BRICK TOWNSHIP BOARD OF EDUCATION
HERBERTSVILLE ELEMENTARY SCHOOL

2282 LANES MILL ROAD
BRICK, NJ 08724

FACILITY ENERGY REPORT

TABLE OF CONTENTS

I. HISTORIC ENERGY CONSUMPTION/COST

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

Electric Utility Provider:	Jersey Central Power & Light
Electric Utility Rate Structure:	GS Secondary 3 Phase
Third Party Supplier:	South Jersey Energy

Natural Gas Utility Provider:	NJ Natural Gas
Utility Rate Structure:	GSL-BGS
Third Party Supplier:	None

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:	Jersey Central Power & Light
Rate:	GS Secondary 3 Phase
Meter No:	100013962954, 100013963010, 100013963119, 100013963234, 100013963275, 100013968845
Account #	20 00 00 0106 4 1
Third Party Utility Provider:	South Jersey Energy
TPS Meter / Acct No:	-

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-10	21,231	64.2	$3,388
Feb-10	16,710	70.7	$3,804
Mar-10	19,128	70.8	$2,496
Apr-10	18,540	77.8	$2,516
May-10	19,943	92.3	$2,896
Jun-10	22,333	92.8	$3,193
Jul-10	11,428	71.9	$1,810
Aug-10	25,622	92.7	$6,902
Sep-10	17,622	84.7	$3,029
Oct-10	16,084	72.7	$2,731
Nov-10	19,413	64.7	$3,149
Dec-10	16,216	58.8	$2,667
Totals	**224,270**	**92.8 Max**	**$38,581**

AVERAGE DEMAND	**76.2**	**KW average**
AVERAGE RATE	**$0.172**	**$/kWh**

Figure 1
Electricity Usage Profile

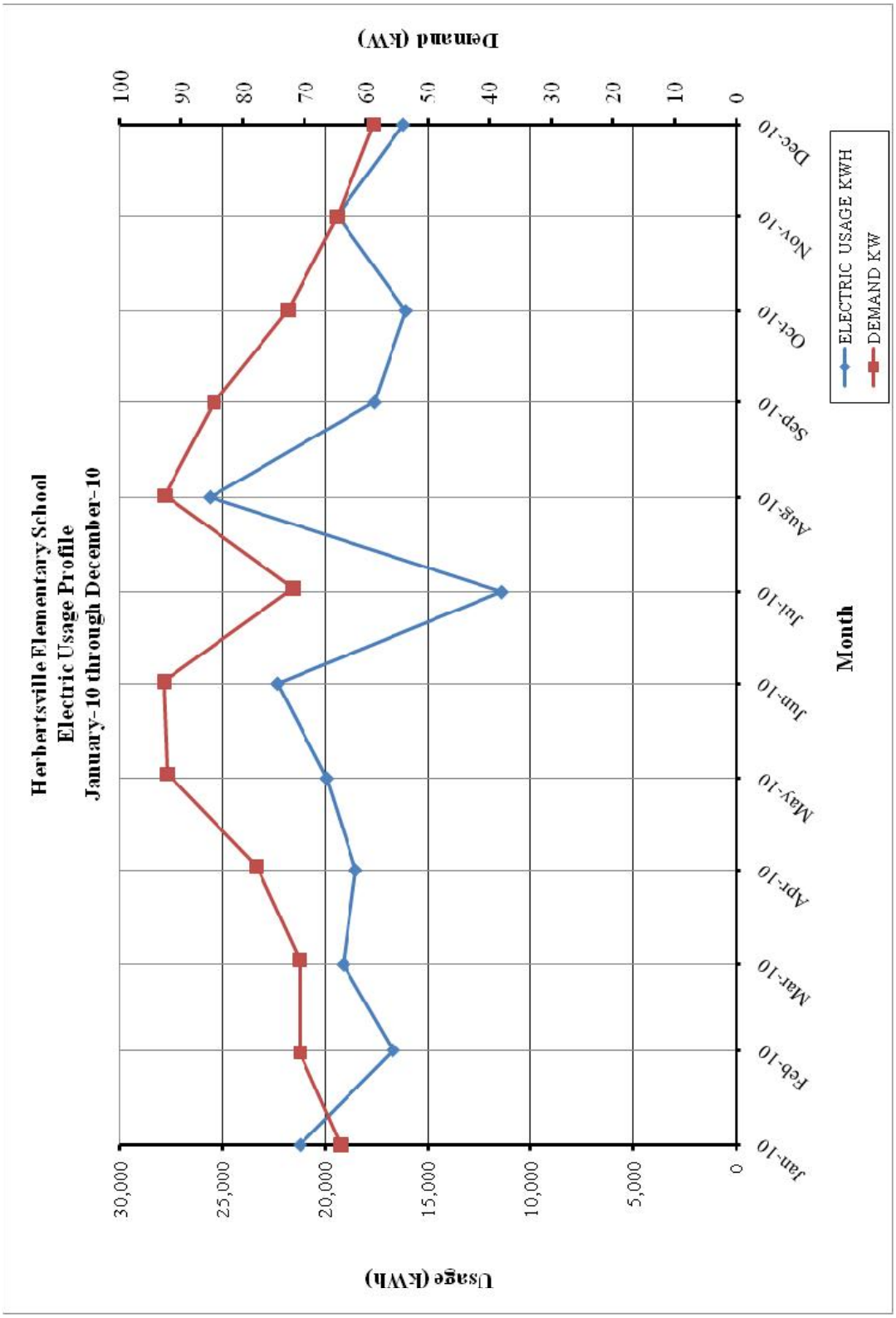


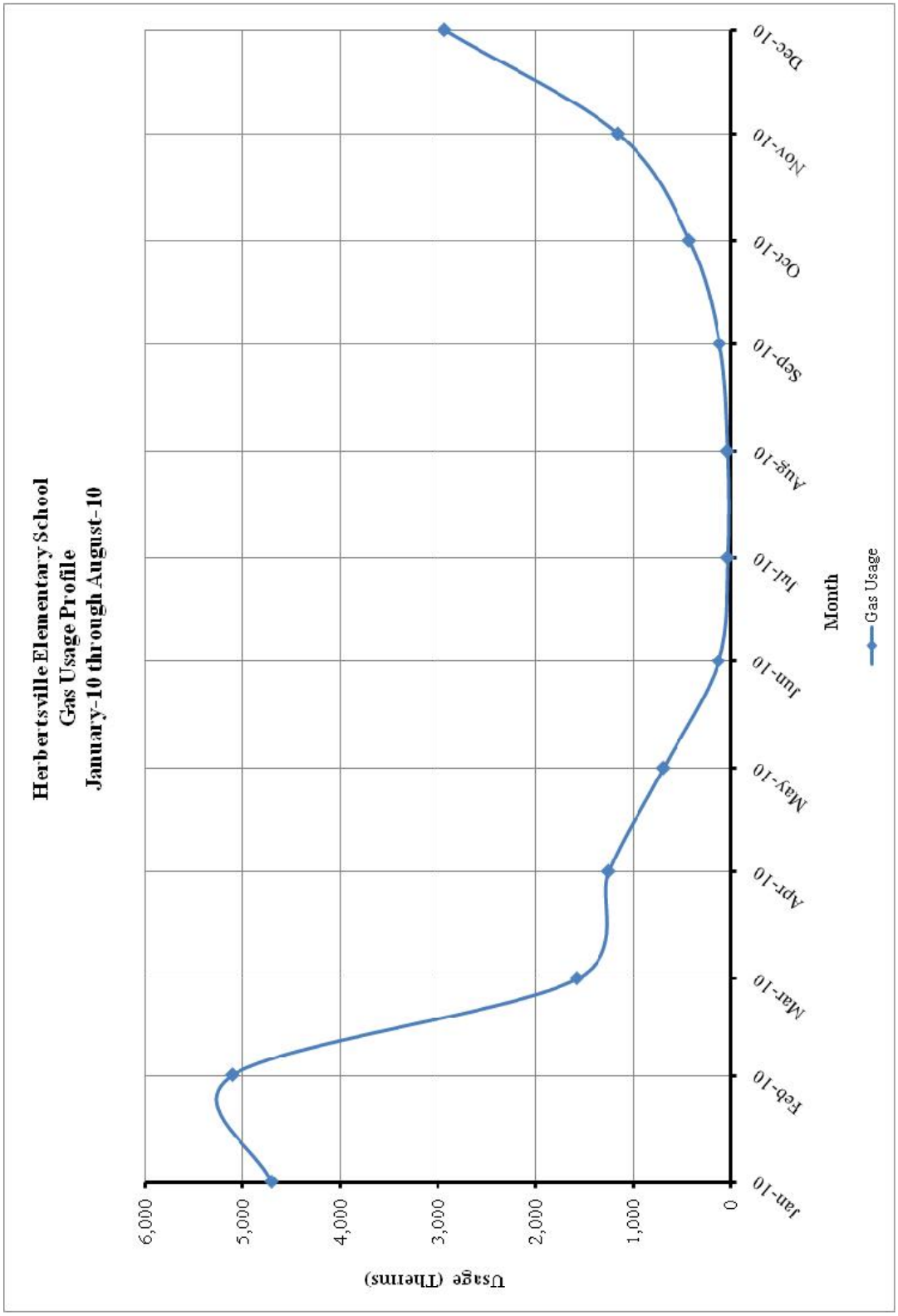
Table 2
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY	
Utility Provider:	NJ Natural Gas
Rate:	GSL-BGS
Meter No:	00641880
Point of Delivery ID:	13-3602-7955-29
Third Party Utility Provider:	N/A
TPS Meter No:	N/A

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Jan-10	4,708.75	$5,690.49
Feb-10	5,109.47	$6,158.71
Mar-10	1,575.73	$2,002.96
Apr-10	1,251.85	$1,517.62
May-10	692.68	$981.19
Jun-10	126.68	$417.94
Jul-10	30.14	$322.54
Aug-10	32.27	$325.31
Sep-10	116.75	$405.44
Oct-10	425.30	$710.06
Nov-10	1,156.62	$1,406.84
Dec-10	2,932.70	$3,548.67
TOTALS	**18,158.94**	**$23,487.77**

AVERAGE RATE: **$1.29** **$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The Brick Township BOE Herbertsville Elementary School is located on at 2282 Lanes Mill Road in Brick Township, New Jersey. The 27,857 SF facility was built in 1949 and has received two additions in 1998 and in 2002. In 1998, classrooms and a multi-purpose room were added. In 2002, additional classrooms and the school's media center were constructed. The building is a single story facility utilized to educate students in grades one through five. The Herbertsville Elementary School spaces comprise of classrooms, enclosed offices, a media center, multi-purpose room, faculty room and kitchen.

Occupancy Profile

The typical hours of operation for the Herbertsville Elementary School are Monday through Friday between 8:00 am and 3:00 pm. The BOE has provided information documenting approximately 37 employees at this facility.

Building Envelope

Exterior walls for the Herbertsville Elementary School are concrete block construction with a painted tan stucco finish. The amount of insulation within the walls is unknown. The windows throughout the facility are in good condition and appear to be maintained. Typical windows throughout the Herbertsville Elementary School are double pane, operable, ¼" clear glass with aluminum frames. Blinds are utilized through the office area of the facility for occupant comfort. The facility has a flat, built-up roof with white stone cover and appears to be in good condition.

HVAC Systems

The Herbertsville Elementary School HVAC systems vary with the construction of the facility. The original building is heated by a main heating plant consisting of one HB Smith Mills 340 gas-fired boiler that is original to the facility and is passed its service life according to ASHRAE. The boiler, based on its original specifications, had an input capacity of 1,458 MBH. Based on the boiler's age, it is assumed the average thermal efficiency is approximately 70%. It appears the burner has been replaced in the recent past. Heating hot water is distributed to the unit ventilators, convectors and fin tube radiation located throughout the classrooms, offices and toilet rooms in the original building via two inline pumps and one end suction pump located in original building's boiler room. Throughout the original building there are window air-conditioning units that provide cooling to the classrooms and offices. The average classroom wind air-conditioning unit has a cooling capacity of 2.5 tons and an energy efficiency of 9.5 EER. It is pertinent to note that the original unit ventilators are well beyond their expected service life per ASHRAE and should be replaced as capital money is available to do so. The replacement of the unit ventilators alone will not provide significant energy savings.

The 1998 addition is heated by a heating plant located in the 1998 addition boiler room adjacent to the multi-purpose room. The heating plant consists of a bank of gas-fired modular boilers that have a total input capacity of 1,200 MBH and output of 960 MBH. This boiler system has a combustion efficiency of 80% and has approximately 12 years remaining service life per

ASHRAE. The boiler system is controlled via a boiler control panel located in the boiler room. There is a single inline pump located in the boiler room that distributes heating hot water to the unit ventilators, cabinet heaters, convectors and other HVAC equipment in the 1998 addition. The 1998 addition classrooms are cooled via window air-conditioning units. The average classroom wind air-conditioning unit has a cooling capacity of 2.5 tons and an energy efficiency of 9.5 EER.

The kitchen is conditioned by a 3 ton packaged rooftop unit manufactured by Trane. The unit appeared to be in good condition however it is in need of some basic maintenance. Based on ASHRAE service life the rooftop unit has one year remaining.

The multi-purpose room is conditioned by two 15 ton packaged rooftop units manufactured by Trane with a cooling efficiency of 9.6 EER. Each unit has an outdoor air pre-conditioning, energy recovery section added to the end of the unit. The energy recovery sections are manufactured by Semco and contain energy recover wheel, supply fan and exhaust fan. This packaged unit is approximately 13 years of age and has an estimated two years service life remaining. Based on inspection it appears that with some basic maintenance the unit can continue to operate for years to come.

The 2002 addition is heated by an outdoor boiler located at roof level. The gas fired outdoor boiler is manufactured by Raypak and has a total input capacity of 181 MBH and output of 144.8 MBH. The outdoor boiler has a combustion efficiency of 82% and has approximately 16 years remaining service life per ASHRAE. There are two inline pumps located above the 2002 addition corridor ceiling that distributes heating hot water to the unit ventilators in the classrooms and a corridor fan coil unit of the 2002 addition. The 2002 addition classrooms are not air-conditioned.

The library that was added in the 2002 addition is heated and cooled via a gas-fired heating, direct expansion cooling packaged rooftop unit manufactured by Aaon. The unit has a five ton cooling capacity (11.7 SEER) and a 72.9 MBH heating capacity. The unit is approximately nine years of age and has an estimated six years remaining service life. With continued basic maintenance the unit will remain in good operation.

The conference and office area that was altered in the original building with the construction of the 2002 addition is heated and cooled via a gas-fired heating, direct expansion cooling packaged rooftop unit manufactured by Aaon. The unit has a three ton cooling capacity (11.3 EER) and a 55.9 MBH heating capacity. The unit is approximately nine years of age and has an estimated six years remaining service life. The same maintenance recommendations are in order for this unit as noted for the library unit.

Exhaust System

Exhaust for the facility is handled by roof-mounted, exhaust fans. These fans operate based on the occupied / unoccupied schedule of the facility. Upon visual inspection some exhaust fans appeared to be in decent condition but are due for replacement. Due to the small horsepower motors in these fans the energy savings will be minimal and the fan's replacement should be handled via the Owner's maintenance budget.

HVAC System Controls

The HVAC systems within the Herbertsville Elementary School are controlled via pneumatic and DDC control systems. It appears that the original boiler controls, new boiler controls, HW pumps and new rooftop units are controlled via the DDC system. However, the original unit ventilators appear to be still operating via the pneumatic control system. The Owner should look at removing all pneumatic controls and replace them with DDC controls to provide better operational efficiency. This effort can be implemented if a unit ventilator replacement initiative is implemented by the Owner.

Domestic Hot Water

Domestic hot water for the facility is fed from three separate systems located throughout the facility. The following is a brief description of each system:

- *Original Construction – 1949*: Domestic hot water for the original construction portion of the facility is provided by one 75 gallon AO Smith natural gas-fired hot water heater, capacity of 75 MBH input. The domestic hot water heater is located in the original mechanical room and is approximately 17 years of age and is past its useful service life. However, based on visual inspection the hot water heater appears to be in fair condition.
- *1998 Addition – Kitchen*: Domestic hot water for the kitchen location in the 1998 addition of the facility is provided by one 86 gallon AO Smith natural gas-fired hot water heater, capacity of 140 MBH input. The domestic hot water heater is located in an adjacent storage room to the kitchen and is approximately 14 years of age. Based on visual inspection the hot water heater appears to be in fair condition.
- *1998 Addition – Restrooms*: Domestic hot water for the restrooms located in the 1998 addition of the facility is provided by one 30 gallon Bradford White electric hot water heater, capacity of 4.5 kW input. The domestic hot water heater is located in the 1998 addition mechanical room adjacent to the multi-purpose room and is approximately 14 years of age.

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.

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	$3,560	$814	4.4	243.0%
ECM #2	Lighting Controls	$2,850	$696	4.1	266.3%
ECM #3	Condensing Boiler Installation	$148,802	$3,420	43.5	-31.0%
ECM #4	Rooftop Unit Replacement	$22,251	$630	35.3	-57.5%
ECM #5	DDC Controls Upgrade	$97,499	$5,227	18.7	-19.6%
ECM #6	NEMA Premium Efficiency Motors	$1,396	$169	8.3	81.6%
ECM #7	Domestic HWH Replacement	$21,654	$1,588	13.6	10.0%
ECM #8	Geothermal HP System	$862,284	-$6,265	N/A	-110.9%
ECM #9	Water Conservation	$23,607	$1,176	20.1	-25.3%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solary Array	$318,757	$35,273	9.0	66.0%
Notes:	A. Cost takes into consideration applicable NJ Smart StartTM incentives.				
	B. Savings takes into consideration applicable maintenance savings.				

Table 2
ECM Energy Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Lighting Upgrade	2.4	4,734	-
ECM #2	Lighting Controls	2.3	4,046	-
ECM #3	Condensing Boiler Installation	-	-	2,754
ECM #4	Rooftop Unit Replacement	2.8	3,662	-
ECM #5	DDC Controls Upgrade	-	16,773	1,816
ECM #6	NEMA Premium Efficiency Motors	0.2	985	-
ECM #7	Domestic HWH Replacement	-	12,640	-309
ECM #8	Geothermal HP System	-	-167,031	17,414
ECM #9	Water Conservation	-	-	237
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	Solary Array	41.3	62,034	-

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	$814	$5,000	$1,440	$3,560	4.4
Lighting Controls	$696	$3,375	$525	$2,850	4.1
Condensing Boiler Installation	***$3,420***	***$154,750***	***$5,948***	***$148,802***	***43.5***
Rooftop Unit Replacement	***$630***	***$23,447***	***$1,196***	***$22,251***	***35.3***
DDC Controls Upgrade	***$5,227***	***$97,499***	***$0***	***$97,499***	***18.7***
NEMA Premium Efficiency Motors	$169	$1,496	$100	$1,396	8.3
Domestic HWH Replacement	$1,588	$22,106	$452	$21,654	13.6
Geothermal HP System	***($6,265)***	***$982,284***	***$120,000***	***$862,284***	***N/A***
Water Conservation	***$1,176***	***$23,607***	***$0***	***$23,607***	***20.1***
Design / Construction Extras (15%)	$0	$4,797	$0	$4,797	-
Total Project	**$3,267**	**$31,977**	**$2,517**	**$29,460**	**9.0**

* Highlighted ECMs are not included within the project totals

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 – Interior spaces

Description:

The majority of the interior lighting throughout Herbertsville Elementary School is provided with a combination of fluorescent fixtures with 34W T12 lamps and magnetic ballasts and 32W T8 lamps with electronic ballasts. CEG recommends, re-lamping all of the T12 fixtures with 28W T8 lamps and replacing the magnetic ballasts with new, more efficient electronic ballasts

The ECM includes retrofit of all older fluorescent fixtures with T8 or T5 fluorescent fixtures with electronic ballasts in the building. The new, energy efficient T8 fixtures will provide adequate lighting and will save on electrical costs due to better performance of the lamp and ballasts. This ECM also includes maintenance savings through the reduced number of lamps replaced per year. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which is approximately 20,000 burn-hours. The facility will need approximately 33% less lamps replaced per year for each one for one fixture replaced.

In addition this ECM includes retrofit of the existing metal halide fixtures within the large spaces such as the gymnasium. The facility utilizes large metal halide fixtures which provide a reasonably efficient option for bay lighting however a few draw-backs that are common. Metal halide fixtures often have poor overall efficacy which limits the amount of light actually leaving the fixture. Also metal halide lamps require a significant warm-up period and even longer cool down period eliminating the potential for occupancy sensors frequent switching. This symptom encourages the gymnasium lighting to be left on continuously during the day. Another drawback is the reduced lumen output (Lumen Maintenance) of the metal halide bulb over its life time. Average bulb output or "mean lumens," is approximately 25% less than the bulb's initial lumens for typical metal halide lamps. In addition the most rapid rate of light output decline is during the beginning of its life, approximately 15-20% light loss within the first 20% of its rated life. It is important to note that the light loss has no savings in energy used; therefore the overall light efficiency is continuously decreasing with age. The final drawback is the light quality or Color Rendering Index (CRI). Typical values for metal halide bulbs is 65, which is a measure of how close the light is to true "full spectrum" light produced by sunlight or incandescent lighting. Metal halide bulbs also show noticeable color shifting when the bulb is reaching the end of its life.

This ECM includes replacement of each of the high bay metal halide light fixtures with T5HO fixtures with reflective lenses. The retrofit for the metal halide fixtures includes a one for one fixture replacement. The fluorescent fixtures selected will provide equivalent light compared to the average light output of the existing metal halide fixtures. The bulb replacement cost for T-5 HO lamps compared to the existing metal halide lamps were found to be approximately equal and therefore not included in the savings calculations.

The 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.

The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. 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. The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. 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. In some locations the bulb replacement will need to be tested to make sure the larger base of the CFL will fit into the existing fixture. 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.

Rebates and Incentives:

$$\text{Smart Start Incentive} = \#\ \text{T12 to T8 Fixtures Retrofitted} \times \$10\ \text{Incentive per Fixture}$$

$$\text{Smart Start Incentive} = \#\ 175\text{W} - 249\text{W MH Fixtures Replaced} \times \$43\ \text{Incentive per Fixture}$$

$$= \#\ 400\text{W} - 999\text{W MH Fixtures Replaced} \times \$100\ \text{Incentive per Fixture}$$

Replacement and Maintenance Savings:

The maintenance savings available for this ECM is based on the a reduced number of fluorescent lamps replaced each year due to the extended life of T-8 Lamps over T-12 Lamps. The savings is calculated as Follows:

$$\text{Maintenance Savings} = \frac{\#\ \text{T12 Lamps Replaced}}{\text{Year}} - \frac{\#\ \text{T8 Lamps Replaced}}{\text{Year}} \times \text{Lamp Installed Cost}$$

Lamp installation cost is estimated to be $7 per lamp ($3 Material cost)

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,000
NJ Smart Start Equipment Incentive ($):	$1,440
Net Installation Cost ($):	$3,560
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$814
Total Yearly Savings ($/Yr):	$814
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.4
Simple Lifetime ROI	243.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$12,210
Internal Rate of Return (IRR)	22%
Net Present Value (NPV)	$6,157.48

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the school building 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 and daylight 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 libraries. 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:

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

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

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

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,375
NJ Smart Start Equipment Incentive ($):	$525
Net Installation Cost ($):	$2,850
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$696
Total Yearly Savings ($/Yr):	$696
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.1
Simple Lifetime ROI	266.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$10,440
Internal Rate of Return (IRR)	23%
Net Present Value (NPV)	$5,458.80

ECM #3: Condensing Boiler Installation

Description:

Space heating for the perimeter offices and classrooms in the majority of the school is provided with unit ventilators and cabinet heaters with hot water coils and hot water radiators. The sources of hot water for this equipment is one gas fired hot water boilers located in the original boiler room, one gas fired sectional boiler in the 1998 addition boiler room and a roof mounted atmospheric boiler in over the 2002 addition.

The first boiler is a 1,458 MBH H.B. Smith 340 Mills model, standard efficiency, sectional cast iron hot water boilers. This boiler is in poor condition and approximately 64 years old, which is beyond their useful life of 30 years per ASHRAE. The second boiler is a 1,200 MBH Hydrotherm model standard efficiency, modular boiler. This boiler is in fair condition and is only 13 years old, which is still within its useful service life, per ASHRAE. The third boiler is a Raypak, roof mounted atmospheric boiler rated for 181 MBH. This boiler is approximately 9 years old and is in good condition.

Typically, standard (non-condensing) boilers provide lower than nominal efficiency compared to condensing boilers. Standard boilers suffer further efficiency losses at part load operating conditions mainly due to limitations in the reduction of the flue gas temperature. Current average combustion efficiency of the boilers is estimated to be 75% due to standard non-condensing boiler technology, limited turn down ratio, cycling losses and outdated design and controls. New condensing boilers could substantially improve the operating efficiency of the heating system of the building. Condensing boiler's peak efficiency tops out at 99% depending on return water temperature.

CEG recommends replacing the two boilers with condensing hot water boilers to provide building with heating throughout the year. The annual average operating efficiency of the proposed boiler set is expected to be 90%, which gives the heating system a 15% increase in efficiency. This ECM is based on variable supply water temperature adjusted based on outdoor temperature.

The following is a summary of the boiler replacement recommendations.

BOILER REPLACEMENT SUMMARY		
EXISTING UNIT	**LOCATION**	**PROPOSED UNITS**
(1) 1.458 MMBH Cast Iron Boilers	Main Boiler Room	(1) 1.5 MMBH
(1) 1.20 MMBH Sectional Boiler	1998 Boiler Room	(1) 1.5 MMBH
(1) 181 MBH Boiler	2002 Addition Roof	(1) 399 MBH

The basis for this ECM is Aerco Benchmark 1.5 and the Aerco Esteem 399 condensing hot water boilers or equivalent. New boilers shall be setup and programmed to be the primary source of heating for the building during entire year. The owner is recommended to retain a professional engineer to confirm equipment sizing and finalize design.

Energy Savings Calculations:

Currently there are multiple boilers and gas fired rooftop units on the building gas meter. The boilers' gas usage is not separately metered. Therefore, annual energy consumption of the boilers has to be estimated. In this calculation, it is assumed that the energy consumption of the boilers will be in proportion with the ratio of the total heating capacity of each equipment.

First, domestic hot water usage is estimated and subtracted from the total usage in order to estimate the net natural gas usage for space heating.

Current total hot water usage can be found in the table below:

ANNUAL GAS USAGE				
MONTH	TOTAL USAGE THERMS	DOMESTIC HW USAGE	HEATING ONLY	COST
Jan-10	4,709	76	4,632	$5,598
Feb-10	5,109	76	5,033	$6,067
Mar-10	1,576	76	1,499	$1,906
Apr-10	1,252	76	1,175	$1,425
May-10	693	76	616	$873
Jun-10	127	76	50	$166
Jul-10	30	76	0	$0
Aug-10	32	76	0	$0
Sep-10	117	76	40	$140
Oct-10	425	76	349	$582
Nov-10	1,157	76	1,080	$1,314
Dec-10	2,933	76	2,856	$3,456
TOTAL	**18,159**	**918**	**17,332**	**$21,526**

Baseline Domestic Hot Water Gas Use = 76 Therms (Average from June-September Gas Use)

Existing Natural Gas Use for Heating = 18,159 Therms – (76 Therms x 12 Months)
= 17,332 Therms

Below calculation is performed to estimate annual gas usage of the cast iron boilers:

Total facility heating capacity (Heating equipment output capacity):

(1) H.B. Smith cast iron boiler	= 1,021 MBH
(1) Hydrother modular boiler	= 960 MBH
(1) Raypak atmospheric boiler	= 148 MBH
(2) Gas Fired RTUs	= 104 MBH
Total Output Capacity	**= 2,233 MMBH**

Total facility heating capacity:	2.233 MBH
Total Capacity – Cast Iron Boilers only:	2,129 MBH
Percent usage by boilers:	95.3% of Total
Estimated natural gas usage	95.3% of 17,332 Therms
Estimated natural gas usage	16,522 Therms

$$\text{Bldg Heat Required} = \text{Heating Nat. Gas (Therm)} \times \text{Heating Eff (\%)} \times \text{Fuel Heat Value } (\frac{\text{BTU}}{\text{Therm}})$$

$$\text{Proposed Heating Gas Usage} = \frac{\text{Bldg. Heat Required (BTU)}}{\text{New Heating Eff (\%)} \times \text{Fuel Heat Value } (\frac{\text{BTU}}{\text{Therm}})}$$

$$\text{Energy Cost } = \text{Heating Gas Usage (Therms)} \times \text{Ave Fuel Cost } (\frac{\$}{\text{Therm}})$$

Energy savings calculations are summarized in the table below:

CONDENSING BOILER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Hot Water Boilers	New Condensing Boilers	-
Existing Nat Gas (Therms)	16,522	-	-
Boiler Efficiency (%)	75%	90%	15%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	-
Equivalent Building Heat Usage (MMBTUs)	1,239	1,239	-
Ave. Gas Cost ($/Therm) (Heating season only)	1.29	1.29	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	16,522	13,769	2,754
Energy Cost ($)	$20,521	$17,101	$3,420
COMMENTS:			

Project Cost, Incentives and Maintenance Savings

Estimated cost for removing the existing boilers and installing two (2) 1.5 MMBH condensing hot water boilers and one (1) 399 MBH condensing hot water boiler with advanced controls is $154,750.

From the **New Jersey Smart Start® Program Incentives Appendix**, installation of a high efficiency hot water boiler falls under the category "Gas Heating" and warrants an incentive based on efficiency at or above 84% for this type of equipment. The program incentives are calculated as follows:

GAS FIRED BOILER REBATE SUMMARY					
UNIT DESCRIPTION	UNIT EFFICIENCY	REBATE $/MBH	PROPOSED CAPACITY, MBH	NUMBER OF UNITS	TOTAL REBATE, $
≥ 300 MBH - 1500 MBH	84% AFUE for Hot Water boilers	$1.75	399	1	$698
≥ 300 MBH - 1500 MBH	84% AFUE for Hot Water boilers	$1.75	1,500	2	$5,250
TOTAL					**$5,948**

Maintenance savings associated with this ECM is estimated to be minimal.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$154,750
NJ Smart Start Equipment Incentive ($):	$5,948
Net Installation Cost ($):	$148,802
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$3,420
Total Yearly Savings ($/Yr):	$3,420
Estimated ECM Lifetime (Yr):	30
Simple Payback	43.5
Simple Lifetime ROI	-31.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$102,600
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	($81,768.49)

ECM #4: RTU Unit Upgrades

Description:

Herbertsville Elementary School uses Rooftop Units for air condition and heating. The majority of the units at the school are in fair condition and within their useful life of 15 years, which is defined by ASHRAE. The units will reach the end of their useful life in the near future, and can be replaced with newer, more reliable, and efficient units. The units currently installed are inefficient compared to modern equipment and can be replaced with new high efficiency units. New air conditioners provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants.

This ECM includes one-for-one replacement of the older air conditioning units with new higher efficiency systems. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacements for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	**SERVICE FOR**	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
RTU	Library	1	60,000	5.0	Carrier WeatherMaster 48HC-A06
RTU	Conf./Office	1	36,000	3.0	Carrier Infinity 48XL-A 36060
RTU	Kitchen	1	36,000	3.0	Carrier Infinity 48XL-A 36060
RTU	MPR	1	24,000	2.0	Carrier Infinity 48XL-A 24040
Total		**4**	**156,000**	**13.0**	

The manufacturers used as the basis for design are Carrier and Trane. All units are one for one style replacements with matching capacity of the new units to the old units.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

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

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

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity}\left(\frac{\$}{\text{kWh}}\right)$$

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS (S)EER**	**SPLIT UNITS (S)EER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
RTU	60,000	1,300	10.36 EER	12.45 EER	1	1,264	1.0
RTU	36,000	1,300	9.88 EER	11.6 EER	1	702	0.5
RTU	36,000	1,300	9.36 EER	11.6 EER	1	966	0.7
RTU	24,000	1,300	9 EER	11.4 EER	1	730	0.6
Total					4	3,662	2.8

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the replacement of split system AC units and unitary systems with high efficiency AC systems falls under the category "Unitary HVAC Split System" and warrants an incentive based on efficiency (EER/SEER). The program incentives are calculated as follows:

$$\text{SmartStart® Incentive} = (\text{Cooling Tons} \times \$/\text{Ton Incentive})$$

RTU AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
≥20 to 30 tons	10.5 EER	79	0	$0
≥ 11.25 to < 20 tons	11.5 EER	79	0	$0
≥ 5.4 to < 11.25 tons	11.5 EER	73	0	$0
5.4 tons or less Unitary AC and Split System	≥14 SEER	$92	13	$1,196
TOTAL			**13**	**$1,196**

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	**INSTALLED COST**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVING**	**PAY BACK YEARS**
RTU	$4,058	1	$4,058	$460	$3,598	$217	16.6
RTU	$2,639	1	$2,639	$276	$2,363	$121	19.6
RTU	$9,250	1	$9,250	$276	$8,974	$166	54.0
RTU	$7,500	1	$7,500	$184	$7,316	$126	58.3
Total	$23,447	4	$23,447	$1,196	$22,251	$630	35.3

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$23,447
NJ Smart Start Equipment Incentive ($):	$1,196
Net Installation Cost ($):	$22,251
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$630
Total Yearly Savings ($/Yr):	$630
Estimated ECM Lifetime (Yr):	15
Simple Payback	35.3
Simple Lifetime ROI	-57.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$9,450
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($14,730.10)

ECM #5: DDC Controls

Description:

The HVAC systems within the facility are controlled manually via electronic local thermostats. The units in the system have individual room thermostats that are controlled by building operators.

The typical hours of operation for this facility are Monday through Friday between 17-35 hours per week, dependent on after school activities and holidays. The building is typically closed on weekends.

There is no thermostat adjustments made and set back/set up functions are not employed. Therefore, a DDC system providing the Owner with full control over the HVAC equipment within the building appears to be an energy saving opportunity.

The installation of a Building Automation system with Direct Digital Controls (DDC) wired through an Ethernet backbone and front end controller is the typical solution to gain control over the HVAC systems and to minimize the system energy use.

In the long term, all equipment replacement should include for each unit being replaced a unit DDC controller. The system replacements should include new thermostat controllers for all indoor air-handling systems and the rooftop units, in addition to each piece of equipment being wired back to a front end controller and computer interface. With the communication between the devices and the front end computer interface, the Owner will be able to take advantage of equipment scheduling for occupied and unoccupied periods based on the actual occupancy of the facility. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours and week-ends.

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

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

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total energy cost for the facility.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $3.50 per SF in accordance with recent Contractor pricing

for systems of this magnitude. Savings from the implementation of this ECM will be from the reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Energy Savings Calculations:

10% Savings on Heating Calculations

$$Savings. = Heat\ Cons.(Therms) \times 0.90 \times 10\%\ Savings \times Ave\ Gas\ Cost\left(\frac{\$}{Therm}\right)$$

10% Savings on Cooling Calculations**:**

$$Savings. = Cool\ Cons.(kWh) \times 10\%\ Savings \times Ave\ Elec\ Cost\left(\frac{\$}{kWh}\right)$$

The calculations are summarized in the table below.

ECM #5 - DDC CONTROLS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Building Total Area (Sq.Ft.)	27,857	27,857	-
Lighting Load (w/Sq.Ft.)	1.5	1.5	-
Plug Load (w/Sq.Ft.)	1	1	-
Annual Electrical Consumption (kWh/yr.)	237,370	237,370	-
Net Annual Mechanical Electrical Consumption (kWh/yr.)	167,728	167,728	-
Energy Savings	0%	10%	-
Electricity Cost ($/kWh)	$0.172	$0.172	-
Natural Gas Cost ($/Therm)	$1.290	$1.290	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Annual Mechanical Electricity Energy (kWh/yr.)	167,728	150,955	16,773
Annual Heat Energy (Therms)	18,158	16,342	1,816
Annual Electricity Cost ($)	$28,849.13	$25,964.22	$2,885
Annual Natural Gas Energy Cost ($)	$23,424	$21,081	$2,342
Total Annual Savings ($/yr.)	**$52,273**	**$47,046**	**$5,227**

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$97,499
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$97,499
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$5,227
Total Yearly Savings ($/Yr):	$5,227
Estimated ECM Lifetime (Yr):	15
Simple Payback	18.7
Simple Lifetime ROI	-19.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$78,405
Internal Rate of Return (IRR)	-3%
Net Present Value (NPV)	($35,099.41)

ECM #6: Install NEMA Premium® Efficiency Motors

Description:

The improved efficiency of the NEMA Premium® efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95 % of its total lifetime operating cost. Because many motors operate continuously 24 hours a day, even small increases in efficiency can yield substantial energy and dollar savings.

The electric motors driving the hot water pumps and supply fans in some of the HVAC equipment are candidates for replacing with premium efficiency motors. These standard efficiency motors run considerable amount of time over a year.

This energy conservation measure replaces existing inefficient electric motors with NEMA Premium® efficiency motors. NEMA Premium® is the most efficient motor designation in the marketplace today.

IMPLEMENTATION SUMMARY					
EQMT ID	**FUNCTION**	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
HWP-3	Heating System	1.5	4,300	75.5%	88.5%
HWP-4	1998 Addition	1	4,300	84.0%	87.5%

Energy Savings Calculations:

$$\text{Electric usage, kWh} = \frac{\text{HP} \times \text{LF} \times 0.746 \times \text{Hours of Operation}}{\text{Motor Efficiency}}$$

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor Motor Efficiency = Motor Nameplate Efficiency

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric cost savings} = \text{Electric Usage Savings} \times \text{Electric Rate} \left(\frac{\$}{\text{kWh}}\right)$$

The calculations were carried out and the results are tabulated in the table below:

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	**MOTOR HP**	**LOAD FACTOR**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**	**POWER SAVINGS kW**	**ENERGY SAVINGS kWH**	**COST SAVINGS**
HWP-3	1.5	90%	75.5%	88.5%	0.20	847	$146
HWP-4	1	90%	84.0%	87.5%	0.03	138	$24
TOTAL					**0.2**	**985**	**$169**

Equipment Cost and Incentives

Below is a summary of SmartStart Building® incentives for premium efficiency motors:

INCENTIVES	
HORSE POWER	**NJ SMART START INCENTIVE**
1	$50
1.5	$50
2	$60
3	$60
5	$60
7.5	$90
10	$100
15	$115
20	$125
25	$130

The following table outlines the summary of motor replacement costs and incentives:

MOTOR REPLACEMENT SUMMARY						
EQMT ID	MOTOR POWER HP	INSTALLED COST	SMART START INCENTIVE	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
HWP-3	1.5	$788	$50	$738	$146	5.1
HWP-4	1	$708	$50	$658	$24	27.7
TOTAL	**Totals:**	**$1,496**	**$100**	**$1,396**	**$169**	**8.2**

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,496
NJ Smart Start Equipment Incentive ($):	$100
Net Installation Cost ($):	$1,396
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$169
Total Yearly Savings ($/Yr):	$169
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.3
Simple Lifetime ROI	81.6%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$2,535
Internal Rate of Return (IRR)	9%
Net Present Value (NPV)	$621.51

ECM #7: High Efficiency Gas Hot Water Heater

Description:

Domestic hot water for Herbertsville Elementary School is provided by a combination of two Gas Fired Hot Water Heaters, and one Electric Hot Water Heater. The gas heater is currently at a lower efficiency than newer high efficiency units and should be replaced along with the electric heater.

This ECM will replace the older electric domestic water heater and gas heater with high efficiency gas heaters. Overall energy costs will be reduced in the conversion from electric to gas as well. Brick Township Board of Education should retain a professional engineer to finalize the sizing and design of the system.

The total square footage of the building is estimated to be 27,857 SF. It was estimated based on drawings and calculations using the domestic hot water gas usage presented below to determine the amount of SF served by the electric heater. An estimated 9,587 SF is currently served by the electric heater.

ANNUAL GAS USAGE				
MONTH	TOTAL USAGE THERMS	DOMESTIC HW USAGE	HEATING ONLY	COST
Jan-10	4,709	76	4,632	$5,598
Feb-10	5,109	76	5,033	$6,067
Mar-10	1,576	76	1,499	$1,906
Apr-10	1,252	76	1,175	$1,425
May-10	693	76	616	$873
Jun-10	127	76	50	$166
Jul-10	30	76	0	$0
Aug-10	32	76	0	$0
Sep-10	117	76	40	$140
Oct-10	425	76	349	$582
Nov-10	1,157	76	1,080	$1,314
Dec-10	2,933	76	2,856	$3,456
TOTAL	**18,159**	**918**	**17,332**	**$21,526**

Energy Savings Calculations GAS:

CONDENSING DOM. HOT WATER GAS HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Hot Water Heater	High Efficiency Hot Water Heater	-
Building Type	Education	Education	-
Building Square-foot	18,000	18,000	-
Domestic Water Usage, kBtu	73,440	73,440	-
DHW Heating Fuel Type	Gas	Gas	-
Heating Efficiency	80%	95%	15%
Total Usage (kBTU)	91,800	77,305	14,495
Nat Gas Cost ($/Therm)	$1.29	$1.29	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	918	773	145
Energy Cost ($)	$1,184	$997	$187

Energy Savings Calculations ELECTRIC:

CONDENSING DOM. HOT WATER ELECTRIC HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Hot Water Heater	High Efficiency Hot Water Heater	-
Building Type	Education	Education	-
Building Square-foot	9,587	9,587	-
Domestic Water Usage, kBtu	43,141.50	43,141.50	-
DHW Heating Fuel Type	Electric	Gas	-
Heating Efficiency	100%	95%	-5%
Total Usage (kBTU)	43,142	45,412	-2,271
Electric Cost ($/kWh)	$0.172	$0.172	-
Nat Gas Cost ($/Therm)	$1.29	$1.29	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Consumption (kWh)	12,640	0	12,640
Nat Gas Consumption (Therms)	0	454	-454
Energy Cost ($)	$2,174	$586	$1,588
COMMENTS:	Savings are based on Energy Information Administration Commercial Building Energy Consumption Survey 2003 Information		

Cost, Rebates and Incentives:

Material cost for (2) 100 Gallon – 150,000 (150 MBH) BTU Cyclone Xi ASME Commercial Gas Water Heaters to be $11,264. (1) 50 Gallon – 76,000 (76 MBH) BTU Cyclone Xi ASME Commercial Gas Water Heaters to be $2,026.

The total installed cost with gas piping is estimated to be $22,106.

From the NJ Smart Start® Program appendix, the hot water heater installation falls under the category "Gas Water Heating" and warrants an incentive as follows:

Smart Start ® Incentive: $2/MBH × Unit Capacity, MBH
(Water Heaters > 50 Gallons, up to 300 MBH)

226 MBH x $2/MBH = **$452**

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$22,106
NJ Smart Start Equipment Incentive ($):	$452
Net Installation Cost ($):	$21,654
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,588
Total Yearly Savings ($/Yr):	$1,588
Estimated ECM Lifetime (Yr):	15
Simple Payback	13.6
Simple Lifetime ROI	10.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$23,820
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	($2,696.56)

ECM #8: Geothermal Heat Pump System Installation

Description:

The existing heating system of Herbertsville Elementary School consists of three (3) boilers that provide hot water to perimeter classroom unit ventilators and heating and ventilation units. In addition to the heating hot water system, heating is also provided through four (4) roof mounted packaged gas fired heating and cooling units. The existing heating system for the whole building utilizes natural gas as the fuel source.

A geothermal heat pump system utilizes the ground as a heat sink to extract and reject heat to depending on the season. Due to the large thermal mass provided by the ground, the HVAC equipment is able to take advantage of cooler temperatures is the summer and warmer temperatures in the winter compared to the ambient air. The benefits include substantial energy efficiency increase with respect to air source systems. In addition, no electrical resistance heat is required in the heating season also reducing electric usage. A geothermal system sized properly requires no additional heat production equipment (such as a boiler) or heat rejection equipment (such as a cooling tower). All loads are handled by the heat pumps and the geothermal water loop. Due to the inefficiency of the boiler and poor operational characteristics of the air to air heat pumps, a geothermal system energy costs become very appealing. The geothermal heat pump system would eliminate the existing boiler and all associated oil usage. It is important to note that this ECM provides cooling for the entire school, which is currently only provided for the new addition.

This ECM includes the installation of ground source heat pumps installed above the ceilings of each classroom, or mounted upright in a closet style configuration. This is in place of the existing unit ventilators in the classrooms and offices. Outside air would be provided by a dedicated central outside air heat pump distributed by ductwork above the corridor to each occupied zone. This system would provide ventilation air to replace the outside air openings currently ducted to each unit ventilator. The air to air heat pumps would be replaced with packaged rooftop ground source heat pumps. The proposed outside air unit would include an energy recovery wheel for additional savings on ventilation air. This ECM also includes installation of new ground loop water pumps with VFD drives. The pumping system is included to pump transfer fluid from the building to the well field and back. The geothermal system would require (not limited to) the following major components:

1. 200-Ton (Heating Dominant) bore field located North side of the building. (67 bores, 450 ft deep each). Bore field sizing is based on 150 linear feet of bore per ton of cooling. A complete geotechnical analysis will have to be performed in order to confirm the actual soil thermal conductivity at the site.
2. (3) Loop condenser water pumps.
3. Condenser water piping distribution system from the well field to the roof top units and indoor heat pumps.

4. Installation of high-efficiency (16 EER) geothermal rooftop units to provide heated and cooled ventilation air and (18 EER) geothermal indoor heat pumps to replace the classroom unit ventilators.
5. Removal all existing AC units, air handlers and unit ventilators

This ECM is based on Climate Master Tranquility Series water source heat pumps model TRE for the rooftop units, and model TS or TV for the horizontal / vertical units or equal. **Note:** Sizing indicated within the calculation of this ECM is based on a one for one replacement of the existing equipment. Owner should have a Professional Engineer verify heating and cooling loads prior to moving forward with this ECM.

Energy Savings Calculations:

The energy savings calculations are based on the energy analysis performed on the energy modeling software by Trane (Trace 700 ver. 6.2.4). The energy consumption of the baseline is compared to the proposed model to determine energy savings for each utility. The savings are applied to the average energy costs based on the facilities actual usage. Note: Heating and cooling is provided for the entire building the geothermal system model. Heating and cooling is only provided for the new addition in the baseline model with heating only provided for the original building. This ECM represents a significant upgrade to the building's HVAC system.

ECM #8 GEOTHERMAL SYSTEM CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Energy Consumption	Proposed Energy Consumption	
Elec Usage (KWH)	224,270	391,301	-167,031
Natural Gas Usage (Therms)*	18,159	745	17,414
Electric Cost ($/KWH)	$0.172	$0.172	
Natural Gas Cost ($/Therm)	$1.29	$1.29	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Energy Cost ($)	$38,574	$67,304	-$28,729
Natural Gas Energy Cost ($)	$23,425	$961	$22,464
Total Energy Cost ($)	$61,999	$68,265	-$6,265
COMMENTS:	This ECM is based on energy models performed on energy analysis software by Trane (Trace 700).		
	*Natural gas usage for existing and proposed systems includes gas fired domestic hot water heating equipment		

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$982,284
NJ Smart Start Equipment Incentive ($):	$120,000
Net Installation Cost ($):	$862,284
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	($6,265)
Total Yearly Savings ($/Yr):	($6,265)
Estimated ECM Lifetime (Yr):	15
Simple Payback	N/A
Simple Lifetime ROI	-110.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	($93,975)
Internal Rate of Return (IRR)	N/A
Net Present Value (NPV)	($937,075.41)

Note: The additional electrical energy consumed by the geothermal heat pump system is greater than the natural gas energy that is saved by eliminating the boilers. Therefore, a geothermal heat pump system is not a practical option at this facility.

ECM #9: Water Conservation

Description:

The facility utilizes standard plumbing fixtures. The typical water closet and urinal water consumption only meet the minimum federally required standard for water efficiency. New fixtures 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 faucets, water closets and urinals within the bathrooms the facility. The estimated usage of the plumbing fixtures is based on the total population of the facility. The number of plumbing fixtures to be replaced is based on observation of the facility in combination with federal minimum standards per occupancy load.

The proposed retrofit includes installation of auto flow sink faucets, low flow aerators, low flow flushometer style water closets that utilize 1.28 gallons per flush and ultra-low flushometer style urinals that utilize 1/8 gallons per flush. For the basis of this calculation the LEED rating system was used to estimate the occupancy usage for students within the school. When water consumption information was not available, the GPF values were estimated for the existing fixtures.

Energy Savings Calculations:

Urinals and Toilets:

$$\text{Water Consumption} = \text{Occupancy}\left(\frac{\text{Days}}{\text{Yr}}\right) \times \text{Use}\left(\frac{\text{Flush}}{\text{Person per Day}}\right) \times \text{Fixture}\left(\frac{\text{Gal}}{\text{Flush}}\right)$$

Faucets:

$$\text{Water Consumption} = \text{Occupancy}\left(\frac{\text{Days}}{\text{Yr}}\right) \times \text{Use}\left(\frac{\text{Use}}{\text{Person per Day}}\right) \times \text{Use Time}\left(\frac{\text{Sec}}{\text{Use}}\right) \times \text{Fixture}\left(\frac{\text{Gal}}{\text{Min}}\right)$$

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

$$\text{Gas Cost (Therms)} = \text{Faucet Water Consumption (Gallons)} \times \frac{8.34\,\text{BTU}}{\text{Gal}} \times \frac{\text{Therm}}{100{,}000\,\text{BTU}}$$

WATER CONSERVATION CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Fixtures	Low Flow / Auto Flow Fixtures	-
Total Number of Students	273	273	-
% Male to Female	50%	50%	-
Estimated % Floor Area Served by Older Bathrooms	100%	100%	-
Occupied Days Per Year	252	252	-
Lavatory Uses per Day per Person	3	3	-
Sink flow time per use, sec	15	12	-
Sink Aerator Flow, GPM	1.5	0.5	-
WC Uses per Day per Person	2.0	2.0	-
Urinal Uses per Day per Person	1.0	1.0	-
Total Urinal Flushes Per Day	137	137	-
Total WC Flushes Per Day	273	273	-
Urinal Gallons Per Flush (GPF)	1.0	0.125	0.875
WC Gallons Per Flush (GPF)	1.6	1.28	0.32
**** Water Cost ($/1000 Gal)**	$8.00	$8.00	-
Gas Cost ($/Therm)	$1.29	$1.29	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Water Consumption, Urinal and WC (Gal)	144,472	92,359	52,113
Water Consumption, Faucets (Gal)	77,396	20,639	56,757
Total Water Consumption, (Gal)	221,867	112,997	108,870
Water Cost ($)	$1,775	$904	$871
Gas Consumption (Therms)	323	86	237
Gas Cost ($/Year)	$416	$111	$305
COMMENTS:	*Savings are based on LEED Reference Guide for Green Building Design and Construction - 2009 Edition for WC and Urinal water usage. ** Cost of Water estimated.		

The cost for installation and materials of 10 water closets, 5 low flow urinals and 11 new auto flow sink faucets throughout the facility is estimated to be $23,607. There are no Smart Start rebates for installation of low flow plumbing fixtures.

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$23,607
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$23,607
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,176
Total Yearly Savings ($/Yr):	$1,176
Estimated ECM Lifetime (Yr):	15
Simple Payback	20.1
Simple Lifetime ROI	-25.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$17,640
Internal Rate of Return (IRR)	-3%
Net Present Value (NPV)	($9,567.99)

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 but save energy none the less.

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

B. Maintain all weather stripping on windows and doors.

C. 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 which saves the monitor screen not energy.

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

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Brick Township Board of Education - Herbertsville Elementary

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade	$5,000	$0	$1,440	$3,560	$814	$0	$814	15	$12,210	$0	243.0%	4.4	21.66%	$6,157.48
ECM #2	Lighting Controls	$3,375	$0	$525	$2,850	$696	$0	$696	15	$10,440	$0	266.3%	4.1	23.38%	$5,458.80
ECM #3	Condensing Boiler Installation	$61,900	$92,850	$5,948	$148,802	$3,420	$0	$3,420	30	$102,600	$0	-31.0%	43.5	-2.25%	($81,768.49)
ECM #4	Rooftop Unit Replacement	$12,039	$11,408	$1,196	$22,251	$630	$0	$630	15	$9,450	$0	-57.5%	35.3	-9.19%	($14,730.10)
ECM #5	DDC Controls Upgrade	$97,499	$0	$0	$97,499	$5,227	$0	$5,227	15	$78,405	$0	-19.6%	18.7	-2.61%	($35,099.41)
ECM #6	NEMA Premium Efficiency Motors	$1,211	$285	$100	$1,396	$169	$0	$169	15	$2,535	$0	81.6%	8.3	8.59%	$621.51
ECM #7	Domestic HWH Replacement	$22,106	$0	$452	$21,654	$1,588	$0	$1,588	15	$23,820	$0	10.0%	13.6	1.22%	($2,696.56)
ECM #8	Geothermal HP System	$431,546	$550,738	$120,000	$862,284	($6,265)	$0	($6,265)	15	-$93,975	$0	-110.9%	N/A	N/A	($937,075.41)
ECM #9	Water Conservation	$23,607	$0	$0	$23,607	$1,176	$0	$1,176	15	$17,640	$0	-25.3%	20.1	-3.44%	($9,567.99)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solary Array	$318,757	$0	$0	$318,757	$11,352	$23,921	$35,273	15	$529,095	$358,815	66.0%	9.0	7.12%	$102,329.78

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

APPENDIX B

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February, 2010:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2004

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit, AFUE ≥ 92%

Variable Frequency Drives

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

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters > 50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH
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	$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$25 per fixture (1-2 lamps) $30 per fixture (3-4 lamps)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	$7 per bulb
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$42 per 5 foot $65 per 6 foot

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled
Daylight Dimming - office	$50 per fixture controlled

Premium Motors

Three-Phase Motors	$45 - $700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	$40 per electronic communicated motor

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
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 a IRR of at least 10%.
Multi Measures Bonus	15%

APPENDIX C

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Herbertsville Elementary School

Building ID: 2731416
For 12-month Period Ending: December 31, 2010[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: July 01, 2011

Facility
Herbertsville Elementary School
2282 Lanes Mill Road
Brick, NJ 08724

Facility Owner
Brick Township Public School District
101 Hendrickson Avenue
Brick, NJ 08724

Primary Contact for this Facility
James Edwards
101 Hendrickson Avenue
Brick, NJ 08724

Year Built: 1949
Gross Floor Area (ft²): 27,857

Energy Performance Rating[2] (1-100) 61

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	765,209
Natural Gas (kBtu)[4]	1,815,894
Total Energy (kBtu)	2,581,103

Energy Intensity[5]

Site (kBtu/ft²/yr)	93
Source (kBtu/ft²/yr)	160

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	205

Electric Distribution Utility
Jersey Central Power & Light Co [FirstEnergy Corp]

National Average Comparison

National Average Site EUI	103
National Average Source EUI	178
% Difference from National Average Source EUI	-10%
Building Type	K-12 School

Stamp of Certifying Professional

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

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

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

Certifying Professional
Michael Fischette
520 South Burnt Mill Road
Voorhees, NJ 08043

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Herbertsville Elementary School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	2282 Lanes Mill Road, Brick, NJ 08724	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Brick Twp BOE - Herbertsville Elementary School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	27,857 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	No	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	49 (Default)	Is this the number of personal computers in the K12 School?		☐
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.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	40 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	10(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Jersey Central Power & Light Co [FirstEnergy Corp]

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))
12/01/2010	12/31/2010	16,216.00
11/01/2010	11/30/2010	19,413.00
10/01/2010	10/31/2010	16,084.00
09/01/2010	09/30/2010	17,622.00
08/01/2010	08/31/2010	25,622.00
07/01/2010	07/31/2010	11,428.00
06/01/2010	06/30/2010	22,333.00
05/01/2010	05/31/2010	19,943.00
04/01/2010	04/30/2010	18,540.00
03/01/2010	03/31/2010	19,128.00
02/01/2010	02/28/2010	16,710.00
01/01/2010	01/31/2010	21,231.00
Electric Consumption (kWh (thousand Watt-hours))		**224,270.00**
Electric Consumption (kBtu (thousand Btu))		**765,209.24**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**765,209.24**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

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

Start Date	End Date	Energy Use (therms)
12/01/2010	12/31/2010	2,932.70
11/01/2010	11/30/2010	1,156.62
10/01/2010	10/31/2010	425.30
09/01/2010	09/30/2010	116.75
08/01/2010	08/31/2010	32.27
07/01/2010	07/31/2010	30.14
06/01/2010	06/30/2010	126.68
05/01/2010	05/31/2010	692.68
04/01/2010	04/30/2010	1,251.85
03/01/2010	03/31/2010	1,575.73

02/01/2010	02/28/2010	5,109.47
01/01/2010	01/31/2010	4,708.75
Gas Consumption (therms)		**18,158.94**
Gas Consumption (kBtu (thousand Btu))		**1,815,894.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**1,815,894.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

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

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

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same PE or RA that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Herbertsville Elementary School
2282 Lanes Mill Road
Brick, NJ 08724

Facility Owner
Brick Township Public School District
101 Hendrickson Avenue
Brick, NJ 08724

Primary Contact for this Facility
James Edwards
101 Hendrickson Avenue
Brick, NJ 08724

General Information

Herbertsville Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	27,857
Year Built	1949
For 12-month Evaluation Period Ending Date:	December 31, 2010

Facility Space Use Summary

Brick Twp BOE - Herbertsville Elementary School	
Space Type	K-12 School
Gross Floor Area(ft^2)	27,857
Open Weekends?	No
Number of PCs[d]	49
Number of walk-in refrigeration/freezer units	2
Presence of cooking facilities	Yes
Percent Cooled	40
Percent Heated	100
Months[o]	10
High School?	No
School District[o]	Brick

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2010)	**Baseline** (Ending Date 12/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	61	61	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	93	93	81	N/A	103
Source (kBtu/ft^2)	160	160	139	N/A	178
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/$ft^2$/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	205	205	179	N/A	228
$kgCO_2e/ft^2$/year	7	7	6	N/A	8

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

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

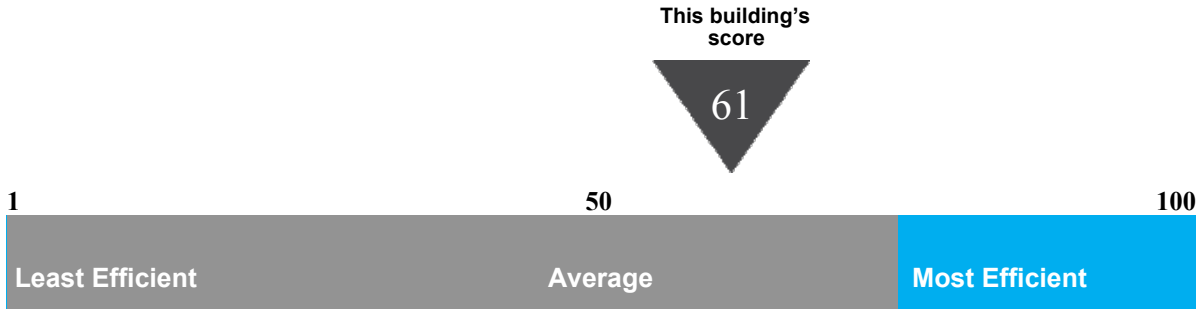
Statement of Energy Performance

2010

Herbertsville Elementary School
2282 Lanes Mill Road
Brick, NJ 08724

Portfolio Manager Building ID: 2731416

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 160 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending December 2010

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

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

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 07/01/2011

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Brick Township BOE

Herbertsville Elementary School

Rooftop / AC Units

Tag	RTU-1	RTU-2	RTU-3
Unit Type	Rooftop Heating & Air Conditioning	Rooftop Heating & Air Conditioning	Cooling Only
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Library	Conf./Office Area	Kitchen
Manufacturer	AAON	AAON	Trane
Model #	RK-05	RK-03	TCD036C10CBC
Serial #	200210-AKGD41473	200210-AKGB41474	M44101712D
Cooling Type	DX R-22	DX R-22	DX R-22
Cooling Capacity (Tons)	5	3	3
Cooling Efficiency (SEER/EER)	11.7 SEER	11.3 SEER	10.7 SEER
Heating Type	Gas HTX	Gas HTX	N/A
Heating Input (MBH)	72.9	55.9	N/A
Efficiency	81%	81%	N/A
Fuel	Natural Gas	Natural Gas	N/A
Approx Age	9	9	14
ASHRAE Service Life	15	15	15
Remaining Life	6	6	1
Comments	Filter Change and Internal Cleaning Needed.	2 HP Supply Fan, 2 HP Return Fan	
Notes	Data indicated as "N/A" is not applicable for the specific category. Data indicated with a dashed line "-" denotes information that is not available for the specific category upon field inspection or post audit research.		

MAJOR EQUIPMENT LIST

Concord Engineering Group

Brick Township BOE

Tag	RTU/HRU		
Unit Type	Packaged Heating and Cooling	Heat Recovery Unit for RTU	
Qty	2	2	
Location	Roof	Roof	
Area Served	MPR	MPR	
Manufacturer	Trane	Semco	
Model #	TCD180B300EA / TCD180B300EA	FV3000 / FV3000	
Serial #	N16103103D / N16102260D	14151/15902-000 / 14151/15902-000	
Cooling Type	DX R-22	N/A	
Cooling Capacity (Tons)	15	N/A	
Cooling Efficiency (SEER/EER)	9.6 EER	N/A	
Heating Type		N/A	
Heating Input (MBH)		N/A	
Efficiency		N/A	
Fuel		N/A	
Approx Age	13	13	
ASHRAE Service Life	15	15	
Remaining Life	2	2	
Comments	Filter Change and Internal Cleaning Needed.	2 HP Supply Fan, 2 HP Return Fan	
Notes	Data indicated as "N/A" is not applicable for the specific category. Data indicated with a dashed line "-" denotes information that is not available for the specific category upon field inspection or post audit research.		

MAJOR EQUIPMENT LIST

Concord Engineering Group

Brick Township BOE

Herbertsville Elementary School

Boilers

Tag	B-1	B-2	B-3
Unit Type	Cast Iron, Water Tube Sectional Hot Water Boiler	Modular Hot Water Boiler	Outdoor Hot Water Boiler
Qty	1	4 Sections	1
Location	Original Building Boiler Room	1998 Addition - Boiler Room	Roof
Area Served	Original Building HVAC Systems	1998 Addition HVAC Systems	2002 Addition HVAC Systems
Manufacturer	H.B. Smith	Hydrotherm	Raypak
Model #	Mills 340-1	MR-1200B-PV	Raytherm H3
Serial #	-	MSJ-2448	0210199862
Input Capacity (MBH)	1,458	1200	181
Rated Output Capacity (Btu/Hr)	1,021	960	144.8
Approx. Efficiency %	70% (est)	80%	82%
Fuel	Natural Gas	Natural Gas	Natural Gas
Approx Age	62	13	9
ASHRAE Service Life	30	25	25
Remaining Life	(32)	12	16
Comments	Boilers are original to the building and are in poor condition. Burner appears to be new.		
Notes	Data indicated as "N/A" is not applicable for the specific category. Data indicated with a dashed line "-" denotes information that is not available for the specific category upon field inspection or post audit research.		

MAJOR EQUIPMENT LIST

Concord Engineering Group

Brick Township BOE

Herbertsville Elementary School

Domestic Water Heaters

Tag	HWH-1	HWH-2	HWH-3
Unit Type	Natural Gas Hot Water Heater	Natural Gas Hot Water Heater	Electric Hot Water Heater
Qty	1	1	1
Location	Original Building Boiler Room	1998 Addition - Kitchen Storage Room	1998 Addition - Boiler Room
Area Served	Bathrooms, Hand Washing	Kitchen	Bathrooms, Hand Washing
Manufacturer	A.O. Smith	A.O. Smith	Bradford White
Model #	BT80-230	BTP-139-964	LD30R33B090
Serial #	MH94-0361401-230	MM97-0698383-964	PK0145345
Size (Gallons)	75	86	30
Input Capacity (MBH/KW)	75 MBH	140 MBH	4.5 KW
Recovery (Gal/Hr)	76.8	127.3	-
Efficiency %	1	1	1
Fuel	Nat Gas	Nat Gas	Electric
Approx Age	17	14	14
ASHRAE Service Life	12	12	12
Remaining Life	(5)	(2)	(2)
Comments	HW Heater appears to be in good condition.	HW Heater appears to be in good condition.	HW Heater appears to be in good condition.
Notes	Data indicated as "N/A" is not applicable for the specific category. Data indicated with a dashed line "-" denotes information that is not available for the specific category upon field inspection or post audit research.		

MAJOR EQUIPMENT LIST

Concord Engineering Group

Brick Township BOE

Herbertsville Elementary School

Pumps

Tag	HWP-1	HWP-2	HWP-3
Unit Type	Inline	Inline	Base Mounted Pump w/ no suction diffuser
Qty	1	1	1
Location	Mechanical Room	Mechanical Room	Mechanical Room
Area Served	Heating System	Heating System	Heating System
Manufacturer	Bell & Gossett	Bell & Gossett	Bell & Gossett
Model #	8QD56A17D59E P	M74792	56C34D5562F P
Serial #	903578	M80082	M99135
Horse Power	0.33	0.75	1.50
Flow (GPM)	-	-	-
Motor Info	Bell & Gossett OEM	Bell & Gossett OEM	Marathon Electric
Electrical Power	115/208-230	115/230	115/208-230
RPM	1725	1725	3450
Motor Efficiency %	75.5% (est)	75.5% (est)	75.5% (est)
Approx Age	Unknown	Unknown	Unknown
ASHRAE Service Life	20	20	20
Remaining Life	N/A	N/A	N/A
Comments	Age of pump and motor is unknown, pump is in fair to poor condition	Age of pump and motor is unknown, pump is in fair to poor condition	Age of pump and motor is unknown, pump is in fair to poor condition
Notes	Data indicated as "N/A" is not applicable for the specific category. Data indicated with a dashed line "-" denotes information that is not available for the specific category upon field inspection or post audit research.		

Pumps

Tag	HWP-4	HWP-5	HWP-6
Unit Type	Inline	Inline	Inline
Qty	1	1	1
Location	1998 Addition - Boiler Room	Corr Ceiling in 2002 Addition	Corr Ceiling in 2002 Addition
Area Served	1998 Addition	2002 Addition	2002 Addition
Manufacturer	Taco	Bell & Gossett	Bell & Gossett
Model #	-	Semes 90	Semes 90
Serial #	-	-	-
Horse Power	1.00	0.25	-
Flow (GPM)	-	6 GPM @ 17 Ft. Head	6 GPM @ 17 Ft. Head
Motor Info	GE	Bell & Gossett OEM	Bell & Gossett OEM
Electrical Power	115/230	120/1/60	120/1/60
RPM	1725	1725	1725
Motor Efficiency %	84.0%	82.5% (est)	82.5% (est)
Approx Age	8	8	8
ASHRAE Service Life	20	20	20
Remaining Life	12	12	12
Comments	Age of pump and motor is unknown, pump is in fair to poor condition	Age of pump and motor is unknown, pump is in fair to poor condition	Age of pump and motor is unknown, pump is in fair to poor condition
Notes	Data indicated as "N/A" is not applicable for the specific category. Data indicated with a dashed line "-" denotes information that is not available for the specific category upon field inspection or post audit research.		

APPENDIX E

Investment Grade Lighting Audit

CEG Job #: 9C11006
Project: Brick Township BOE LGEA — Herbertsville Elementary School
2282 Lanes Mill Road
Brick, NJ 08724
Bldg. Sq. Ft. 27,857

KWH COST: $0.172

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
211.11	MER	1800	2	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendent Mnt., Prismatic Lens	34	0.07	122.4	$21.05	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	$19.20	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Corridor Outside MER	3000	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	558.0	$95.98	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Office Conf. RM	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	334.8	$57.59	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Office	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	770.4	$132.51	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Corridor	3000	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	372.0	$63.98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
122.21	Principal	1800	2	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.16	280.8	$48.30	2	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.10	180	$30.96	$80.00	$160.00	0.06	100.8	$17.34	9.23
232.21		1800	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.09	154.8	$26.63	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	6	1800	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.70	1,252.8	$215.48	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.21	Library	1800	15	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.61	2,889.0	$496.91	15	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Corridor at Library	3000	4	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.25	744.0	$127.97	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	16	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.03	1,857.6	$319.51	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.41		1800	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Primatic Lens	30	0.06	108.0	$18.58	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	17	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.03	1,857.6	$319.51	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.41		1800	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Primatic Lens	30	0.06	108.0	$18.58	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	5	1800	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.70	1,252.8	$215.48	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	4	1800	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.70	1,252.8	$215.48	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
242.21	Main Office	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	770.4	$132.51	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
212.11	Nurse's Office	1800	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Wall MNt., No Lens	32	0.06	115.2	$19.81	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Nurse's Toilet Room	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	$19.20	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	11	1800	13	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.12	2,012.4	$346.13	13	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	$20.12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37		1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.12	208.8	$35.91	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	12	1800	13	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.12	2,012.4	$346.13	13	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	$20.12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37		1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.12	208.8	$35.91	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	14	1800	13	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.12	2,012.4	$346.13	13	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	$20.12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37		1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.12	208.8	$35.91	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	15	1800	13	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.12	2,012.4	$346.13	13	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	$20.12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37		1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.12	208.8	$35.91	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	New Addition Corridor	3000	13	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.81	2,418.0	$415.90	13	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	New Addition Boy's Room	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	334.8	$57.59	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	New Addition Girl's Room	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	334.8	$57.59	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Faculty	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.52	928.8	$159.75	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
227.21	Faculty Toilet Room	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	$20.12	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	Faculty Storage Room	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.06	29.0	$4.99	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.37	MER @ MPR	1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.12	208.8	$35.91	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
769	MPR	1800	12	1	400w MH, Clear Lens	465	5.58	10,044.0	$1,727.57	12	6	2x4 54w T5HO 6 Lamp w/Prismatic Lens	354	4.25	7646.4	$1,315.18	$240.00	$2,880.00	1.33	2397.6	$412.39	6.98
232.21	Kitchen	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.03	1,857.6	$319.51	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
111	Girl's Toilet Room	1800	1	1	1x4, 1-Lamp, 34w T12, Mag. Ballast, Pendent Mnt., Prismatic Lens	48	0.05	86.4	$14.86	1	1	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	30	0.03	54	$9.29	$80.00	$80.00	0.02	32.4	$5.57	14.36
111	Boy's Toilet Room	1800	1	1	1x4, 1-Lamp, 34w T12, Mag. Ballast, Pendent Mnt., Prismatic Lens	48	0.05	86.4	$14.86	1	1	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	30	0.03	54	$9.29	$80.00	$80.00	0.02	32.4	$5.57	14.36
222.21	Girl's Toiletroom at Library	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	$19.20	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Boy's Toiletroom at Libray	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	$19.20	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
111	Storage at Classroom 16	500	1	1	1x4, 1-Lamp, 34w T12, Mag. Ballast, Pendent Mnt., Prismatic Lens	48	0.05	24.0	$4.13	1	1	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	30	0.03	15	$2.58	$80.00	$80.00	0.02	9	$1.55	51.68
612	Janitor's Storage	500	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	50.0	$8.60	1	1	(1) 26w CFL Lamp	26	0.03	13	$2.24	$20.00	$20.00	0.07	37	$6.36	3.14
242.21	Corridor - Main	3000	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.86	2,568.0	$441.70	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
142.21	Corridor - Main	3000	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.94	2,808.0	$482.98	6	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.52	1548	$266.26	$100.00	$600.00	0.42	1260	$216.72	2.77
142	Corridor - 1	3000	1	4	1x4, 4-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.16	468.0	$80.50	1	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.09	258	$44.38	$100.00	$100.00	0.07	210	$36.12	2.77
241.11	Corridor - 1	3000	3	4	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	104	0.31	936.0	$160.99	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Corridor - 1	3000	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.12	372.0	$63.98	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.37	1	1800	12	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.36	648.0	$111.46	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.37	2	1800	16	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.48	864.0	$148.61	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
612	Toilet Classroom 2	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	180.0	$30.96	1	1	(1) 26w CFL Lamp	26	0.03	46.8	$8.05	$20.00	$20.00	0.07	133.2	$22.91	0.87

Investment Grade Lighting Audit

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
3520	Closet Classroom 2	1800	1	2	Ceiling Mount White Globe, 11w CFL Lamp	52	0.05	93.6	$16.10	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
111	3	1800	12	1	1x4, 1-Lamp, 34w T12, Mag. Ballast, Pendent Mnt., Prismatic Lens	48	0.58	1,036.8	$178.33	12	1	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	30	0.36	648	$111.46	$80.00	$960.00	0.22	388.8	$66.87	14.36
612	Toilet Classroom 3	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	180.0	$30.96	1	1	(1) 26w CFL Lamp	26	0.03	46.8	$8.05	$20.00	$20.00	0.07	133.2	$22.91	0.87
211.37	7	1800	16	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.48	864.0	$148.61	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.37	8	1800	16	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.48	864.0	$148.61	16	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.37	9	1800	12	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.36	648.0	$111.46	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.37	10	1800	12	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.36	648.0	$111.46	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		350	130				54,299	$9,339	350	21			5.5	10,510	$1,808		$5,000	2.4	4,734	$814	6.14

CEG Job #: 9C11006
Project: Brick Township BOE LGEA
Address: 218 Drum Point Road
Brick, NJ 08724
Building SF: 46,743

KWH COST: $0.172

FALSE

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										SAVINGS				
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
211.11	MER	1800	2	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendent Mnt., Prismatic Lens	34	0.068	122.4	21.0528	2		No Change	34	0.07	0%	122.4	$21.05		$0.00	0.00	0	$0.00	0.00
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	19.1952	1		No Change	62	0.06	0%	111.6	$19.20		$0.00	0.00	0	$0.00	0.00
222.21	Corridor Outside MER	3000	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.186	558	95.976	3		No Change	62	0.19	0%	558	$95.98		$0.00	0.00	0	$0.00	0.00
222.21	Office Conf. RM	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.186	334.8	57.5856	3		No Change	62	0.19	0%	334.8	$57.59		$0.00	0.00	0	$0.00	0.00
242.21		1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.428	770.4	132.5088	4		No Change	107	0.43	0%	770.4	$132.51		$0.00	0.00	0	$0.00	0.00
222.21	Corridor	3000	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	372	63.984	2		No Change	62	0.12	0%	372	$63.98		$0.00	0.00	0	$0.00	0.00
122.21	Principal	1800	2	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.156	280.8	48.2976	2		No Change	78	0.16	0%	280.8	$48.30		$0.00	0.00	0	$0.00	0.00
232.21		1800	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.086	154.8	26.6256	1		No Change	86	0.09	0%	154.8	$26.63		$0.00	0.00	0	$0.00	0.00
221.37	6	1800	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.696	1252.8	215.4816	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	58	0.56	20%	1002.24	$172.39	$450.00	$450.00	0.14	250.56	$43.10	10.44
242.21		1800	15	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.605	2889	496.908	15		No Change	107	1.61	0%	2889	$496.91		$0.00	0.00	0	$0.00	0.00
222.21		3000	4	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.248	744	127.968	4		No Change	62	0.25	0%	744	$127.97		$0.00	0.00	0	$0.00	0.00
232.21	16	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.032	1857.6	319.5072	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.83	20%	1486.08	$255.61	$450.00	$450.00	0.21	371.52	$63.90	7.04
211.41		1800	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Primatic Lens	30	0.06	108	18.576	2		No Change	30	0.06	0%	108	$18.58		$0.00	0.00	0	$0.00	0.00
232.21	17	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.032	1857.6	319.5072	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.83	20%	1486.08	$255.61	$450.00	$450.00	0.21	371.52	$63.90	7.04
211.41		1800	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Primatic Lens	30	0.06	108	18.576	2		No Change	30	0.06	0%	108	$18.58		$0.00	0.00	0	$0.00	0.00

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
221.37	5	1800	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.696	1252.8	215.4816	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	58	0.56	20%	1002.24	$172.39	$450.00	$450.00	0.14	250.56	$43.10	10.44
221.37	4	1800	12	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.696	1252.8	215.4816	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	58	0.56	20%	1002.24	$172.39	$450.00	$450.00	0.14	250.56	$43.10	10.44
242.21	Main Office	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.428	770.4	132.5088	4		No Change	107	0.43	0%	770.4	$132.51		$0.00	0.00	0	$0.00	0.00
212.11	Nurse's Office	1800	2	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Wall MNt., No Lens	32	0.064	115.2	19.8144	2		No Change	32	0.06	0%	115.2	$19.81		$0.00	0.00	0	$0.00	0.00
222.21	Nurse's Toilet Room	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	19.1952	1		No Change	62	0.06	0%	111.6	$19.20		$0.00	0.00	0	$0.00	0.00
232.21		1800	13	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.118	2012.4	346.1328	13	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.89	20%	1609.92	$276.91	$450.00	$450.00	0.22	402.48	$69.23	6.50
227.21	11	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	20.124	1		No Change	65	0.07	0%	117	$20.12		$0.00	0.00	0	$0.00	0.00
221.37		1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.116	208.8	35.9136	2		No Change	58	0.12	0%	208.8	$35.91		$0.00	0.00	0	$0.00	0.00
232.21		1800	13	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.118	2012.4	346.1328	13	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.89	20%	1609.92	$276.91	$450.00	$450.00	0.22	402.48	$69.23	6.50
227.21	12	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	20.124	1		No Change	65	0.07	0%	117	$20.12		$0.00	0.00	0	$0.00	0.00
221.37		1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.116	208.8	35.9136	2		No Change	58	0.12	0%	208.8	$35.91		$0.00	0.00	0	$0.00	0.00
232.21		1800	13	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.118	2012.4	346.1328	13	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.89	20%	1609.92	$276.91	$450.00	$450.00	0.22	402.48	$69.23	6.50
227.21	14	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	20.124	1		No Change	65	0.07	0%	117	$20.12		$0.00	0.00	0	$0.00	0.00
221.37		1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.116	208.8	35.9136	2		No Change	58	0.12	0%	208.8	$35.91		$0.00	0.00	0	$0.00	0.00
232.21		1800	13	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.118	2012.4	346.1328	13	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.89	20%	1609.92	$276.91	$450.00	$450.00	0.22	402.48	$69.23	6.50
227.21	15	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	20.124	1		No Change	65	0.07	0%	117	$20.12		$0.00	0.00	0	$0.00	0.00

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
221.37		1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.116	208.8	35.9136	2		No Change	58	0.12	0%	208.8	$35.91		$0.00	0.00	0	$0.00	0.00
222.21	New Addition Corridor	3000	13	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.806	2418	415.896	13		No Change	62	0.81	0%	2418	$415.90		$0.00	0.00	0	$0.00	0.00
222.21	New Addition Boy's Room	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.186	334.8	57.5856	3		No Change	62	0.19	0%	334.8	$57.59		$0.00	0.00	0	$0.00	0.00
222.21	New Addition Girl's Room	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.186	334.8	57.5856	3		No Change	62	0.19	0%	334.8	$57.59		$0.00	0.00	0	$0.00	0.00
232.21	Faculty	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.516	928.8	159.7536	6		No Change	86	0.52	0%	928.8	$159.75		$0.00	0.00	0	$0.00	0.00
227.21	Faculty Toilet Room	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	20.124	1		No Change	65	0.07	0%	117	$20.12		$0.00	0.00	0	$0.00	0.00
221.37	Faculty Storage Room	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.058	29	4.988	1		No Change	58	0.06	0%	29	$4.99		$0.00	0.00	0	$0.00	0.00
221.37	MER @ MPR	1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	0.116	208.8	35.9136	2		No Change	58	0.12	0%	208.8	$35.91		$0.00	0.00	0	$0.00	0.00
769	MPR	1800	12	1	400w MH, Clear Lens	465	5.58	10044	1727.568	12		No Change	465	5.58	0%	10044	$1,727.57		$0.00	0.00	0	$0.00	0.00
232.21	Kitchen	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.032	1857.6	319.5072	12		No Change	86	1.03	0%	1857.6	$319.51		$0.00	0.00	0	$0.00	0.00
111	Girl's Toilet Room	1800	1	1	1x4, 1-Lamp, 34w T12, Mag. Ballast, Pendent Mnt., Prismatic Lens	48	0.048	86.4	14.8608	1		No Change	48	0.05	0%	86.4	$14.86		$0.00	0.00	0	$0.00	0.00
111	Boy's Toilet Room	1800	1	1	1x4, 1-Lamp, 34w T12, Mag. Ballast, Pendent Mnt., Prismatic Lens	48	0.048	86.4	14.8608	1		No Change	48	0.05	0%	86.4	$14.86		$0.00	0.00	0	$0.00	0.00
222.21	Girl's Toiletroom at Library	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	19.1952	1		No Change	62	0.06	0%	111.6	$19.20		$0.00	0.00	0	$0.00	0.00
222.21	Boy's Toiletroom at Libray	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	19.1952	1		No Change	62	0.06	0%	111.6	$19.20		$0.00	0.00	0	$0.00	0.00
111	Storage at Classroom 16	500	1	1	1x4, 1-Lamp, 34w T12, Mag. Ballast, Pendent Mnt., Prismatic Lens	48	0.048	24	4.128	1		No Change	48	0.05	0%	24	$4.13		$0.00	0.00	0	$0.00	0.00
612	Janitor's Storage	500	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	50	8.6	1		No Change	100	0.10	0%	50	$8.60		$0.00	0.00	0	$0.00	0.00

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
242.21	Corridor - Main	3000	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.856	2568	441.696	8		No Change	107	0.86	0%	2568	$441.70		$0.00	0.00	0	$0.00	0.00
142.21	Corridor - Main	3000	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	0.936	2808	482.976	6		No Change	156	0.94	0%	2808	$482.98		$0.00	0.00	0	$0.00	0.00
142	Corridor - 1	3000	1	4	1x4, 4-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.156	468	80.496	1		No Change	156	0.16	0%	468	$80.50		$0.00	0.00	0	$0.00	0.00
241.11	Corridor - 1	3000	3	4	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	104	0.312	936	160.992	3		No Change	104	0.31	0%	936	$160.99		$0.00	0.00	0	$0.00	0.00
221.11	Corridor - 1	3000	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.124	372	63.984	2		No Change	62	0.12	0%	372	$63.98		$0.00	0.00	0	$0.00	0.00
211.37	1	1800	12	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.36	648	111.456	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	30	0.29	20%	518.4	$89.16	$450.00	$450.00	0.07	129.6	$22.29	20.19
211.37	2	1800	16	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.48	864	148.608	16		No Change	30	0.48	0%	864	$148.61		$0.00	0.00	0	$0.00	0.00
612	Toilet Classroom 2	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	180	30.96	1		No Change	100	0.10	0%	180	$30.96		$0.00	0.00	0	$0.00	0.00
3520	Closet Classroom 2	1800	1	2	Ceiling Mount White Globe, 11w CFL Lamp	52	0.052	93.6	16.0992	1		No Change	52	0.05	0%	93.6	$16.10		$0.00	0.00	0	$0.00	0.00
111	3	1800	12	1	1x4, 1-Lamp, 34w T12, Mag. Ballast, Pendent Mnt., Prismatic Lens	48	0.576	1036.8	178.3296	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	48	0.46	20%	829.44	$142.66	$450.00	$450.00	0.12	207.36	$35.67	12.62
612		1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	180	30.96	1		No Change	100	0.10	0%	180	$30.96		$0.00	0.00	0	$0.00	0.00
211.37	7	1800	16	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.48	864	148.608	16	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	30	0.38	20%	691.2	$118.89	$450.00	$450.00	0.10	172.8	$29.72	15.14
211.37	8	1800	16	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.48	864	148.608	16	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	30	0.38	20%	691.2	$118.89	$450.00	$450.00	0.10	172.8	$29.72	15.14
211.37	9	1800	12	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.36	648	111.456	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	30	0.29	20%	518.4	$89.16	$450.00	$450.00	0.07	129.6	$22.29	20.19
211.37	10	1800	12	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Primatic Lens	30	0.36	648	111.456	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	30	0.29	20%	518.4	$89.16	$450.00	$450.00	0.07	129.6	$22.29	20.19
	Totals		350	130			27.8	54,298.6	$9,339	350	15			25.6		50,252.2	$8,643.38		$6,750	2.25	4,046	$696	9.70

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
Herbertsville Elementary School	5331	SHARP NU-U235F2	217	17.5	3,806	51.00	62,034	41.3	9,092	13.40

.= Proposed PV Layout

Notes:

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

PVWatts Program Data Output - Flat Roof Panels

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	51.0 kW
DC to AC Derate Factor:	0.810
AC Rating:	41.3 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	18.3 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.58	3313	606.28
2	3.33	3912	715.90
3	4.31	5463	999.73
4	5.20	6223	1138.81
5	5.85	7107	1300.58
6	6.14	6918	1265.99
7	6.06	6988	1278.80
8	5.54	6422	1175.23
9	4.85	5522	1010.53
10	3.76	4509	825.15
11	2.65	3159	578.10
12	2.23	2767	506.36
Year	4.38	62304	11401.63

Project Name: **LGEA Solar PV Project - 9C110096**
Location: **Herbertsville Elementary School**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$318,757
Annual kWh Production	62,034
Annual Energy Cost Reduction	$11,352
Average Annual SREC Revenue	$23,921

Simple Payback: **9.04** Years

Life Cycle Cost Analysis

Analysis Period (years): 15
Discount Rate: 3%
Average Energy Cost ($/kWh) **$0.183**
Financing Rate: 6.00%

Financing %: 100%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
Average SREC Value ($/kWh) $0.386

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	62,034	$11,352	$0	$34,119	$18,758	$13,521	$13,193	$13,193
2	$0	61,724	$11,693	$0	$33,948	$17,924	$14,355	$13,363	$26,555
3	$0	61,415	$12,044	$0	$30,708	$17,038	$15,240	$10,473	$37,028
4	$0	61,108	$12,405	$0	$27,499	$16,098	$16,180	$7,625	$44,654
5	$0	60,803	$12,777	$626	$27,361	$15,100	$17,178	$7,234	$51,887
6	$0	60,499	$13,160	$623	$27,224	$14,041	$18,237	$7,483	$59,371
7	$0	60,196	$13,555	$620	$24,078	$12,916	$19,362	$4,735	$64,106
8	$0	59,895	$13,962	$617	$23,958	$11,722	$20,556	$5,025	$69,131
9	$0	59,596	$14,381	$614	$20,858	$10,454	$21,824	$2,347	$71,478
10	$0	59,298	$14,812	$611	$20,754	$9,108	$23,170	$2,677	$74,155
11	$0	59,001	$15,256	$608	$17,700	$7,679	$24,599	$71	$74,226
12	$0	58,706	$15,714	$605	$17,612	$6,162	$26,117	$443	$74,669
13	$0	58,413	$16,186	$602	$14,603	$4,551	$27,727	($2,091)	$72,578
14	$0	58,121	$16,671	$599	$14,530	$2,841	$29,438	($1,676)	$70,902
15	$0	57,830	$17,171	$596	$11,566	$1,025	$31,253	($4,137)	$66,765
	Totals:	898,637	$211,139	$6,719	$346,519	$165,416	$318,757	$66,765	$870,697

Net Present Value (NPV) **$57,563**

APPENDIX G

MONTHLY ENERGY CONSUMPTION

By CONCORD ENGINEERING GROUP

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2	**Herbertsville ES**												
Electric													
On-Pk Cons. (kWh)	44,143	43,474	41,299	24,192	27,501	22,679	28,295	29,090	29,085	26,136	32,679	42,726	391,301
On-Pk Demand (kW)	248	248	262	248	210	229	240	243	229	248	248	248	262
Gas													
On-Pk Cons. (therms)	75	67	82	71	78	26	24	28	71	78	75	71	745
On-Pk Demand (therms/hr)	1	1	1	1	1	0	0	0	1	1	1	1	1

Energy Consumption

Building	45,970	Btu/(ft2-year)
Source	133,192	Btu/(ft2-year)
Floor Area	30,673	ft2

Environmental Impact Analysis

CO2	294,485 lbm/year
SO2	800 gm/year
NOX	413 gm/year