.11	Classroom 2	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
221.11	Classroom 3	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
221.11	Classroom 4	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
221.11	Classroom 5	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
221.11	Classroom 6	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
221.11	Classroom 7	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
221.11	Classroom 8	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
221.11	Classroom 9	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
221.11	Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	6	0.37	446	Existing to Remain	Existing to Remain	2	62	0	0.37	446	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Girls Restroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	Girls Restroom	2600	28w CFL	1	28	1	0.03	73	Existing to Remain	Existing to Remain	1	28	0	0.03	73	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Boys Restroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	Boys Restroom	2600	28w CFL	1	28	1	0.03	73	Existing to Remain	Existing to Remain	1	28	0	0.03	73	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
3	Janitor Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Nurse	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	64	$8
1	Nurse Restroom	1200	Combination Fan w/ Incandescent 60w	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Teacher Lounge	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	129	$17
221.11	Back Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	3	0.19	558	Existing to Remain	Existing to Remain	2	62	0	0.19	558	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Back Hallway	3000	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	109	6	0.65	1,962	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	6	0.43	1,296	0.22	666	$87	0	No New Controls	0	0.0%	0	$0

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
242.21	Main Corridor	3000	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	109	6	0.65	1,962	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	6	0.43	1,296	0.22	666	$87	0	No New Controls	0	0.0%	0	$0
227.21	Front Lobby	3000	2x2, 2 Lamp U-Tube, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	65	6	0.39	1,170	Re-Lamp / Re-Ballast Reflector	Sylvania Lamp FO17/841/XP/ECO Sylvania Ballast QHE2X32T8/UNV ISL-SC	2	34	6	0.20	612	0.19	558	$73	0	No New Controls	0	0.0%	0	$0
4	Front Lobby	3000	60w Incandescent High Hat	1	60	4	0.24	720	Re-Lamp	13w CFL Screw Base	1	13	4	0.05	156	0.19	564	$74	0	No New Controls	0	0.0%	0	$0
221.11	Front Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	4	0.25	744	Existing to Remain	Existing to Remain	2	62	0	0.25	744	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Front Hallway	3000	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	109	6	0.65	1,962	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	6	0.43	1,296	0.22	666	$87	0	No New Controls	0	0.0%	0	$0
221.11	Kindergarden Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	6	0.37	1,116	Existing to Remain	Existing to Remain	2	62	0	0.37	1,116	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Maintenance Hallway	3000	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	109	4	0.44	1,308	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	4	0.29	864	0.15	444	$58	0	No New Controls	0	0.0%	0	$0
227.11	Storage 1	1200	2x2, 2 Lamp, F17 T8, 17w, Elect. Ballast, Wall Mnt., Prismatic Lens	2	33	7	0.23	277	Existing to Remain	Existing to Remain	2	33	0	0.23	277	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
227.11	Storage 2	1200	2x2, 2 Lamp, F17 T8, 17w, Elect. Ballast, Wall Mnt., Prismatic Lens	2	33	7	0.23	277	Existing to Remain	Existing to Remain	2	33	0	0.23	277	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
227.11	Mechanical Room	1200	2x2, 2 Lamp, F17 T8, 17w, Elect. Ballast, Wall Mnt., Prismatic Lens	2	33	10	0.33	396	Existing to Remain	Existing to Remain	2	33	0	0.33	396	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Janitor Office	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	3	0.19	484	Existing to Remain	Existing to Remain	2	62	0	0.19	484	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
227.11	Janitor Office	2600	2x2, 2 Lamp, F17 T8, 17w, Elect. Ballast, Wall Mnt., Prismatic Lens	2	33	1	0.03	86	Existing to Remain	Existing to Remain	2	33	0	0.03	86	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Kitchen	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	109	2	0.22	567	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	2	0.14	374	0.07	192	$25	0	No New Controls	0	0.0%	0	$0
2	Kitchen Storage	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
5	Multi-Purpose Room	2600	250w Metal Halide Recessed	1	295	8	2.36	6,136	Remove & Replace New Fixture	2x4, 4 Lamp, 54w T5, (2) 2/54 Elect. Ballast, Singlepoint Mnt., High Bay, Wire Guard, Lens	4	240	8	1.92	4,992	0.44	1,144	$150	0	No New Controls	0	0.0%	0	$0
1	Stage	2600	Combination Fan w/ Incandescent 60w	1	60	1	0.06	156	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	34	0.05	122	$16	0	No New Controls	0	0.0%	0	$0
221.11	K-1 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	29	1.80	4,675	Existing to Remain	Existing to Remain	2	62	0	1.80	4,675	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	935	$122
221.11	K-1 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	2	0.12	149	Existing to Remain	Existing to Remain	2	62	0	0.12	149	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
3	K-1 Restroom	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	K-2 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	23	1.43	3,708	Existing to Remain	Existing to Remain	2	62	0	1.43	3,708	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
3	K-2 Storage	1200	60w Incandescent	1	60	2	0.12	144	Re-Lamp	13w CFL Screw Base	1	13	2	0.03	31	0.09	113	$15	0	No New Controls	0	0.0%	0	$0

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
221.11	K-2 Restroom	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
231.11	Main Office	2600	1x4, 3 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	3	72	6	0.43	1,123	Existing to Remain	Existing to Remain	3	72	0	0.43	1,123	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	225	$29
227.21	Main Office Closet	2600	2x2, 2 Lamp U-Tube, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	65	2	0.13	338	Re-Lamp / Re-Ballast Reflector	Sylvania Lamp FO17/841/XP/ECO Sylvania Ballast QHE2X32T8/UNV ISL-SC	2	34	2	0.07	177	0.06	161	$21	0	No New Controls	0	0.0%	0	$0
231.11	Principal Office	2600	1x4, 3 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	3	72	4	0.29	749	Existing to Remain	Existing to Remain	3	72	0	0.29	749	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	150	$20
231.11	Media Center	2600	1x4, 3 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	3	72	30	2.16	5,616	Existing to Remain	Existing to Remain	3	72	0	2.16	5,616	0.00	0	$0	4	Dual Tech. Occupancy Sensor w/2 Powerpacks - Remote Mnt.	2	20.0%	1,123	$147
2	Media Center Closet	2600	28w CFL	1	28	1	0.03	73	Existing to Remain	Existing to Remain	1	28	0	0.03	73	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	Media Center Closet	2600	28w CFL	1	28	1	0.03	73	Existing to Remain	Existing to Remain	1	28	0	0.03	73	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Classroom 10	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 10 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Classroom 11	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 11 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Classroom 12	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 12 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Classroom 13	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 13 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Classroom 14	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 14 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Classroom 15	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 15 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Classroom 16	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 16 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
221.11	Classroom 17	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 17 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
221.11	Classroom 18	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	580	$76
3	Classroom 18 Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	$7	0	No New Controls	0	0.0%	0	$0
	TOTAL					**537**	**36**	**91,449**					**59**	**33**	**85,475**	**2.5**	**5,973**	**$783**			**25**	**5**	**12,975**	**$1,700**

APPENDIX F

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Total KW_{AC}	Panel Weight (41.9 lbs)	W/SQFT
School #16	5775	SHARP NU-U235F2	296	17.5	5,192	69.56	79,449	56.3	12,402	13.40

= Proposed Roof PV Layout = Proposed Parking PV Layout

Notes:

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

Project Name: **LGEA Solar PV Project - School #16**
Location: **Clifton, NJ**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$462,312
Annual kWh Production	79,449
Annual Energy Cost Reduction	$10,408
Average Annual SREC Revenue	$15,181

Simple Payback: **18.07** Years

Life Cycle Cost Analysis

Analysis Period (years): 15
Discount Rate: 3%
Average Energy Cost ($/kWh) **$0.131**
Financing Rate: 6.00%
Financing %: 100%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
Average SREC Value ($/kWh) $0.191

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	$0	0	0	0	$0	0	0	0	0
1	$0	79,449	$10,408	$0	$19,862	$27,205	$19,610	($16,545)	($16,545)
2	$0	79,052	$10,720	$0	$19,763	$25,996	$20,819	($16,332)	($32,877)
3	$0	78,656	$11,042	$0	$19,664	$24,712	$22,103	($16,109)	($48,986)
4	$0	78,263	$11,373	$0	$19,566	$23,348	$23,467	($15,876)	($64,863)
5	$0	77,872	$11,714	$802	$19,468	$21,901	$24,914	($16,435)	($81,298)
6	$0	77,483	$12,066	$798	$15,497	$20,364	$26,451	($20,051)	($101,349)
7	$0	77,095	$12,427	$794	$15,419	$18,733	$28,082	($19,763)	($121,111)
8	$0	76,710	$12,800	$790	$15,342	$17,001	$29,814	($19,463)	($140,574)
9	$0	76,326	$13,184	$786	$15,265	$15,162	$31,653	($19,152)	($159,726)
10	$0	75,944	$13,580	$782	$11,392	$13,210	$33,605	($22,626)	($182,351)
11	$0	75,565	$13,987	$778	$11,335	$11,137	$35,678	($22,271)	($204,623)
12	$0	75,187	$14,407	$774	$11,278	$8,937	$37,878	($21,905)	($226,527)
13	$0	74,811	$14,839	$771	$11,222	$6,600	$40,215	($21,525)	($248,052)
14	$0	74,437	$15,284	$767	$7,444	$4,120	$42,695	($24,854)	($272,906)
15	$0	74,065	$15,743	$763	$7,406	$1,487	$45,328	($24,429)	($297,335)
	Totals:	1,150,915	$193,574	$8,606	$219,922	$239,913	$462,312	($297,335)	($2,199,122)

Net Present Value (NPV) **($219,085)**

APPENDIX G

DESCRIPTION: CONDENSATE RETURN PUMP/RECEIVER REPLACEMENT

UNIT #	FUNCTION		MOTOR HP	MOTOR EFF.%	HR/DAY OPER.	ANNUAL KWh	PREMIUM EFF.%	ANNUAL KWh	ANNUAL KWh SAVINGS	$ SAV. $0.131	COND LOSS QT/MIN	ANNUAL HTG $ SAV	**TOTAL $ ENERGY SAV (E&G)**	EQUIP.& INST. COST	TOTAL COST NOTE 2
	COND. PUMP		0.75	75.0%	11	2,662	77.0%	2,593	69	$9	0.25	$241	$250	$15,000	$21,750
TOTALS=										**$9**		**$241**	**$ 250**		**$21,750**

NOTE 1: KWH= HP / MOTOR% * 746 /1000 * HR/DAY * 365 * 0.8(MOTOR LOAD) * 0.9 PF
NOTE 2: INCLUDES 15% CONTINGENCY + 25% FOR RETROFIT WORK+ 15% CONTR. OH&P+ 10% Cx
NOTE 3: SAVINGS CALCULATED ON HEATING MAKE-UP FROM 60 F TO 200 F AND $.96/THERM AND 70% EFFICIENT BOILER PLANT

APPENDIX H

STEAM TRAP REPLACEMENT ANALYSIS

Calculation Assumptions		
Description	**Value**	**Units**
Ann. Gas Usage	18,565	Therm
Less DHW Gas Usage	1,900	Therm
Less Other Gas Usage	0	Therm
Net Heating Gas Usage	16,665	Therm
Est. Steam Production	1,242,420	lbs
Boiler Efficiency	75%	
Makeup Water	50	°F
Condenstate Return	200	°F
30% Makeup		
Feedwater Enthalpy	155	btu/lb
Steam Enthalpy	1161	btu/lb
Steam Production Conversion	74.55	lb / Th
Hours per Day On	8	
Days per Week	5.5	
Htg Months per Year	6	
Ann. System Operation	1,144	hrs / yr
Gas Cost ($/Th)	$0.96	
Trap Failure Rate	15.00%	

Building Area	Estimated Quantity
Boiler Plant	4
Air Handlers	0
Condensate Pumps	1
Various Classrooms	20
TOTAL	25

STEAM TRAP LOSS CALCULATION

Steam Trap Sizes	Trap Orifice Diamter (in)	Steam Loss lb/hr (15 PSI)	Quantity of Traps	Estimated Quantity Failed	Annual Steam Loss lbs	Annual Steam Loss Therm	Cost Savings
1/2" Trap	1/8"	13.70	0	0	0	0	$0
3/4" Trap	3/16"	30.70	20	3	105,362	1,413	$1,357
1" Trap	1/4"	54.70	0	0	0	0	$0
1 -1/2" Trap	3/8"	123.00	5	1	105,534	1,416	$1,359
TOTAL			**25**	**4**	**210,896**	**2,829**	**$2,716**