

**CLIFTON PUBLIC SCHOOLS
PUBLIC SCHOOL #17**

**361 LEXINGTON AVENUE
CLIFTON, NEW JERSEY 07011**

FACILITY ENERGY REPORT

TABLE OF CONTENTS

I. HISTORIC ENERGY CONSUMPTION/COST..... 2

II. FACILITY DESCRIPTION 7

III. MAJOR EQUIPMENT LIST 10

IV. ENERGY CONSERVATION MEASURES..... 11

V. ADDITIONAL RECOMMENDATIONS 27

APPENDICES

- Appendix A – ECM Cost & Savings Breakdown
- Appendix B – New Jersey Smart Start[®] Program Incentives
- Appendix C – Portfolio Manager “Statement of Energy Performance”
- Appendix D – Major Equipment List
- Appendix E – Investment Grade Lighting Audit
- Appendix F – Renewable / Distributed Energy Measures Calculations

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:	Large Power & Lighting Service (LPLS)
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

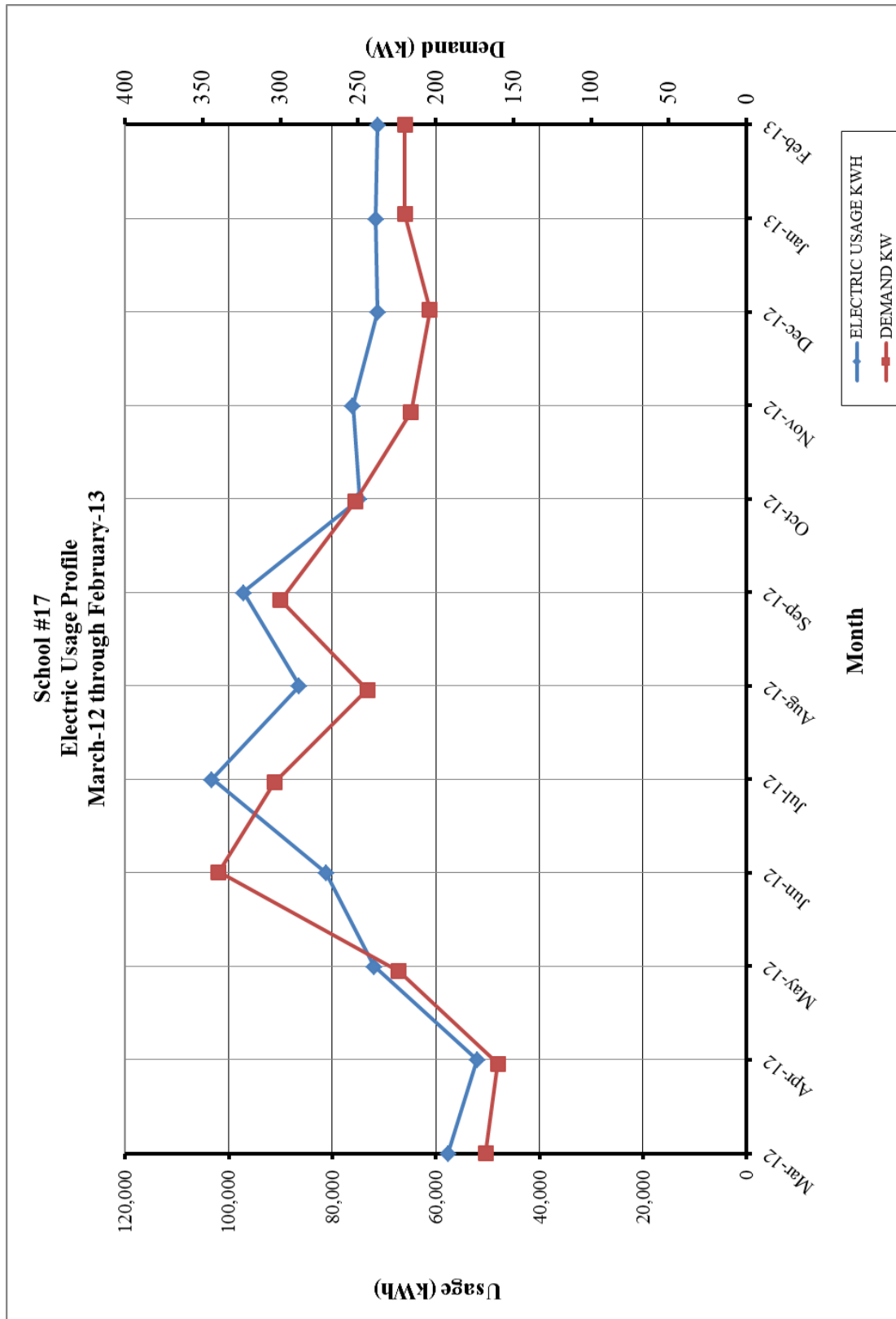
The electric usage profile represents the actual electrical usage for the facility. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts 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: LPLS			
Meter No: 778011518			
Account No: 42 005 441 05			
Third Party Utility Provider: Champion Energy Services LLC			
TPS Meter / Acct No: -			
MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-12	57,600	168.0	\$10,355
Apr-12	52,000	160.0	\$9,613
May-12	72,000	224.0	\$13,833
Jun-12	81,200	340.0	\$15,930
Jul-12	103,200	304.0	\$17,887
Aug-12	86,400	244.0	\$15,101
Sep-12	97,200	300.0	\$14,436
Oct-12	74,800	252.0	\$12,078
Nov-12	76,000	216.0	\$11,813
Dec-12	71,200	204.0	\$11,363
Jan-13	71,600	220.0	\$11,509
Feb-13	71,200	220.0	\$11,547
Totals	914,400	340.0 Max	\$155,467
AVERAGE DEMAND		237.7 KW average	
AVERAGE RATE		\$0.170 \$/kWh	

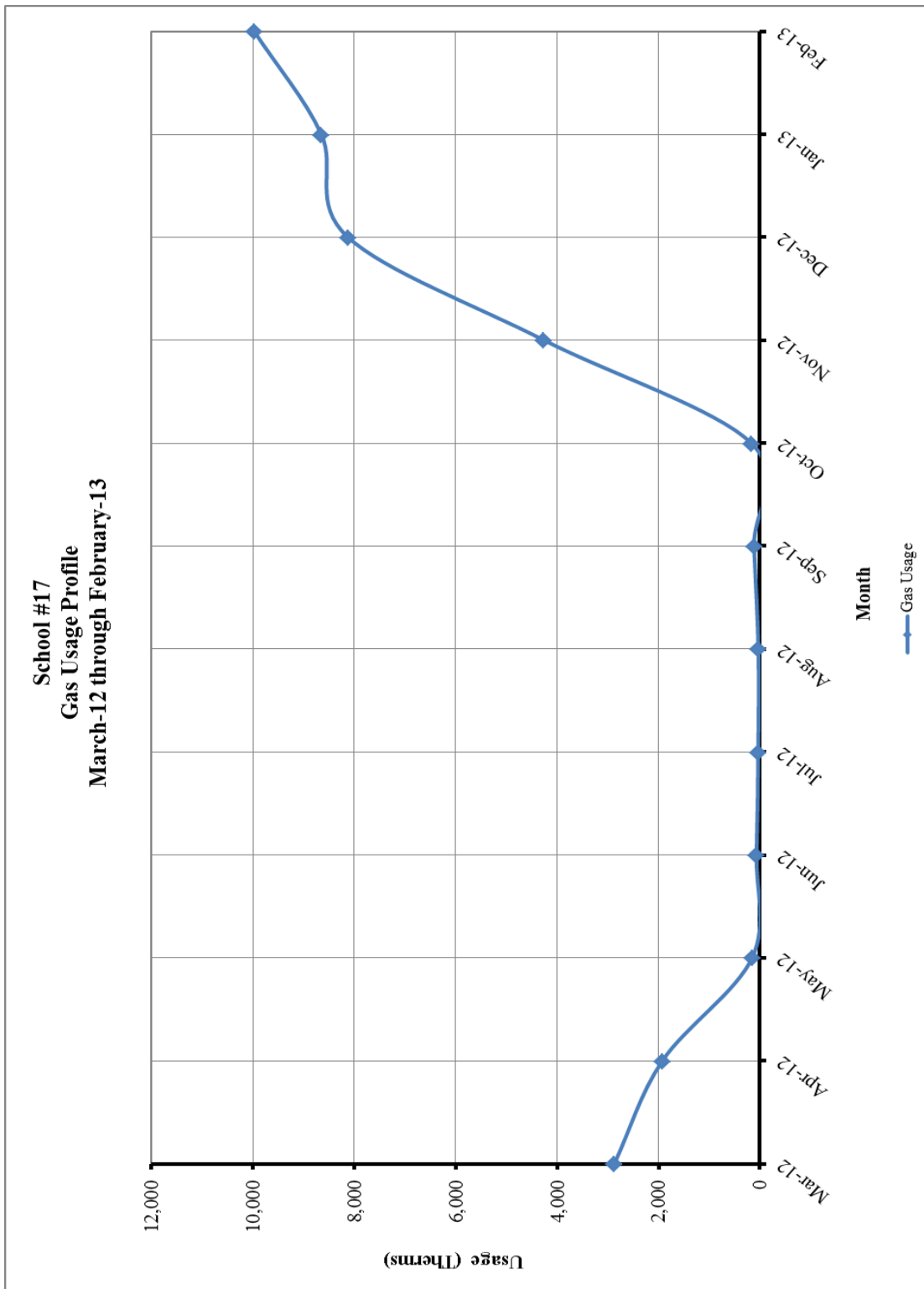
Figure 1
Electricity Usage Profile



**Table 4
Natural Gas Billing Data**

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: LVG		
Meter No: 3164283		
Account No: 42 005 441 05		
Third Party Utility Provider: Hess		
TPS Meter No: 446575/446938		
MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Mar-12	2,872.23	\$1,885.88
Apr-12	1,923.66	\$1,020.13
May-12	153.38	\$175.04
Jun-12	69.45	\$137.41
Jul-12	34.37	\$119.46
Aug-12	31.02	\$118.23
Sep-12	117.53	\$166.31
Oct-12	177.15	\$1,022.39
Nov-12	4,270.85	\$4,039.19
Dec-12	8,130.93	\$7,176.96
Jan-13	8,654.08	\$7,483.58
Feb-13	9,980.40	\$8,676.16
TOTALS	36,415.03	\$32,020.74
AVERAGE RATE:	\$0.88	\$/THERM

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

School #17 is located at 361 Lexington Avenue in Clifton, New Jersey. This 92,300 SF elementary school was built in 2004 with no recent additions/renovations. The building is a 3-story facility comprised of administration offices, teacher's room, audio-visual room, general classrooms, special education classrooms, small group instruction rooms, child study team room, nurse's office, kitchen serving area, multi-purpose gym/cafeteria/assembly, stage, custodial office/supplies, boiler room, storage rooms, and mechanical/electrical rooms.

Occupancy Profile

The typical hours of operation for School #17 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 540 students and has 78 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 solar tinted pane, operable, 1/4" glass with aluminum frames. The various elevations of roofing are built-up bitumen with asphalt sheets over cover board, rigid roof insulation and metal decking along with cover board, ply sheets and an asphalt roof coating.

HVAC Systems

School #17 HVAC systems consists of four (4) condensing, modular boilers, two (2) heating hot water pumps, eight (8) packaged rooftop units, VAV terminal units for the classrooms, offices, etc. and a split AC unit rated at 1.5 Tons for the EMI closet.

The four (4) Aerco Benchmark 2.0 high-efficiency, gas-fired, condensing, modular hot water boilers are approximately 9 years old with a rated input of 2,000 MBH each and a rated output of 1,860 (when new). Having an existing thermal efficiency of approximately 92%, these boilers produce hot water for coils throughout the facility. Hot water is circulated via (two) 2 Taco Model FI3009 pumps rated at 100 GPM each with 5-HP motors. These two (2) pumps supply hot water to coils in the rooftop units, VAV terminal units, fin-tube radiators, cabinet/unit heaters, etc.

During the site inspection, Concord Engineering noticed that several of the VAV terminal units served by RTU-4 and RTU-5 were not working properly (low flow, cold air flowing from the supply air diffusers (outside temperature was 34°F)).

The kitchen has a rooftop make-up air unit manufactured by Reznor (Model RPB400) rated at 400 MBH input with an 80% thermal efficiency when new. In addition, the kitchen hood is exhausted by a Greenheck model CUBE-120 HP-VG/5/A F with a 1/2 HP fan motor.

Eight (8) rooftop units with hot water coils and DX cooling provide conditioned air for a majority of the facility. These units are as follows:

<u>Unit Tag</u>	<u>Area Served</u>	<u>Manufacturer</u>	<u>Size (Tons) Each</u>
RTU-1A, 2A	Gym	Aaon	30
RTU-3	Cafetorium	McQuay	40
RTU-4	Media Center	Aaon	16
RTU-5	Guidance Offices	Aaon	16
RTU-6, 7	Three (3) East Wings	McQuay	50
RTU-8	Three (3) West Wings	McQuay	70

Fresh air is supplied to the classrooms, offices, cafetorium, media center, guidance offices, and gym via the rooftop units and outside air intake louvers for the storage rooms, mechanical rooms, and other smaller spaces.

Exhaust System

Air is exhausted from the many toilet rooms through roof exhausters. The areas served by the eight (8) rooftop units are exhausted by these air handlers. There are also several roof exhausters for the various storage rooms, mechanical rooms, corridors, etc.

HVAC System Controls

The entire HVAC system is controlled by a Johnson Controls Metasys system with N30 controllers at various locations throughout the facility controlling the major HVAC sub-systems.

Domestic Hot Water

Domestic hot water for the facility is supplied by two (2) A. O. Smith Cyclone XHE Model BTH 120 970 Series high-efficiency, gas-fired, hot water heaters with a capacity of 60 gallons each and an input of 125 MBH (gas). A 1/10 HP Bell & Gossett 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 serving kitchen is equipped with Kolpak walk-in refrigerator and freezer with the appropriate RDI condenser units on the roof; Market Force steamers, four (4) Victory double ovens, several Powers milk refrigerators, and a Rational ClimaPlus combination oven.

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	\$2,504	\$705	3.6	322.3%
ECM #2	Lighting Controls Upgrade	\$12,115	\$4,398	2.8	444.5%
ECM #3	VFD on Hot Water Pumps	\$14,946	\$126	118.6	-87.4%
ECM #4	Retro Commissioning	\$74,000	\$9,369	7.9	89.9%
ECM #5	Water Conservation	\$595	\$1,035	0.6	1639.5%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	73.32 KW PV System	\$453,379	\$30,593	14.8	1.2%
Notes:	A. Cost takes into consideration applicable NJ Smart Start TM 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	1.7	4,146	-
ECM #2	Lighting Controls Upgrade	-	25,871	-
ECM #3	VFD on Hot Water Pumps	-	741	-
ECM #4	Retro Commissioning	-	45,720	1,821
ECM #5	Water Conservation	-	-	562 (108,000 Gallons of Water)
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	73.32 KW PV System	73.3	84,725	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	\$705	\$2,724	\$220	\$2,504	3.6
Lighting Controls Upgrade	\$4,398	\$14,000	\$1,885	\$12,115	2.8
VFD on Hot Water Pumps	\$126	\$14,946	\$0	\$14,946	118.6
Retro Commissioning	\$9,369	\$74,000	\$0	\$74,000	7.9
Water Conservation	\$1,035	\$595	\$0	\$595	0.6
<i>Design / Construction Extras (15%)</i>		\$13,698		\$13,698	
Total Project	\$15,507	\$105,017	\$2,105	\$102,912	6.6

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 #17 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 (\$):	\$2,724
NJ Smart Start Equipment Incentive (\$):	\$220
Net Installation Cost (\$):	\$2,504
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$705
Total Yearly Savings (\$/Yr):	\$705
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.6
Simple Lifetime ROI	322.3%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$10,575
Internal Rate of Return (IRR)	27%
Net Present Value (NPV)	\$5,912.24

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Clifton Elementary School #17 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:

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

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

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

$$= (\# \text{ Wall mount sensors} \times \$20 \text{ per sensor})$$

$$+ (\# \text{ Ceiling mount sensors} \times \$35 \text{ per sensor})$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$14,000
NJ Smart Start Equipment Incentive (\$):	\$1,885
Net Installation Cost (\$):	\$12,115
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$4,398
Total Yearly Savings (\$/Yr):	\$4,398
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.8
Simple Lifetime ROI	444.5%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$65,971
Internal Rate of Return (IRR)	36%
Net Present Value (NPV)	\$40,388.96

ECM #3: Install VFD on Hot Water Pumps

Description:

The Clifton Elementary School #17 currently has 5 horsepower hot water pumps to distribute heating water to the air handling units for the large open spaces and unit ventilators for the classroom and office spaces. The existing pumps operate at constant flow and ride the pump curve only.

This ECM includes the installation of Variable Frequency Drives on the two (2) 5 horsepower existing hot water pumps. The VFD control is based on a differential pressure sensor in the water loop to measure demand for water.

Energy Savings Calculations:

$$\text{Pump Power HP} = \frac{\text{Flow}_{\text{GPM}} \times \text{Head}_{\text{ft-hd.}}}{3650 \times \eta_{\text{Pump}} \times \eta_{\text{motor}}}$$

$$\text{Energy Consumption (kWh)} = \text{Motor HP} \times 0.746 \frac{\text{kW}}{\text{HP}} \times \text{Hours of operation (Hr)} \times \frac{1}{\eta_{\text{motor}}}$$

$$\text{Total Energy Consumption (kWh)} = \sum \text{Energy Consumption of Each Motor}$$

$$\text{Energy Cost (\$)} = \text{Total Consumption (kWh)} \times \text{Average Cost of Electric} \left(\frac{\$}{\text{kWh}} \right)$$

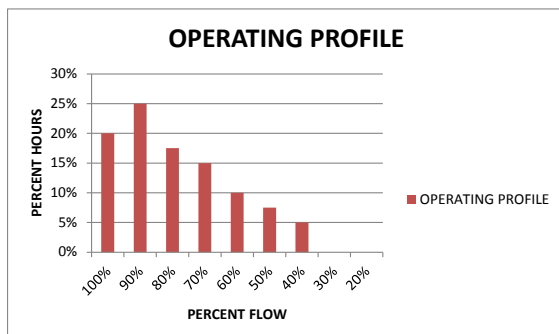
Affinity Laws are used in order to calculate energy savings by calculating the reduced power consumption requirement based a reduction in flow. Affinity laws, are as following:

Q = Flow, n = RPM, p = total pressure

$$\frac{Q_2}{Q_1} = \frac{n_2}{n_1} \quad \frac{p_2}{p_1} = \left(\frac{n_2}{n_1} \right)^2 \quad \frac{HP_2}{HP_1} = \left(\frac{n_2}{n_1} \right)^3$$

HW PUMPS VFD CALCULATION			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	CV Pumps	VFD Pumps	
Flow Control	Throttle	VFD	-
Motor Nameplate HP	5.0	5.0	
Flow* (GPM)	100	100	-
Head* (Ft)	80	80	-
Pump Efficiency (%)	75.0%	75.0%	-
Motor Efficiency (%)	89.5%	89.5%	0.0%
Operating Hrs	4000	4000	-
Estimated Power (HP)	3.0	3.0	0.00
Elec Cost (\$/kWh)	0.170	0.170	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Electric Energy (kWh)	10,034	9,293	741
Electric Energy Cost (\$)	\$1,706	\$1,580	\$126
COMMENTS:	Estimated Flow and Head Pressure, Savings for One Pump, assumed two operate.		

Estimated Operating Profile with VFD



Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$14,946
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$14,946
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$126
Total Yearly Savings (\$/Yr):	\$126
Estimated ECM Lifetime (Yr):	15
Simple Payback	118.6
Simple Lifetime ROI	-87.4%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$1,890
Internal Rate of Return (IRR)	-19%
Net Present Value (NPV)	(\$13,441.82)

ECM #4: Retro-Commissioning

Description:

During the walkthrough of Clifton Elementary School #17, Concord Engineering was informed that the building was being overheated and the controls system was not functioning properly and communicating with the HVAC equipment. After further investigation, Concord Engineering received an Energy Star rating for this building of 51, which for a recently built school, raises some alarms.

Retro-commissioning is a quality-oriented process for verifying and documenting that HVAC systems within the building perform as closely as possible to defined performance criteria. The benefits include: documenting accurately the existing system's function and performance; verifying that system performance meets the facility's requirements; benchmarking the performance of existing systems for future changes; and most importantly identifying problems in the system.

For this ECM, the variable air volume rooftop units along with the VAV terminal units and the associated controls will be investigated for proper operation and control and verified that they meet the requirements of the Construction Documents and Basis of Design. After review of the approved TAB Report, random airflow measurements and testing of the sequence of operation along with trending various critical parameters using the existing Johnson Controls Metasys Building Management System (BMS) will be undertaken. In addition, during the investigation, various Retro-Cx Measures such as economizer optimization, mixed air temperature reset, discharge air temperature reset, modification of VAV setpoint control, static pressure reset, and calibration of the outside air temperature sensor will be explored.

The energy savings from retro-commissioning critical systems such as HVAC is approximately 5% of the total energy used (Source: E. Mills et al, "Cost-effectiveness of Commissioning 224 Buildings across 21 states – 2004").

Energy Savings Calculations:

Following table summarizes energy savings for this facility via implementation of a Retro-Commissioning process:

RETRO COMMISSIONING CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing System Operation	Improved Operation from Retro Cx	
Energy Savings, Nat. Gas	-	5%	
Energy Savings, Electricity	-	5%	
Gas Cost (\$/Therm)	\$0.88	\$0.880	
Electricity Cost (\$/kWh)	\$0.170	\$0.170	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Natural Gas Usage (Therms)	36,415	34,594	1,821
Electricity Usage (kWh)	914,400	868,680	45,720
Natural Gas Cost (\$)	\$32,021	\$30,443	\$1,578
Electricity Cost (\$)	\$155,467	\$147,676	\$7,791
Total Energy Cost (\$)	\$187,488	\$178,119	\$9,369
COMMENTS:			

Estimated Cost of Retro-Commissioning = \$0.80/SF x 92,312 SF = Approximately \$74,000

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$74,000
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$74,000
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$9,369
Total Yearly Savings (\$/Yr):	\$9,369
Estimated ECM Lifetime (Yr):	15
Simple Payback	7.9
Simple Lifetime ROI	89.9%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$140,535
Internal Rate of Return (IRR)	9%
Net Present Value (NPV)	\$37,846.51

ECM #5: Water Conservation

Description:

The facility utilizes standard plumbing fixtures. The typical sink aerator consumption only meets the minimum federally required standard for water efficiency. New fixtures and aerators are available that use less water than today's requirements and can add up to significant water reduction over a long period.

This ECM includes the replacement of the existing sink aerators with low flow sink aerators in the restrooms.

Energy Savings Calculations:

Faucets:

$$\text{Water Consumption} = \text{Occupancy} \left(\frac{\text{Days}}{\text{Yr}} \right) \times \text{Use} \left(\frac{\text{min}}{\text{Day}} \right) \times \text{Fixture Quantity} \times \text{Fixture} \left(\frac{\text{Gal}}{\text{Min}} \right)$$

$$\text{Water Cost} = \frac{\text{Water Consumption (Gallons)} \times \text{Ave Cost} \left(\frac{\$}{1000 \text{ Gal}} \right)}{1000(\text{Gal})}$$

Water Heating Usage (therm)

$$= \frac{\text{Gallons}}{\text{year}} \times 8.33 \frac{\text{Btu}}{\text{gal}} \times \Delta T (50^\circ\text{F}) \times \frac{1}{\text{Heater Eff (80\%)}} \times \frac{\text{therm}}{100,000 \text{ Btu}}$$

LOW FLOW WATER SAVING DEVICES			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
Quantity of Sinks	20	20	
Flow Rate (GPM)	2.2	1.0	1.2
Device Usage (min per day)	30	30	
Facility Operation (days / year)	150	150	
Natural Gas Rate (\$/therm)	\$0.880	\$0.880	
Water Rate (\$/1000gal)	\$5.000	\$5.000	
ENERGY SAVINGS CALCULATIONS			
Natural Gas Usage (Therm)	1,031	469	562
Water Usage (gallons)	198,000	90,000	108,000
Energy Cost (\$)	\$1,897	\$862	\$1,035
COMMENTS:			

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$595
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$595
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$1,035
Total Yearly Savings (\$/Yr):	\$1,035
Estimated ECM Lifetime (Yr):	10
Simple Payback	0.6
Simple Lifetime ROI	1639.5%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$10,350
Internal Rate of Return (IRR)	174%
Net Present Value (NPV)	\$8,233.76

REM #1: 73.32 kW Solar System**Description:**

The Clifton Elementary School #17 has available roof space that could accommodate a significant amount of solar generation. Based on the available areas a 73.32 kilowatt solar array could be installed. The array will produce approximately 84,725 kilowatt-hours annually that will reduce the overall electric usage of the facility by 9.27%.

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}):	73.32
Electric Generation (KWH/Yr):	84,725
Installation Cost (\$):	\$453,379
SREC Revenue (\$/Yr):	\$16,190
Energy Savings (\$/Yr):	\$14,403
Total Yearly Savings (\$/Yr):	\$30,593
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	14.8
Analysis Period Electric Savings (\$):	\$267,885
Analysis Period SREC Revenue (\$):	\$234,526
Net Present Value (NPV)	(\$143,115.01)

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

TABLE OF CONTENTS

I. HISTORIC ENERGY CONSUMPTION/COST..... 2

II. FACILITY DESCRIPTION 7

III. MAJOR EQUIPMENT LIST 10

IV. ENERGY CONSERVATION MEASURES..... 11

V. ADDITIONAL RECOMMENDATIONS 27

APPENDICES

- Appendix A – ECM Cost & Savings Breakdown
- Appendix B – New Jersey Smart Start[®] Program Incentives
- Appendix C – Portfolio Manager “Statement of Energy Performance”
- Appendix D – Major Equipment List
- Appendix E – Investment Grade Lighting Audit
- Appendix F – Renewable / Distributed Energy Measures Calculations

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: Large Power & Lighting Service (LPLS)
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

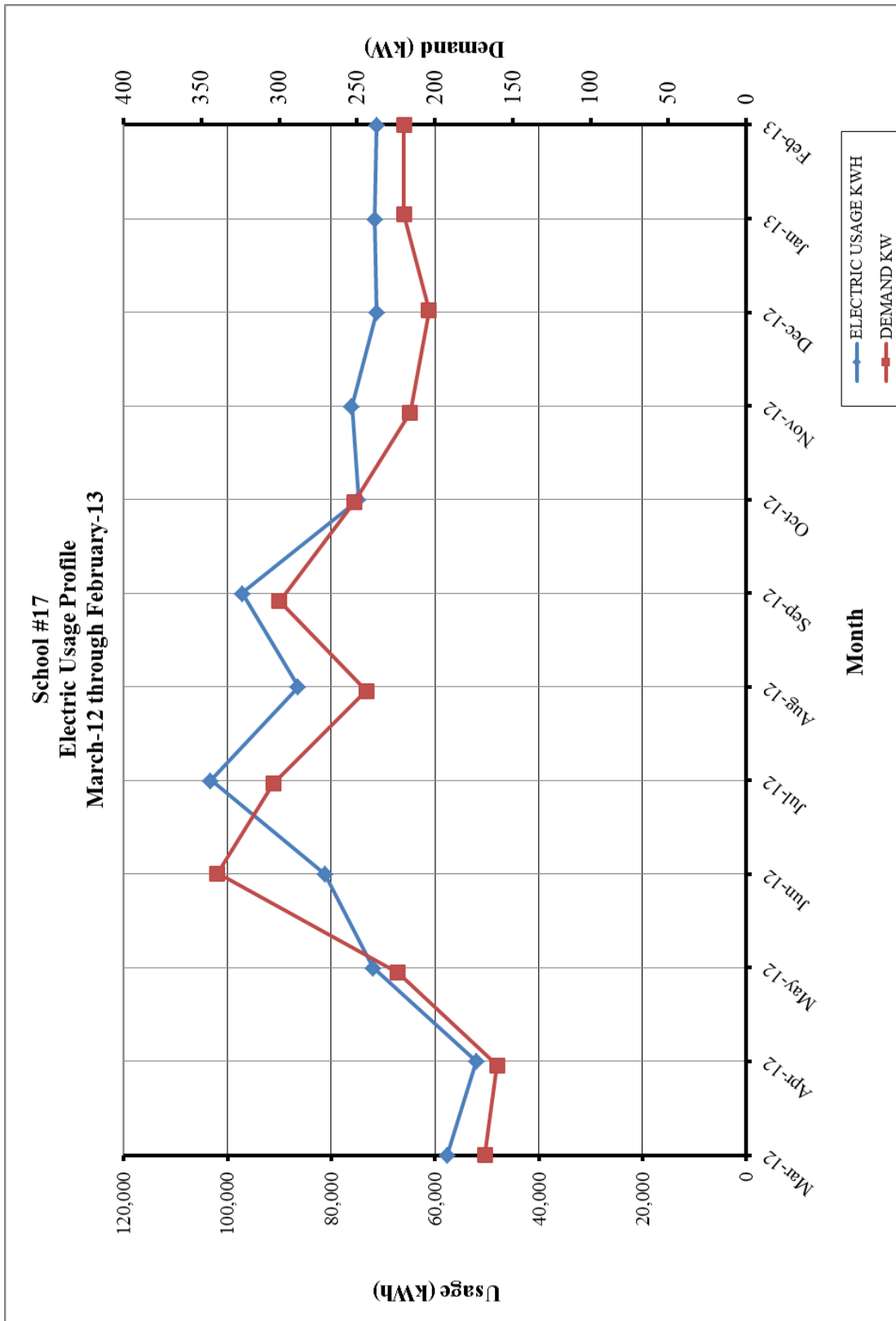
The electric usage profile represents the actual electrical usage for the facility. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts 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: LPLS			
Meter No: 778011518			
Account No: 42 005 441 05			
Third Party Utility Provider: Champion Energy Services LLC			
TPS Meter / Acct No: -			
MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-12	57,600	168.0	\$10,355
Apr-12	52,000	160.0	\$9,613
May-12	72,000	224.0	\$13,833
Jun-12	81,200	340.0	\$15,930
Jul-12	103,200	304.0	\$17,887
Aug-12	86,400	244.0	\$15,101
Sep-12	97,200	300.0	\$14,436
Oct-12	74,800	252.0	\$12,078
Nov-12	76,000	216.0	\$11,813
Dec-12	71,200	204.0	\$11,363
Jan-13	71,600	220.0	\$11,509
Feb-13	71,200	220.0	\$11,547
Totals	914,400	340.0 Max	\$155,467
AVERAGE DEMAND		237.7 KW average	
AVERAGE RATE		\$0.170 \$/kWh	

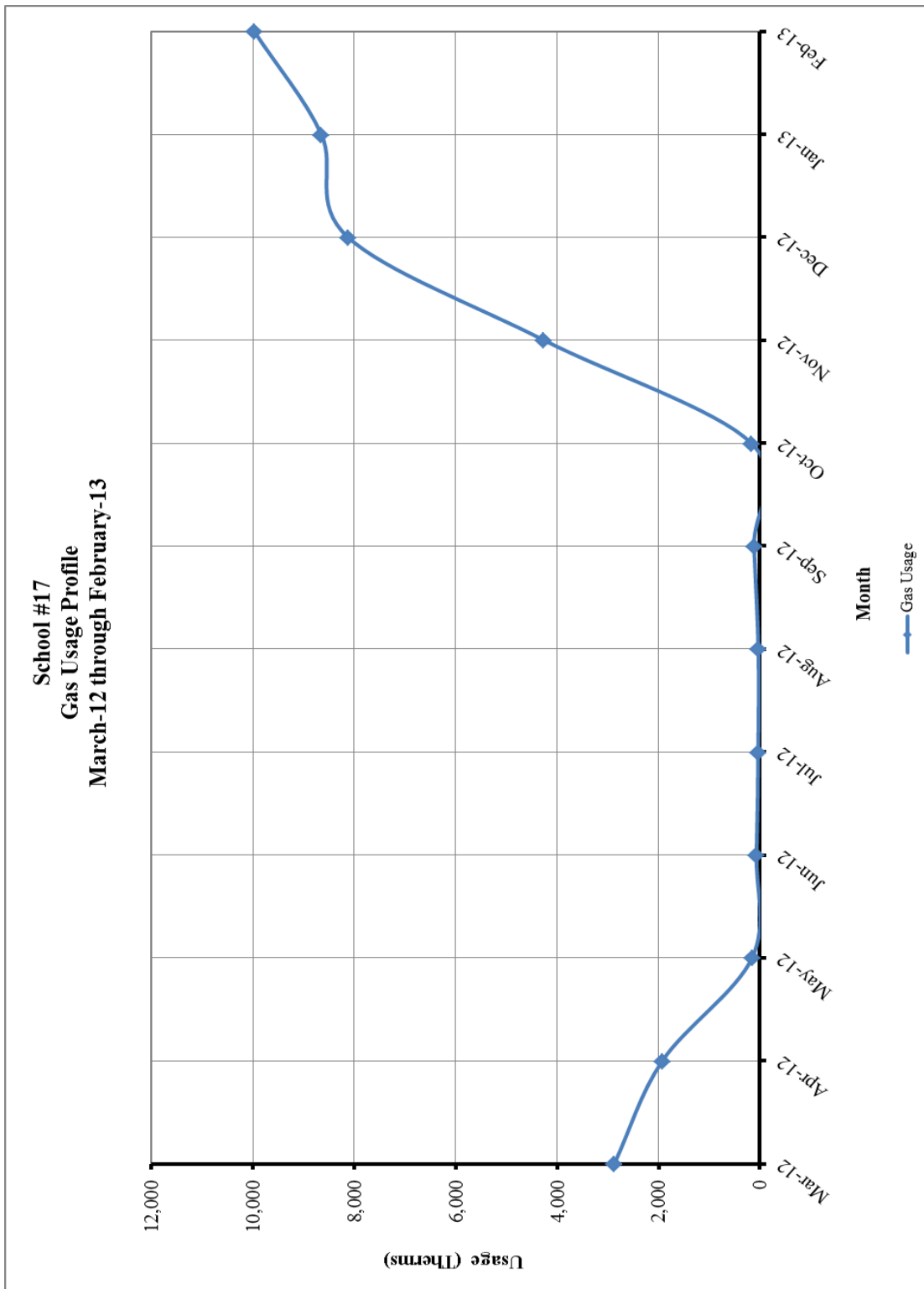
Figure 1
Electricity Usage Profile



**Table 4
Natural Gas Billing Data**

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: LVG		
Meter No: 3164283		
Account No: 42 005 441 05		
Third Party Utility Provider: Hess		
TPS Meter No: 446575/446938		
MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Mar-12	2,872.23	\$1,885.88
Apr-12	1,923.66	\$1,020.13
May-12	153.38	\$175.04
Jun-12	69.45	\$137.41
Jul-12	34.37	\$119.46
Aug-12	31.02	\$118.23
Sep-12	117.53	\$166.31
Oct-12	177.15	\$1,022.39
Nov-12	4,270.85	\$4,039.19
Dec-12	8,130.93	\$7,176.96
Jan-13	8,654.08	\$7,483.58
Feb-13	9,980.40	\$8,676.16
TOTALS	36,415.03	\$32,020.74
AVERAGE RATE:	\$0.88	\$/THERM

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

School #17 is located at 361 Lexington Avenue in Clifton, New Jersey. This 92,300 SF elementary school was built in 2004 with no recent additions/renovations. The building is a 3-story facility comprised of administration offices, teacher's room, audio-visual room, general classrooms, special education classrooms, small group instruction rooms, child study team room, nurse's office, kitchen serving area, multi-purpose gym/cafeteria/assembly, stage, custodial office/supplies, boiler room, storage rooms, and mechanical/electrical rooms.

Occupancy Profile

The typical hours of operation for School #17 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 540 students and has 78 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 solar tinted pane, operable, 1/4" glass with aluminum frames. The various elevations of roofing are built-up bitumen with asphalt sheets over cover board, rigid roof insulation and metal decking along with cover board, ply sheets and an asphalt roof coating.

HVAC Systems

School #17 HVAC systems consists of four (4) condensing, modular boilers, two (2) heating hot water pumps, eight (8) packaged rooftop units, VAV terminal units for the classrooms, offices, etc. and a split AC unit rated at 1.5 Tons for the EMI closet.

The four (4) Aerco Benchmark 2.0 high-efficiency, gas-fired, condensing, modular hot water boilers are approximately 9 years old with a rated input of 2,000 MBH each and a rated output of 1,860 (when new). Having an existing thermal efficiency of approximately 92%, these boilers produce hot water for coils throughout the facility. Hot water is circulated via (two) 2 Taco Model FI3009 pumps rated at 100 GPM each with 5-HP motors. These two (2) pumps supply hot water to coils in the rooftop units, VAV terminal units, fin-tube radiators, cabinet/unit heaters, etc.

During the site inspection, Concord Engineering noticed that several of the VAV terminal units served by RTU-4 and RTU-5 were not working properly (low flow, cold air flowing from the supply air diffusers (outside temperature was 34°F)).

The kitchen has a rooftop make-up air unit manufactured by Reznor (Model RPB400) rated at 400 MBH input with an 80% thermal efficiency when new. In addition, the kitchen hood is exhausted by a Greenheck model CUBE-120 HP-VG/5/A F with a 1/2 HP fan motor.

Eight (8) rooftop units with hot water coils and DX cooling provide conditioned air for a majority of the facility. These units are as follows:

<u>Unit Tag</u>	<u>Area Served</u>	<u>Manufacturer</u>	<u>Size (Tons) Each</u>
RTU-1A, 2A	Gym	Aaon	30
RTU-3	Cafetorium	McQuay	40
RTU-4	Media Center	Aaon	16
RTU-5	Guidance Offices	Aaon	16
RTU-6, 7	Three (3) East Wings	McQuay	50
RTU-8	Three (3) West Wings	McQuay	70

Fresh air is supplied to the classrooms, offices, cafetorium, media center, guidance offices, and gym via the rooftop units and outside air intake louvers for the storage rooms, mechanical rooms, and other smaller spaces.

Exhaust System

Air is exhausted from the many toilet rooms through roof exhausters. The areas served by the eight (8) rooftop units are exhausted by these air handlers. There are also several roof exhausters for the various storage rooms, mechanical rooms, corridors, etc.

HVAC System Controls

The entire HVAC system is controlled by a Johnson Controls Metasys system with N30 controllers at various locations throughout the facility controlling the major HVAC sub-systems.

Domestic Hot Water

Domestic hot water for the facility is supplied by two (2) A. O. Smith Cyclone XHE Model BTH 120 970 Series high-efficiency, gas-fired, hot water heaters with a capacity of 60 gallons each and an input of 125 MBH (gas). A 1/10 HP Bell & Gossett 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 serving kitchen is equipped with Kolpak walk-in refrigerator and freezer with the appropriate RDI condenser units on the roof; Market Force steamers, four (4) Victory double ovens, several Powers milk refrigerators, and a Rational ClimaPlus combination oven.

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	\$2,504	\$705	3.6	322.3%
ECM #2	Lighting Controls Upgrade	\$12,115	\$4,398	2.8	444.5%
ECM #3	VFD on Hot Water Pumps	\$14,946	\$126	118.6	-87.4%
ECM #4	Retro Commissioning	\$74,000	\$9,369	7.9	89.9%
ECM #5	Water Conservation	\$595	\$1,035	0.6	1639.5%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	73.32 KW PV System	\$453,379	\$30,593	14.8	1.2%
Notes:	A. Cost takes into consideration applicable NJ Smart Start TM 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	1.7	4,146	-
ECM #2	Lighting Controls Upgrade	-	25,871	-
ECM #3	VFD on Hot Water Pumps	-	741	-
ECM #4	Retro Commissioning	-	45,720	1,821
ECM #5	Water Conservation	-	-	562 (108,000 Gallons of Water)
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	73.32 KW PV System	73.3	84,725	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	\$705	\$2,724	\$220	\$2,504	3.6
Lighting Controls Upgrade	\$4,398	\$14,000	\$1,885	\$12,115	2.8
VFD on Hot Water Pumps	\$126	\$14,946	\$0	\$14,946	118.6
Retro Commissioning	\$9,369	\$74,000	\$0	\$74,000	7.9
Water Conservation	\$1,035	\$595	\$0	\$595	0.6
<i>Design / Construction Extras (15%)</i>		\$13,698		\$13,698	
Total Project	\$15,507	\$105,017	\$2,105	\$102,912	6.6

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 #17 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 (\$):	\$2,724
NJ Smart Start Equipment Incentive (\$):	\$220
Net Installation Cost (\$):	\$2,504
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$705
Total Yearly Savings (\$/Yr):	\$705
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.6
Simple Lifetime ROI	322.3%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$10,575
Internal Rate of Return (IRR)	27%
Net Present Value (NPV)	\$5,912.24

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Clifton Elementary School #17 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:

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

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

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

$$= (\# \text{ Wall mount sensors} \times \$20 \text{ per sensor})$$

$$+ (\# \text{ Ceiling mount sensors} \times \$35 \text{ per sensor})$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$14,000
NJ Smart Start Equipment Incentive (\$):	\$1,885
Net Installation Cost (\$):	\$12,115
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$4,398
Total Yearly Savings (\$/Yr):	\$4,398
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.8
Simple Lifetime ROI	444.5%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$65,971
Internal Rate of Return (IRR)	36%
Net Present Value (NPV)	\$40,388.96

ECM #3: Install VFD on Hot Water Pumps

Description:

The Clifton Elementary School #17 currently has 5 horsepower hot water pumps to distribute heating water to the air handling units for the large open spaces and unit ventilators for the classroom and office spaces. The existing pumps operate at constant flow and ride the pump curve only.

This ECM includes the installation of Variable Frequency Drives on the two (2) 5 horsepower existing hot water pumps. The VFD control is based on a differential pressure sensor in the water loop to measure demand for water.

Energy Savings Calculations:

$$\text{Pump Power HP} = \frac{\text{Flow}_{\text{GPM}} \times \text{Head}_{\text{ft-hd.}}}{3650 \times \eta_{\text{Pump}} \times \eta_{\text{motor}}}$$

$$\text{Energy Consumption (kWh)} = \text{Motor HP} \times 0.746 \frac{\text{kW}}{\text{HP}} \times \text{Hours of operation (Hr)} \times \frac{1}{\eta_{\text{motor}}}$$

$$\text{Total Energy Consumption (kWh)} = \sum \text{Energy Consumption of Each Motor}$$

$$\text{Energy Cost (\$)} = \text{Total Consumption (kWh)} \times \text{Average Cost of Electric} \left(\frac{\$}{\text{kWh}} \right)$$

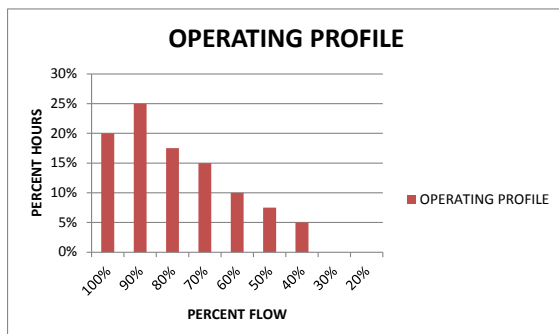
Affinity Laws are used in order to calculate energy savings by calculating the reduced power consumption requirement based a reduction in flow. Affinity laws, are as following:

Q = Flow, n = RPM, p = total pressure

$$\frac{Q_2}{Q_1} = \frac{n_2}{n_1} \quad \frac{p_2}{p_1} = \left(\frac{n_2}{n_1} \right)^2 \quad \frac{HP_2}{HP_1} = \left(\frac{n_2}{n_1} \right)^3$$

HW PUMPS VFD CALCULATION			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	CV Pumps	VFD Pumps	
Flow Control	Throttle	VFD	-
Motor Nameplate HP	5.0	5.0	
Flow* (GPM)	100	100	-
Head* (Ft)	80	80	-
Pump Efficiency (%)	75.0%	75.0%	-
Motor Efficiency (%)	89.5%	89.5%	0.0%
Operating Hrs	4000	4000	-
Estimated Power (HP)	3.0	3.0	0.00
Elec Cost (\$/kWh)	0.170	0.170	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Electric Energy (kWh)	10,034	9,293	741
Electric Energy Cost (\$)	\$1,706	\$1,580	\$126
COMMENTS:	Estimated Flow and Head Pressure, Savings for One Pump, assumed two operate.		

Estimated Operating Profile with VFD



Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$14,946
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$14,946
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$126
Total Yearly Savings (\$/Yr):	\$126
Estimated ECM Lifetime (Yr):	15
Simple Payback	118.6
Simple Lifetime ROI	-87.4%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$1,890
Internal Rate of Return (IRR)	-19%
Net Present Value (NPV)	(\$13,441.82)

ECM #4: Retro-Commissioning

Description:

During the walkthrough of Clifton Elementary School #17, Concord Engineering was informed that the building was being overheated and the controls system was not functioning properly and communicating with the HVAC equipment. After further investigation, Concord Engineering received an Energy Star rating for this building of 51, which for a recently built school, raises some alarms.

Retro-commissioning is a quality-oriented process for verifying and documenting that HVAC systems within the building perform as closely as possible to defined performance criteria. The benefits include: documenting accurately the existing system's function and performance; verifying that system performance meets the facility's requirements; benchmarking the performance of existing systems for future changes; and most importantly identifying problems in the system.

For this ECM, the variable air volume rooftop units along with the VAV terminal units and the associated controls will be investigated for proper operation and control and verified that they meet the requirements of the Construction Documents and Basis of Design. After review of the approved TAB Report, random airflow measurements and testing of the sequence of operation along with trending various critical parameters using the existing Johnson Controls Metasys Building Management System (BMS) will be undertaken. In addition, during the investigation, various Retro-Cx Measures such as economizer optimization, mixed air temperature reset, discharge air temperature reset, modification of VAV setpoint control, static pressure reset, and calibration of the outside air temperature sensor will be explored.

The energy savings from retro-commissioning critical systems such as HVAC is approximately 5% of the total energy used (Source: E. Mills et al, "Cost-effectiveness of Commissioning 224 Buildings across 21 states – 2004").

Energy Savings Calculations:

Following table summarizes energy savings for this facility via implementation of a Retro-Commissioning process:

RETRO COMMISSIONING CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing System Operation	Improved Operation from Retro Cx	
Energy Savings, Nat. Gas	-	5%	
Energy Savings, Electricity	-	5%	
Gas Cost (\$/Therm)	\$0.88	\$0.880	
Electricity Cost (\$/kWh)	\$0.170	\$0.170	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Natural Gas Usage (Therms)	36,415	34,594	1,821
Electricity Usage (kWh)	914,400	868,680	45,720
Natural Gas Cost (\$)	\$32,021	\$30,443	\$1,578
Electricity Cost (\$)	\$155,467	\$147,676	\$7,791
Total Energy Cost (\$)	\$187,488	\$178,119	\$9,369
COMMENTS:			

Estimated Cost of Retro-Commissioning = \$0.80/SF x 92,312 SF = Approximately \$74,000

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$74,000
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$74,000
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$9,369
Total Yearly Savings (\$/Yr):	\$9,369
Estimated ECM Lifetime (Yr):	15
Simple Payback	7.9
Simple Lifetime ROI	89.9%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$140,535
Internal Rate of Return (IRR)	9%
Net Present Value (NPV)	\$37,846.51

ECM #5: Water Conservation

Description:

The facility utilizes standard plumbing fixtures. The typical sink aerator consumption only meets the minimum federally required standard for water efficiency. New fixtures and aerators are available that use less water than today's requirements and can add up to significant water reduction over a long period.

This ECM includes the replacement of the existing sink aerators with low flow sink aerators in the restrooms.

Energy Savings Calculations:

Faucets:

$$\text{Water Consumption} = \text{Occupancy} \left(\frac{\text{Days}}{\text{Yr}} \right) \times \text{Use} \left(\frac{\text{min}}{\text{Day}} \right) \times \text{Fixture Quantity} \times \text{Fixture} \left(\frac{\text{Gal}}{\text{Min}} \right)$$

$$\text{Water Cost} = \frac{\text{Water Consumption (Gallons)} \times \text{Ave Cost} \left(\frac{\$}{1000 \text{ Gal}} \right)}{1000(\text{Gal})}$$

$$\begin{aligned} \text{Water Heating Usage (therm)} \\ = \frac{\text{Gallons}}{\text{year}} \times 8.33 \frac{\text{Btu}}{\text{gal}} \times \Delta T (50^\circ\text{F}) \times \frac{1}{\text{Heater Eff (80\%)}} \times \frac{\text{therm}}{100,000 \text{ Btu}} \end{aligned}$$

LOW FLOW WATER SAVING DEVICES			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
Quantity of Sinks	20	20	
Flow Rate (GPM)	2.2	1.0	1.2
Device Usage (min per day)	30	30	
Facility Operation (days / year)	150	150	
Natural Gas Rate (\$/therm)	\$0.880	\$0.880	
Water Rate (\$/1000gal)	\$5.000	\$5.000	
ENERGY SAVINGS CALCULATIONS			
Natural Gas Usage (Therm)	1,031	469	562
Water Usage (gallons)	198,000	90,000	108,000
Energy Cost (\$)	\$1,897	\$862	\$1,035
COMMENTS:			

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$595
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$595
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$1,035
Total Yearly Savings (\$/Yr):	\$1,035
Estimated ECM Lifetime (Yr):	10
Simple Payback	0.6
Simple Lifetime ROI	1639.5%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$10,350
Internal Rate of Return (IRR)	174%
Net Present Value (NPV)	\$8,233.76

REM #1: 73.32 kW Solar System**Description:**

The Clifton Elementary School #17 has available roof space that could accommodate a significant amount of solar generation. Based on the available areas a 73.32 kilowatt solar array could be installed. The array will produce approximately 84,725 kilowatt-hours annually that will reduce the overall electric usage of the facility by 9.27%.

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}):	73.32
Electric Generation (KWH/Yr):	84,725
Installation Cost (\$):	\$453,379
SREC Revenue (\$/Yr):	\$16,190
Energy Savings (\$/Yr):	\$14,403
Total Yearly Savings (\$/Yr):	\$30,593
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	14.8
Analysis Period Electric Savings (\$):	\$267,885
Analysis Period SREC Revenue (\$):	\$234,526
Net Present Value (NPV)	(\$143,115.01)

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 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 \geq 16
	\$600 per ton, EER \geq 18
	\$750 per ton, EER \geq 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 \geq 10 hp	\$60 per VFD rated hp
Boiler Fans \geq 5 HP	\$65 to \$155 per hp
Boiler Feed Water Pumps \geq 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 \leq 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 \geq 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	\$50 per fixture
HID \geq 100w Replacement with new HID \geq 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



STATEMENT OF ENERGY PERFORMANCE

14-Clifton BOE - PS 17

Building ID: 3477610
For 12-month Period Ending: February 28, 2013¹
Date SEP becomes ineligible: N/A

Date SEP Generated: April 11, 2013

Facility
 14-Clifton BOE - PS 17
 361 Lexington Avenue
 Clifton, NJ 07011

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: 2004
Gross Floor Area (ft²): 93,312

Energy Performance Rating² (1-100) 51

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	3,119,282
Natural Gas (kBtu) ⁴	3,511,385
Total Energy (kBtu)	6,630,667

Energy Intensity⁴

Site (kBtu/ft ² /yr)	71
Source (kBtu/ft ² /yr)	151

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	629
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Electric Distribution Utility

Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	72
National Median Source EUI	153
% Difference from National Median Source EUI	-1%
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 Standards⁵ 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	<input checked="" type="checkbox"/>
Building Name	14-Clifton BOE - PS 17	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
Type	K-12 School	Is this an accurate description of the space in question?		<input type="checkbox"/>
Location	361 Lexington Avenue, Clifton, NJ 07011	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
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.		<input type="checkbox"/>
Elementary School 17 (K-12 School)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Gross Floor Area	93,312 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		<input type="checkbox"/>
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.		<input type="checkbox"/>
Number of PCs	157	Is this the number of personal computers in the K12 School?		<input type="checkbox"/>
Number of walk-in refrigeration/freezer units	2	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		<input type="checkbox"/>
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		<input type="checkbox"/>
Percent Cooled	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		<input type="checkbox"/>
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		<input type="checkbox"/>
Months	10(Optional)	Is this school in operation for at least 8 months of the year?		<input type="checkbox"/>

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'.		<input type="checkbox"/>
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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))
01/06/2013	02/05/2013	71,600.00
12/06/2012	01/05/2013	71,200.00
11/06/2012	12/05/2012	76,000.00
10/06/2012	11/05/2012	74,800.00
09/06/2012	10/05/2012	97,200.00
08/06/2012	09/05/2012	86,400.00
07/06/2012	08/05/2012	103,200.00
06/06/2012	07/05/2012	81,200.00
05/06/2012	06/05/2012	72,000.00
04/06/2012	05/05/2012	52,000.00
03/06/2012	04/05/2012	57,600.00
Electric Consumption (kWh (thousand Watt-hours))		843,200.00
Electric Consumption (kBtu (thousand Btu))		2,876,998.40
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		2,876,998.40
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		<input type="checkbox"/>
Fuel Type: Natural Gas		
Meter: gas (therms) Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
01/06/2013	02/05/2013	8,654.08
12/06/2012	01/05/2013	8,130.93
11/06/2012	12/05/2012	4,270.85
10/06/2012	11/05/2012	177.15
09/06/2012	10/05/2012	117.53
08/06/2012	09/05/2012	31.02
07/06/2012	08/05/2012	34.37
06/06/2012	07/05/2012	69.45
05/06/2012	06/05/2012	153.38
04/06/2012	05/05/2012	1,923.66
03/06/2012	04/05/2012	2,872.23

gas Consumption (therms)	26,434.65
gas Consumption (kBtu (thousand Btu))	2,643,465.00
Total Natural Gas Consumption (kBtu (thousand Btu))	2,643,465.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	<input type="checkbox"/>

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.	<input type="checkbox"/>

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.	<input type="checkbox"/>

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
14-Clifton BOE - PS 17
361 Lexington Avenue
Clifton, NJ 07011

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

14-Clifton BOE - PS 17	
Gross Floor Area Excluding Parking: (ft ²)	93,312
Year Built	2004
For 12-month Evaluation Period Ending Date:	February 28, 2013

Facility Space Use Summary

Elementary School 17	
Space Type	K-12 School
Gross Floor Area (ft ²)	93,312
Open Weekends?	No
Number of PCs	157
Number of walk-in refrigeration/freezer units	2
Presence of cooking facilities	Yes
Percent Cooled	100
Percent Heated	100
Months °	10
High School?	No
School District °	clifton

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 02/28/2013)	Baseline (Ending Date 02/28/2013)	Rating of 75	Target	National Median
Energy Performance Rating	51	51	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	71	71	56	N/A	72
Source (kBtu/ft ²)	151	151	120	N/A	153
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 ₂ e/year	629	629	498	N/A	636
kgCO ₂ e/ft ² /year	7	7	6	N/A	7

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.

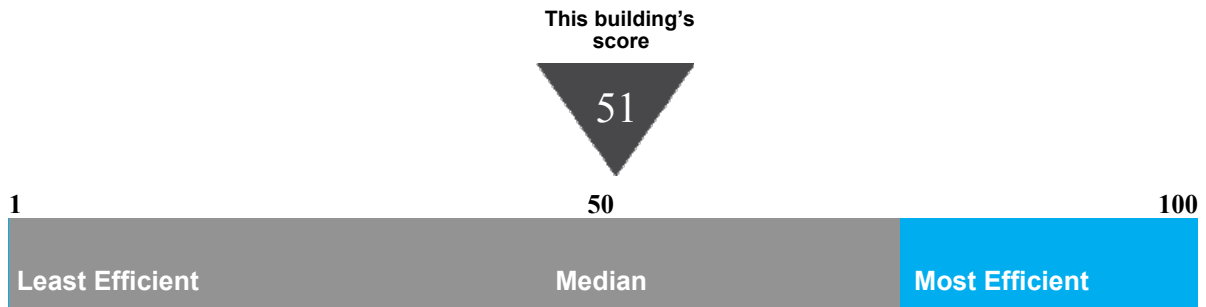
Statement of Energy Performance

2013

14-Clifton BOE - PS 17
361 Lexington Avenue
Clifton, NJ 07011

Portfolio Manager Building ID: 3477610

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 151 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



APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

School #17

Pumps

Tag	P-1,2		
Unit Type	End Suction Pump		
Qty	2		
Location	Mechanical Room		
Area Served	Hot Water Loop		
Manufacturer	Taco		
Model #	FI3009E2EAJ1LOA		
Serial #	-		
Horse Power	5 HP		
Flow	100 GPM @ 80' TDH		
Motor Info	Baldor Super E		
Electrical Power	230/460/3/60		
RPM	1750 RPM		
Motor Efficiency %	89.5%		
Approx Age	9		
ASHRAE Service Life	20		
Remaining Life	11		
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

School #17

AC Units

Tag	RTU-3	RTU-8	RTU-6,7
Unit Type	Packaged Unit	Packaged Unit	Packaged Unit
Qty	1	1	2
Location	Roof	Roof	Roof
Area Served	Cafetorium	1F 2F 3F West Section	1F 2F 3F East Section
Manufacturer	McQuay	McQuay	McQuay
Model #	RPS040CLW	RPS070CSW	RPS050CSW
Serial #	FBOU03080032 02	FBOU03080009 02	FBOU03070035 00
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	40 Tons	70 Tons	50 Tons
Cooling Efficiency (SEER/EER)	11 EER	11 EER	11 EER
Heating Type	Hot Water	Hot Water	Hot Water
Heating Input (MBH)	-	-	-
Efficiency	See Boilers	See Boilers	See Boilers
Fuel	See Boilers	See Boilers	See Boilers
Approx Age	9	9	9
ASHRAE Service Life	15	15	15
Remaining Life	6	6	6
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag	RTU-5	RTU-4	RTU-1A,2A
Unit Type	Packaged Unit	Packaged Unit	Packaged Unit
Qty	1	1	2
Location	Roof	Roof	Roof
Area Served	Guidance	Media Center	Gym
Manufacturer	Aaon	Aaon	Aaon
Model #	RM-016-3-0-AB02-EJH	49108-RK-16-3-EO-75	49107-RK30-3-EO-750
Serial #	200309-AMWM00021	200309-AKWM01792	200509-AKWS01796
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	16 Tons	16 Tons	30 Tons
Cooling Efficiency (SEER/EER)	12.2 EER	12.2 EER	12.2 EER
Heating Type	Hot Water	Hot Water	Hot Water
Heating Input (MBH)	-	-	-
Efficiency	See Boilers	See Boilers	See Boilers
Fuel	See Boilers	See Boilers	See Boilers
Approx Age	9	9	9
ASHRAE Service Life	15	15	15
Remaining Life	6	6	6
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag	4A	12	12B
Unit Type	Condensing Unit	Make-Up Air Unit	Freezer Condensing Unit
Qty	1	1	1
Location	Roof	Low Roof	Low Roof
Area Served	Server Room 3rd Floor	Kitchen	Kitchen
Manufacturer	EMI	Reznor	Rdi
Model #	SCC18DF000AA0A	RPB400-8-S	86343-11203R
Serial #	1-04-C-5058-10	EBCH66K1N08100M UA	4C2018B
Cooling Type	DX, R-22	N/A	DX, R-404A
Cooling Capacity (Tons)	1.5 Tons	N/A	-
Cooling Efficiency (SEER/EER)	13 SEER	N/A	-
Heating Type	N/A	Gas Fired Furnace	N/A
Heating Input (MBH)	N/A	400 MBH	N/A
Efficiency	N/A	80%	N/A
Fuel	N/A	Natural Gas	N/A
Approx Age	9	9	9
ASHRAE Service Life	15	15	15
Remaining Life	6	6	6
Comments			Evap: MN PR204LOP SN 4C20118B

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag	12A		
Unit Type	Refrigerator Condensing Unit		
Qty	1		
Location	Low Roof		
Area Served	Kitchen		
Manufacturer	Rdi		
Model #	86325-6463		
Serial #	4C2018A		
Cooling Type	DX, R-22		
Cooling Capacity (Tons)	-		
Cooling Efficiency (SEER/EER)	-		
Heating Type	N/A		
Heating Input (MBH)	N/A		
Efficiency	N/A		
Fuel	N/A		
Approx Age	9		
ASHRAE Service Life	15		
Remaining Life	6		
Comments	Evap: MN PR100 MOP SN 4C20118A		

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

School #17

Boilers

Tag	B-1,2,3,4	
Unit Type	Condensing Boilers	
Qty	4	
Location	Mechanical Room	
Area Served	Hot Water Loop	
Manufacturer	Aerco	
Model #	Benchmark 2.0	
Serial #	-	
Input Capacity (Btu/Hr)	2000 MBH	
Rated Output Capacity (Btu/Hr)	1706-1860 MBH	
Approx. Efficiency %	92.0%	
Fuel	Natural Gas	
Approx Age	9	
ASHRAE Service Life	25	
Remaining Life	16	
Comments		

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

School #17

Domestic Water Heaters

Tag			
Unit Type	Gas Fired Domestic Hot Water Heater		
Qty	2		
Location	Mechanical Room		
Area Served	Domestic Hot Water Loop		
Manufacturer	AO Smith Cyclone XHE		
Model #	BTH 120 970		
Serial #	MM030003451		
Size (Gallons)	60		
Input Capacity (MBH/KW)	125 MBH		
Recovery (Gal/Hr)	142.42 GPH		
Efficiency %	92%		
Fuel	Natural Gas		
Approx Age	9		
ASHRAE Service Life	12		
Remaining Life	3		
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

APPENDIX E

CEG Project #: 9C12066
 Facility Name: School #17
 Address: 361 Lexington Avenue
 City, State, Zip: Clifton, NJ 07011

Fixture Reference #	Location	Average Burn Hours	EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT								RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS				
			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, kWh	Energy Savings, kWh	Energy Savings, \$	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
221.31	Boiler Room	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	9	0.56	670	Existing To Remain	Existing To Remain	2	62	0	0.56	670	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
221.31	Room 162	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	3	0.19	223	Existing To Remain	Existing To Remain	2	62	0	0.19	223	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
221.31	164 Delivery	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	3	0.19	223	Existing To Remain	Existing To Remain	2	62	0	0.19	223	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
222.21	Corridor	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	9	0.56	1,674	Existing To Remain	Existing To Remain	2	62	0	0.56	1,674	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
5	161 Gym	2600	8 Lamp CFL Baix Pendants	8	256	40	10.24	26,624	Existing To Remain	Existing To Remain	8	256	0	10.24	26,624	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
222.21	166 Storage	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	3	0.19	223	Existing To Remain	Existing To Remain	2	62	0	0.19	223	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
222.21	168 Kitchen	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	5	0.31	806	Existing To Remain	Existing To Remain	2	62	0	0.31	806	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
242.21	168 Kitchen	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	109	7	0.76	1,984	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp F028841/XP/PL/SSECO3 Sylvania Ballast QHE2X32T/UNV ISL-SC	3	72	7	0.50	1,310	0.26	673	\$114	0	No New Controls	0	0.0%	0	\$0
221.22	172 Cafeteria	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	56	3.47	9,027	Existing To Remain	Existing To Remain	2	62	0	3.47	9,027	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.22	172 Cafeteria	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	5	0.43	1,118	Existing To Remain	Existing To Remain	3	86	0	0.43	1,118	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.21	171 Faculty Lounge	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	6	0.52	1,342	Existing To Remain	Existing To Remain	3	86	0	0.52	1,342	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	268	\$46
222.21	Corridor	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	23	1.43	4,278	Existing To Remain	Existing To Remain	2	62	0	1.43	4,278	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
221.22	Boys Restroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	24	1.49	3,869	Existing To Remain	Existing To Remain	2	62	0	1.49	3,869	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
1	153 Custodian	1200	CFL Flood Lamp 18w	1	18	12	0.22	259	Existing To Remain	Existing To Remain	1	18	0	0.22	259	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
222.21	Girls Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	0	No New Controls	0	0.0%	0	\$0
222.21	Womens Faculty Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	Mens Faculty Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	4	0.25	298	Existing To Remain	Existing To Remain	2	62	0	0.25	298	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.22	148 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	1	0.09	224	Existing To Remain	Existing To Remain	3	86	0	0.09	224	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	45	\$8
222.21	148 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	146 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106

Fixture Reference #	Location	Average Burn Hours	EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						
			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, kWh	Energy Savings, \$	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$	
222.21	146 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	143 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	143 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.21	184 IDF	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	1	0.09	224	Existing To Remain	Existing To Remain	3	86	0	0.09	224	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	45	\$8
232.22	141 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	141 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	185 Book Room	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	\$11
222.21	138 Elevator Machine Room	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	137 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	7	0.60	1,565	Existing To Remain	Existing To Remain	3	86	0	0.60	1,565	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	313	\$53
232.22	183 Office	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	89	\$15
242.22	181 Reception	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	4	109	2	0.22	567	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28841/XPXL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	2	0.14	374	0.07	192	\$33	0	No New Controls	0	0.0%	0	\$0
232.22	182 Guidance	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.22	178 Office	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	89	\$15
232.22	179 Office	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	89	\$15
221.22	Vestibule	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic 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
232.22	Main Office	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	6	0.52	1,342	Existing To Remain	Existing To Remain	3	86	0	0.52	1,342	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
227.21	Main Office	2600	2x2, 2 Lamp U-Tube, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	65	4	0.26	676	Re-Lamp / Re-Ballast Reflector	Sylvania Lamp FO17841/XP/ECO Sylvania Ballast QHE2X32T8/UNV ISL-SC	2	34	4	0.14	354	0.12	322	\$55	0	No New Controls	0	0.0%	0	\$0
1	Main Office	2600	CFL Flood Lamp 18w	1	18	2	0.04	94	Existing To Remain	Existing To Remain	1	18	0	0.04	94	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.22	104 Conf Room	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	4	Dual Tech. Occupancy Sensor w/2 Powerpacks - Remote Mnt.	0.5	20.0%	89	\$15
1	104 Conf Room	2600	CFL Flood Lamp 18w	1	18	10	0.18	468	Existing To Remain	Existing To Remain	1	18	0	0.18	468	0.00	0	\$0	4	Dual Tech. Occupancy Sensor w/2 Powerpacks - Remote Mnt.	0.5	20.0%	94	\$16
222.21	107 Work Room	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	\$11

Fixture Reference #	Location	Average Burn Hours	EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						
			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, \$
232.22	105 Principal	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	4	0.34	894	Existing To Remain	Existing To Remain	3	86	0	0.34	894	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	179	\$30
222.21	Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	108 Vice Principal	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	89	\$15
1	Closet 1	1200	CFL Flood Lamp 18w	1	18	1	0.02	22	Existing To Remain	Existing To Remain	1	18	0	0.02	22	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
1	Closet 2	1200	CFL Flood Lamp 18w	1	18	1	0.02	22	Existing To Remain	Existing To Remain	1	18	0	0.02	22	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
242.21	117 Nurse	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	109	3	0.33	850	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28841/XP/L/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	3	0.22	562	0.11	289	\$49	0	No New Controls	0	0.0%	0	\$0
232.21	117 Nurse	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.21	Nurse Restroom	1200	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	1	0.09	103	Existing To Remain	Existing To Remain	3	86	0	0.09	103	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.22	134 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	134 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	131 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	131 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	127 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	127 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	125 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	125 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	121 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	121 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	118 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	118 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	Middle Stairs	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	5	0.31	930	Existing To Remain	Existing To Remain	2	62	0	0.31	930	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0

Fixture Reference #	Location	Average Burn Hours	EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						
			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, \$
221.41	Middle Stairs	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic Lens	2	62	1	0.06	186	Existing To Remain	Existing To Remain	2	62	0	0.06	186	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
1	Middle Stairs	3000	CFL Flood Lamp 18w	1	18	2	0.04	108	Existing To Remain	Existing To Remain	1	18	0	0.04	108	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
222.21	Stairs	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	5	0.31	930	Existing To Remain	Existing To Remain	2	62	0	0.31	930	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
222.21	2F Hallway	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	22	1.36	4,092	Existing To Remain	Existing To Remain	2	62	0	1.36	4,092	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
1	2F Hallway	3000	CFL Flood Lamp 18w	1	18	32	0.58	1,728	Existing To Remain	Existing To Remain	1	18	0	0.58	1,728	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
221.22	2F Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic 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
222.21	Stairs	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	5	0.31	930	Existing To Remain	Existing To Remain	2	62	0	0.31	930	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
221.41	Stairs	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic Lens	2	62	1	0.06	186	Existing To Remain	Existing To Remain	2	62	0	0.06	186	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
1	Stairs	3000	CFL Flood Lamp 18w	1	18	2	0.04	108	Existing To Remain	Existing To Remain	1	18	0	0.04	108	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.22	201 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
222.21	201 Storage	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	Hall Storage	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	204 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
232.22	205 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	205 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	207 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	207 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	209 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	209 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	212 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	212 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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

Fixture Reference #	Location	Average Burn Hours	EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						
			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, kWh	Energy Savings, \$	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$	
232.22	216 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	216 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	218 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	218 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	222 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	222 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	225 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing To Remain	Existing To Remain	3	86	0	1.20	3,130	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	626	\$106
222.21	225 Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	229 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing To Remain	Existing To Remain	3	86	0	0.77	2,012	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	\$68
232.22	232 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
2	Hall Storage	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	\$10	0	No New Controls	0	0.0%	0	\$0
222.21	Server Room	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	1	0.06	161	Existing To Remain	Existing To Remain	2	62	0	0.06	161	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
222.21	Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	1	0.06	161	Existing To Remain	Existing To Remain	2	62	0	0.06	161	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.22	236 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
232.22	238 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
222.21	Prop Storage	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	241 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
2	Storage	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	\$10	0	No New Controls	0	0.0%	0	\$0
222.21	Boys Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	0	No New Controls	0	0.0%	0	\$0
222.21	Girls Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	0	No New Controls	0	0.0%	0	\$0

Fixture Reference #	Location	Average Burn Hours	EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						
			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, \$
222.21	Janitor Closet	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	247 Prep	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	9	0.56	1,451	Existing To Remain	Existing To Remain	2	62	0	0.56	1,451	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	\$49
232.22	248 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	19	1.63	4,248	Existing To Remain	Existing To Remain	3	86	0	1.63	4,248	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.21	248 Storage	1200	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	2	0.17	206	Existing To Remain	Existing To Remain	3	86	0	0.17	206	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.21	248 Kiln Room	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
222.21	250 Maintenance Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	7	0.43	1,128	Existing To Remain	Existing To Remain	2	62	0	0.43	1,128	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	226	\$38
222.21	3F Hallway	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	19	1.18	3,534	Existing To Remain	Existing To Remain	2	62	0	1.18	3,534	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
1	3F Hallway	3000	CFL Flood Lamp 18w	1	18	14	0.25	756	Existing To Remain	Existing To Remain	1	18	0	0.25	756	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
232.22	301 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
232.22	303 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
232.22	304 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	10	0.86	2,236	Existing To Remain	Existing To Remain	3	86	0	0.86	2,236	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	\$76
3	304 Classroom	2600	Hi-Hat 2 Lamp Biax CFL 18w	2	36	7	0.25	655	Existing To Remain	Existing To Remain	2	36	0	0.25	655	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	131	\$22
4	304 Classroom	2600	Flood Lamp Incandescent 60w	1	60	10	0.60	1,560	Re-Lamp	13w CFL Screw Base	1	13	10	0.13	338	0.47	1,222	\$208	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	68	\$11
222.21	304 Storage	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	308 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	10	0.86	2,236	Existing To Remain	Existing To Remain	3	86	0	0.86	2,236	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	\$76
3	308 Classroom	2600	Hi-Hat 2 Lamp Biax CFL 18w	2	36	6	0.22	562	Existing To Remain	Existing To Remain	2	36	0	0.22	562	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	112	\$19
4	308 Classroom	2600	Flood Lamp Incandescent 60w	1	60	10	0.60	1,560	Re-Lamp	13w CFL Screw Base	1	13	10	0.13	338	0.47	1,222	\$208	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	68	\$11
222.21	308 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	1	0.06	161	Existing To Remain	Existing To Remain	2	62	0	0.06	161	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	32	\$5
232.22	308 Office	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	89	\$15
232.22	308 Office	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	447	Existing To Remain	Existing To Remain	3	86	0	0.17	447	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	89	\$15
232.22	312 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91

Fixture Reference #	Location	Average Burn Hours	EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						
			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, \$
232.22	314 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
2	Hall Storage	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	\$10	0	No New Controls	0	0.0%	0	\$0
222.21	Hall Storage	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
232.22	318 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
232.22	321 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
222.21	Storage	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
2	Storage	1200	60w Incandescent	1	60	1	0.06	72	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	16	0.05	56	\$10	0	No New Controls	0	0.0%	0	\$0
232.22	323 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing To Remain	Existing To Remain	3	86	0	1.03	2,683	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$91
222.21	Boys Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	0	No New Controls	0	0.0%	0	\$0
222.21	Girls Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	0	No New Controls	0	0.0%	0	\$0
222.21	Janitor Closet	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
222.21	329 Prep	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	10	0.62	1,612	Existing To Remain	Existing To Remain	2	62	0	0.62	1,612	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	322	\$55
232.22	331 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing To Remain	Existing To Remain	3	86	0	0.77	2,012	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	\$68
232.22	332 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing To Remain	Existing To Remain	3	86	0	0.77	2,012	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	\$68
232.22	333 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	6	0.52	1,342	Existing To Remain	Existing To Remain	3	86	0	0.52	1,342	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	268	\$46
221.33	335 Computer	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Direct/Indirect	2	62	10	0.62	1,612	Existing To Remain	Existing To Remain	2	62	0	0.62	1,612	0.00	0	\$0	4	Dual Tech. Occupancy Sensor w/2 Powerpacks - Remote Mnt.	1	20.0%	322	\$55
221.33	336 Media Center	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Direct/Indirect	2	62	71	4.40	11,445	Existing To Remain	Existing To Remain	2	62	0	4.40	11,445	0.00	0	\$0	4	Dual Tech. Occupancy Sensor w/2 Powerpacks - Remote Mnt.	1	20.0%	2,289	\$389
222.22	338 Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	6	0.37	967	Existing To Remain	Existing To Remain	2	62	0	0.37	967	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	193	\$33
222.22	339 Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	4	0.25	645	Existing To Remain	Existing To Remain	2	62	0	0.25	645	0.00	0	\$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	129	\$22

Fixture Reference #	Location	Average Burn Hours	EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						
			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, \$
222.21	Servers	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mt., 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
222.21	storage	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mt., 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
TOTAL						1.076	84	214.481					40	82	210.335	1.70	4,146	\$705			62	13	25,871	\$4,398

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 #17	7650	SHARP NU-U235F2	312	17.5	5,473	73.32	84,725	59.4	13,073	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 #17 Location: Clifton, NJ Description: Photovoltaic System 100% Financing - 15 year										
Simple Payback Analysis										
		Photovoltaic System 100% Financing - 15 year								
Total Construction Cost		\$453,379								
Annual kWh Production		84,725								
Annual Energy Cost Reduction		\$14,403								
Average Annual SREC Revenue		\$16,190								
Simple Payback:		14.82								Years
Life Cycle Cost Analysis										
Analysis Period (years):		15				Financing %:		100%		
Discount Rate:		3%				Maintenance Escalation Rate:		3.0%		
Average Energy Cost (\$/kWh)		\$0.170				Energy Cost Escalation Rate:		3.0%		
Financing Rate:		6.00%				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	84,725	\$14,403	\$0	\$21,181	\$26,680	\$19,231	(\$10,326)	(\$10,326)	
2	\$0	84,301	\$14,835	\$0	\$21,075	\$25,493	\$20,417	(\$10,000)	(\$20,326)	
3	\$0	83,880	\$15,280	\$0	\$20,970	\$24,234	\$21,676	(\$9,660)	(\$29,986)	
4	\$0	83,460	\$15,739	\$0	\$20,865	\$22,897	\$23,013	(\$9,306)	(\$39,292)	
5	\$0	83,043	\$16,211	\$855	\$20,761	\$21,478	\$24,433	(\$9,794)	(\$49,086)	
6	\$0	82,628	\$16,697	\$851	\$16,526	\$19,971	\$25,939	(\$13,539)	(\$62,625)	
7	\$0	82,215	\$17,198	\$847	\$16,443	\$18,371	\$27,539	(\$13,116)	(\$75,741)	
8	\$0	81,804	\$17,714	\$843	\$16,361	\$16,672	\$29,238	(\$12,678)	(\$88,419)	
9	\$0	81,395	\$18,246	\$838	\$16,279	\$14,869	\$31,041	(\$12,224)	(\$100,643)	
10	\$0	80,988	\$18,793	\$834	\$12,148	\$12,955	\$32,956	(\$15,803)	(\$116,447)	
11	\$0	80,583	\$19,357	\$830	\$12,087	\$10,922	\$34,988	(\$15,296)	(\$131,743)	
12	\$0	80,180	\$19,937	\$826	\$12,027	\$8,764	\$37,147	(\$14,772)	(\$146,515)	
13	\$0	79,779	\$20,536	\$822	\$11,967	\$6,473	\$39,438	(\$14,230)	(\$160,744)	
14	\$0	79,380	\$21,152	\$818	\$7,938	\$4,040	\$41,870	(\$17,638)	(\$178,383)	
15	\$0	78,983	\$21,786	\$814	\$7,898	\$1,458	\$44,453	(\$17,039)	(\$195,422)	
Totals:		1,227,344	\$267,885	\$9,177	\$234,526	\$235,277	\$453,379	(\$195,422)	(\$1,405,696)	
Net Present Value (NPV)							(\$143,115)			