RINGWOOD BOARD OF EDUCATION

ROBERT ERSKINE ELEMENTARY SCHOOL

ENERGY ASSESSMENT

FOR
NEW JERSEY
BOARD OF PUBLIC UTILITIES

December 2012

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CHA PROJECT NO. 24736

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REPORT DISCLAIMER

This audit was conducted in accordance with the standards developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) for a Level II audit. Cost and savings calculations for a given measure were estimated to within ±20%, and are based on data obtained from the owner, data obtained during site observations, professional experience, historical data, and standard engineering practice. Cost data does not include soft costs such as engineering fees, legal fees, project management fees, financing, etc.

A thorough walkthrough of the school was performed, which included gathering nameplate information and operating parameters for all accessible equipment and lighting systems. Unless otherwise stated, model, efficiency, and capacity information included in this report were collected directly from equipment nameplates and /or from documentation provided by the owner during the site visit. Typical operation and scheduling information was obtained from interviewing staff and spot measurements taken in the field.

1.0 EXECUTIVE SUMMARY

This energy audit is performed by CHA in connection with the New Jersey Board of Public Utilities' Local Government Energy Audit Program for the Ringwood Board of Education. The purpose of this report is to identify energy savings opportunities associated with major energy consumers and inefficient practices. This report details the results of the energy audit conducted for:

Building Name	Address	Square Feet	Construction Date
Robert Erskine Elementary School	88 Erskine Road Ringwood, NJ 07456	31,700	1960

The potential annual energy and cost savings for each energy conservation measure (ECM) is shown in below in Table 1. Each individual measure's annual savings are dependent on that measure alone, there are no interactive effects calculated. There are three options shown for Lighting ECM savings; only one option can be chosen. Incentives shown (if any) are based only on the SmartStart Incentive Program. Other NJBPU or local utility incentives may also be available/ applicable and are discussed in Section 5.0.

Each measure recommended by CHA typically has a simple payback period of 15 years or less to be consistent with the requirements of the Energy Savings Improvement Plan (ESIP) which has a maximum payback period of 15 years. Occasionally, we will recommend an ECM that has a longer payback period, based on the need to replace that piece(s) of equipment, such as a boiler for example. If the recommended measures are implemented a total potential annual savings of $12,300 may be realized with an average simple payback period of 31.0 years.

Table 1: Summary of Energy Conservation Measures

Summary of Energy Conservation Measures								
Energy Conservation Measure		Approx. Costs ($)	Approx. Savings ($/year)	Payback (Years) w/o Incentive	Potential Incentive ($)*	Payback (Years) w/ Incentive	Recommended
ECM-1a	Replace Window Seals	18,000	1,600	11.3	0	11.3	
ECM-1b	Window Replacements and Reduced Glazing	450,000	2,900	>20	0	>20	
ECM-2	Replace Door Seals	1,700	200	8.5	0	8.5	
ECM-3	Replace (2) Boilers with Condensing Boilers	316,000	3,500	>20	4,000	>20	X
ECM-4	Install VSDs on Hot Water Pumps (5 HP)	9,000	1,100	8.2	2,000	6.4	X
ECM-5	Replace Waste Water Pump Motors with Hi Efficiency Motors	3,000	600	5.0	2,800	0.3	X
ECM-6	Replace Window A/C Unit with Energy Star Equivalent Units	4,200	300	14.0	0	14.0	
ECM-7	Unoccupied Set-Back (72-55)	17,000	900	18.9	0	18.9	
ECM-8	Replace Domestic Hot Water Heater w/ Instantaneous Unit	11,300	200	>20	300	>20	
ECM-9	Lighting Replacement s / Upgrades	54,000	3,000	18.0	5,100	16.5	
ECM-10	Install Lighting Controls (occupancy sensors)	15,000	5,600	2.7	1,900	2.3	
ECM-11	Lighting Replacement s with Lighting Controls	69,000	7,100	9.7	6,500	8.8	X
ECM-12	Convert Electric Dish Washer Booster Heater to NG	15,000	600	>20	0	>20	
ECM-13	Add Dedicated Hood and Fan for Oven	12,000	200	>20	0	>20	

2.0 INTRODUCTION AND BACKGROUND

The Robert Erskine Elementary School is a 31,700 square foot building consisting of two floors. The building was constructed in 1960. The school includes the following spaces: classrooms, offices, multi-purpose room, kitchen, storage, toilet rooms and a media center. The school hours of operation are from 8:45 AM – 11:00 PM Monday through Friday, with various after-school activities and Saturdays 8:00AM to 3:00PM. The school has approximately 236 students and 45 faculty and staff members. The school has 73 computers.

Figure 1: Robert Erskine Elementary School

3.0 UTILITY

Utilities include electricity and natural gas. Electricity is delivered by Orange & Rockland Company and is currently supplied by Direct Energy. The School district participates in an energy purchasing consortium. The consortium started using Direct Energy as the electric supplier for the 2012 school year. Each year the consortium seeks out a supplier with the lowest utility cost. Natural gas is delivered by Public Service Enterprise Group (PSE&G) and supplied by Hess. The school district did not provide bills for its water usage.

For the 12-month period ending in August 2012, the utilities usage for the building was as follows:

Table 2: Actual Cost & Site Utility Usage

Electric		
Annual Usage	252,320	kWh/year
Annual Cost	38,910	$
Blended Rate	0.154	$/kWh
Supply Rate	0.123	$/kWh
Demand Rate	0.953	$/kW
Peak Demand	77.6	kW
Min. Demand	35.2	kW
Avg. Demand	68.7	kW
Natural Gas		
Annual Usage	24,912	Therms/year
Annual Cost	23,041	$
Rate	0.925	$/Therm

Electrical usage was generally higher in the summer months when window air conditioning equipment was operational. Natural gas consumption was highest in winter months for heating. See Appendix A for a detailed utility analysis.

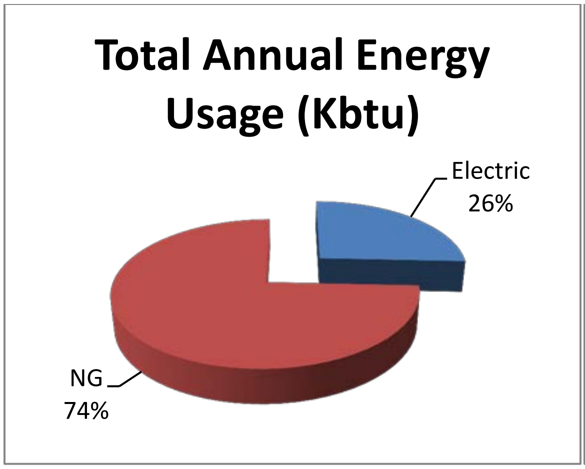


Figure 2: Annual Site Energy Usage

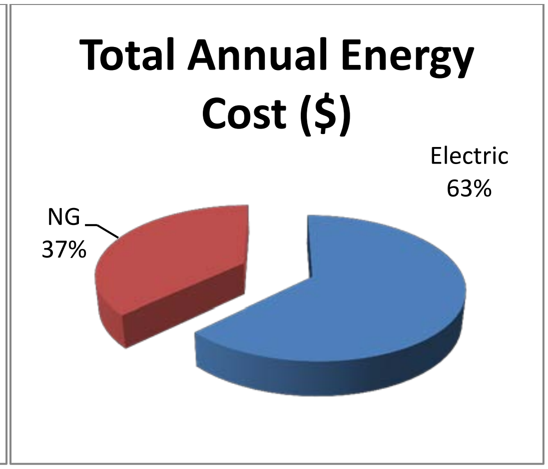


Figure 3: Annual Energy Cost

Under New Jersey's energy deregulation law, the supply portion of the electric (or natural gas) bill is separated from the delivery portion. The supply portion is open to competition, and customers can shop around for the best price for their energy suppliers. The electric and natural gas distribution utilities will still deliver the gas/ electric supplies through their wires and pipes – and respond to emergencies, should they arise – regardless of where those supplies are purchased. Purchasing the energy supplies from a company other than your electric or gas utility is purely an economic decision; it has no impact on the reliability or safety of the service. Additional information on selecting a third party energy supplier is available here:

http://www.state.nj.us/bpu/commercial/shopping.html.

See Appendix A for a list of third-party energy suppliers licensed by the Board of Public Utilities to sell within the building's service area.

4.0 EXISTING CONDITIONS & AREAS OF ENERGY OPPORTUNITY

Energy conservation measures (ECM) are energy savings improvement recommendations that require a financial investment. These recommendations are justified by the energy and/or cost savings realized over time. Operational and maintenance measures (OMM) are low or no cost operational opportunities, which can be implemented to have positive impacts on overall building operation, comfort levels, or energy usage.

4.1 Building Envelope

The original building is built of concrete masonry units with brick veneer. The interior walls are block walls with painted plaster. There is currently no insulation in the walls of the original school.

Windows throughout the school building are operable aluminum framed single glazing windows. The windows seem to be in fair condition. During the site visit it was noted in the kickoff meeting that the windows were installed in 1960 and the infiltration from these windows was significant. The doors were installed at the same time as the windows. They are in fair condition as well. The seals around the doors have deteriorated with time and need to be replaced.

The roof of the school is a four ply built up roofing system on rigid insulation. During the site visit it was noted that the roof was in fair condition.

The following energy conservation measures were identified for building envelope improvements:

4.1.1 ECM-1a Replace Window Seals

The seals around exterior windows over time fail. This leads to unwanted infiltration of unconditioned outside air and exfiltration of conditioned air resulting in increased heating energy usage. This measure calls for the replacement of all exterior window seals.

The school electrical savings are minimal due to the only area having air-conditioning is the media center. There isn’t a kW demand savings as a result. This ECM Does not qualify for Incentive from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-1a Replace Window Seals

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
18,000	0	0	1,700		1,600	0	1,600	(0.6)	0	11.3	11.3

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities.

Expected Life: 5 years
Lifetime Savings: 0 kWh 8,500 therms $ 8,000

This measure is not recommended.

4.1.2 ECM-1b Window Replacements and Reduced Glazing

The facility has 4,500 square feet of window area. These windows are constructed with aluminum frames and single pane glazing. Due to age, construction type, and condition, the windows incur excess air infiltration and provide average thermal resistance to heat transfer. An assessment considered installing aluminum frame with triple pane glazing with internal blinds to decrease energy losses.

The calculation uses bin hours to estimate the occupied and unoccupied bin hours. This is converted to existing energy for the occupied and unoccupied cases using the existing window U-factor and the heating and cooling temperature. The two are summed together to create the annual utility usage for the baseline. The same steps are done to calculate the proposed utility usage. The difference in heating losses through the windows resulted in annual heating.

The school electrical savings are minimal due to the only area having air-conditioning is the media center. There isn't a kW demand savings as a result. This ECM does not qualify for Incentive from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized as follows:

ECM-1b Window Replacements and Reduced Glazing

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
450,000	0	0	3,100		2,900	0	2,900	(0.8)	0	>20	>20

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities.

Expected Life: 30 years
Lifetime Savings: 0 kWh 93,000 therms $ 87,000

This measure is not recommended.

4.1.3 ECM-2 Replace Door Seals

The seals around exterior doors over time fail. This leads to unwanted infiltration of unconditioned outside air and exfiltration of conditioned air resulting in increased heating energy usage. This measure calls for the replacement of all exterior door seals.

The school electrical savings are minimal due to the only area having air-conditioning is the media center. There isn't a kW demand savings as a result. This ECM does not qualify for Incentive from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-2 Replace Door Seals

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
1,700	0	0	200		200	0	200	(0.5)	0	8.5	8.5

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities.

Expected Life: 5 years
Lifetime Savings: 0 kWh 1,000 therms $ 1,000

This measure is not recommended.

4.2 HVAC Systems

4.2.a Heating Hot Water System

Robert Erskine Elementary School has (2) natural gas fired hot water boilers manufactured by Cleaver Brooks. The boilers were installed in 1960 and have a heating output capacity of 2,010 MBH with a thermal efficiency estimated to be 75% due to age of boilers. The boilers operate in a lead / lag fashion and maintenance personnel alternate the lead and lag boilers. The boilers are set to fire when the temperature drops below 60F during the months of October through May. The boilers are completely shut down the remaining months. Hot water is pumped by (2) 5.0 HP pumps that also operate in lead/lag to provide heating to the building. The classrooms are heated by unit ventilators having hot water coils. The gymnasium is heated by (1) Trane heating & ventilation (HV) unit. The Unit Ventilators and HV unit are controlled by pneumatic valves, dampers and actuators. The pneumatic controls are not precise due to the age of the system.

Specifics on mechanical equipment can be found within the equipment inventory located in Appendix B.

4.2.b Direct Expansion (DX) and Split System Cooling Systems

Cooling is provided to the Media Center by retrofitting a unit ventilator to work in conjunction with condensing unit (CU) located in the courtyard of the building. There was no nameplate present and therefore no information could be obtained regarding the model or cooling capacity of the unit. Sixteen (16) spaces in the building have window A/C units that provide cooling on hot days. These units are controlled by the personnel. There is no cooling in the cafeteria or gymnasium.

Specifics on mechanical equipment can be found within the equipment inventory located in Appendix B.

The following ECMs were identified as HVAC system improvements:

4.2.1 ECM-3 Replace Boilers

Two (2) Cleaver Brooks P142-60 hot water boilers, have inputs of 2,010,000 BTU and estimated 75% efficiency based on the age of boilers. They were installed in 1960 and are in fair condition. This ECM would involve replacing the existing boilers with two (2) 2,000 MBH condensing boilers. Condensing boilers operate at higher efficiencies when producing lower water temperatures, typically in the 92-96% range. The increased system efficiency will result in lower natural gas usage. The proposed boiler replacement will involve piping and wiring modifications as well as new venting and combustion air ducting.

This ECM is eligible for an incentive up to $4,000 from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-3 Replace (2) Condensing Boilers

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive *	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
316,000	0	0	3,800		3,500	0	3,500	(0.7)	4,000	>20	>20

* Incentive shown is per the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities

Expected Life: 25 years

Lifetime Savings: 0 kWh 95,000 therms $ 87,500

This measure is recommended due to age of boilers.

4.2.2 ECM-4 Install VFDs on Hot water Pumps

The hot water system is served by two (2) 5 HP pumps. The pumps are constant volume with standard efficiency motors. The hot water system pumps operate at a constant speed (constant water flows) even though the building load does not require all of the flow to maintain temperatures. By adding variable speed drives (VSDs) and inverter duty premium efficiency motors, and reducing the flow (by slowing the motors down), significant electrical energy can be saved.

The calculation use a system “on” set point of 55°F and bin weather data to estimate the heating hours of the building for the year. It was calculated that the heating hours are

4,887. The assumption of this calculation is that the operating hours, motor horsepower, and capacity stay the same.

This ECM is eligible for an incentive up to $2,000 from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-4 Install VFDs on Hot water Pumps (5 HP)

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
12,000	0.1	8,800	0		1,100	0	1,100	0.9	2,000	10.9	9.1

* Incentive shown is per the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities

Expected Life: 15 years
Lifetime Savings: 132,000 kWh 0 therms $ 16,500

This measure is recommended.

4.2.3 ECM-5 Replace Waste Water Pump Motors with High Efficiency Motors

The hot water treatment plant uses two (2) 5 HP and two (2) 1.5 HP pumps. The pumps are constant volume with 84% efficiency motors. The hot water system pumps operate at a constant speed (constant water flows). By adding inverter duty premium efficiency motors with an estimated efficiency of 90% for the 5 HP and 86% for the 1.5 HP pumps, significant electrical energy can be saved.

The calculation uses electrical nameplate data (HP) from the motor, efficiency and the runtime hours to estimate the annual electrical usage in kWh. The proposed annual electrical usage in kWh is calculated from converting the electrical nameplate data (HP) from the motor to kW using the efficiency multiplied by the runtime hours. The difference between the two values is the energy savings.

This ECM is eligible for an incentive up to $2,800 from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-5 Replace Waste Water Pump Motors with Hi Efficiency Motors

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
3,000	0.5	4,400	0		600	0	600	2.1	2,800	5.0	0.3

* Incentive shown is per the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities

Expected Life: 15 years

Lifetime Savings: 66,000 kWh   0 therms $ 9,000

This measure is recommended.

4.2.4 ECM-6 Replace Window A/C units w/Energy Star Units

The school has 16 one ton window mounted A/C units. However, this measure assessed replacing the window units with newer Energy Star appliances to be installed by the maintenance staff.

The assumption of this calculation is that the operating hours and capacity stay the same. The energy saving results from operating a higher efficiency unit.

This ECM does not qualify for Incentive from the New Jersey SmartStart Program. There isn't a kW savings because the units are not operated simultaneously.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-6 Replace Window A/C units w/Energy Star Units

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
4,000	0	1,800	0		300	0	300	(0.2)	0	13.3	13.3

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities.

Expected Life: 12 years

Lifetime Savings: 21,600 kWh   0 therms $ 3,300

This measure is not recommended.

4.3 Control Systems

The building does not have a direct digital control system. The hydronic heating system including the classroom unit ventilators and the steam boiler utilize pneumatic controls.

The system includes valves, actuators and dampers controlled through the use of a 5 horsepower air compressor. The pneumatic system is old and outdated, does not function correctly and has depreciated with age. The rooftop units have their own thermostats.

Typical set points range between 70 and 72° F. There is no unoccupied set point and the school is set to turn on automatically when the outside temperature drops below 60 °F during the heating season between October and May. The majority of the school is not cooled. The window air conditioning units that are used are manually controlled by teachers in those classrooms.

The following ECMs identified are improvements to the school's HVAC control system:

4.3.1 ECM-7 Add Unoccupied Set-back Schedule

School maintenance personnel indicated that the Robert Erskine Elementary School's hydronic heating system maintains indoor temperatures of 70-72 °F whenever outside temperatures dip below 60°F even during unoccupied times including nights and weekends. Significant savings could be had by through the implementation of unoccupied setback timers.

The annual natural gas usage for the facility was taking from the utility bills. According to the US Energy Information Agency (EIA), implementing a night setback system typically saves 5% of a facility's annual heating cost. This savings is multiplied by the annual natural gas and converted to monetary savings using the unit cost of the fuel obtained from the utility analysis.

Savings are seen from temperature scheduling for occupied and unoccupied hours. This ECM does not qualify for Incentive from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-7 Unoccupied Set-Back (72-55 °F)

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
17,000	0	0	1,000	900	0	900	(0.2)	0	18.9	18.9

* There is no incentive available through the New Jersey Smart Start Programs for this ECM. See section 5.0 for other incentive opportunities.

Expected Life: 10 years

Lifetime Savings: 0 kWh 10,000 therms $ 9,000

This measure is not recommended.

4.4 Domestic Hot Water System

Robert Erskine Elementary School has two domestic hot water heater located in the mechanical room and the water treatment plant office. The water heater in the mechanical room is an A.O. Smith (BT 251-880) natural gas fired commercial domestic hot water heater with a capacity of 80 gallons with 80% efficiency and an input of 240,000 BTU. This water heater is in fair condition. The domestic hot water heater serves the kitchen, toilet rooms and sinks located throughout the school. The water heater in the water treatment plant office is a Bradford White (M16U6SS-1NA1) electric commercial domestic hot water heater with a capacity of 6 gallons and an input of 120V. The domestic hot water heater serves the sinks located in the office. This water heater is in good condition

The following ECM identifies an improvement to the school's Domestic Hot Water System:

4.5 ECM-8 Replace Domestic Hot Water Heater with Instantaneous unit

The school utilizes an 80 gallon, 240,000 BTU A.O Smith BT 251-880 domestic hot water heater (DWH). The DHW is 80% efficiency and is past it useful life according to ASHRAE. This ECM assesses replacing this DWH with a more efficient tankless type domestic water heater sized to meet the DHW requirements of the building.

According to the U.S. Department of Energy, 2.5% of stored capacity is lost every hour during DHW heater standby. This value was applied to the total volume to determine annual standby losses. Proposed efficiency was based on a typical high efficiency natural gas condensing type hot water heater. The new water heater will require water and gas piping modifications, venting, and electrical connections.

This ECM is eligible for an incentive up to $300 from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-8 Replace Domestic Hot Water Heater w/ Instantaneous unit

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
11,300	0	0	200		200	0	200	(0.8)	300	>20	>20

* Incentive shown is per the New Jersey SmartStart Install Program. See section 5.0 for other incentive opportunities.

Expected Life: 12 years

Lifetime Savings: 0 kWh 2,400 therms $ 2,400

This measure is not recommended.

4.6 Lighting/Electrical Systems

The majority of the lighting in the elementary school is compact florescent lighting (CFLs) with electronic ballasts and incandescent lamps. The school utilizes 34 watt T-8 fluorescent tube fixtures for offices, multipurpose room, hallways, and classrooms and 60 W incandescent bulbs for storage closets and various restrooms. The building exterior utilizes a 400W metal halide wall packs that are controlled by a timer.

Robert Erskine School utilizes 55 computers throughout the building in classrooms, offices, media centers and computer labs. All of the computers have flat screen LCD monitors.

The following ECMs identified are improvements to Robert Erskine Elementary School's lighting and electrical system:

4.6.1 ECM-9 Lighting Replacement / Upgrades

The majority of the lighting in the elementary school is compact florescent lighting (CFLs) with electronic ballasts and incandescent lamps. The school utilizes 34 watt T-8 fluorescent tube fixtures for offices, multipurpose room, hallways, and classrooms and 60 W incandescent bulbs for storage closets and various restrooms.

Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to estimated times of operation. The difference between energy requirements resulted in a total annual savings of 18,300 kWh with an electrical demand reduction of about 6.4 kW. These calculations are based upon 1 to 1 replacements with the fixtures. They do not take into account lumen output and square footage. A more comprehensive study may be performed to determine correct lighting levels.
Supporting calculations, including assumptions for lighting hours and annual energy usage for each fixture, are provided in Appendix C.

This ECM is eligible for an incentive up to $4,600 from the New Jersey SmartStart Program to upgrade the T-8 lamps to high efficiency T-8s and the incandescent bulbs to compact florescent spirals.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-9 Lighting Replacement / Upgrades

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive *	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
54,000	6.4	18,300	0		3,000	0	3,000	(0.2)	4,600	18.0	16.5

* Incentive shown is per the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities.

Expected Life: 15 years
Lifetime Savings: 274,500 kWh 0 therms $ 45,000

This measure is not recommended in lieu of ECM-11.

4.6.2 ECM-10 Install Lighting Controls (Occupancy Sensors)

Review of the comprehensive lighting survey determined that lighting in classrooms and various other spaces are typically operational, regardless of occupancy. Therefore, installing an occupancy sensor in these spaces to turn off lights when the areas are unoccupied was assessed.

This measure recommends installing occupancy sensors for the current lighting system. Using a process similar to that utilized in section 4.5.1, the energy savings for this measure was calculated by applying the known fixture wattages in the space to the estimated existing and proposed times of operation for each fixture. The difference between the two values resulted in an annual savings of 43,600 kWh.

There isn't a kW savings for this calculation because the same lamps are being used and the sensors are just reducing the This ECM is eligible for an incentive up to $1,900 from the New Jersey SmartStart Program.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-10 Install Lighting Controls (Occupancy Sensors)

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive *	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
15,000	0	45,400	0		5,600	0	5,600	6.2	1,900	2.7	2.3

* Incentive shown is per the New Jersey Direct Install Program. See section 5.0 for other incentive opportunities.

Expected Life: 15 years
Lifetime Savings: 681,000 kWh 0 therms $84,000

This measure is not recommended in lieu of ECM-11.

4.6.3 ECM-11 Lighting Replacements with Controls (Occupancy Sensors)

This measure is a combination of ECM-9 and ECM-10; recommending replace/upgrade the current lighting fixtures to more efficient ones and installing occupancy sensors on the new lights. Interactive effects of the higher efficiency lights and occupancy sensors lead the energy and cost savings for this measure to not be cumulative or equivalent to the sum of replacing the lighting fixtures alone and installing occupancy sensors without the lighting upgrade. The calculated annual savings is 51,900 kWh with a demand reduction of 6.4 kW at a total of $7,100.

This ECM is eligible for an incentive up to $6,500 from the New Jersey SmartStart Program to install occupancy sensors, upgrade the T-8 lamps to high efficiency T-8s and the incandescent bulbs to compact florescent spirals.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-11 Lighting Replacements with Controls (Occupancy Sensors)

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive *	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
69,000	6.4	51,900	0		7,100	0	7,100	0.5	6,500	9.7	8.8

* Incentive shown is per the New Jersey Direct Install Program. See section 5.0 for other incentive opportunities.

Expected Life: 15 years

Lifetime Savings: 778,500 kWh 0 therms $106,500

This measure is recommended.

4.7 Plumbing Systems

Faucets, toilets and urinals installed before the 90s consume more water than modern plumbing fixtures. On average faucets installed before the 90s have a flow rate of 3 gallons per minute (gpm), urinals consume approximately 3 gallons per flush (gpf) and toilets typically use 5.5 gpf. Newer toilets use 1.6 gpf, newer urinals consume 1.0 gpf and newer sinks use 0.5 gpm.

There are no ECMs associated with the plumbing system because the school uses well water and does not pay a utility for it.

4.8 Kitchen Equipment

Cooking equipment for the kitchen within the school runs partly on electricity and partly on natural gas. This includes the exhaust hoods, stove, oven, dishwasher, and dishwasher booster heater. There isn't any walk-in cooler / freezers on site.

The following ECMs identified are improvements to Robert Erskine Elementary School's kitchen equipment:

4.8.1 ECM-12 Convert Electric Dish Washer Booster Heater to Natural Gas

The school uses a 10.4 kW electric heater for drying dishes. This electric heater has 8 1.3 KW heating elements. The facility uses this heater for four hours per day for 180 days per year. Utilizing natural gas for the heater was assessed.

The calculation uses electrical consumption and annual electrical cost as the baseline, which was converted to natural gas for the proposed case. The difference between the two values is the energy savings.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-12 Convert Electric Dish Washer Booster Heater to Natural Gas

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
15,000	25.0	4,200	(200)		600	0	600	1.6	0	>20	>20

* Does not qualify for an Incentive per the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities.

Expected Life: 12 years

Lifetime Savings: 51,400 kWh (2,400) therms $ 7,200

This measure is not recommended.

4.8.2 ECM-13 Add Dedicated Hood and Fan for Oven

There is an oven in the kitchen that needs an independent exhaust hood. To save money a contractor tied the exhaust system for the oven into the hood exhaust for the stove. The hood exhaust utilizes a 1 HP exhaust fan that would typically run 4 hours per day but is required to run continuously for the oven. This ECM will address putting the oven on an independent exhaust system.

The calculation uses electrical nameplate data (HP) from the exhaust fan and the runtime hours to estimate the annual electrical usage in kWh. A new motor is selected for the oven exhaust based on the amount of air that can travel through an 8"D duct. The proposed annual electrical usage in kWh is calculated from converting the electrical nameplate data (HP) from the new exhaust fan multiplied by the runtime hours. The difference between the two values is the energy savings.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-13 Add Dedicated Hood and Fan for Oven Convert Electric

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive *	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas		Total						
$	kW	kWh	Therms		$	$	$		$	Years	Years
12,000	0.6	1,000	0		190	0	190	(0.8)	0	>20	>20

* Does not qualify for an Incentive per the New Jersey SmartStart Program. See section 5.0 for other incentive opportunities.

Expected Life:	15	years				
Lifetime Savings:	15,000	kWh	0	therms		$ 2,400

This measure is not recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance Program

The facility will be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives are available from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects applied to facilities whose demand in any of the preceding 12 months exceeds 100 kW. This average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations, however. Facilities that meet this criterion must also achieve a minimum performance target of 15% energy reduction by using the EPA Portfolio Manager benchmarking tool before and after implementation of the measure(s). If the participant is a municipal electric company customer, and a customer of a regulated gas New Jersey Utility, only gas measures will be eligible under the Program. Available incentives are as follows:

Incentive #1: Energy Reduction Plan – This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP).

- Incentive Amount: $0.10/SF
- Minimum incentive: $5,000
- Maximum Incentive: $50,000 or 50% of Facility annual energy cost

The standard incentive pays $0.10 per square foot, up to a maximum of $50,000, not to exceed 50% of facility annual energy cost, paid after approval of application. For building audits funded by the New Jersey Board of Public Utilities, which receive an initial 75% incentive toward performance of the energy audit, facilities are only eligible for an additional $0.05 per square foot, up to a maximum of $25,000, rather than the standard incentive noted above.

Incentive #2: Installation of Recommended Measures – This incentive is based on projected energy savings as determined in Incentive #1 (Minimum 15% savings must be achieved), and is paid upon successful installation of recommended measures.

<u>Electric</u>

- Base incentive based on 15% savings: $0.09/ per projected kWh saved.
- For each % over 15% add: $0.005 per projected kWh saved.
- Maximum incentive: $0.11/ kWh per projected kWh saved

<u>Gas</u>

- Base incentive based on 15% savings: $0.90/ per projected Therm saved.
- For each % over 15% add: $0.05 per projected Therm saved.
- Maximum incentive: $1.25 per projected Therm saved

Incentive cap: 25% of total project cost

Incentive #3: Post-Construction Benchmarking Report – This incentive is paid after acceptance of a report proving energy savings over one year utilizing the Environmental Protection Agency (EPA) Portfolio Manager benchmarking tool.

Electric

- Base incentive based on 15% savings: $0.09/ per projected kWh saved.
- For each % over 15% add: $0.005 per projected kWh saved.
- Maximum incentive: $0.11/ kWh per projected kWh saved

Gas

- Base incentive based on 15% savings: $0.90/ per projected Therm saved.
- For each % over 15% add: $0.05 per projected Therm saved.
- Maximum incentive: $1.25 per projected Therm saved

Combining incentives #2 and #3 will provide a total of $0.18/ kWh and $1.8/therm not to exceed 50% of total project cost. Additional incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above the 15% minimum target to 20%, calculated with the EPA Portfolio Manager benchmarking tool, not to exceed 50% of total project cost.

Total P4P incentives are summarized below:

	Incentives $		
	Electric	**Gas**	**Total**
Incentive #1	$0	$0	$5,000
Incentive #2	$7,821	$12,357	$20,178
Incentive #3	$7,821	$12,357	$20,178
Total	**$15,643**	**$24,714**	**$45,357**

The current ECM's meet the minimum savings requirement of 15% for the Pay for Performance Program and therefore the building would be eligible for incentives#1, #2 and #3. See Appendix D for additional details.

5.1.2 New Jersey Smart Start Program

For this energy audit, incentives for applicable ECM's shown are calculated using the 2012 New Jersey Smart Start Incentive program. This program provides incentives for mechanical and electrical equipment upgrades. If the School District wishes to and is eligible to participate in the Energy Savings Plan (ESIP program and/or the Pay for Performance Incentive Program (P4P), It cannot participate in either the Smart Start or Direct Install Programs as well.

5.1.3 Direct Install Program

The Direct Install Program applies to facilities that have a peak electrical demand of 150 kW or less in any of the previous 12 months. Buildings must be located in New Jersey and served by one of the state's public, regulated electric utility companies.

Direct Install is funded through New Jersey's Clean Energy Program and is designed to provide capital for building energy upgrade projects to fast track implementation. The program will pay up to 70% of the costs for lighting, HVAC, motors, refrigeration, and other equipment upgrades with higher efficiency alternatives. If a building is eligible for this funding, the Direct Install Program can reduce the implementation cost of energy conservation projects.

The program pays a maximum amount of $75,000 per building, and up to $250,000 per customer per year. Installations must be completed by a Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website at http://www.njcleanenergy.com. Contractors will coordinate with the applicant to arrange installation of recommended measures identified in a previous energy assessment, such as this document.

This school is eligible to receive funding from the Direct Install Program because the electrical demand is less than the maximum peak electrical demand of 150 kW in the last 12 month period.

5.1.4 Energy Savings Improvement Plans (ESIP)

The Energy Savings Improvement Program (ESIP) allows government agencies to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. Under the recently enacted Chapter 4 of the Laws of 2009 (the law), the ESIP provides all government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources.

ESIP allows local units to use “energy savings obligations” to pay for the capital costs of energy improvements to their facilities. This can be done over a maximum term of 15 years. Energy savings obligations are not considered “new general obligation debt” of a local unit and do not count against debt limits or require voter approval. They may be issued as refunding bonds or leases. Savings generated from the installation of energy conservation measures pay the principal of and interest on the bonds; for that reason, the debt service created by the ESOs is not paid from the debt service fund, but is paid from the general fund.

For local governments interested in pursuing an ESIP, the first step is to perform an energy audit. Pursuing a Local Government Energy Audit through New Jersey's Clean Energy Program is a valuable first step to the ESIP approach. The “Local Finance Notice” outlines how local governments can develop and implement an ESIP for their facilities (see Appendix E). The ESIP can be prepared internally if the entity has qualified staff. If not, the ESIP must be implemented by an independent contractor and not by the energy savings company producing the Energy Reduction Plan.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Local units should carefully consider all alternatives to develop an approach that best meets their needs.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Solar

6.1.1 Photovoltaic Rooftop Solar Power Generation

The facility was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a solar cell array. However, there is not sufficient room to accommodate a system that will provide the entire electrical demand of the building. For this analysis we will consider a 90.0 KW system.

The PVWATTS solar power generation model was utilized to calculate PV power generation; this model is provided in Appendix E.

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. There is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. Renewable Energy Consultants estimates an average of $55/ SREC for 2012 and this number was utilized in the cash flow for this report.

The system costs for PV installations were derived from contractor budgetary pricing in the state of New Jersey for estimates of total cost of system installation. It should be noted that the cost of installation is currently about $4.00 per watt or $4,000 per kW of installed system, for a 90 kW system. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

The implementation cost and savings related to this ECM are presented in Appendix E and summarized as follows:

Photovoltaic (PV) Rooftop Solar Power Generation – 90.0 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total					
$	kW	kWh	Therms	$	$	$	$	Years	Years
360,000	90.0	115,200	0	17,741	17,740	0	6,336	>20	15.0

** Estimated Solar Renewable Energy Certificate Program (SREC) at $55/1000 kWh

This measure is not recommended due to the long payback time. It is suggested, however, that the school continue to monitor the SREC credits and evaluate the PV installation again should the SREC credit values increase.

6.1.2 Solar Thermal Hot Water Plant

Active solar thermal systems use solar collectors to gather the sun's energy to heat water, another fluid, or air. An absorber in the collector converts the sun's energy into heat. The heat is then transferred by circulating water, antifreeze, or sometimes air to another location for immediate use or storage for later utilization. Applications for active solar thermal energy include providing hot water, heating swimming pools, space heating, and preheating air in residential and commercial buildings.

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production. DHW is presently produced by gas-fired water heaters and, therefore, this measure would offer natural gas utility savings.

6.2 Wind

Small wind turbines use a horizontal axis propeller, or rotor, to capture the kinetic energy of the wind and convert it into rotary motion to drive a generator which usually is designed specifically for the wind turbine. The rotor consists of two or three blades, usually made from wood or fiberglass. These materials give the turbine the needed strength and flexibility, and have the added advantage of not interfering with television signals. The structural backbone of the wind turbine is the mainframe, and includes the slip-rings that connect the wind turbine, which rotates as it points into changing wind directions, and the fixed tower wiring. The tail aligns the rotor into the wind.

To avoid turbulence and capture greater wind energy, turbines are mounted on towers. Turbines should be mounted at least 30 feet above any structure or natural feature within 300 feet of the installation. Smaller turbines can utilize shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Tower designs include tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also provide towers.

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a $3.20 per kWh incentive. Systems producing over 16,000 kWh will receive $51,200 for the first 16,000 kWh of production with an additional $0.50 per kWh up to a maximum cap of 750,000 kWh per year.

This measure is not recommended due to space and code requirements.

6.3 Geothermal

Geothermal heat pumps (GHP) transfer heat between the constant temperature of the earth and the building to maintain the building's interior space conditions. Below the surface of the earth throughout New Jersey the temperature remains in the low 50°F range throughout the year. This stable temperature provides a source for heat in the winter and a means to reject excess heat in the summer. With GHP systems, water is circulated between the building and the piping buried in the ground. The ground heat exchanger in a GHP system is made up of a closed or open loop pipe system. Most common is the closed loop in which high density polyethylene pipe is buried horizontally at 4-6 feet deep or vertically at 100 to 400 feet deep. These pipes are filled with an environmentally friendly antifreeze/water solution that acts as a heat exchanger. In the summer, the water picks up heat from the building and moves it to the ground. In the winter the system reverses and fluid picks up heat from the ground and moves it to the building. Heat pumps make collection and transfer of this heat to and from the building possible.

To take advantage of a GHP system, the existing mechanical equipment would have to be removed or overhauled; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

This measure is not recommended because the extent of HVAC system renovation needed for implementation greatly outweighs the savings over the life of the equipment.

6.4 Combined Heat and Power Generation (CHP)

Combined heat and power, cogeneration, is self-production of electricity on-site with beneficial recovery of the heat byproduct from the electrical generator. Common CHP equipment includes reciprocating engine-driven, micro turbines, steam turbines, and fuel cells. Typical CHP customers include industrial, commercial, institutional, educational institutions, and multifamily residential facilities. CHP systems that are commercially viable at the present time are sized approximately 50 kW and above, with numerous options in blocks grouped around 300 kW, 800 kW, 1,200 kW and larger. Typically, CHP systems are used to produce a portion of the electricity needed by a facility some or all of the time, with the balance of electric needs satisfied by purchase from the grid.

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location. The facility has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter, thermal usage during the summer months is low. Thermal energy produced by the CHP plant in the warmer months will be wasted. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building. The most viable selection for a CHP plant at this location would be a reciprocating engine natural gas-fired unit. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended based on the relatively low electrical and thermal usage of the school, the lack of a need for simultaneous heating and cooling and the low occupancy during the summer months.

6.5 Biomass Power Generation

Biomass power generation is a process in which waste organic materials are used to produce electricity or thermal energy. These materials would otherwise be sent to the landfill or expelled to the atmosphere. To participate in NJCEP's Customer On-Site Renewable Energy program, participants must install an on-site sustainable biomass or fuel cell energy generation system. Incentives for bio-power installations are available to support up to 1MW-dc of rated capacity.

*Class I organic residues are eligible for funding through the NJCEP CORE program. Class I wastes include the following renewable supply of organic material:

- Wood wastes not adulterated with chemicals, glues or adhesives
- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes
- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

- Digestion of sewage sludge
- Landfill gas facilities
- Combustion of wood wastes to steam turbine
- Gasification of wood wastes to reciprocating engine
- Gasification or pyrolysis of bio-solid wastes to generation equipment

* from NJOCE Website

This measure is not recommended due to noise issues and because the facility does not have a steady waste stream to utilize as a fuel source.

6.6 Demand Response Curtailment

Presently, Electricity is delivered by Public Service Electric and Gas (PSE&G), which receives the electricity from regional power grid RFC. PSE&G is the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia including the State of New Jersey.

Utility Curtailment is an agreement with the utility provider’s regional transmission organization and an approved Curtailment Service Provider (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator; therefore, reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and utility provider offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run emergency generators with notice to test the system.

A pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. From July 2011 through August 2012 the facility had a peak electricity demand of 77.6 kW and a minimum of 35.2 kW. The monthly average over the observed 12 month period was 68.7 kW.

This measure is not recommended.

7.0 EPA PORTFOLIO MANAGER

The EPA Portfolio Manager benchmarking tool was used to assess the building's energy performance. Portfolio Manager provides a site and source Energy Use Intensity (EUI), as well as an Energy Star performance rating for qualifying building types. The EUIs are provided in kBtu/ft^2/year, and the performance rating represents how energy efficient a building is on a scale of 1 to 100, with 100 being the most efficient. In order for a building to receive and Energy Star label, the energy benchmark rating must be at least 75. As energy use decreases from implementation of the proposed measures, the Energy Star rating will increase.

The site EUI is the amount of heat and electricity consumed by a building as reflected in utility bills. Site energy may be delivered to a facility in the form of primary energy, which is raw fuel burned to create heat or electricity, such as natural gas or oil; or as secondary energy, which is the product created from a raw fuel such as electricity or district steam. To provide an equitable comparison for different buildings with varying proportions of primary and secondary energy consumption, Portfolio Manager uses the convention of source EUIs. The source energy also accounts for losses incurred in production, storage, transmission, and delivery of energy to the site, which provide an equivalent measure for various types of buildings with differing energy sources. The results of the Portfolio Manager benchmarking tool are contained in the table below.

Building	Site EUI kBtu/ft^2/yr	Source EUI Btu/ft^2/yr	Energy Star Rating (1-100)
Robert J Erskine Elementary School	106	173	28

The Robert Erskine Elementary School has an above average site EUI and therefore a below average Energy Star Rating Score of 28 (50 being the median score). This is most likely attributed to the poor windows and antiquated boilers. By implementing the measures discussed in this report, it is expected that the EUI can be reduced and the Energy Star Rating increased.

The Portfolio Manager account can be accessed by entering the username and password shown below at the login screen of the Portfolio Manager website (https://www.energystar.gov/istar/pmpam/).

[redacted]

A full EPA Energy Star Portfolio Manager Report is located in Appendix G.

[redacted]

8.0 CONCLUSIONS & RECOMMENDATIONS

The LGEA energy audit conducted by CHA at the Robert Erskine Elementary School identified potential annual savings of $12,300 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

Summary of Energy Conservation Measures							
Energy Conservation Measure		**Approx. Costs ($)**	**Approx. Savings ($/year)**	**Payback (Years) w/o Incentive**	**Potential Incentive ($)***	**Payback (Years) w/ Incentive**	**Recommended**
ECM -3	Replace (2) Boilers with Condensing Boilers	316,000	3,500	>20	4,000	>20	X
ECM -4	Install VSDs on Hot Water Pumps (5 HP)	9,000	1,100	8.2	2,000	6.4	X
ECM -5	Replace Waste Water Pump Motors with Hi Efficiency Motors	3,000	600	5.0	2,800	0.3	X
ECM 11	Lighting Replacement s with Lighting Controls (occupancy sensors)	69,000	7,100	9.7	6,500	8.8	X

APPENDIX A

Utility Usage Analysis

Ringwood BOE
88 Erskine Road, Ringwood, NJ 07456

Annual Utilities

12-month Summary

Electric		
Annual Usage	252,320	kWh/yr
Annual Cost	38,910	$
Blended Rate	0.154	$/kWh
Consumption Rate	0.123	$/kWh
Demand Rate	9.53	$/kW
Peak Demand	77.6	kW
Min. Demand	35.2	kW
Avg. Demand	68.7	kW
Natural Gas		
Annual Usage	24,912	Therms/yr
Annual Cost	23,041	$
Rate	0.925	$/Therm

Ringwood BOE
88 Erskine Road, Ringwood, NJ 07456

Utility Bills: Account Numbers

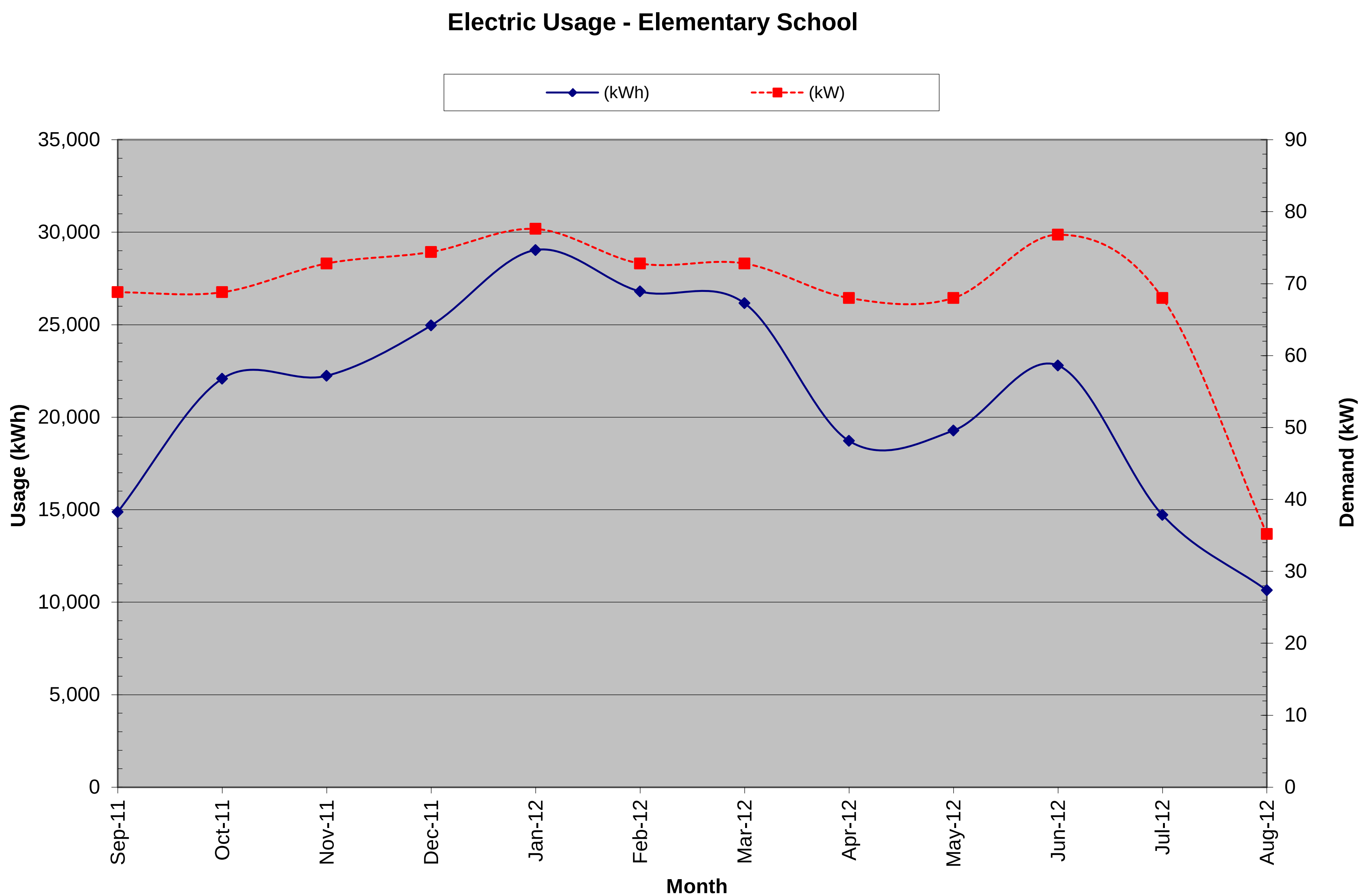
Account Number	School Building	Location	Type	Notes
67933-10000	Robert Erskine School	88 Erskine Road, Ringwood, NJ 07456	Electricity	
67 602 530 00	Robert Erskine School	88 Erskine Road, Ringwood, NJ 07456	Natural Gas	
	Robert Erskine School	88 Erskine Road, Ringwood, NJ 07456	Water	

Ringwood BOE
88 Erskine Road, Ringwood, NJ 07456

For Service at: **Robert Erskine School**
Account No.: **67933-10000** **Delivery -** Orange & Rockland Electric Company
Meter No.: **95800048** **Supplier -** Direct Energy
Electric Service

			Provider Charges			Usage (kWh) vs. Demand (kW) Charges		Unit Costs		
Month	**Consumption (kWh)**	**Demand (kW)**	**Delivery ($)**	**Supplier ($)**	**Total ($)**	**Consumption ($)**	**Demand ($)**	**Blended Rate ($/kWh)**	**Consumption ($/kWh)**	**Demand ($/kW)**
September-11	14,880	68.80	2,793.24		2,793.24	2,074.86	718.38	0.19	0.14	10.44
October-11	22,080	68.80	3,291.28		3,291.28	2,618.83	672.45	0.15	0.12	9.77
November-11	22,240	72.80	3,306.34		3,306.34	2,608.00	698.34	0.15	0.12	9.59
December-11	24,960	74.40	3,637.60		3,637.60	2,922.77	714.83	0.15	0.12	9.61
January-12	29,040	77.60	4,118.23		4,118.23	3,370.46	747.77	0.14	0.12	9.64
February-12	26,800	72.80	3,826.22		3,826.22	3,127.88	698.34	0.14	0.12	9.59
March-12	26,160	72.80	3,757.75		3,757.75	3,059.41	698.34	0.14	0.12	9.59
April-12	18,720	68.00	2,854.33		2,854.33	2,205.43	648.90	0.15	0.12	9.54
May-12	19,280	68.00	2,918.65		2,918.65	2,269.75	648.90	0.15	0.12	9.54
June-12	22,800	76.80	3,511.94		3,511.94	2,743.68	768.26	0.15	0.12	10.00
July-12	14,720	68.00	2,470.54	978.87	3,449.41	2,775.31	674.10	0.23	0.19	9.91
August-12	10,640	35.20	740.94	703.73	1,444.67	1,284.30	160.37	0.14	0.12	4.56
Total (All)	**252,320**	**77.60**	**$37,227.06**	**$1,682.60**	**$38,909.66**	**$31,060.68**	**$7,848.98**	**$0.15**	**$0.12**	**$9.53**
Total (last 12-months)	**252,320**	**77.60**	**$37,227.06**	**$1,682.60**	**$38,909.66**	**$31,060.68**	**$7,848.98**	**$0.15**	**$0.12**	**$9.53**
Notes	1	2	3	4	5	6	7	8	9	10

1.) Number of kWh of electric energy used per month
2.) Number of kW of power measured
3.) Electric charges from Delivery provider
4.) Electric charges from Supply provider
5.) Total charges (Delivery + Supplier)
6.) Charges based on the number of kWh of electric energy used
7.) Charges based on the number of kW of power measured
8.) Total Charges ($) / Consumption (kWh)
9.) Consumption Charges ($) / Consumption (kWh)
10.) Demand Charges ($) / Demand (kW)

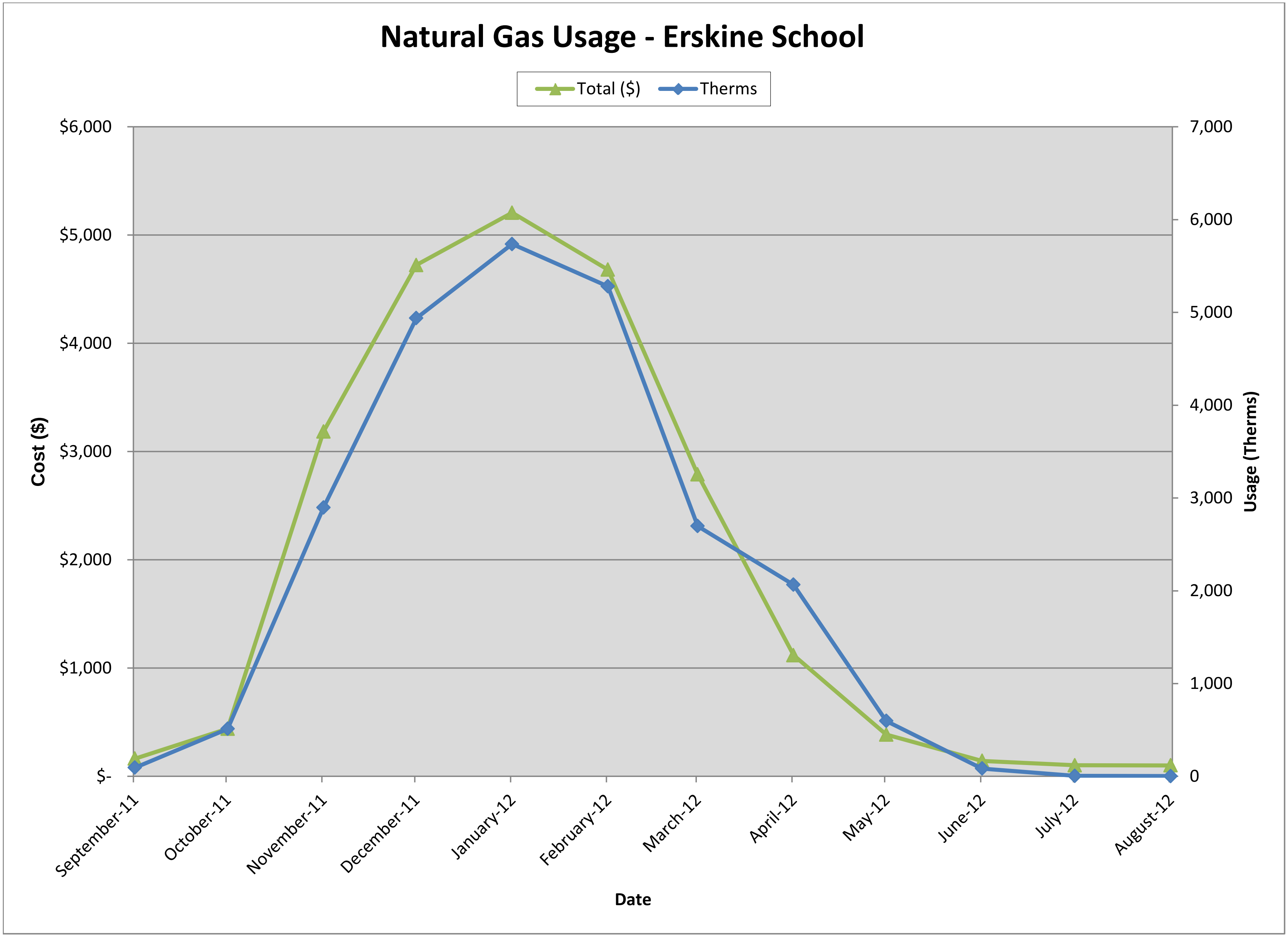


Erskine ES - Utility Data.xlsx
Electric Graph

Ringwood BOE
88 Erskine Road, Ringwood, NJ 07456

For Service at:	**Robert Erskine School**	
Meter #:	**2523428**	
Natural Gas Service		**Account No.**
Delivery -	**PSEG**	**67 602 530 00**
Supplier -	**Hess**	**446675/447466**

Month	Total ($)	Supply ($)	Delivery ($)	Therms	$/Therm
September-11	$ 163.92	$ 51.62	$ 112.30	94.13	$ 1.74
October-11	$ 440.30	$ 271.15	$ 169.15	512.42	$ 0.86
November-11	$ 3,184.89	$ 1,633.47	$ 1,551.42	2,896.64	$ 1.10
December-11	$ 4,723.58	$ 2,804.17	$ 1,919.41	4,938.42	$ 0.96
January-12	$ 5,206.02	$ 3,189.67	$ 2,016.35	5,736.99	$ 0.91
February-12	$ 4,680.97	$ 2,850.43	$ 1,830.54	5,280.92	$ 0.89
March-12	$ 2,788.66	$ 1,423.61	$ 1,365.05	2,696.86	$ 1.03
April-12	$ 1,118.99	$ 790.18	$ 328.81	2,065.68	$ 0.54
May-12	$ 386.29	$ 206.54	$ 179.75	597.02	$ 0.65
June-12	$ 143.61	$ 32.79	$ 110.82	84.21	$ 1.71
July-12	$ 102.51	$ 2.29	$ 100.22	5.36	$ 19.12
August-12	$ 101.39	$ 1.46	$ 99.93	3.22	$ 31.53
Total	**$ 23,041.13**			**24,911.87**	**$ 0.92**


Natural Gas Usage - Erskine School
Total ($)
Therms
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$-
Cost ($)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Usage (Therms)
September-11
October-11
November-11
December-11
January-12
February-12
March-12
April-12
May-12
June-12
July-12
August-12
Date

APPENDIX B

Equipment Inventory

New Jersey BPU Energy Audit Program
CHA Project #242736
Ringwood BOE - NJBPU
Robert Erskine Elementary School
Original Construction Date: 1960
Renovation/Addtion Date: -

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size/Efficiency	Output	Fuel Type	Motor HP	Eff.	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)	Other Info.
Boiler	2	Cleaverbrooks	P142-60	#1: L-22907 #2: L-28104	Heating	input 2,010,000 BTUH	-	Natural Gas	-	75.0%	MER	School	1960	-27	Fair
P-1, P-1	2	B&G	1510 BF-8	#1: 1BF069LFE11 #2: 1BF069E80	Heating	-	-	HW	5	89.5%	MER	School	2010	13	Good
P-2, P-3	2	-	-	-	Heating	-	-	HW	5	84.0%	WWTP	WWTP	-	-	Good
P-4, P-5	2	-	-	-	Heating	-	-	HW	1.5	84.0%	WWTP	WWTP	-	-	Good
DWH	1	A.O. Smith	BT 251-880	MF93-0276065-880	DHW Heater	80 Gallon, 240,000 BTUH		Natural Gas	-	80.0%	MER	School	1993	-7	Fair
DWH	1	Bradford White	M16U6SS-1NA1	FJ12427035	DHW Heater	6 Gallon, 120V	-	Electric	-	-	WWTP Office	WWTP Office	-	-	Good
Window A/C	16	GE	ASM12AK51	AM441077	Cooling	EER 10.8, 18,000 BTUH	-	Electric		-	Classrooms	Classrooms	2007	7	Good
HV-1	1	Trane	2M13 BI 4406	274093	HV	-	-	Electric	-	-	MER	Multipurpose Room	2002	20	Good
HV-2	2	Trane	UHSA-0905-8A-AAE	580L-19263	HV	-	-	Electric	-	-	Garage	School's Return	1960	-	Good
AC-1	1	Speedaire	3Z420E	-	AIR COMPRESSOR	-	-	Elect	3	-	MER	School	1960	-	Good
CU-1	1	-	-	-	DX cooling			Elect			Outside	Media Center	-	-	Good
Classroom Unit Ventilator	22	Nesbitt			HW			HW			Classrooms	Classrooms	-	-	Fair

APPENDIX C

ECM Calculations

Summary of Energy Conservation Measures							
Energy Conservation Measure		Approx. Costs ($)	Approx. Savings ($/year)	Payback (Years) w/o Incentive	Potential Incentive ($)*	Payback (Years) w/ Incentive	Recommended For Implementation
ECM-1a	Replace Window Seals	18,000	1,600	11	0	11	
ECM-1b	Window Replacements and Reduced Glazing	450,000	2,900	>20	0	>20	
ECM-2	Replace Door Seals	1,700	200	9	0	9	
ECM-3	Replace (2) Boilers with Condensing Boilers	316,000	3,500	>20	4,000	>20	X
ECM-4	Install VSDs on Hot water Pumps (5 HP)	12,000	1,100	11	2,000	9	X
ECM-5	Replace Waste Water Pump Motors with Hi Efficiency Motors	3,000	600	5	2,800	0	X
ECM-6	Replace Window A/C units with Energy Star Window A/C units	4,200	300	14	0	14	
ECM-7	Unoccupied Set-Back (72 to 55)	17,000	900	19	0	19	
ECM-8	Replace Domestic Hot Water Heater w/ Instantaneous unit	11,300	200	>20	300	>20	
ECM-9	Lighting Replacement / Upgrades	54,000	3,000	18	4,600	16	
ECM-10	Install Lighting Controls (Occupancy Sensors)	15,000	5,600	3	1,900	2	
ECM-11	Lighting Replacements with Lighting Controls (Occupancy Sensors)	69,000	7,100	10	6,500	9	X
ECM-12	Convert Electric Dish Washer Booster Heater to Natural Gas	15,000	600	>20	0	>20	
ECM-13	Add Dedicated Hood and Fan for Oven	12,000	190	>20	0	>20	

Ringwood BOE - NJBPU
CHA Project #242736
Robert Erskine Elementary School

<u>ECM Summary Sheet</u>

ECM-1a **Replace Window Seals**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
18,000	0	0	1,700	1,600	0	1,600	(0.6)	0	11.3	11.3

Expected Life: 5 years
Lifetime Savings: 0 kWh 8,500 therms $ 8,000

ECM-1b **Window Replacements and Reduced Glazing**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
450,000	0	0	3,100	2,900	0	2,900	(0.8)	0	>20	>20

Expected Life: 30 years
Lifetime Savings: 0 kWh 93,000 therms $ 87,000

ECM-2 **Replace Door Seals**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
1,700	0	0	200	200	0	200	(0.5)	0	8.5	8.5

Expected Life: 5 years
Lifetime Savings: 0 kWh 1,000 therms $ 1,000

ECM-3 **Replace (2) Boilers with Condensing Boilers**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
316,000	0	0	3,800	3,500	0	3,500	(0.7)	4,000	>20	>20

Expected Life: 25 years
Lifetime Savings: 0 kWh 95,000 therms $ 87,500

ECM-4 **Install VSDs on Hot water Pumps (5 HP)**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
12,000	8,800	0.1	0	1,100	0	1,100	0.4	2,000	10.9	9.1

Expected Life: 15 years
Lifetime Savings: 132,000 kWh 0 therms $ 16,500

ECM-5 **Replace Waste Water Pump Motors with Hi Efficiency Motors**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
3,000	4,400	0	0	600	0	600	2.1	2,800	5.0	0.3

Expected Life: 15 years
Lifetime Savings: 66,000 kWh 0 therms $ 9,000

ECM-6 **Replace Window A/C units with Energy Star Window A/C units**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
4,200	1,800	0	0	300	0	300	(0.2)	0	14.0	14.0

Expected Life: 12 years
Lifetime Savings: 21,600 kWh 0 therms $ 3,300

ECM-7 **Unoccupied Set-Back (72 to 55)**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
17,000	0	0	1,000	900	0	900	(0.4)	0	18.9	18.9

Expected Life: 10 years
Lifetime Savings: 0 kWh 10,000 therms $ 9,000

ECM-8 **Replace Domestic Hot Water Heater w/ Instantaneous unit**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
11,300	0	0	200	200	0	200	(0.8)	300	>20	>20

Expected Life: 12 years
Lifetime Savings: 0 kWh 2,400 therms $ 2,400

ECM-9 **Lighting Replacement / Upgrades**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
54,000	18,300	6.4	0	3,000	0	3,000	(0.2)	4,600	18.0	16.5

Expected Life: 15 years
Lifetime Savings: 274,500 kWh 0 therms $ 45,000

ECM-10 **Install Lighting Controls (Occupancy Sensors)**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
15,000	45,400	0	0	5,600	0	5,600	6.2	1,900	2.7	2.3

Expected Life: 15 years
Lifetime Savings: 681,000 kWh 0 therms $ 84,000

ECM-11 **Lighting Replacements with Lighting Controls (Occupancy Sensors)**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
69,000	51,900	6.4	0	7,100	0	7,100	0.5	6,500	9.7	8.8

Expected Life: 15 years
Lifetime Savings: 778,500 kWh 0 therms $ 106,500

ECM-12 **Convert Electric Dish Washer Booster Heater to Natural Gas**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
15,000	4,200	0	(200)	600	0	600	1.6	0	>20	>20

Expected Life: 12 years

Lifetime Savings: 50,400 kWh (2,400) therms $ 7,200

ECM-13 **Add Dedicated Hood and Fan for Oven**

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	ROI	Incentive *	Payback (without incentive)	Payback (with incentive)
	Electric	Electric	Nat Gas	Total						
$	kWh	kW	Therms	$	$	$		$	Years	Years
12,000	1,000	0.6	0	190	0	190	(0.8)	0	>20	>20

Expected Life: 15 years

Lifetime Savings: 15,000 kWh 0 therms $ 2,900

Ringwood BOE - NJBPU
CHA Project #242736

Rate of Discount (used for NPV) 3.0%

Utility Costs		Yearly Usage	MTCDE	Building Area	Annual Utility Cost	
$ 0.154	$/kWh blended		0.00042021	31,700	Electric	Natural Gas
$ 0.123	$/kWh supply	252,320	0.00042021		$38,909.66	$23,041.13
$ 9.53	$/kW	77.60	0			
$ 0.92	$/Therm	24,912	0.00533471			
$ -	$/kgals	-	0			

Robert Erskine Elementary School

	Item	Savings						Cost	Simple Payback	MTCDE	Life Expectancy	NJ Smart Start Incentives	Direct Install Eligible (Y/N)*	Direct Install Incentives**	Max Incentives	Payback w/ Incentives***	Simple Projected Lifetime Savings						ROI	NPV	IRR
		kW	kWh	therms	cooling kWh	kgal/yr	$										kW	kWh	therms	cooling	kgal/yr	$			
ECM-1a	Replace Window Seals	0.0	0	1,739	0	0	$ 1,600	$ 17,889	11.2	9.3	5.0			$ -	$ -	11.2	0.0	0	8,694	0	0	$ 8,041	(0.6)	($28,143)	-22.0%
ECM-1b	Window Replacements and Reduced Glazing	0.0	0	3,144	0	0	$ 2,900	$ 450,076	155.2	16.8	30.0			$ -	$ -	155.2	0.0	0	94,325	0	0	$ 87,242	(0.8)	($831,857)	-8.4%
ECM-2	Replace Door Seals	0.0	0	202	0	0	$ 200	$ 1,723	8.6	1.1	5.0			$ -	$ -	8.6	0.0	0	1,009	0	0	$ 933	(0.5)	($2,507)	-15.8%
ECM-3	Replace (2) Boilers with Condensing Boilers	0.0	0	3,775	0	0	$ 3,500	$ 315,612	90.2	20.1	25.0	$ 4,000	Y	$ 75,000	$ 4,000	89.0	0.0	0	94,367	0	0	$ 87,281	(0.7)	($554,977)	-8.1%
ECM-4	Install VSDs on Hot water Pumps (5 HP)	0.1	8,814	0	0	0	$ 1,100	$ 11,651	10.6	3.7	15.0	$ 2,000	Y	$ 8,200	$ 2,000	8.8	1.9	132,213	0	0	0	$ 16,491	0.4	($6,271)	7.6%
ECM-5	Replace Waste Water Pump Motors with Hi Efficiency Motors	0.5	4,428	0	0	0	$ 600	$ 2,914	4.9	1.9	15.0	$ 2,800	Y	$ 2,000	$ 2,800	0.2	7.6	66,426	0	0	0	$ 9,044	2.1	$6,729	524.7%
ECM-6	Replace Window A/C units with Energy Star Window A/C units	0.0	0	0	1,810	0	$ 300	$ 4,200	14.0	0.8	12.0			$ -	$ -	14.0	0.0	0	0	21,722	0	$ 3,350	(0.2)	($5,378)	-2.3%
ECM-7	Unoccupied Set-Back (72 to 55)	0.0	0	1,021	0	0	$ 900	$ 16,830	18.7	5.4	10.0			$ -	$ -	18.7	0.0	0	10,214	0	0	$ 9,447	(0.4)	($25,716)	-10.0%
ECM-8	Replace Domestic Hot Water Heater w/ Instantaneous unit	0.0	0	184	0	0	$ 200	$ 11,319	56.6	1.0	12.0	$ 300	Y	$ 7,900	$ 300	55.1	0.0	0	2,203	0	0	$ 2,037	(0.8)	($19,784)	-18.1%
ECM-9	Lighting Replacement / Upgrades	6.4	18,345	0	0	0	$ 3,000	$ 54,281	18.1	7.7	15.0	$ 4,600	Y	$ 38,000	$ 4,600	16.6	95.5	275,175	0	0	0	$ 44,793	(0.2)	($63,144)	-1.2%
ECM-10	Install Lighting Controls (Occupancy Sensors)	0.0	45,398	0	0	0	$ 5,600	$ 14,580	2.6	19.1	15.0	$ 1,890	Y	$ 10,200	$ 1,890	2.3	0.0	680,964	0	0	0	$ 105,010	6.2	$39,895	43.9%
ECM-11	Lighting Replacements with Lighting Controls (Occupancy Sensors)	6.4	51,856	0	0	0	$ 7,100	$ 68,861	9.7	21.8	15.0	$ 6,490	Y	$ 48,200	$ 6,490	8.8	95.5	777,846	0	0	0	$ 106,672	0.5	($40,635)	7.6%
ECM-12	Convert Electric Dish Washer Booster Heater to Natural Gas	25.0	4,193	(179)	0	0	$ 600	$ 14,985	25.0	0.8	12.0			$ -	$ -	25.0	299.5	50,319	(2,147)	0	0	$ 38,446	1.6	($23,735)	-9.8%
ECM-13	Add Dedicated Hood and Fan for Oven	0.6	1,007	0	0	0	$ 190	$ 12,441	65.5	0.4	15.0			$ -	$ -	65.5	8.4	15,107	0	0	0	$ 2,819	(0.8)	($22,317)	-14.5%
	Total (Does Not Include ECM-9 & ECM-10)	**32.0**	**69,292**	**9,886**	**1,810**	**0**	**$ 19,000**	**$ 916,060**	48.2	82.6	14.2	$ 15,590		$ 141,300	$ 15,590		404.5	1,026,804	208,666	21,722	0	$ 368,983	(0.6)	($1,566,339)	-13.2%
	Total Measures with Payback <15	**7.0**	**65,099**	**3,775**	**0**	**0**	**$ 12,300**	**$ 399,038**	32.4	47.5	13.0	$ 15,290		$ 58,400	$ 11,290	31.5	105.0	976,485	1,009	0	0	$ 133,139	(0.7)	($637,202)	-10.8%

Ringwood BOE - NJBPU
CHA Project #242736
Robert Erskine Elementary School

Note: pricing is for energy calculations only -do not use for procurement

ECM-1: Replace Window Seals

Existing: Windows are not properly sealed. This can lead to increased energy consumption due to infiltration/exfiltration and heat gain/loss.
Proposed: Install weather strip or caulking to properly seal windows

Linear Feet of window Edge	3,118.0	LF	Cooling System Efficiency		kW/ton	Heating System Efficiency	80%	
Area of window glass	4,500.8	SF	Ex Occupied Clng Temp.	70	*F	Heating On Temp.	55	*F
Existing Infiltration Factor	1.5	**cfm/LF**	Ex Unoccupied Clng Temp.	70	*F	Ex Occupied Htg Temp.	70	*F
Proposed Infiltration Factor	0.45	**cfm/LF**	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Ex Unoccupied Htg Temp.	70	*F
Existing U Value	**0.60**	**Btuh/SF/°F**	Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Electricity	$ 0.154	$/kWh
Proposed U Value	**0.60**	**Btuh/SF/°F**				Natural Gas	$ 0.92	$/therm

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	**Unoccupied**	**Occupied**	**Unoccupied**				
Avg Outdoor Air Temp. Bins °F	**Avg Outdoor Air Enthalpy**	**Existing Equipment Bin Hours**	**Occupied Equipment Bin Hours**	**Unoccupied Equipment Bin Hours**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Existing Cooling Energy kWh**	**Proposed Cooling Energy kWh**	**Existing Heating Energy Therms**	**Proposed Heating Energy Therms**
A		**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
102.5	50.1	0	0	0	-475,651	-475,651	-230,460	-230,460	0	0	0	0
97.5	42.5	6	2	4	-315,698	-315,698	-168,972	-168,972	0	0	0	0
92.5	39.5	45	16	29	-252,558	-252,558	-136,528	-136,528	0	0	0	0
87.5	36.6	146	52	94	-191,523	-191,523	-104,715	-104,715	0	0	0	0
82.5	34.0	298	106	192	-136,802	-136,802	-74,797	-74,797	0	0	0	0
77.5	31.6	476	170	306	-86,291	-86,291	-46,141	-46,141	0	0	0	0
72.5	29.2	662	237	426	-35,779	-35,779	-17,485	-17,485	0	0	0	0
67.5	27.0	740	264	476	0	0	0	0	0	0	0	0
62.5	24.5	765	273	492	0	0	0	0	0	0	0	0
57.5	21.4	733	262	471	0	0	0	0	0	0	0	0
52.5	18.7	668	239	430	88,395	88,395	73,777	73,777	0	0	738	616
47.5	16.2	659	235	424	113,651	113,651	94,856	94,856	0	0	937	782
42.5	14.4	685	245	441	138,907	138,907	115,935	115,935	0	0	1,190	993
37.5	12.6	739	264	475	164,163	164,163	137,014	137,014	0	0	1,517	1,266
32.5	10.7	717	256	461	189,419	189,419	158,093	158,093	0	0	1,698	1,418
27.5	8.6	543	194	349	214,674	214,674	179,172	179,172	0	0	1,458	1,217
22.5	6.8	318	114	205	239,930	239,930	200,251	200,251	0	0	954	796
17.5	5.5	245	88	158	265,186	265,186	221,330	221,330	0	0	813	678
12.5	4.1	156	56	100	290,442	290,442	242,409	242,409	0	0	567	473
7.5	2.6	92	33	59	315,698	315,698	263,488	263,488	0	0	363	303
2.5	1.0	36	13	23	340,953	340,953	284,567	284,567	0	0	153	128
-2.5	0.0	19	7	12	366,209	366,209	305,647	305,647	0	0	87	73
-7.5	-1.5	8	3	5	391,465	391,465	326,726	326,726	0	0	39	33
TOTALS		**8,760**	**3,129**	**5,631**					0	0	**10,515**	**8,776**

Existing Window Infiltration	**4,677**	**cfm**
Existing Window Heat Transfer	**0**	**Btuh/°F**
Proposed Window Infiltration	**1,403**	**cfm**
Proposed Window Heat Transfer	**2,700**	**Btuh/°F**

Savings	**1,739**	**Therms**	**$**	**1,608**
	0	**kWh**	**$**	**-**
			$	**1,608**

Window ID	Location	Quantity	Width (ft)	Height (ft)	Linear Feet (LF)	Area (SF)	Infiltration Rate (CFM/LF)	U Value (Btuh/SF/°F)	Infiltration (CFM)	Heat Transfer (Btuh/°F)
1	Exterior Wall	88	5.6	7.3	2273.3	3603.1	1.5		3410.0	0.0
2	Exterior Wall	12	3.5	3.8	176.0	161.0	1.5		264.0	0.0
3	Exterior Wall	34	3.3	6.5	668.7	736.7	1.5		1003.0	0.0
Total		**134**	**12.4**	**17.7**	**3,118.0**	**4,500.8**	**1.50**	**0.00**	**4677.0**	**0.0**

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-1: Replace Window Seals - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Window Seals	134	ea	$ 60.00	$ 50.00		$ 8,844	$ 9,045	$ -	$ 17,889	RS Means 2012
					$ -	$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

$ 17,889	Subtotal
$ -	
$ -	
$ -	
$ 17,889	**Total**

Ringwood BOE - NJBPU
CHA Project #242736
Robert Erskine Elementary School

Note: pricing is for energy calculations only -do not use for procurement

ECM-1: Window Replacements and Reduced Glazing

Existing: Windows are not properly sealed. This can lead to increased energy consumption due to infiltration/exfiltration and heat gain/loss.
Proposed: Install weather strip or caulking to properly seal windows

Linear Feet of window Edge	3,118.0	LF	Cooling System Efficiency		kW/ton	Heating System Efficiency	80%	
Area of window glass	4,500.8	SF	Ex Occupied Clng Temp.	70	*F	Heating On Temp.	55	*F
Existing Infiltration Factor	1.5	**cfm/LF**	Ex Unoccupied Clng Temp.	70	*F	Ex Occupied Htg Temp.	70	*F
Proposed Infiltration Factor	0.45	**cfm/LF**	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Ex Unoccupied Htg Temp.	70	*F
Existing U Value	**0.60**	**Btuh/SF/°F**	Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Electricity	$ 0.154	$/kWh
Proposed U Value	**0.45**	**Btuh/SF/°F**				Natural Gas	$ 0.92	$/therm

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	**Unoccupied**	**Occupied**	**Unoccupied**				
Avg Outdoor Air Temp. Bins °F	**Avg Outdoor Air Enthalpy**	**Existing Equipment Bin Hours**	**Occupied Equipment Bin Hours**	**Unoccupied Equipment Bin Hours**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Window Infiltration & Heat Load BTUH**	**Existing Cooling Energy kWh**	**Proposed Cooling Energy kWh**	**Existing Heating Energy Therms**	**Proposed Heating Energy Therms**
A		**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
102.5	50.1	0	0	0	-475,651	-475,651	-208,519	-208,519	0	0	0	0
97.5	42.5	6	2	4	-315,698	-315,698	-150,406	-150,406	0	0	0	0
92.5	39.5	45	16	29	-252,558	-252,558	-121,338	-121,338	0	0	0	0
87.5	36.6	146	52	94	-191,523	-191,523	-92,901	-92,901	0	0	0	0
82.5	34.0	298	106	192	-136,802	-136,802	-66,358	-66,358	0	0	0	0
77.5	31.6	476	170	306	-86,291	-86,291	-41,077	-41,077	0	0	0	0
72.5	29.2	662	237	426	-35,779	-35,779	-15,797	-15,797	0	0	0	0
67.5	27.0	740	264	476	0	0	0	0	0	0	0	0
62.5	24.5	765	273	492	0	0	0	0	0	0	0	0
57.5	21.4	733	262	471	0	0	0	0	0	0	0	0
52.5	18.7	668	239	430	88,395	88,395	61,962	61,962	0	0	738	518
47.5	16.2	659	235	424	113,651	113,651	79,666	79,666	0	0	937	657
42.5	14.4	685	245	441	138,907	138,907	97,369	97,369	0	0	1,190	834
37.5	12.6	739	264	475	164,163	164,163	115,073	115,073	0	0	1,517	1,063
32.5	10.7	717	256	461	189,419	189,419	132,776	132,776	0	0	1,698	1,191
27.5	8.6	543	194	349	214,674	214,674	150,480	150,480	0	0	1,458	1,022
22.5	6.8	318	114	205	239,930	239,930	168,183	168,183	0	0	954	669
17.5	5.5	245	88	158	265,186	265,186	185,887	185,887	0	0	813	570
12.5	4.1	156	56	100	290,442	290,442	203,590	203,590	0	0	567	397
7.5	2.6	92	33	59	315,698	315,698	221,294	221,294	0	0	363	255
2.5	1.0	36	13	23	340,953	340,953	238,997	238,997	0	0	153	108
-2.5	0.0	19	7	12	366,209	366,209	256,701	256,701	0	0	87	61
-7.5	-1.5	8	3	5	391,465	391,465	274,404	274,404	0	0	39	27
TOTALS		**8,760**	**3,129**	**5,631**					0	0	**10,515**	**7,370**

Existing Window Infiltration	**4,677**	**cfm**
Existing Window Heat Transfer	**0**	**Btuh/°F**
Proposed Window Infiltration	**1,403**	**cfm**
Proposed Window Heat Transfer	**2,025**	**Btuh/°F**

Savings	**3,144**	**Therms**	**$**	**2,908**
	0	**kWh**	**$**	**-**
			$	**2,908**

Window ID	Location	Quantity	Width (ft)	Height (ft)	Linear Feet (LF)	Area (SF)	Infiltration Rate (CFM/LF)	U Value (Btuh/SF/°F)	Infiltration (CFM)	Heat Transfer (Btuh/°F)
1	Exterior Wall	88	5.6	7.3	2273.3	3603.1	1.5		3410.0	0.0
2	Exterior Wall	12	3.5	3.8	176.0	161.0	1.5		264.0	0.0
3	Exterior Wall	34	3.3	6.5	668.7	736.7	1.5		1003.0	0.0
Total		**134**	**12.4**	**17.7**	**3,118.0**	**4,500.8**	**1.50**	**0.00**	**4677.0**	**0.0**

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-1: Window Replacements and Reduced Glazing - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Windows	4500.8	$ / SF	$ 45.45	$ 37.04		$ 225,038	$ 225,038	$ -	$ 450,076	Vendor Quote Per SF
					$ -	$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

$ 450,076	Subtotal
$ -	
$ -	
$ -	
$ 450,076	**Total**

ECM-2: Replace Door Seals

Existing: Lack of door seals result in excessive heat loss and infiltration
Proposed: Install door seals and/or weather-stripping to reduce air infiltration

Heating System Efficiency	80%		Ex Occupied Clng Temp.	70	*F	Ex Occupied Htg Temp.		70	*F
Cooling System Efficiency	0.00	kW/ton	Ex Unoccupied Clng Temp.	70	*F	Ex Unoccupied Htg Temp.		70	*F
Linear Feet of Door Edge	84		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Electricity	$	0.15	$/kWh
Existing Infiltration Factor*	1.5	cfm/LF	Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb	Natural Gas	$	0.92	$/therm
Proposed Infiltration Factor*	0.45	cfm/LF							

*Infiltration Factor per Carrier Handbook of Air Conditioning System Design
based on average door seal gap calculated below.

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	Unoccupied	Occupied	Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L
102.5	44.7	0	0	0	-9,752	-9,752	-2,926	-2,926	0	0	0	0
97.5	42.7	6	2	4	-8,618	-8,618	-2,586	-2,586	0	0	0	0
92.5	40.7	45	16	29	-7,484	-7,484	-2,245	-2,245	0	0	0	0
87.5	39.7	146	52	94	-6,917	-6,917	-2,075	-2,075	0	0	0	0
82.5	37.7	298	106	192	-5,783	-5,783	-1,735	-1,735	0	0	0	0
77.5	35.7	476	170	306	-4,649	-4,649	-1,395	-1,395	0	0	0	0
72.5	33.7	662	237	426	-3,515	-3,515	-1,055	-1,055	0	0	0	0
67.5	31.3	740	264	476	340	340	102	102	0	0	3	1
62.5	29.7	765	273	492	1,021	1,021	306	306	0	0	10	3
57.5	28	733	262	471	1,701	1,701	510	510	0	0	16	5
52.5	25.2	668	239	430	2,381	2,381	714	714	0	0	20	6
47.5	21.8	659	235	424	3,062	3,062	919	919	0	0	25	8
42.5	18.8	685	245	441	3,742	3,742	1,123	1,123	0	0	32	10
37.5	16.9	739	264	475	4,423	4,423	1,327	1,327	0	0	41	12
32.5	14.5	717	256	461	5,103	5,103	1,531	1,531	0	0	46	14
27.5	12.7	543	194	349	5,783	5,783	1,735	1,735	0	0	39	12
22.5	10.9	318	114	205	6,464	6,464	1,939	1,939	0	0	26	8
17.5	8.8	245	88	158	7,144	7,144	2,143	2,143	0	0	22	7
12.5	7.2	156	56	100	7,825	7,825	2,347	2,347	0	0	15	5
7.5	5.6	92	33	59	8,505	8,505	2,552	2,552	0	0	10	3
2.5	4.1	36	13	23	9,185	9,185	2,756	2,756	0	0	4	1
-2.5	2.7	19	7	12	9,866	9,866	2,960	2,960	0	0	2	1
-7.5	1.3	8	3	5	10,546	10,546	3,164	3,164	0	0	1	0
TOTALS		**8,760**	**3,129**	**5,631**					**0**	**0**	**312**	**94**

Existing Door Infiltration	**126**	**cfm**
Existing Unoccupied Door Infiltration	**126**	**cfm**
Proposed Door Infiltration	**38**	**cfm**
Proposed Unoccupied Door Infiltration	**38**	**cfm**

Savings	**218**	**therms**	**$**	**202**
	0	**kWh**	**$**	**-**
			$	**202**

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-2: Replace Door Seals - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Door Seals (3'x7')	14	ea	$ 35	$ 50					$ -	RS Means 2012
36" Door Threshold Seal	14	ea	$ 50.00	$ 45.00	$ -	$ 770	$ 851	$ -	$ 1,621	RS Means 2012
Side and Top Door Seal	14	ft	$ 3.00	$ 3.00	$ -	$ 46	$ 57	$ -	$ 103	RS Means 2012
					$ -	$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

$ 1,723	Subtotal
$ -	
$ -	
$ -	
$ 1,723	**Total**

ECM-3: Replace (2) Boilers with Condensing Boilers

Existing Fuel	Nat.Gas
Proposed Fuel	Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 0.92	/ Therm	
Proposed Fuel Cost	$ 0.92	/ Therm	
Baseline Fuel Use	20,428	Therms	Based on historical utility data
Existing Boiler Plant Efficiency	75%		Estimated or Measured
Baseline Boiler Load	1,532,080	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms
Baseline Fuel Cost	$ 18,894		
Proposed Boiler Plant Efficiency	92%		New Boiler Efficiency
Proposed Fuel Use	16,653	Therms	Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 15,402		

*Note to engineer: Link savings back to summary sheet in appropriate column.

BOILER REPLACEMENT SAVINGS SUMMARY					
	Electric Demand	**Electric Usage**	**Nat Gas Usage**	**Maint.**	**Total Cost**
	(kW)	**(kWh)**	**(Therms)**	**($)**	**($)**
Savings	**0**	**0**	**3,775**	**$0**	**$3,491**

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-3: Replace (2) Boilers with Condensing Boilers - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Boiler demo	2	EA	$ -	$ 7,500		$ -	$ 20,250	$ -	$ 20,250	RS Means 2012
2,000 MBH NG Condensing Boiler	2	EA	$ 32,000	$ 25,000		$ 70,400	$ 67,500	$ -	$ 137,900	Vendor Quote
Flue Installation	2	LS	$ 10,000	$ 5,000		$ 22,000	$ 13,500	$ -	$ 35,500	RS Means 2012
Pump	2	EA	$ 2,500	$ 1,500		$ 5,500	$ 4,050	$ -	$ 9,550	RS Means 2012
Miscellaneous Electrical	2	LS	$ 1,500	$ 3,000		$ 3,300	$ 8,100	$ -	$ 11,400	RS Means 2012
Miscellaneous HW Piping	2	LS	$ 5,000	$ 5,000		$ 11,000	$ 13,500	$ -	$ 24,500	RS Means 2012
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

$ 239,100	Subtotal
$ 23,910.00	10% Contingency
$ 52,602.00	20% Contractor O&P
$ -	
$ 315,612	**Total**

ECM-4: Install VFDs on Hot water Pumps (5 HP)

Variable Inputs

Blended Electric Rate	$0.15
Heating System "On" Point	55
VFD Efficiency	98.5%

ECM Description Summary

PUMP SCHEDULE							
Pump ID	Qty	HP	Total HP	Existing Motor Motor Eff.	New Motor Motor Eff.	Exist. Motor kW Note 1	New Motor kW Note 2
P-1, P-2	1	5.0	5.0	89.5%	93.0%	3.33	3.21
					Total:	3.33	3.21

SAVINGS ANALYSIS									
OAT - DB Avg Temp F	OAT - WB Avg Temp F	Annual Hours in Bin	Heating Hours Bin	Pump Load %	Existing Pump kWh	Proposed Pump kW	Speed efficiency %	Proposed Pump kWh	Proposed Savings kWh
(A) See Note 3	(B) See Note 3	(C) See Note 3	(D) =IF(A>TP,0,C)	(E) =0.5+0.5* (50-A)/(50-10)) See Note 4	(F) =D*AA	(G) =BB*E^2.5/CC See Note 5	(H)	(I) =D*G	(J) =F-H
97.5	75	6	0	0%	0	0.0	0.0%	0	0
92.5	74	45	0	0%	0	0.0	0.0%	0	0
87.5	72	146	0	0%	0	0.0	0.0%	0	0
82.5	69	298	0	0%	0	0.0	0.0%	0	0
77.5	67	476	0	0%	0	0.0	0.0%	0	0
72.5	64	662	0	0%	0	0.0	0.0%	0	0
67.5	62	740	0	0%	0	0.0	0.0%	0	0
62.5	58	765	0	0%	0	0.0	0.0%	0	0
57.5	53	733	0	0%	0	0.0	0.0%	0	0
52.5	47	668	668	53%	2,228	0.7	84.1%	524	1,705
47.5	43	659	659	58%	2,198	0.8	88.8%	628	1,570
42.5	38	685	685	64%	2,285	1.1	92.7%	785	1,499
37.5	34	739	739	69%	2,465	1.3	95.9%	1,010	1,455
32.5	30	717	717	75%	2,392	1.6	98.2%	1,159	1,232
27.5	25	543	543	81%	1,811	1.9	99.8%	1,033	778
22.5	20	318	318	86%	1,061	2.2	100.0%	713	348
17.5	16	245	245	92%	817	2.6	100.0%	642	175
12.5	11	156	156	97%	520	3.0	99.7%	475	45
7.5	6	92	92	100%	307	3.3	99.0%	303	4
2.5	2	36	36	100%	120	3.3	99.0%	118	2
-2.5	-3	19	19	100%	63	3.3	99.0%	63	1
-7.5	-8	8	8	100%	27	3.3	99.0%	26	0
		8,760	4,887		16,294			7,480	8,814

Notes:
1) Existing motor power was determined using…
2) New motor power is the same as existing motor power adjusted for the new efficiency, if a new motor is proposed.
3) Weather data from NOAA for …
4) The pump load is estimated at 100% at X deg. OAT and 50% at X deg. OAT and varies linearly in between.
5) The required VFD motor draw is based on a 2.5 power relationship to load.

HW PUMP VFD - SAVINGS SUMMARY					
	Electric Demand (kW)	Electric Usage (kWh)	Nat Gas Usage (Therms)	Maint. ($)	Total Cost ($)
Savings	0	8,814	0	$0	$1,359

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.00

ECM-4: Install VFDs on Hot water Pumps (5 HP) - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
5.0 VFD	2	ea	$ 1,706	$ 431		$ 3,754	$ 1,162	$ -	$ 4,916	RS Means 2012
5.0 Motor	2	ea	$ 373	$ 79		$ 820	$ 213	$ -	$ 1,033	RS Means 2012
Electrical - misc.	2	ea	$ 200	$ 150		$ 440	$ 405	$ -	$ 845	RS Means 2012
Pipe pressure sensor/transmitter	1	ea	$ 850	$ 500		$ 935	$ 675	$ -	$ 1,610	RS Means 2012
Misc. piping modification	1	ea	$ 200	$ 150		$ 220	$ 203	$ -	$ 423	RS Means 2012
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

$ 8,826	Subtotal
$ 883	10% Contingency
$ 1,942	20% Contractor O&P
$ -	
$ 11,651	**Total**

Demand Cost	Energy Cost
$/kW-month	$/kWh
$ 9.53	$ 0.12

Multipliers		
Material	Labor	Equipment
1.10	1.35	1.10

ECM-5: Replace Waste Water Pump Motors with Hi Efficiency Motors

Savings Analysis

#	Description	Location	Existing HP	Load Factor	Existing Efficiency$_a$	Existing kW	New HP$_b$	New Load Factor	New Efficiency$_a$	New kW	Demand Savings	Demand Savings $	Annual Hours	kWh Savings	$ kWh Savings	Total $ Savings	Estimated Cost	Payback Years
1		WWTP	5	0.8	0.840	3.6	5	0.8	0.897	3.3	0.224	$ 26	8,760	1,963	$ 242	$ 267	$ 943	3.5
2		WWTP	5	0.8	0.840	3.6	5	0.8	0.897	3.3	0.224	$ 26	8,760	1,963	$ 242	$ 267	$ 943	3.5
3		WWTP	1.5	0.8	0.840	1.1	2	0.8	0.863	1.0	0.029	$ 3	8,760	251	$ 31	$ 34	$ 515	15.1
4		WWTP	1.5	0.8	0.840	1.1	2	0.8	0.863	1.0	0.029	$ 3	8,760	251	$ 31	$ 34	$ 515	15.1
		Total	**13**			**9.2**	**13**			**8.7**	**0.51**	**$ 58**		**4,428**	**$ 545**	**$ 603**	**$ 2,914**	

Cost Estimates

#	Unit Costs Materials	Unit Costs Labor	Unit Costs Equipment	Subtotal Costs Materials	Subtotal Costs Labor	Subtotal Costs Equipment	Total Cost	Remarks
1	$ 550	$ 250	$ -	$ 605	$ 338	$ -	$ 943	RS Means 2012
2	$ 550	$ 250	$ -	$ 605	$ 338	$ -	$ 943	RS Means 2012
3	$ 284	$ 150	$ -	$ 312	$ 203	$ -	$ 515	RS Means 2012
4	$ 284	$ 150	$ -	$ 312	$ 203	$ -	$ 515	RS Means 2012
Total								

Notes

a Existing and new efficiencies should be entered if known. If not known, use provided curve fit based on "DOE Survey Installed Average" and NEMA Premium values, respectively.

b Same as existing HP unless resized to better match load

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

Ringwood BOE - NJBPU
CHA Project #242736
Robert Erskine Elementary School

ECM-6: Replace Window A/C units with Energy Star Units

ECM Description Summary
By replacing older DX window unit air conditioners with newer equipment which have EER ratings, significant electrical energy can be saved. It is recommended these units be replaced by more modern Energy Star rated window units.

ASSUMPTIONS				Comments
Electric Cost		$0.154	/ kWh	
Average run hours per Week		60	Hours	Unit is manually turned on (even if after hours)
Space Balance Point		55	F	
Space Temperature Setpoint		70	deg F	setpoint
Avg. BTU / Hr Rating of existing RTU		18,000	Btu / Hr	(typical size for cooling spaces in this type of building)
Average EER		9.4		

Item	Value	Units	Comments
Total Number of Units	16		
Existing Annual Electric Usage	12,445	kWh	
Proposed EER	11.0		New Energy Star Unit (per Energy webpage)
Proposed Annual Electric Usage	10,635	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	1,810	kWh
Annual Cost Savings	$279	

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	6	2	89%	2
92.5	45	16	79%	13
87.5	146	52	68%	36
82.5	298	106	58%	62
77.5	476	170	47%	81
72.5	662	237	37%	87
67.5	740	264	26%	70
62.5	765	273	16%	43
57.5	733	262	5%	14
52.5	668	0	0%	0
47.5	659	0	0%	0
42.5	685	0	0%	0
37.5	739	0	0%	0
32.5	717	0	0%	0
27.5	543	0	0%	0
22.5	318	0	0%	0
17.5	245	0	0%	0
12.5	156	0	0%	0
7.5	92	0	0%	0
2.5	36	0	0%	0
-2.5	19	0	0%	0
-7.5	8	0	0%	0
Total	8,760	1,383	29%	406

Ringwood BOE - NJBPU
CHA Project #242736
Robert Erskine Elementary School

ECM-6: Replace Window A/C units with Energy Star Units Cost

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
18,000 MBH Energy Star A/C unit	16	EA	$ 220	$ -	$ -	$ 3,872	$ -	$ -	$ 3,872	RS Means 2012
						$ -	$ -	$ -	$ -	

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

$ 3,872	Subtotal
$ 309.76	8% tax
$ -	
$ -	
$ 4,200	**Total**

Ringwood BOE - NJBPU
CHA Project #242736
Robert Erskine Elementary School

ECM-7: Unoccupied Set-Back (72 to 55)

EXISTING CONDITIONS		
Existing Facility Total Electric usage	252,320	kWh
Existing Facility Natural Gas Usage	20,428	Therms
Cost of Electricty	$ 0.15	$/kWh
Cost of Natural Gas	$ 0.92	$/Therm
SAVINGS		
TOD Electric savings	0	kWh[1]
TOD Natural Gas savings	1,021	Therms[2]
Total Cost Savings	$ 945	

Assumptions

1	0%	Approximate electric savings due to night setback
2	5%	Approximate natural gas savings due to night setback

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-7: Unoccupied Set-Back (72 to 55) - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Connect Existing DDC to Cetralized System	1	ea	$ 300	$ 200	$ -	$ 330	$ 270	$ -	$ 600	Vendor Quote
Reprogram DDC	1	ea	$ -	$ 9,000	$ -	$ -	$ 12,150	$ -	$ 12,150	Engineering Estimate

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

$ 12,750	Subtotal
$ 1,275.00	10% Contingency
$ 2,805.00	20% Contractor O&P
$ -	
$ 16,830	**Total**

Ringwood BOE - NJBPU
CHA Project #242736
Robert Erskine Elementary School

ECM-8: Replace Domestic Hot Water Heater w/ Instantaneous unit

Summary
* Replace Existing NG 80 gallon DHWH w/ Instantaneous, Condensing, NG DHW Heater

Item	Value	Units	Formula/Comments
Occupied days per week	5	days/wk	
Water supply Temperature	60	˚F	Termperature of water coming into building
Hot Water Temperature	120	˚F	
Hot Water Usage per day	567	gal/day	Calculated from usage below
Annual Hot Water Energy Demand	56,627	MBTU/yr	Energy required to heat annual quantity of hot water to setpoint
Existing Tank Size	80	Gallons	Per manufacturer nameplate
Hot Water Temperature	120	˚F	Per building personnel
Average Room Temperature	70	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.8	MBH	
Annual Standby Hot Water Load	7,300	MBTU/yr	
Total Annual Hot Water Demand (w/ standby losses)	63,927	Mbtu/yr	Building demand plus standby losses
Existing Water Heater Efficiency	80%		Per Manufacturer
Total Annual Energy Required	79,909	Mbtu/yr	
Total Annual Natural Gas Required	**799.1**	**Therms /yr**	**Per Utility Bills**
New Tank Size	0	Gallons	tankless
Hot Water Temperature	120	˚F	
Average Room Temperature	70	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.0	MBH	
Annual Standby Hot Water Load	0	MBTU/yr	
Prop Annual Hot Water Demand (w/ standby losses)	56,627	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on condensing tankless DHW Heater
Proposed Total Annual Energy Required	61,551	MBTU/yr	
Proposed Fuel Use	616	Therms /yr	Standby Losses and inefficient DHW heater eliminated
Proposed Fuel Savings	**184**	**Therms /yr**	
Propane Utility Unit Cost	$1.03	$/Therm	
Existing Operating Cost of DHW	$823	$/yr	
Proposed Operating Cost of DHW	$634	$/yr	
Annual Utility Cost Savings	**$189**	**$/yr**	

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-8: Replace Domestic Hot Water Heater w/ Instantaneous unit - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Gas-Fired DHW Heater Removal	1	LS		$ 500		$ -	$ 675	$ -	$ 675	RS Means 2012
Rannai Tankless Gas-Fired DHW Heater	2	LS	$ 1,000	$ 1,000		$ 2,200	$ 2,700	$ -	$ 4,900	Vendor Quote
Venting	2	LS	$ 500	$ 500		$ 1,100	$ 1,350	$ -	$ 2,450	RS Means 2012
Miscellaneous Electrical	1	LS	$ 300			$ 330	$ -	$ -	$ 330	RS Means 2012
Miscellaneous Piping and Valves	1	LS	$ 200			$ 220	$ -	$ -	$ 220	RS Means 2012
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Note: Costs are for enrgy savings calcualtions only- do not use for procurement

$ 8,575	Subtotal
$ 858	10% Contingency
$ 1,887	20% Contractor O&P
$ -	
$ 11,319	**Total**

TITLE:	**Convert Electric Dish Washer Booster Heater to Natural Gas**
PROJECT:	Ringwood BOE - NJBPU
SITE:	Robert Erskine Elementary School

DESCRIPTION: When fuel costs are less expensive than electric, converting from electric to fuel heating results in reduce cost.

GIVEN:

Electrical Energy Cost	=	$0.123	$/kWh
Electrical Demand Cost	=	$ 9.53	$/kW
Fuel Energy Cost	=	$0.92	$/Therm (Nat'l Gas)
Booster Heater Capacity	=	10.4	Kw
Operation (Hours/Day)	=	4.00	Hours/Day
Operation (Days/Year)	=	180.00	Day/Year
Operation (Hours/Year)	=	720	Hours/Year

ASSUMPTION:

Efficiency (Fuel)	=	80%
Efficiency (Electric)	=	100%
Operating Months per Year	=	10
Scheduled Usage	=	70%
Utilization Factor (Demand)	=	30%

FORMULA:

Energy Use (Kwh) = (Capacity(Kw)) x (Hours of Operation/Year) x (Scheduled Usage) / (Efficiency)
Fuel Use (Unit) = (Electrical Use(Kwh)) x (3413 btu/kw) x (Electrical Efficiency) / (Fuel Efficiency) / (Heating Value of Fuel)
Energy Demand (Kw) = (Capacity (Kw)) x (Months/Year) x (Demand Utilization Factor)
Electrical Energy Cost ($) = (Energy Cost (Kwh) x ($/Kwh)) + (Demand (Kw) x ($/Kw))
Fuel Energy Cost ($) = ((Fuel Use(Unit) x Fuel Cost($/Unit))

CALCULATION:

	Capacity	Hours/Year	Scheduled Usage	Efficiency		
Electric Usage = (	10.4)x(	720)x(	70%)/(	100%) =		**5,242 Kwh**

	Electrical Use	Conversion	Efficiency (Electric)	Efficiency (Fuel)	Conversion	
Fuel Usage = (	5,242)x(	3,413) x (	100%)/(	80%)/(	100,000) =	**224 Therm**

	Capacity	Months/Year	Utilization Factor	
Electric Demand =(	10.4)*(	10)*(	30%) =	**31 Kw**

	Kwh	$/kwh	Kw	$/Kw	
Existing Energy Cost = (	**5,242**)*(	$0.123)+(	**31**)*(	$9.53) =	**$ 942**

	Therm	$/fuel unit	
Proposed Energy Cost = (	**224**)*(	$0.925) =	**$ 207**

Result

Existing Annual Use=	**5,242**	**Kwh**	**31**	**Kw**	**$**	**942**
Proposed Annual Use=			**224**	**Therm**	**$**	**207**

100%	**Annual Savings=**	**5,242**	**Kwh**	**31**	**Kw**	**$**	**736**
	Savings as Percent of Existing =			**(224)**	**Therm**		**78%**
80%	**Annual Savings=**	**4,193**	**Kwh**	**25**	**Kw**	**$**	**588**
	Savings as Percent of Existing =			**(179)**	**Therm**		**62%**

COMMENTS:

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

Convert Electric Dish Washer Booster Heater to Natural Gas - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
New Booster Heater	1	ea	$ 5,400.00	$ 6,700.00		$ 5,940	$ 9,045	$ -	$ 14,985	RS Means 2012
					$ -	$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Note: Costs shown are for enrgy savings calculations only. Do not use for procurement

$ 14,985	Subtotal
$ -	
$ -	
$ -	
$ 14,985	**Total**

Ringwood BOE - NJBPU
CHA Project #242736
Robert Erskine Elementary School

ECM-13: Add Dedicated Hood and Fan for Oven

EXISTING CONDITIONS		
	Length	**Width**
Dimension of Kitchen Hood (ft)	6	3.3
Linear Feet of Kitchen Hood	19	Feet
CFM of Kitchen Hood	1,867	CFM[1]
Existing Electric Requirements of Hood	1	HP
Existing Electric Requirements of Hood	0.746	kW[2]
Hours of Operation	1,800	Hours
Existing Annual Electric Usage	1,343	kWh
Cost of Electricity	$ 0.15	$/kWh
Cost of Annual Electric Usage	$ 207.07	$

PROPOSED CONDITIONS		
CFM of Kitchen Hood for Oven	250	CFM[3]
Proposed Electric Requirements of Hood	0.25	HP
Proposed Electric Requirements of Hood	0.187	kW[2]
Existing Annual Electric Usage	336	kWh
Cost of Annual Electric Usage	$ 51.77	$

SAVINGS		
Annual Electric savings	1,007	kWh
Total Cost Savings	$ 155.30	

Assumptions

1	100	CFM per Linear Foot of Hood
2	0.746	Conversion from HP to kW
3	250	Based on 8'D Duct Tying Into Exhaust Ductwork

Multipliers	
Material:	1.10
Labor:	1.35
Equipment:	1.10

ECM-13: Add Dedicated Hood and Fan for Oven - Cost

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Exhaust Hood	1	EA	$ 1,300	$ 1,700		$ 1,430	$ 2,295	$ -	$ 3,725	RS Means 2012
Exhaust Fan & Curb	1	EA	$ 500	$ 1,000		$ 550	$ 1,350	$ -	$ 1,900	RS Means 2012
Ductwork	1	EA	$ 500	$ 1,000		$ 550	$ 1,350	$ -	$ 1,900	RS Means 2012
Miscellaneous Electric Wiring	1	EA	$ 500	$ 1,000		$ 550	$ 1,350	$ -	$ 1,900	RS Means 2012
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Note: Costs are for enrgy savings calcualtions only- do not use for procurement

$ 9,425	Subtotal
$ 943	10% Contingency
$ 2,074	20% Contractor O&P
$ -	
$ 12,441	**Total**

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2012.
Building must have a minimum average electric demand of 100 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
Values used in this calculation are for measures with a positive return on investment (ROI) only.

Total Building Area (Square Feet)	31,700
Is this audit funded by NJ BPU (Y/N)	Yes

Board of Public Utilites (BPU)

Incentive #1		
Audit is funded by NJ BPU	$0.10	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$38,910	$23,041
Existing Usage (from utility)	252,320	24,912
Proposed Savings	71,102	9,886
Existing Total MMBtus	3,352	
Proposed Savings MMBtus	1,231	
% Energy Reduction	**36.7%**	
Proposed Annual Savings	$19,000	

	Min (Savings = 15%)		Increase (Savings > 15%)		Max Incentive		Achieved Incentive	
	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm
Incentive #2	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.11	$1.25
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.11	$1.25

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$5,000
Incentive #2	$7,821	$12,357	$20,178
Incentive #3	$7,821	$12,357	$20,178
Total All Incentives	**$15,643**	**$24,714**	**$45,357**

Total Project Cost	$916,060

		Allowable Incentive
% Incentives #1 of Utility Cost*	8.1%	$5,000
% Incentives #2 of Project Cost**	2.2%	$20,178
% Incentives #3 of Project Cost**	2.2%	$20,178
Total Eligible Incentives***	**$45,357**	
Project Cost w/ Incentives	$870,704	

Project Payback (years)	
w/o Incentives	w/ Incentives
48.2	45.8

* Maximum allowable incentive is 50% of annual utility cost if not funded by NJ BPU, and %25 if it is.

** Maximum allowable amount of Incentive #2 is 25% of total project cost.

Maximum allowable amount of Incentive #3 is 25% of total project cost.

*** Maximum allowable amount of Incentive #1 is $50,000 if not funded by NJ BPU, and $25,000 if it is.

Maximum allowable amount of Incentive #2 & #3 is $1 million per gas account and $1 million per electric account; maximum 2 million per project

ECM-9 Lighting Replacements

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Incentive	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	Years	Years
$54,281	**6.4**	**18,345**	**0**	**$2,985**	**0**	**$2,985**	**$4,600**	**18.2**	**16.6**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

ECM-10 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Incentive	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	Years	Years
$14,580	**0.0**	**45,398**	**0**	**$5,584**	**0**	**$5,584**	**$1,890**	**2.6**	**2.3**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

ECM-11 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Incentive	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	Years	Years
$68,861	**6.4**	**51,856**	**0**	**$7,107**	**0**	**$7,107**	**$6,490**	**9.7**	**8.8**

*Incentive based on New Jersey Smart Start Prescriptive Lighting Measures

Energy Audit of Robert Erskine Elementary School
CHA Project No. 24736
Existing Lighting

Cost of Electricity: $0.123 $/kWh
$9.53 $/kW

			EXISTING CONDITIONS									
	Area Description	**Usage**	**No. of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**	
Field Code	**Unique description of the location - Room number/Room name: Floor number (if applicable)**	**Describe Usage Type using Operating Hours**	**No. of fixtures before the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Fixt No.)**	**Pre-inst. control device**	**Estimated annual hours for the usage group**	**Retrofit control device**	**(kW/space) * (Annual Hours)**	**Notes**
201	101 Classroom	Classrooms	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	3000	C-OCC	1,080	
71	101 Classroom	Classrooms	1	I 60	I60/1	60	0.06	SW	3000	C-OCC	180	
201	102 Classroom	Classrooms	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	3000	C-OCC	1,080	
71	102 Classroom	Classrooms	1	I 60	I60/1	60	0.06	SW	3000	C-OCC	180	
196	102 Classroom	Classrooms	1	W 32 C F 4 (ELE)	F44ILL	112	0.11	SW	3000	C-OCC	336	
13	103 Faculty Room	Break/Lunch Rooms	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	3000	C-OCC	360	
196	103 Faculty Room	Break/Lunch Rooms	2	W 32 C F 4 (ELE)	F44ILL	112	0.22	SW	3000	C-OCC	672	
13	103 Faculty Room Women TR	Bath Room	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	C-OCC	120	
199	103 Faculty Room Women TR	Bath Room	1	W 32 C F 1 (ELE)	F41LL	32	0.03	SW	2000	C-OCC	64	
13	103 Faculty Room Men TR	Bath Room	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	2000	C-OCC	120	
199	103 Faculty Room Men TR	Bath Room	1	W 32 C F 1 (ELE)	F41LL	32	0.03	SW	2000	C-OCC	64	
196	Nurse Office	Offices	4	W 32 C F 4 (ELE)	F44ILL	112	0.45	SW	3000	C-OCC	1,344	
201	Nurse Office	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	3000	C-OCC	540	
201	Copier Room	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	3000	C-OCC	540	
201	Office	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	3000	C-OCC	540	
201	Main Office	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	3000	C-OCC	1,620	
201	Principal Office	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	3000	C-OCC	1,080	
71	Principal Office	Offices	1	I 60	I60/1	60	0.06	SW	3000	C-OCC	180	
201	Stairs	Hallways	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	3000	C-OCC	540	
13	Stairs	Hallways	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	3000	C-OCC	180	
196	Corridor	Hallways	14	W 32 C F 4 (ELE)	F44ILL	112	1.57	SW	3000	C-OCC	4,704	
71	Boy's TR	Bath Room	2	I 60	I60/1	60	0.12	SW	2000	C-OCC	240	
71	Girl's TR	Bath Room	2	I 60	I60/1	60	0.12	SW	2000	C-OCC	240	
13	Cust Room	Storage Areas	3	S 32 P F 2 (ELE)	F42LL	60	0.18	SW	1000	C-OCC	180	
196	All Purpose Room	Gynasium	20	W 32 C F 4 (ELE)	F44ILL	112	2.24	SW	3000	C-OCC	6,720	
201	Kitchen	Cafeteria	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.08	SW	3000		3,240	
74	Kitchen	Cafeteria	2	I 50	I50/1	50	0.10	SW	3000		300	
13	Boiler Room	Mechanical Room	7	S 32 P F 2 (ELE)	F42LL	60	0.42	SW	1000		420	
196	Storage / Garage	Classrooms	3	W 32 C F 4 (ELE)	F44ILL	112	0.34	SW	3000	C-OCC	1,008	
13	Storage / Garage	Bath Room	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	C-OCC	240	
13	201 Classroom	Bath Room	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	2000	C-OCC	1,560	
13	203 Classroom	Classrooms	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	3000	C-OCC	2,340	
13	205 Classroom	Classrooms	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	3000	C-OCC	2,340	
13	207 Classroom	Classrooms	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	3000	C-OCC	2,340	
13	208 Classroom	Classrooms	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	3000	C-OCC	2,340	
13	206 Classroom	Classrooms	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	3000	C-OCC	2,340	
13	204 Classroom	Classrooms	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	3000	C-OCC	2,340	
13	202 Classroom	Classrooms	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	3000	C-OCC	2,340	
13	209 Classroom	Classrooms	13	S 32 P F 2 (ELE)	F42LL	60	0.78	SW	3000	C-OCC	2,340	
13	211 Classroom	Classrooms	21	S 32 P F 2 (ELE)	F42LL	60	1.26	SW	3000	C-OCC	3,780	
13	213 Classroom	Classrooms	21	S 32 P F 2 (ELE)	F42LL	60	1.26	SW	3000	C-OCC	3,780	
13	215 Classroom	Classrooms	20	S 32 P F 2 (ELE)	F42LL	60	1.20	SW	3000	C-OCC	3,600	
13	217 Classroom	Classrooms	20	S 32 P F 2 (ELE)	F42LL	60	1.20	SW	3000	C-OCC	3,600	
13	219 Classroom	Classrooms	19	S 32 P F 2 (ELE)	F42LL	60	1.14	SW	3000	C-OCC	3,420	
71	219 TR	Bath Room	1	I 60	I60/1	60	0.06	SW	2000	C-OCC	120	
13	221 Classroom	Classrooms	19	S 32 P F 2 (ELE)	F42LL	60	1.14	SW	3000	C-OCC	3,420	
13	223 Classroom	Classrooms	31	S 32 P F 2 (ELE)	F42LL	60	1.86	SW	3000	C-OCC	5,580	
71	223 TR	Bath Room	1	I 60	I60/1	60	0.06	SW	2000	C-OCC	120	
13	225 Classroom	Classrooms	6	S 32 P F 2 (ELE)	F42LL	60	0.36	SW	3000	C-OCC	1,080	
71	225 TR	Bath Room	1	I 60	I60/1	60	0.06	SW	2000	C-OCC	120	
13	214 Classroom	Classrooms	20	S 32 P F 2 (ELE)	F42LL	60	1.20	SW	3000	C-OCC	3,600	
13	212 Classroom	Classrooms	20	S 32 P F 2 (ELE)	F42LL	60	1.20	SW	3000	C-OCC	3,600	
13	210 Classroom	Classrooms	20	S 32 P F 2 (ELE)	F42LL	60	1.20	SW	3000	C-OCC	3,600	
13	Storage	Storage Areas	1	S 32 P F 2 (ELE)	F42LL	60	0.06	SW	1000	C-OCC	60	
13	Boy's TR	Bath Room	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	C-OCC	240	
13	Girl's TR	Bath Room	2	S 32 P F 2 (ELE)	F42LL	60	0.12	SW	2000	C-OCC	240	
196	Hallway	Hallways	20	W 32 C F 4 (ELE)	F44ILL	112	2.24	SW	3000	C-OCC	6,720	
	Total		**472**				**32.71**				**95,072**	

Energy Audit of Robert Erskine Elementary School
CHA Project No. 24736
ECM-9 Lighting Replacements

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
201	101 Classroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080	4	0	F43SSILL	72	0.3	SW	3,000	864	216	0.1	$ 34.80	$ 425.00	$40	12.2	11.1
71	101 Classroom	1	I 60	I60/1	60	0.1	SW	3000	180	1	CF 26	CFQ26/1-L	27	0.0	SW	3,000	81	99	0.0	$ 15.95	$ 6.75	$0	0.4	0.4
201	102 Classroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080	4	0	F43SSILL	72	0.3	SW	3,000	864	216	0.1	$ 34.80	$ 425.00	$40	12.2	11.1
71	102 Classroom	1	I 60	I60/1	60	0.1	SW	3000	180	1	CF 26	CFQ26/1-L	27	0.0	SW	3,000	81	99	0.0	$ 15.95	$ 6.75	$0	0.4	0.4
196	102 Classroom	1	W 32 C F 4 (ELE)	F44ILL	112	0.1	SW	3000	336	1	0	F44SSILL	96	0.1	SW	3,000	288	48	0.0	$ 7.73	$ 141.75	$10	18.3	17.0
13	103 Faculty Room	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	3000	360	2	0	F42SSILL	48	0.1	SW	3,000	288	72	0.0	$ 11.60	$ 229.50	$20	19.8	18.1
196	103 Faculty Room	2	W 32 C F 4 (ELE)	F44ILL	112	0.2	SW	3000	672	2	0	F44SSILL	96	0.2	SW	3,000	576	96	0.0	$ 15.47	$ 283.50	$20	18.3	17.0
13	103 Faculty Room Women TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	0	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.32	$ 114.75	$10	26.5	24.2
199	103 Faculty Room Women TR	1	W 32 C F 1 (ELE)	F41LL	32	0.0	SW	2000	64	1	0	F41SSILL	26	0.0	SW	2,000	52	12	0.0	$ 2.16	$ 106.25	$10	49.1	44.5
13	103 Faculty Room Men TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	0	F42SSILL	48	0.0	SW	2,000	96	24	0.0	$ 4.32	$ 114.75	$10	26.5	24.2
199	103 Faculty Room Men TR	1	W 32 C F 1 (ELE)	F41LL	32	0.0	SW	2000	64	1	0	F41SSILL	26	0.0	SW	2,000	52	12	0.0	$ 2.16	$ 106.25	$10	49.1	44.5
196	Nurse Office	4	W 32 C F 4 (ELE)	F44ILL	112	0.4	SW	3000	1,344	4	0	F44SSILL	96	0.4	SW	3,000	1,152	192	0.1	$ 30.94	$ 567.00	$40	18.3	17.0
201	Nurse Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540	2	0	F43SSILL	72	0.1	SW	3,000	432	108	0.0	$ 17.40	$ 212.50	$20	12.2	11.1
201	Copier Room	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540	2	0	F43SSILL	72	0.1	SW	3,000	432	108	0.0	$ 17.40	$ 212.50	$20	12.2	11.1
201	Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540	2	0	F43SSILL	72	0.1	SW	3,000	432	108	0.0	$ 17.40	$ 212.50	$20	12.2	11.1
201	Main Office	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	3000	1,620	6	0	F43SSILL	72	0.4	SW	3,000	1,296	324	0.1	$ 52.20	$ 637.50	$60	12.2	11.1
201	Principal Office	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080	4	0	F43SSILL	72	0.3	SW	3,000	864	216	0.1	$ 34.80	$ 425.00	$40	12.2	11.1
71	Principal Office	1	I 60	I60/1	60	0.1	SW	3000	180	1	CF 26	CFQ26/1-L	27	0.0	SW	3,000	81	99	0.0	$ 15.95	$ 6.75	$0	0.4	0.4
201	Stairs	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540	2	0	F43SSILL	72	0.1	SW	3,000	432	108	0.0	$ 17.40	$ 212.50	$20	12.2	11.1
13	Stairs	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	3000	180	1	0	F42SSILL	48	0.0	SW	3,000	144	36	0.0	$ 5.80	$ 114.75	$10	19.8	18.1
196	Corridor	14	W 32 C F 4 (ELE)	F44ILL	112	1.6	SW	3000	4,704	14	0	F44SSILL	96	1.3	SW	3,000	4,032	672	0.2	$ 108.27	$ 1,984.50	$140	18.3	17.0
71	Boy's TR	2	I 60	I60/1	60	0.1	SW	2000	240	2	CF 26	CFQ26/1-L	27	0.1	SW	2,000	108	132	0.1	$ 23.78	$ 13.50	$0	0.6	0.6
71	Girl's TR	2	I 60	I60/1	60	0.1	SW	2000	240	2	CF 26	CFQ26/1-L	27	0.1	SW	2,000	108	132	0.1	$ 23.78	$ 13.50	$0	0.6	0.6
13	Cust Room	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	1000	180	3	0	F42SSILL	48	0.1	SW	1,000	144	36	0.0	$ 8.54	$ 344.25	$30	40.3	36.8
196	All Purpose Room	20	W 32 C F 4 (ELE)	F44ILL	112	2.2	SW	3000	6,720	20	0	F44SSILL	96	1.9	SW	3,000	5,760	960	0.3	$ 154.68	$ 2,835.00	$200	18.3	17.0
201	Kitchen	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.1	SW	3000	3,240	12	0	F43SSILL	72	0.9	SW	3,000	2,592	648	0.2	$ 104.41	$ 1,275.00	$120	12.2	11.1
74	Kitchen	2	I 50	I50/1	50	0.1	SW	3000	300	2	CF 26	CFQ26/1-L	27	0.1	SW	3,000	162	138	0.0	$ 22.23	$ 40.50	$0	1.8	1.8
13	Boiler Room	7	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	1000	420	7	0	F42SSILL	48	0.3	SW	1,000	336	84	0.1	$ 19.94	$ 803.25	$70	40.3	36.8
196	Storage / Garage	3	W 32 C F 4 (ELE)	F44ILL	112	0.3	SW	3000	1,008	3	0	F44SSILL	96	0.3	SW	3,000	864	144	0.0	$ 23.20	$ 425.25	$30	18.3	17.0
13	Storage / Garage	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	0	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.65	$ 229.50	$20	26.5	24.2
13	201 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	2000	1,560	13	0	F42SSILL	48	0.6	SW	2,000	1,248	312	0.2	$ 56.22	$ 1,491.75	$130	26.5	24.2
13	203 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	SW	3,000	1,872	468	0.2	$ 75.40	$ 1,491.75	$130	19.8	18.1
13	205 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	SW	3,000	1,872	468	0.2	$ 75.40	$ 1,491.75	$130	19.8	18.1
13	207 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	SW	3,000	1,872	468	0.2	$ 75.40	$ 1,491.75	$130	19.8	18.1
13	208 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	SW	3,000	1,872	468	0.2	$ 75.40	$ 1,491.75	$130	19.8	18.1
13	206 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	SW	3,000	1,872	468	0.2	$ 75.40	$ 1,491.75	$130	19.8	18.1
13	204 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	SW	3,000	1,872	468	0.2	$ 75.40	$ 1,491.75	$130	19.8	18.1
13	202 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	SW	3,000	1,872	468	0.2	$ 75.40	$ 1,491.75	$130	19.8	18.1
13	209 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	SW	3,000	1,872	468	0.2	$ 75.40	$ 1,491.75	$130	19.8	18.1
13	211 Classroom	21	S 32 P F 2 (ELE)	F42LL	60	1.3	SW	3000	3,780	21	0	F42SSILL	48	1.0	SW	3,000	3,024	756	0.3	$ 121.81	$ 2,409.75	$210	19.8	18.1
13	213 Classroom	21	S 32 P F 2 (ELE)	F42LL	60	1.3	SW	3000	3,780	21	0	F42SSILL	48	1.0	SW	3,000	3,024	756	0.3	$ 121.81	$ 2,409.75	$210	19.8	18.1
13	215 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	SW	3,000	2,880	720	0.2	$ 116.01	$ 2,295.00	$200	19.8	18.1
13	217 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	SW	3,000	2,880	720	0.2	$ 116.01	$ 2,295.00	$200	19.8	18.1
13	219 Classroom	19	S 32 P F 2 (ELE)	F42LL	60	1.1	SW	3000	3,420	19	0	F42SSILL	48	0.9	SW	3,000	2,736	684	0.2	$ 110.21	$ 2,180.25	$190	19.8	18.1
71	219 TR	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	SW	2,000	54	66	0.0	$ 11.89	$ 6.75	$0	0.6	0.6
13	221 Classroom	19	S 32 P F 2 (ELE)	F42LL	60	1.1	SW	3000	3,420	19	0	F42SSILL	48	0.9	SW	3,000	2,736	684	0.2	$ 110.21	$ 2,180.25	$190	19.8	18.1
13	223 Classroom	31	S 32 P F 2 (ELE)	F42LL	60	1.9	SW	3000	5,580	31	0	F42SSILL	48	1.5	SW	3,000	4,464	1,116	0.4	$ 179.81	$ 3,557.25	$310	19.8	18.1
71	223 TR	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	SW	2,000	54	66	0.0	$ 11.89	$ 6.75	$0	0.6	0.6
13	225 Classroom	6	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	3000	1,080	6	0	F42SSILL	48	0.3	SW	3,000	864	216	0.1	$ 34.80	$ 688.50	$60	19.8	18.1
71	225 TR	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	SW	2,000	54	66	0.0	$ 11.89	$ 6.75	$0	0.6	0.6
13	214 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	SW	3,000	2,880	720	0.2	$ 116.01	$ 2,295.00	$200	19.8	18.1
13	212 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	SW	3,000	2,880	720	0.2	$ 116.01	$ 2,295.00	$200	19.8	18.1
13	210 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	SW	3,000	2,880	720	0.2	$ 116.01	$ 2,295.00	$200	19.8	18.1
13	Storage	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	60	1	0	F42SSILL	48	0.0	SW	1,000	48	12	0.0	$ 2.85	$ 114.75	$10	40.3	36.8
13	Boy's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	0	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.65	$ 229.50	$20	26.5	24.2
13	Girl's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	0	F42SSILL	48	0.1	SW	2,000	192	48	0.0	$ 8.65	$ 229.50	$20	26.5	24.2
196	Hallway	20	W 32 C F 4 (ELE)	F44ILL	112	2.2	SW	3000	6,720	20	0	F44SSILL	96	1.9	SW	3,000	5,760	960	0.3	$ 154.68	$ 2,835.00	$200	18.3	17.0
	Total	**472**				**32.7**			**95,072**	**472**			**3,055**	**26.3**			**76,727**	**18,345**	**6.4**	**$2,985**	**$54,281**	**$4,600**		
																	Demand Savings			**6.4**	**$728**			
																	kWh Savings			**18,345**	**$2,256**			
																	Total savings				**$2,985**		**18.2**	**16.6**

Energy Audit of Robert Erskine Elementary School
CHA Project No. 24736
ECM-10 Install Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
201	101 Classroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080.0	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	C-OCC	1600	576.0	504.0	0.0	$61.99	$270.00	$35.00	4.4	3.8
71	101 Classroom	1	I 60	I60/1	60	0.1	SW	3000	180.0	1	I 60	I60/1	60	0.1	C-OCC	1600	96.0	84.0	0.0	$10.33	$270.00	$35.00	26.1	22.7
201	102 Classroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080.0	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	C-OCC	1600	576.0	504.0	0.0	$61.99	$270.00	$35.00	4.4	3.8
71	102 Classroom	1	I 60	I60/1	60	0.1	SW	3000	180.0	1	I 60	I60/1	60	0.1	C-OCC	1600	96.0	84.0	0.0	$10.33	$270.00	$35.00	26.1	22.7
196	102 Classroom	1	W 32 C F 4 (ELE)	F44ILL	112	0.1	SW	3000	336.0	1	W 32 C F 4 (ELE)	F44ILL	112	0.1	C-OCC	1600	179.2	156.8	0.0	$19.29	$270.00	$35.00	14.0	12.2
13	103 Faculty Room	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	3000	360.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	2000	240.0	120.0	0.0	$14.76	$270.00	$35.00	18.3	15.9
196	103 Faculty Room	2	W 32 C F 4 (ELE)	F44ILL	112	0.2	SW	3000	672.0	2	W 32 C F 4 (ELE)	F44ILL	112	0.2	C-OCC	2000	448.0	224.0	0.0	$27.55	$270.00	$35.00	9.8	8.5
13	103 Faculty Room Women TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	72.0	48.0	0.0	$5.90	$270.00	$35.00	45.7	39.8
199	103 Faculty Room Women TR	1	W 32 C F 1 (ELE)	F41LL	32	0.0	SW	2000	64.0	1	W 32 C F 1 (ELE)	F41LL	32	0.0	C-OCC	1200	38.4	25.6	0.0	$3.15	$270.00	$35.00	85.7	74.6
13	103 Faculty Room Men TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	72.0	48.0	0.0	$5.90	$270.00	$35.00	45.7	39.8
199	103 Faculty Room Men TR	1	W 32 C F 1 (ELE)	F41LL	32	0.0	SW	2000	64.0	1	W 32 C F 1 (ELE)	F41LL	32	0.0	C-OCC	1200	38.4	25.6	0.0	$3.15	$270.00	$35.00	85.7	74.6
196	Nurse Office	4	W 32 C F 4 (ELE)	F44ILL	112	0.4	SW	3000	1,344.0	4	W 32 C F 4 (ELE)	F44ILL	112	0.4	C-OCC	2000	896.0	448.0	0.0	$55.10	$270.00	$35.00	4.9	4.3
201	Nurse Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540.0	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	C-OCC	2000	360.0	180.0	0.0	$22.14	$270.00	$35.00	12.2	10.6
201	Copier Room	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540.0	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	C-OCC	2000	360.0	180.0	0.0	$22.14	$270.00	$35.00	12.2	10.6
201	Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540.0	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	C-OCC	2000	360.0	180.0	0.0	$22.14	$270.00	$35.00	12.2	10.6
201	Main Office	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	3000	1,620.0	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	C-OCC	2000	1,080.0	540.0	0.0	$66.42	$270.00	$35.00	4.1	3.5
201	Principal Office	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080.0	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	C-OCC	2000	720.0	360.0	0.0	$44.28	$270.00	$35.00	6.1	5.3
71	Principal Office	1	I 60	I60/1	60	0.1	SW	3000	180.0	1	I 60	I60/1	60	0.1	C-OCC	2000	120.0	60.0	0.0	$7.38	$270.00	$35.00	36.6	31.8
201	Stairs	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540.0	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	C-OCC	1600	288.0	252.0	0.0	$31.00	$270.00	$35.00	8.7	7.6
13	Stairs	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	3000	180.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1600	96.0	84.0	0.0	$10.33	$270.00	$35.00	26.1	22.7
196	Corridor	14	W 32 C F 4 (ELE)	F44ILL	112	1.6	SW	3000	4,704.0	14	W 32 C F 4 (ELE)	F44ILL	112	1.6	C-OCC	1600	2,508.8	2,195.2	0.0	$270.01	$270.00	$35.00	1.0	0.9
71	Boy's TR	2	I 60	I60/1	60	0.1	SW	2000	240.0	2	I 60	I60/1	60	0.1	C-OCC	1200	144.0	96.0	0.0	$11.81	$270.00	$35.00	22.9	19.9
71	Girl's TR	2	I 60	I60/1	60	0.1	SW	2000	240.0	2	I 60	I60/1	60	0.1	C-OCC	1200	144.0	96.0	0.0	$11.81	$270.00	$35.00	22.9	19.9
13	Cust Room	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	1000	180.0	3	S 32 P F 2 (ELE)	F42LL	60	0.2	C-OCC	250	45.0	135.0	0.0	$16.61	$270.00	$35.00	16.3	14.2
196	All Purpose Room	20	W 32 C F 4 (ELE)	F44ILL	112	2.2	SW	3000	6,720.0	20	W 32 C F 4 (ELE)	F44ILL	112	2.2	C-OCC	1600	3,584.0	3,136.0	0.0	$385.73	$270.00	$35.00	0.7	0.6
201	Kitchen	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.1	SW	3000	3,240.0	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.1		3000			0.0		$0.00	$0.00		
74	Kitchen	2	I 50	I50/1	50	0.1	SW	3000	300.0	2	I 50	I50/1	50	0.1		3000			0.0		$0.00	$0.00		
13	Boiler Room	7	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	1000	420.0	7	S 32 P F 2 (ELE)	F42LL	60	0.4		1000			0.0		$0.00	$0.00		
196	Storage / Garage	3	W 32 C F 4 (ELE)	F44ILL	112	0.3	SW	3000	1,008.0	3	W 32 C F 4 (ELE)	F44ILL	112	0.3	C-OCC	1600	537.6	470.4	0.0	$57.86	$270.00	$35.00	4.7	4.1
13	Storage / Garage	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	144.0	96.0	0.0	$11.81	$270.00	$35.00	22.9	19.9
13	201 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	2000	1,560.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1200	936.0	624.0	0.0	$76.75	$270.00	$35.00	3.5	3.1
13	203 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1600	1,248.0	1,092.0	0.0	$134.32	$270.00	$35.00	2.0	1.7
13	205 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1600	1,248.0	1,092.0	0.0	$134.32	$270.00	$35.00	2.0	1.7
13	207 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1600	1,248.0	1,092.0	0.0	$134.32	$270.00	$35.00	2.0	1.7
13	208 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1600	1,248.0	1,092.0	0.0	$134.32	$270.00	$35.00	2.0	1.7
13	206 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1600	1,248.0	1,092.0	0.0	$134.32	$270.00	$35.00	2.0	1.7
13	204 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1600	1,248.0	1,092.0	0.0	$134.32	$270.00	$35.00	2.0	1.7
13	202 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1600	1,248.0	1,092.0	0.0	$134.32	$270.00	$35.00	2.0	1.7
13	209 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340.0	13	S 32 P F 2 (ELE)	F42LL	60	0.8	C-OCC	1600	1,248.0	1,092.0	0.0	$134.32	$270.00	$35.00	2.0	1.7
13	211 Classroom	21	S 32 P F 2 (ELE)	F42LL	60	1.3	SW	3000	3,780.0	21	S 32 P F 2 (ELE)	F42LL	60	1.3	C-OCC	1600	2,016.0	1,764.0	0.0	$216.97	$270.00	$35.00	1.2	1.1
13	213 Classroom	21	S 32 P F 2 (ELE)	F42LL	60	1.3	SW	3000	3,780.0	21	S 32 P F 2 (ELE)	F42LL	60	1.3	C-OCC	1600	2,016.0	1,764.0	0.0	$216.97	$270.00	$35.00	1.2	1.1
13	215 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600.0	20	S 32 P F 2 (ELE)	F42LL	60	1.2	C-OCC	1600	1,920.0	1,680.0	0.0	$206.64	$270.00	$35.00	1.3	1.1
13	217 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600.0	20	S 32 P F 2 (ELE)	F42LL	60	1.2	C-OCC	1600	1,920.0	1,680.0	0.0	$206.64	$270.00	$35.00	1.3	1.1
13	219 Classroom	19	S 32 P F 2 (ELE)	F42LL	60	1.1	SW	3000	3,420.0	19	S 32 P F 2 (ELE)	F42LL	60	1.1	C-OCC	1600	1,824.0	1,596.0	0.0	$196.31	$270.00	$35.00	1.4	1.2
71	219 TR	1	I 60	I60/1	60	0.1	SW	2000	120.0	1	I 60	I60/1	60	0.1	C-OCC	1200	72.0	48.0	0.0	$5.90	$270.00	$35.00	45.7	39.8
13	221 Classroom	19	S 32 P F 2 (ELE)	F42LL	60	1.1	SW	3000	3,420.0	19	S 32 P F 2 (ELE)	F42LL	60	1.1	C-OCC	1600	1,824.0	1,596.0	0.0	$196.31	$270.00	$35.00	1.4	1.2
13	223 Classroom	31	S 32 P F 2 (ELE)	F42LL	60	1.9	SW	3000	5,580.0	31	S 32 P F 2 (ELE)	F42LL	60	1.9	C-OCC	1600	2,976.0	2,604.0	0.0	$320.29	$270.00	$35.00	0.8	0.7
71	223 TR	1	I 60	I60/1	60	0.1	SW	2000	120.0	1	I 60	I60/1	60	0.1	C-OCC	1200	72.0	48.0	0.0	$5.90	$270.00	$35.00	45.7	39.8
13	225 Classroom	6	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	3000	1,080.0	6	S 32 P F 2 (ELE)	F42LL	60	0.4	C-OCC	1600	576.0	504.0	0.0	$61.99	$270.00	$35.00	4.4	3.8
71	225 TR	1	I 60	I60/1	60	0.1	SW	2000	120.0	1	I 60	I60/1	60	0.1	C-OCC	1200	72.0	48.0	0.0	$5.90	$270.00	$35.00	45.7	39.8
13	214 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600.0	20	S 32 P F 2 (ELE)	F42LL	60	1.2	C-OCC	1600	1,920.0	1,680.0	0.0	$206.64	$270.00	$35.00	1.3	1.1
13	212 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600.0	20	S 32 P F 2 (ELE)	F42LL	60	1.2	C-OCC	1600	1,920.0	1,680.0	0.0	$206.64	$270.00	$35.00	1.3	1.1
13	210 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600.0	20	S 32 P F 2 (ELE)	F42LL	60	1.2	C-OCC	1600	1,920.0	1,680.0	0.0	$206.64	$270.00	$35.00	1.3	1.1
13	Storage	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	60.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	250	15.0	45.0	0.0	$5.54	$270.00	$35.00	48.8	42.5
13	Boy's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	144.0	96.0	0.0	$11.81	$270.00	$35.00	22.9	19.9
13	Girl's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	144.0	96.0	0.0	$11.81	$270.00	$35.00	22.9	19.9
196	Hallway	20	W 32 C F 4 (ELE)	F44ILL	112	2.2	SW	3000	6,720.0	20	W 32 C F 4 (ELE)	F44ILL	112	2.2	C-OCC	1600	3,584.0	3,136.0	0.0	$385.73	$270.00	$35.00	0.7	0.6
	Total	**472**				**32.7**			**95,072**	**472**				**33**			**49,674**	**41,438**	**0**	**5,097**	**$14,580**	**1,890**		
																	Demand Savings			**0.0**	**$0**			
																	kWh Savings			**45,398**	**$5,584**			
																	Total Savings				**$5,584**		**2.6**	**2.3**

Energy Audit of Robert Erskine Elementary School
CHA Project No. 24736
ECM-11 Lighting Replacements with Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
201	101 Classroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080	4	0	F43SSILL	72	0.3	C-OCC	1,600	461	619	0.1	$ 84.40	$ 695.00	$ 75	8.2	7.3
71	101 Classroom	1	I 60	I60/1	60	0.1	SW	3000	180	1	CF 26	CFQ26/1-L	27	0.0	C-OCC	1,600	43	137	0.0	$ 20.60	$ 276.75	$ 35	13.4	11.7
201	102 Classroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080	4	0	F43SSILL	72	0.3	C-OCC	1,600	461	619	0.1	$ 84.40	$ 695.00	$ 75	8.2	7.3
71	102 Classroom	1	I 60	I60/1	60	0.1	SW	3000	180	1	CF 26	CFQ26/1-L	27	0.0	C-OCC	1,600	43	137	0.0	$ 20.60	$ 276.75	$ 35	13.4	11.7
196	102 Classroom	1	W 32 C F 4 (ELE)	F44ILL	112	0.1	SW	3000	336	1	0	F44SSILL	96	0.1	C-OCC	1,600	154	182	0.0	$ 24.26	$ 411.75	$ 45	17.0	15.1
13	103 Faculty Room	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	3000	360	2	0	F42SSILL	48	0.1	C-OCC	2,000	192	168	0.0	$ 23.41	$ 499.50	$ 55	21.3	19.0
196	103 Faculty Room	2	W 32 C F 4 (ELE)	F44ILL	112	0.2	SW	3000	672	2	0	F44SSILL	96	0.2	C-OCC	2,000	384	288	0.0	$ 39.08	$ 553.50	$ 55	14.2	12.8
13	103 Faculty Room Women TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	0	F42SSILL	48	0.0	C-OCC	1,200	58	62	0.0	$ 9.05	$ 384.75	$ 45	42.5	37.6
199	103 Faculty Room Women TR	1	W 32 C F 1 (ELE)	F41LL	32	0.0	SW	2000	64	1	0	F41SSILL	26	0.0	C-OCC	1,200	31	33	0.0	$ 4.72	$ 376.25	$ 45	79.7	70.2
13	103 Faculty Room Men TR	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	0	F42SSILL	48	0.0	C-OCC	1,200	58	62	0.0	$ 9.05	$ 384.75	$ 45	42.5	37.6
199	103 Faculty Room Men TR	1	W 32 C F 1 (ELE)	F41LL	32	0.0	SW	2000	64	1	0	F41SSILL	26	0.0	C-OCC	1,200	31	33	0.0	$ 4.72	$ 376.25	$ 45	79.7	70.2
196	Nurse Office	4	W 32 C F 4 (ELE)	F44ILL	112	0.4	SW	3000	1,344	4	0	F44SSILL	96	0.4	C-OCC	2,000	768	576	0.1	$ 78.17	$ 837.00	$ 75	10.7	9.7
201	Nurse Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540	2	0	F43SSILL	72	0.1	C-OCC	2,000	288	252	0.0	$ 35.11	$ 482.50	$ 55	13.7	12.2
201	Copier Room	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540	2	0	F43SSILL	72	0.1	C-OCC	2,000	288	252	0.0	$ 35.11	$ 482.50	$ 55	13.7	12.2
201	Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540	2	0	F43SSILL	72	0.1	C-OCC	2,000	288	252	0.0	$ 35.11	$ 482.50	$ 55	13.7	12.2
201	Main Office	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	3000	1,620	6	0	F43SSILL	72	0.4	C-OCC	2,000	864	756	0.1	$ 105.34	$ 907.50	$ 95	8.6	7.7
201	Principal Office	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3000	1,080	4	0	F43SSILL	72	0.3	C-OCC	2,000	576	504	0.1	$ 70.23	$ 695.00	$ 75	9.9	8.8
71	Principal Office	1	I 60	I60/1	60	0.1	SW	3000	180	1	CF 26	CFQ26/1-L	27	0.0	C-OCC	2,000	54	126	0.0	$ 19.27	$ 276.75	$ 35	14.4	12.5
201	Stairs	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	3000	540	2	0	F43SSILL	72	0.1	C-OCC	1,600	230	310	0.0	$ 42.20	$ 482.50	$ 55	11.4	10.1
13	Stairs	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	3000	180	1	0	F42SSILL	48	0.0	C-OCC	1,600	77	103	0.0	$ 14.07	$ 384.75	$ 45	27.4	24.2
196	Corridor	14	W 32 C F 4 (ELE)	F44ILL	112	1.6	SW	3000	4,704	14	0	F44SSILL	96	1.3	C-OCC	1,600	2,150	2,554	0.2	$ 339.71	$ 2,254.50	$ 175	6.6	6.1
71	Boy's TR	2	I 60	I60/1	60	0.1	SW	2000	240	2	CF 26	CFQ26/1-L	27	0.1	C-OCC	1,200	65	175	0.1	$ 29.10	$ 283.50	$ 35	9.7	8.5
71	Girl's TR	2	I 60	I60/1	60	0.1	SW	2000	240	2	CF 26	CFQ26/1-L	27	0.1	C-OCC	1,200	65	175	0.1	$ 29.10	$ 283.50	$ 35	9.7	8.5
13	Cust Room	3	S 32 P F 2 (ELE)	F42LL	60	0.2	SW	1000	180	3	0	F42SSILL	48	0.1	C-OCC	250	36	144	0.0	$ 21.83	$ 614.25	$ 65	28.1	25.2
196	All Purpose Room	20	W 32 C F 4 (ELE)	F44ILL	112	2.2	SW	3000	6,720	20	0	F44SSILL	96	1.9	C-OCC	1,600	3,072	3,648	0.3	$ 485.30	$ 3,105.00	$ 235	6.4	5.9
201	Kitchen	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.1	SW	3000	3,240	12	0	F43SSILL	72	0.9		3,000	2,592	648	0.2	$ 104.41	$ 1,275.00	$ 120	12.2	11.1
74	Kitchen	2	I 50	I50/1	50	0.1	SW	3000	300	2	CF 26	CFQ26/1-L	27	0.1		3,000	162	138	0.0	$ 22.23	$ 40.50	$ -	1.8	1.8
13	Boiler Room	7	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	1000	420	7	0	F42SSILL	48	0.3		1,000	336	84	0.1	$ 19.94	$ 803.25	$ 70	40.3	36.8
196	Storage / Garage	3	W 32 C F 4 (ELE)	F44ILL	112	0.3	SW	3000	1,008	3	0	F44SSILL	96	0.3	C-OCC	1,600	461	547	0.0	$ 72.79	$ 695.25	$ 65	9.6	8.7
13	Storage / Garage	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	0	F42SSILL	48	0.1	C-OCC	1,200	115	125	0.0	$ 18.10	$ 499.50	$ 55	27.6	24.6
13	201 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	2000	1,560	13	0	F42SSILL	48	0.6	C-OCC	1,200	749	811	0.2	$ 117.62	$ 1,761.75	$ 165	15.0	13.6
13	203 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	C-OCC	1,600	998	1,342	0.2	$ 182.86	$ 1,761.75	$ 165	9.6	8.7
13	205 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	C-OCC	1,600	998	1,342	0.2	$ 182.86	$ 1,761.75	$ 165	9.6	8.7
13	207 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	C-OCC	1,600	998	1,342	0.2	$ 182.86	$ 1,761.75	$ 165	9.6	8.7
13	208 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	C-OCC	1,600	998	1,342	0.2	$ 182.86	$ 1,761.75	$ 165	9.6	8.7
13	206 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	C-OCC	1,600	998	1,342	0.2	$ 182.86	$ 1,761.75	$ 165	9.6	8.7
13	204 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	C-OCC	1,600	998	1,342	0.2	$ 182.86	$ 1,761.75	$ 165	9.6	8.7
13	202 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	C-OCC	1,600	998	1,342	0.2	$ 182.86	$ 1,761.75	$ 165	9.6	8.7
13	209 Classroom	13	S 32 P F 2 (ELE)	F42LL	60	0.8	SW	3000	2,340	13	0	F42SSILL	48	0.6	C-OCC	1,600	998	1,342	0.2	$ 182.86	$ 1,761.75	$ 165	9.6	8.7
13	211 Classroom	21	S 32 P F 2 (ELE)	F42LL	60	1.3	SW	3000	3,780	21	0	F42SSILL	48	1.0	C-OCC	1,600	1,613	2,167	0.3	$ 295.38	$ 2,679.75	$ 245	9.1	8.2
13	213 Classroom	21	S 32 P F 2 (ELE)	F42LL	60	1.3	SW	3000	3,780	21	0	F42SSILL	48	1.0	C-OCC	1,600	1,613	2,167	0.3	$ 295.38	$ 2,679.75	$ 245	9.1	8.2
13	215 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	C-OCC	1,600	1,536	2,064	0.2	$ 281.32	$ 2,565.00	$ 235	9.1	8.3
13	217 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	C-OCC	1,600	1,536	2,064	0.2	$ 281.32	$ 2,565.00	$ 235	9.1	8.3
13	219 Classroom	19	S 32 P F 2 (ELE)	F42LL	60	1.1	SW	3000	3,420	19	0	F42SSILL	48	0.9	C-OCC	1,600	1,459	1,961	0.2	$ 267.25	$ 2,450.25	$ 225	9.2	8.3
71	219 TR	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	C-OCC	1,200	32	88	0.0	$ 14.55	$ 276.75	$ 35	19.0	16.6
13	221 Classroom	19	S 32 P F 2 (ELE)	F42LL	60	1.1	SW	3000	3,420	19	0	F42SSILL	48	0.9	C-OCC	1,600	1,459	1,961	0.2	$ 267.25	$ 2,450.25	$ 225	9.2	8.3
13	223 Classroom	31	S 32 P F 2 (ELE)	F42LL	60	1.9	SW	3000	5,580	31	0	F42SSILL	48	1.5	C-OCC	1,600	2,381	3,199	0.4	$ 436.04	$ 3,827.25	$ 345	8.8	8.0
71	223 TR	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	C-OCC	1,200	32	88	0.0	$ 14.55	$ 276.75	$ 35	19.0	16.6
13	225 Classroom	6	S 32 P F 2 (ELE)	F42LL	60	0.4	SW	3000	1,080	6	0	F42SSILL	48	0.3	C-OCC	1,600	461	619	0.1	$ 84.40	$ 958.50	$ 95	11.4	10.2
71	225 TR	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	C-OCC	1,200	32	88	0.0	$ 14.55	$ 276.75	$ 35	19.0	16.6
13	214 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	C-OCC	1,600	1,536	2,064	0.2	$ 281.32	$ 2,565.00	$ 235	9.1	8.3
13	212 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	C-OCC	1,600	1,536	2,064	0.2	$ 281.32	$ 2,565.00	$ 235	9.1	8.3
13	210 Classroom	20	S 32 P F 2 (ELE)	F42LL	60	1.2	SW	3000	3,600	20	0	F42SSILL	48	1.0	C-OCC	1,600	1,536	2,064	0.2	$ 281.32	$ 2,565.00	$ 235	9.1	8.3
13	Storage	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	60	1	0	F42SSILL	48	0.0	C-OCC	250	12	48	0.0	$ 7.28	$ 384.75	$ 45	52.9	46.7
13	Boy's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	0	F42SSILL	48	0.1	C-OCC	1,200	115	125	0.0	$ 18.10	$ 499.50	$ 55	27.6	24.6
13	Girl's TR	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	0	F42SSILL	48	0.1	C-OCC	1,200	115	125	0.0	$ 18.10	$ 499.50	$ 55	27.6	24.6
196	Hallway	20	W 32 C F 4 (ELE)	F44ILL	112	2.2	SW	3000	6,720	20	0	F44SSILL	96	1.9	C-OCC	1,600	3,072	3,648	0.3	$ 485.30	$ 3,105.00	$ 235	6.4	5.9
S	Total	472				32.7			95,072	472				26.3			43,216		6.4	7,107	68,861	$6,490		
S																	Demand Savings			6.4	$728			
S																	kWh Savings			51,856	$6,378			
S																	Total Savings				$7,107		9.7	8.8

APPENDIX D

Local Government Energy Audit Programs

I. SMART START

NJ SmartStart Buildings

Program Overview

With New Jersey SmartStart Buildings ...

... A smart start now means better performance later! Whether you're starting a commercial or industrial project from the ground up, renovating existing space, or upgrading equipment, you have unique opportunities to upgrade the energy efficiency of the project.

New Jersey SmartStart Buildings can provide a range of support — at no cost to you — to yield substantial energy savings, both now and for the future. Learn more about:

- Project Categories
- Custom Measures
- Incentives for Qualifying Equipment and Projects
- Program Terms and Conditions
- Find a Trade Ally

Please note: pre-approval is required for almost all energy efficiency incentives. This means you must submit an application form (and applicable worksheets) and receive an approval letter from the program before any equipment is installed (click here for complete Terms and Conditions.) Upon receipt of an approval letter, you may proceed to install the equipment listed on your approved application. Equipment installed prior to the date of the approval letter is not eligible for an incentive. **Any customer and/or agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Getting Started

Submit your project application form as soon as you know you will be doing a construction project, or replacing/adding equipment.

Smart-Growth Eligibility: *Check to make sure your project is eligible for incentives.*

Incentives for new construction are available only for projects in areas designated for growth in the NJ State Development and Redevelopment Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for incentives throughout the State.

Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Site Evaluator Tool available from the HMFA website. Contact a program representative if you are uncertain about project eligibility. The Smart Growth policies will be implemented consistent with Board Orders as described more fully in the C&I Operational Procedure Manual.

Apply for pre-approval by submitting an application for the type of equipment you have chosen to install. The application should be accompanied by a related worksheet, where applicable, and a manufacturer's specification sheet (refer to the specific program requirements on the back of the application for specs needed for your project) for the equipment you are planning to install. (Program representatives will review your application package and approve it, reject it, and/or advise you of upgrades in equipment that will save energy costs and/or increase your incentives.)

Support for Custom Energy-Efficiency Measures

Custom measures allows program participants the opportunity to receive an incentive for unique energy-efficiency measures that are not on the prescriptive equipment Incentive list, but are project/facility specific.

Incentives for Qualifying Equipment and Projects

Financial incentives are available for large and small projects. These incentives offset some — or maybe even all! — of the added cost to purchase qualifying energy-efficient equipment, which provides significant long-term energy savings. Ranges of incentives are available for qualifying equipment (depending on type, size, and efficiency) in several categories.

Find out more about equipment incentives!

For specific details on equipment requirements and financial incentives, including incentives for equipment not listed here, contact a program representative. Annual financial incentives may be

Program Updates

- Notice of 2013 Changes to C&I Programs
- Warranty and Lease Terms for CHP/Fuel Cells Increased to 10 Years
- Large Combined Heat & Power/Fuel Cell Program Update
- Board Order - Standby Charges for Distributed Generation Customers

Other updates posted.

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT

- PROGRAMS
  - NJ SMARTSTART BUILDINGS
    - EQUIPMENT INCENTIVES
    - APPLICATION FORMS
    - TOOLS AND RESOURCES
  - PAY FOR PERFORMANCE
  - COMBINED HEAT & POWER AND FUEL CELLS
  - LOCAL GOVERNMENT ENERGY AUDIT
  - LARGE ENERGY USERS PILOT
  - ENERGY SAVINGS IMPROVEMENT PROGRAM
  - DIRECT INSTALL
  - ENERGY BENCHMARKING
  - OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS
  - EDA PROGRAMS
  - T-12 SCHOOLS LIGHTING INITIATIVE
  - TEACH
  - ARRA
- TECHNOLOGIES
- TOOLS AND RESOURCES
- PROGRAM UPDATES
- CONTACT US

Home » Commercial & Industrial » Programs » NJ SmartStart Buildings

Equipment Incentives

More reasons for a smart start on your next project!

New Jersey SmartStart Buildings provides **financial incentives for qualifying equipment**. These incentives were developed to help our customers offset some of the added cost to purchase qualifying energy-efficient equipment, which provides significant long-term energy savings. A wide range of incentives are available for qualifying equipment (depending on type, size and efficiency).

Listed below are the types of qualifying equipment and ranges of incentives. For details on equipment requirements and full listings of incentives, refer to the **online application forms**.

Please note that almost all equipment incentives require pre-approval before equipment is installed. (click for exceptions) To start the pre-approval process, submit an Equipment Application, and appropriate Equipment Worksheets, for the type or types of equipment you are planning to install along with equipment specification sheets (refer to the specific program requirements on the back of the application for specifications needed for your project) and a current utility bill(s).

In order to be eligible to receive financial incentives under this Program, Applicants must receive electric and/or gas service from one of the regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Electric Chillers

- Water-cooled chillers ($12 - $170 per ton)
- Air-cooled chillers ($8 - $52 per ton)

Gas Cooling

- Gas absorption chillers ($185-$450 per ton)
- Gas Engine-Driven Chillers (Calculated through Custom Measure Path)

Desiccant Systems ($1.00 per cfm - gas or electric)

Electric Unitary HVAC

- Unitary AC and split systems ($73 - $92 per ton)
- Air-to-air heat pumps ($73 - $92 per ton)
- Water-source heat pumps ($81 per ton)
- Packaged terminal AC & HP ($65 per ton)
- Central DX AC Systems ($40 - $72 per ton)
- Dual Enthalpy Economizer Controls ($250)
- Occupancy Controlled Thermostats ($75 each)

Ground Source Heat Pumps

- Closed Loop ($450-750 per ton)

Gas Heating

- Gas-fired boilers < 300 MBH ($300 per unit)
- Gas-fired boilers ≥ 300 MBH - 1500 MBH ($1.75 per MBH)
- Gas-fired boilers ≥ 1500 MBH - ≤ 4000 MBH ($1.00 per MBH)
- Gas-fired boilers > 4000 MBH (Calculated through Custom Measure Path)
- Gas furnaces ($300-$400 per unit)

Variable Frequency Drives

- Variable air volume ($65 - $155 per hp)
- Chilled-water pumps ($60 per hp)
- Compressors ($5,250 to $12,500 per drive)

Natural Gas Water Heating

Program Updates

- Notice of 2013 Changes to C&I Programs
- Warranty and Lease Terms for CHP/Fuel Cells Increased to 10 Years
- Large Combined Heat & Power/Fuel Cell Program Update
- Board Order - Standby Charges for Distributed Generation Customers

Other updates posted.

II. DIRECT INSTALL

COMMERCIAL, INDUSTRIAL AND LOCAL GOVERNMENT
PROGRAMS
NJ SMARTSTART BUILDINGS
PAY FOR PERFORMANCE
COMBINED HEAT & POWER AND FUEL CELLS
LOCAL GOVERNMENT ENERGY AUDIT
LARGE ENERGY USERS PILOT
ENERGY SAVINGS IMPROVEMENT PROGRAM
DIRECT INSTALL
PARTICIPATION STEPS
PARTICIPATING CONTRACTORS
SUSTAINABLE JERSEY
ENERGY BENCHMARKING
OIL, PROPANE & MUNICIPAL ELECTRIC CUSTOMERS
EDA PROGRAMS
T-12 SCHOOLS LIGHTING INITIATIVE
TEACH
ARRA
TECHNOLOGIES
TOOLS AND RESOURCES
PROGRAM UPDATES
CONTACT US

Home » Commercial & Industrial » Programs » Direct Install

Direct Install - Steps to Participation

New Jersey SmartStart Buildings

NEW JERSEY'S CLEAN ENERGY PROGRAM DIRECT Install

SIX SIMPLE STEPS TO PARTICIPATION

CONTACT THE PARTICIPATING CONTRACTOR IN YOUR AREA

Identify the contractor assigned and trained to provide Direct Install services in the county where your project is located. Using the contact information provided, call or send an e-mail to the participating contractor to discuss your project. The contractor will schedule an energy assessment and work with you to complete the program application and participation agreement.

If you're unable to contact the participating contractor or have questions, you may contact us at 866-NJSMART or send an e-mail to DirectInstall@NJCleanEnergy.com..

REVIEW RESULTS

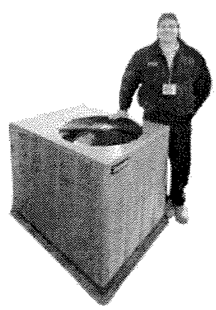
After the energy assessment, the contractor will review the results with you, including what measures qualify and your share of the project cost.

MOVE FORWARD

You will sign a scope of work document to proceed with implementation of qualifying measures.

ARRANGE INSTALLATION

You and the participating contractor will set a convenient start date for the installation.



CONFIRM INSTALLATION

Once the participating contractor completes the installation, you accept the work by signing a project completion form.

COMPLETE TRANSACTION

You pay the participating contractor your share of the project cost and New Jersey's Clean Energy Program pays the rest.

Program Updates

Notice of 2013 Changes to C&I Programs

Warranty and Lease Terms for CHP/Fuel Cells Increased to 10 Years

Large Combined Heat & Power/Fuel Cell Program Update

Board Order - Standby Charges for Distributed Generation Customers

Other updates posted.

III. PAY FOR PERFORMANCE (P4P)

New Jersey's Clean Energy Program
Your Power to Save
njcleanenergy.com

New Jersey SmartStart Buildings®

BPU

2012 PAY FOR PERFORMANCE PROGRAM
Existing Buildings Incentive Structure

Incentive #1: Energy Reduction Plan

Incentive Amount: .... $0.10 per sq ft
Minimum Incentive: $5,000
Maximum Incentive:: .... $50,000 or 50% of facility annual energy cost (whichever is less)

This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP) and is paid upon ERP approval. Incentive is contingent on implementation of recommended measures outlined in the ERP.

Incentive #2: Installation of Recommended Measures

Minimum Performance Target: 15%

Electric Incentives

Base Incentive based on 15% savings: ...... $0.09 per projected kWh saved
For each % over 15% add: .... $0.005 per projected kWh saved
Maximum Incentive: .... $0.11 per projected kWh saved

Gas Incentives

Base Incentive based on 15% savings: ...... $0.90 per projected Therm saved
For each % over 15% add: .... $0.05 per projected Therm saved
Maximum Incentive: .... $1.25 per projected Therm saved

Incentive Cap: .... 25% of total project cost

This incentive is based on projected energy savings outlined in the ERP. Incentive is paid upon successful installation of recommended measures.

Incentive #3: Post-Construction Benchmarking Report

Minimum Performance Target: 15%

Electric Incentives

Base Incentive based on 15% savings: ...... $0.09 per actual kWh saved
For each % over 15% add: .... $0.005 per actual kWh saved
Maximum Incentive: .... $0.11 per actual kWh saved

Gas Incentives

Base Incentive based on 15% savings: ...... $0.90 per actual Therm saved
For each % over 15% add: .... $0.05 per actual Therm saved
Maximum Incentive: .... $1.25 per actual Therm saved

Incentive Cap: .... 25% of total project cost

This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. To validate the savings and achievement of the Energy Target, the EPA Portfolio Manager shall be used. Savings should be rounded to the nearest percent. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. Incentives will be limited to $1 million per gas and electric account per building; maximum of $2 million per project. See Participation Agreement for details.

IV. ENERGY SAVINGS IMPROVEMENT PLAN (ESIP)

Energy Savings Improvement Program

A new State law allows government agencies to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. Under the recently enacted Chapter 4 of the Laws of 2009 (the law), the "Energy Savings Improvement Program" (ESIP), provides all government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources.

This Local Finance Notice outlines how local governments can develop and implement an ESIP for their facilities. Below are two sample RFPs:

Local Government
School Districts (K-12)

The Board also adopted protocols to measure energy savings.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Local units should carefully consider all alternatives to develop an approach that best meets their needs. Local units considering an ESIP should carefully review the Local Finance Notice, the law, and consult with qualified professionals to determine how they should approach the task.

FIRST STEP – ENERGY AUDIT

For local governments interested in pursuing an ESIP, the first step is to perform an energy audit. As explained in the Local Finance Notice, this may be done internally if an agency has qualified staff to conduct the audit. If not, the audit must be implemented by an independent contractor and not by the energy savings company producing the Energy Reduction Plan.

Pursuing a Local Government Energy Audit through New Jersey's Clean Energy Program is a valuable first step to the ESIP approach - and it's free. **Incentives provide 100% of the cost of the audit.**

ENERGY REDUCTION PLANS

If you have an ESIP plan you would like to submit to the Board of Public Utilities, please email it to ESIP@bpu.state.nj.us. Please limit the file size to 3MB (or break it into smaller files).

Frankford Township School District
Northern Hunterdon-Voorhees Regional High School
Manalapan Township ***(180 MB** - Right Click, Save As)*

Program Updates

- Notice of 2013 Changes to C&I Programs
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- Board Order - Standby Charges for Distributed Generation Customers

Other updates posted.

new jersey department of community affairs
division of local government services
people.places.progress

LFN 2011-17

June 16, 2011

Local Finance Notice

Chris Christie, Governor | Kim Guadagno, Lt. Governor | Lori Grifa, Commissioner | Thomas H. Neff, Director

Contact Information

Director's Office
V. 609.292.6613
F. 609.292.9073

Local Government Research
V. 609.292.6110
F. 609.292.9073

Financial Regulation and Assistance
V. 609.292.4806
F. 609.984.7388

Local Finance Board
V. 609.292.0479
F. 609.633.6243

Local Management Services
V. 609.292.7842
F. 609.633.6243

Authority Regulation
V. 609.984.0132
F. 609.984.7388

Mail and Delivery
101 South Broad St.
PO Box 803
Trenton, New Jersey
08625-0803
Web: www.nj.gov/dca/lgs
E-mail: dlgs@dca.state.nj.us

Distribution

Municipal and Freeholder Clerks

Municipal and County Chief Financial Officers

Local Authority and Fire District Officials

School Business Administrators

Local Procurement Officials

Update on Implementing Energy Savings Improvement Programs

This Local Finance Notice provides guidance concerning Energy Savings Improvement Program (ESIP) matters that affect local units covered under the Local Public Contracts Law (LPCL, N.J.S.A. 40A:11) and the Public School Contracts Law (PSCL, N.J.S.A. 18A:18A).

The Notice covers a model ESCO (Energy Services Company) Request for Proposal document and provides information on using the "Do-It-Yourself" process for implementing an ESIP. This Notice supplements Local Finance Notice 2009-11 concerning ESIPs.

Model ESCO Request for Proposal Document

General Issues

The Division of Local Government Services and the Board of Public Utilities have completed development of a model ESCO Request for Proposal Document. It is designed to assist all organizations (contracting units) covered by the LPCL and PSCL hire an energy services company (ESCO) to develop and implement an Energy Savings Plan (ESP) as part of an Energy Savings Improvement Program as authorized under N.J.S.A. 40A:11-4.6 and 18A:18A-4.6.

Specifically, the document serves as the starting point for these government agencies to select an ESCO through the competitive contracting procedure (N.J.S.A. 40A:11-4.1 et seq. and 18A:18A-4.1 et seq.).

Notwithstanding the efforts of the State agencies to ensure that the RFP is consistent with all relevant procurement procedures, laws, and regulations, there are several issues contracting unit personnel should keep in mind:

1) Local legal advisors should review the document to ensure it is consistent with any allowable local practices and legal considerations.
2) The individual responsible for managing the project should review the entire RFP in order to be able to answer questions and ensure the document meets local needs.
3) Forms have been carefully designed to meet the need of this specific process. Care should be taken if proposed forms are removed and replaced with ones normally used by the contracting unit.

The RFP also uses a formal process for potential proposers to submit questions and requests for clarifications. Appendix B is a form for the submission of these requests and is referred to throughout the text.

Contracting units are also reminded the Competitive Contracting process does not allow for negotiating proposals. While legal elements of the contract (project development agreement) may require legal determinations and modifications, the process does not allow for negotiation of price or related substantive elements and any element that would have provided less than a level playing field for proposers.

Contracting units are also cautioned that setting qualification standards that arbitrarily limit competition is inconsistent with public bidding requirements.

Office of State Comptroller Filing: Contracting units are also reminded of their obligations to meet State Comptroller requirements for public contracts. In accordance with N.J.S.A 52:15C-10, contracting units must notify OSC as early as practicable, but no later than 30 days before advertisement, of any negotiation or solicitation of a contract that may exceed $10 million. Contracting units must also provide post-award notification for any contract for an amount exceeding $2 million. Notification must be given within 20 days of the award.

Substantive Edits:

Several sections are highlighted in green. These sections should be carefully edited to meet contracting unit needs. This has important application to evaluation criteria in Section D. Once finalized, the green highlight should be removed.

Section B-16; Insurance should be reviewed by the contracting unit's Risk Management professionals to be sure the standards are appropriate to the contracting unit and the work to be done.

The following Sections also require local decisions and editing:

- A-3: # of copies of proposal and # of CDs to be submitted
- A-4: Web posting address, if desired
- A-5: If extra credit is to be provided on evaluation scoring for attending site walk through
- B-11: Delete LPCL or PSCL section as appropriate
- B-34: Use only if PSCL
- C-1: Explanation of type of audit information
- C-3(k): Include if ESCO is to provide financing option
- Use of Appendix F and Proposal Requirements #8: These forms are related to submission of Political Contribution Disclosure forms. Only PSCL agencies are required to use these forms as pursuant to Public School Fiscal Accountability Procedures (N.J.A.C. 6A23A-6.3). The forms and references to it should be removed for all LPCL users.

Under the ESIP DIY approach, there would be no conflict in a properly procured single organization conducting the audit, developing the ESP, then preparing plans and specifications. This does not apply when using the ESCO approach, where the auditor and ESCO must be independent.

Once construction plans and specifications are complete, the contracting unit would then conduct the bidding process as it would any public works construction project: manage the project as it sees fit (the firm that did the plans could also serve as construction manager), and then contract as necessary for commissioning and final third party verification. The two verification steps (the ESP and verifying implementation) must be performed by an organization independent of the ones preparing the ESP, overseeing construction and commissioning.

By following this process, the contracting unit can then apply to the Local Finance Board for the issuance of ESIP-based energy saving obligations or enter into appropriate lease financing.

The ESIP approach to energy improvement provides a range of options for contracting units to accrue energy savings while improving the environment, taking advantage of low-cost financing and state and federal incentives. DLGS and the BPU encourage comments and questions (through the ESIP web page) on this new opportunity so we can improve it as time goes on.

Approved: Thomas H. Neff, Director, Division of Local Government Services

Table of Web Links

Page	Shortcut text	Internet Address
1, 4	Local Finance Notice 2009-11	http://www.nj.gov/dca/lgs/lfns/09lfns/2009-11.doc
2	ESIP webpage	http://www.nj.gov/dca/lgs/lpcl/esip.htm
2	email comments	mailto:lpcl@dca.state.nj.us
2	to register (via email	mailto:lpcl@dca.state.nj.us
2	GovConnect Local Procurement	http://www.nj.gov/dca/surveys/ppsurvey.htm
3	State Comptroller requirements.	http://www.nj.gov/comptroller/compliance/index.html

New Jersey's Clean Energy Program
Your Power to Save
njcleanenergy.com

New Jersey SmartStart Buildings®

BPU

2012 PAY FOR PERFORMANCE PROGRAM
Existing Buildings Incentive Structure

Incentive #1: Energy Reduction Plan

Incentive Amount:..............................**$0.10 per sq ft**
Minimum Incentive:...........................**$5,000**
Maximum Incentive::.........................**$50,000 or 50% of facility annual energy cost (whichever is less)**

This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP) and is paid upon ERP approval. Incentive is contingent on implementation of recommended measures outlined in the ERP.

Incentive #2: Installation of Recommended Measures

Minimum Performance Target:................**15%**

Electric Incentives

Base Incentive based on 15% savings:......**$0.09 per projected kWh saved**
For each % over 15% add:.........................**$0.005 per projected kWh saved**
Maximum Incentive:.................................**$0.11 per projected kWh saved**

Gas Incentives

Base Incentive based on 15% savings:......**$0.90 per projected Therm saved**
For each % over 15% add:.........................**$0.05 per projected Therm saved**
Maximum Incentive:.................................**$1.25 per projected Therm saved**

Incentive Cap:....................................**25% of total project cost**

This incentive is based on projected energy savings outlined in the ERP. Incentive is paid upon successful installation of recommended measures.

Incentive #3: Post-Construction Benchmarking Report

Minimum Performance Target:................**15%**

Electric Incentives

Base Incentive based on 15% savings:......**$0.09 per actual kWh saved**
For each % over 15% add:.........................**$0.005 per actual kWh saved**
Maximum Incentive:.................................**$0.11 per actual kWh saved**

Gas Incentives

Base Incentive based on 15% savings:......**$0.90 per actual Therm saved**
For each % over 15% add:.........................**$0.05 per actual Therm saved**
Maximum Incentive:.................................**$1.25 per actual Therm saved**

Incentive Cap:....................................**25% of total project cost**

This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. To validate the savings and achievement of the Energy Target, the EPA Portfolio Manager shall be used. Savings should be rounded to the nearest percent. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. Incentives will be limited to $1 million per gas and electric account per building; maximum of $2 million per project. See Participation Agreement for details.

APPENDIX E

Photovoltaic Analysis

Ringwood BOE - NJBPU
Robert Erskine Elementary School

Cost of Electricity	$ 0.15	/kWh
Electricity Usage	252,320	kWh/yr
System Unit Cost	$4,000	/kW

Photovoltaic (PV) Solar Power Generation - Screening Assessment

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	Federal Tax Credit	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$360,000	**90.0**	**115,200**	**0**	**$17,741**	**0**	**$17,741**	**$0**	**$6,336**	**20.3**	**15.0**

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $55 /1000kwh

Area Output*
2,221 m2
23,905 ft2

Perimeter Output*
323 m
1,060 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 85%
11,310 ft2

Approximate System Size: Is the roof flat? (Yes/No) Yes

8 watt/ft2
90,478 DC watts
90 kW Enter into PV Watts

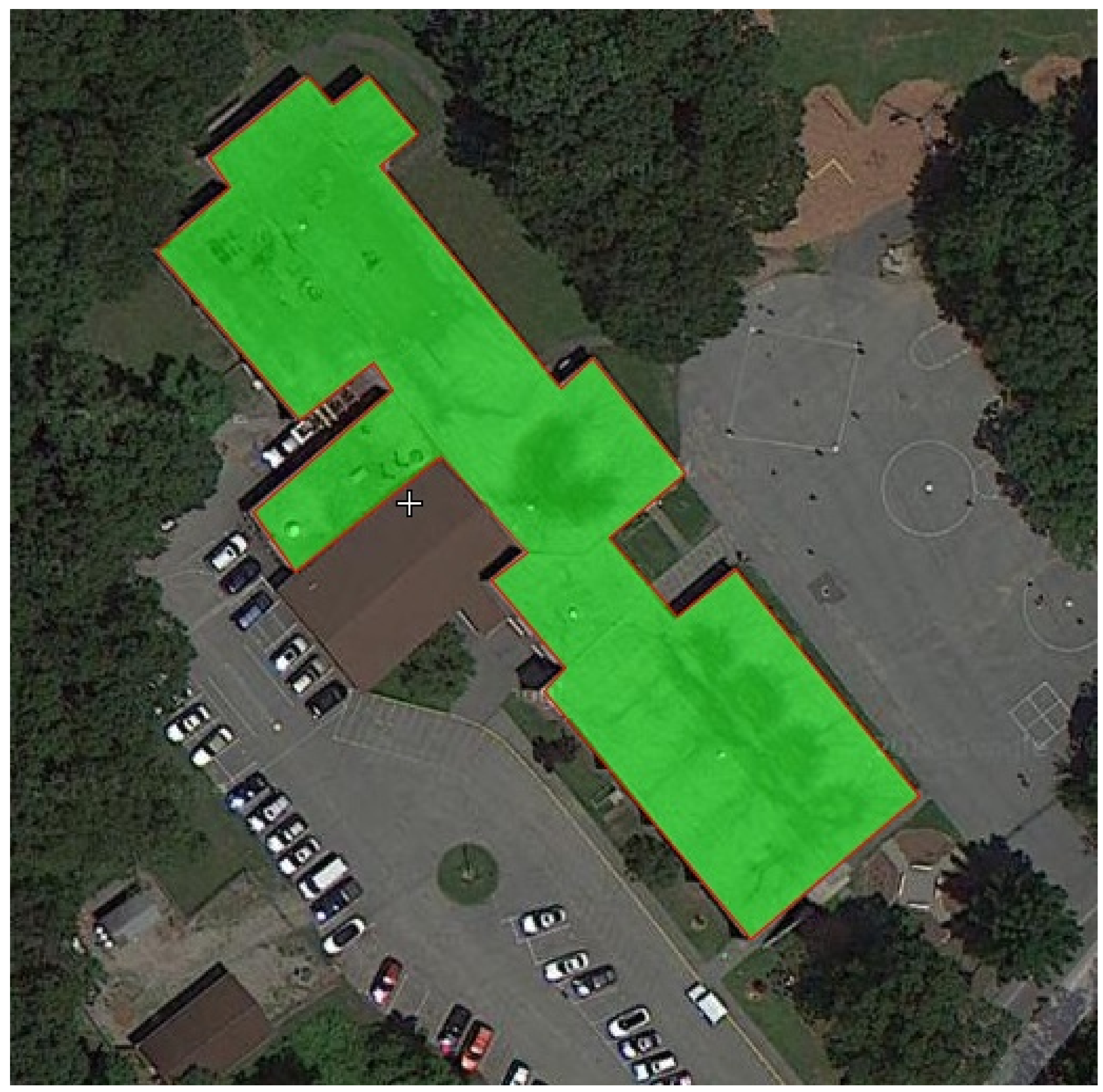
PV Watts Inputs*

Array Tilt Angle	20	Enter into PV Watts (always 20 if flat, if pitched - enter estimated roof angle)
Array Azimuth	180	Enter into PV Watts (default)
Zip Code	07456	Enter into PV Watts
DC/AC Derate Factor	0.83	Enter info PV Watts

PV Watts Output
115,200 annual kWh calculated in PV Watts program

% Offset Calc

Usage	252,320 (from utilities)
PV Generation	115,200 (generated using PV Watts)
% offset	46%



* http://www.freemaptools.com/area-calculator.htm
**http://www.flettexchange.com

PVWatts * * * * *

AC Energy & Cost Savings

* * * * * Cautions for Interpreting the Results

(Type comments here to appear on printout; maximum 1 row of 90 characters.)

Station Identification

Cell ID:	0268369
State:	New York
Latitude:	41.3 ° N
Longitude:	74.2 ° W

PV System Specifications

DC Rating:	90.0 kW
DC to AC Derate Factor:	0.830
AC Rating:	74.7 kW
Array Type:	Fixed Tilt
Array Tilt:	20.0 °
Array Azimuth:	180.0 °

Energy Specifications

Cost of Electricity:	15.4 ¢/kWh

Results

Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.60	6197	954.34
2	3.55	7661	1179.79
3	4.71	10829	1667.67
4	5.12	10991	1692.61
5	5.79	12615	1942.71
6	6.17	12676	1952.10
7	5.86	12217	1881.42
8	5.43	11381	1752.67
9	4.90	10122	1558.79
10	4.02	8917	1373.22
11	2.75	6004	924.62
12	2.39	5592	861.17
Year	4.45	115200	17740.80

Output Hourly Performance Data

(Gridded data is monthly, hourly output not available.)

Output Results as Text

Saving Text from a Browser

Run PVWATTS v.2 for another location

Run PVWATTS v.1

Please send questions and comments to Webmaster

RReDC home page (*http://rredc.nrel.gov*)

APPENDIX F

EPA Portfolio Manager

STATEMENT OF ENERGY PERFORMANCE
Robert Erskine School

Building ID: 3320577
For 12-month Period Ending: August 31, 2012[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: October 19, 2012

Facility	Facility Owner	Primary Contact for this Facility
Robert Erskine School 88 Erskine Road Ringwood, NJ 07456	Ringwood BOE 121 Carletondale Road Ringwood, NJ 07456	Warren Mitchell 121 Carletondale Road Ringwood, NJ 07456

Year Built: 1960
Gross Floor Area (ft²): 31,700

Energy Performance Rating[2] (1-100) 28

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	860,916
Natural Gas (kBtu)[4]	2,491,187
Total Energy (kBtu)	3,352,103
Energy Intensity[4]	
Site (kBtu/ft²/yr)	106
Source (kBtu/ft²/yr)	173
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	211
Electric Distribution Utility	
Rockland Electric Co [Consolidated Edison Inc]	
National Median Comparison	
National Median Site EUI	87
National Median Source EUI	142
% Difference from National Median Source EUI	22%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[5] for Indoor Environmental Conditions:

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

Certifying Professional
Gary Edmerson
6 Campus Drive
Parsippany, NJ 07054

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	Robert Erskine 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	88 Erskine Road, Ringwood, NJ 07456	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of a hospital, k-12 school, hotel and senior care facility) nor can they be submitted as representing only a portion of a building.		☐

Robert Erskine School (K-12 School)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	31,700 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	55	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	20 %	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 Consumption

Power Generation Plant or Distribution Utility: Rockland Electric Co [Consolidated Edison Inc]

Fuel Type: Electricity		
Meter: Electric (kWh (thousand Watt-hours)) **Space(s):** Robert Erskine School **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
08/01/2012	08/31/2012	10,640.00
07/01/2012	07/31/2012	14,720.00
06/01/2012	06/30/2012	22,800.00
05/01/2012	05/31/2012	19,280.00
04/01/2012	04/30/2012	18,720.00
03/01/2012	03/31/2012	26,160.00
02/01/2012	02/29/2012	26,800.00
01/01/2012	01/31/2012	29,040.00
12/01/2011	12/31/2011	24,960.00
11/01/2011	11/30/2011	22,240.00
10/01/2011	10/31/2011	22,080.00
09/01/2011	09/30/2011	14,880.00
Electric Consumption (kWh (thousand Watt-hours))		**252,320.00**
Electric Consumption (kBtu (thousand Btu))		**860,915.84**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**860,915.84**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Natural Gas (therms) **Space(s):** Robert Erskine School		
Start Date	**End Date**	**Energy Use (therms)**
08/01/2012	08/31/2012	3.22
07/01/2012	07/31/2012	5.36
06/01/2012	06/30/2012	84.21
05/01/2012	05/31/2012	597.02
04/01/2012	04/30/2012	2,065.68
03/01/2012	03/31/2012	2,696.86
02/01/2012	02/29/2012	5,280.92
01/01/2012	01/31/2012	5,736.99
12/01/2011	12/31/2011	4,938.42
11/01/2011	11/30/2011	2,896.64

10/01/2011	10/31/2011	512.42
09/01/2011	09/30/2011	94.13
Natural Gas Consumption (therms)		**24,911.87**
Natural Gas Consumption (kBtu (thousand Btu))		**2,491,187.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**2,491,187.00**
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
Robert Erskine School
88 Erskine Road
Ringwood, NJ 07456

Facility Owner
Ringwood BOE
121 Carletondale Road
Ringwood, NJ 07456

Primary Contact for this Facility
Warren Mitchell
121 Carletondale Road
Ringwood, NJ 07456

General Information

Robert Erskine School	
Gross Floor Area Excluding Parking: (ft^2)	31,700
Year Built	1960
For 12-month Evaluation Period Ending Date:	August 31, 2012

Facility Space Use Summary

Robert Erskine School	
Space Type	K-12 School
Gross Floor Area (ft^2)	31,700
Open Weekends?	Yes
Number of PCs	55
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	20
Percent Heated	100
Months o	10
High School?	No
School District o	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 08/31/2012)	**Baseline** (Ending Date 08/31/2012)	**Rating of 75**	**Target**	**National Median**
Energy Performance Rating	28	28	75	N/A	50
Energy Intensity					
Site (kBtu/ft2)	106	106	68	N/A	87
Source (kBtu/ft2)	173	173	111	N/A	142
Energy Cost					
$/year	$ 61,950.79	$ 61,950.79	$ 39,886.61	N/A	$ 51,006.58
$/ft2/year	$ 1.95	$ 1.95	$ 1.26	N/A	$ 1.61
Greenhouse Gas Emissions					
$MtCO_2e$/year	211	211	136	N/A	174
$kgCO_2e/ft^2$/year	7	7	5	N/A	6

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

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

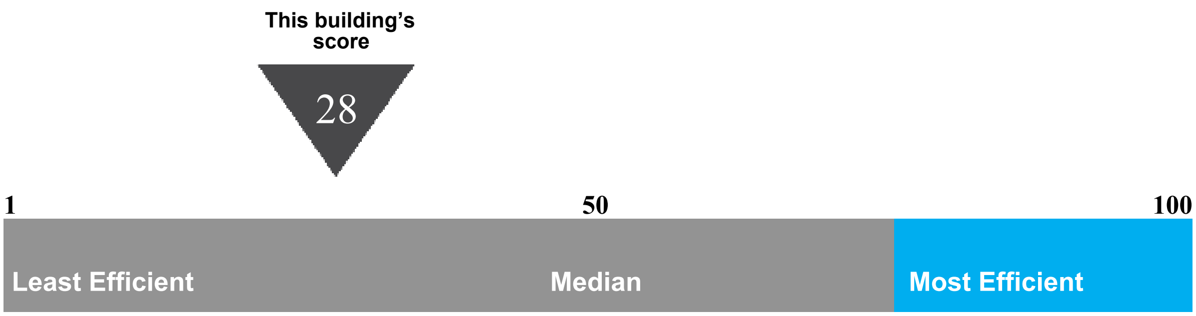
Statement of Energy Performance

2012

Robert Erskine School
88 Erskine Road
Ringwood, NJ 07456

Portfolio Manager Building ID: 3320577

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 173 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending August 2012

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: 10/19/2012