EAST BRUNSWICK BOARD OF EDUCATION

BOWNE MUNRO ELEMENTARY SCHOOL

120 Main Street, East Brunswick, NJ 08816

LOCAL GOVERNMENT ENERGY AUDIT PROGRAM
FOR
NEW JERSEY
BOARD OF PUBLIC UTILITIES

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CHA PROJECT NO. 31007

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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 building 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.

List of Common Energy Audit Abbreviations

- A/C – Air Conditioning
- AHS – Air Handling Unit
- BMS – Building Management System
- Btu – British thermal unit
- CDW – Condenser Water
- CFM – Cubic feet per minute
- CHW – Chilled Water
- DCV – Demand Control Ventilation
- DDC – Direct Digital Control
- DHW – Domestic Hot Water
- DX – Direct Expansion
- EER – Energy Efficiency Ratio
- EF – Exhaust Fan
- EUI – Energy Use Intensity
- Gal – Gallon
- GPD – Gallons per day
- GPF – Gallons Per Flush
- GPH – Gallons per hour
- GPM – Gallons per minute
- GPS – Gallons per second
- HHW – Heating Hot Water
- HID – High Intensity Discharge
- HP – Horsepower
- HRU – Heat Recovery Unit
- HVAC – Heating, Ventilation, Air Conditioning
- HX – Heat Exchanger
- kbtu/mbtu – One thousand (1,000) Btu
- kW – Kilowatt (1,000 watts)
- kWh – Kilowatt-hours
- LED – Light Emitting Diode
- mbh – Thousand Btu per hour
- mmbtu – One million (1,000,000) Btu
- OCC – Occupancy Sensor
- PSI – Pounds per square inch
- RTU – Rooftop Unit
- SBC – System Benefits Charge
- SF – Square foot
- UH – Unit Heater
- V – Volts
- VAV – Variable Air Volume
- VSD – Variable Speed Drive
- W – Watt

1.0 EXECUTIVE SUMMARY

This report summarizes the energy audit performed by CHA for the East Brunswick Board Of Education in connection with the New Jersey Board of Public Utilities (NJBPU) Local Government Energy Audit (LGEA) Program. The purpose of this report is to identify energy savings opportunities associated with major energy consumers and inefficient practices. Low-cost and no-cost are also identified during the study. This report details the results of the energy audit conducted for the building listed below:

Building Name	Address	Square Feet	Construction Date
Bowne Munro Elementary School	120 Main Street East Brunswick NJ 08816	32,738	1953

The potential total annual energy and cost savings for the recommended energy conservation measures (ECM) identified in the survey are shown below:

Building Name	Electric Savings (kWh)	NG Savings (therms)	Total Savings ($)	Payback (years)
Bowne Munro Elementary School	101,573	0	13,931	10.6

Each individual measure's annual savings are dependent on that measure alone, there are no interactive effects calculated. 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 6.0.

Each measure recommended by CHA typically has a stand-alone simple payback period of 15 years or less. However, if the owner choses to pursue an Energy Savings Improvement Plan (ESIP), high payback measures could be bundled with lower payback measures which ultimately can result in a payback which is favorable for an ESIP project to proceed. Occasionally, we will recommend an ECM that has a longer payback period, based on the need to replace that piece(s) of equipment due to its age, such as a boiler for example

The following table provides a detailed summary of each ECM for the building surveyed, including costs, savings, SmartStart incentives and payback.

Summary of Energy Conservation Measures

ECM #	Energy Conservation Measure	Est. Costs ($)	Est. Savings ($/year)	Payback w/o Incentive	Potential Incentive ($)*	Payback w/ Incentive	Recommended
ECM-1	Replace RTUs with High Efficiency RTUs	32,300	1,323	24.4	1,336	23.4	Y
ECM-2	Install Walk-In Controls	22,275	890	25.0	-	25.0	Y
ECM-3	Install VFDs on HHW Pumps	11,172	304	36.7	1,550	31.6	Y
ECM-4	Install Low Flow Plumbing Fixtures	82,078	1	N/A	-	N/A	N
ECM-L1	Lighting Replacement With Controls	93,456	11,414	8.2	8,230	7.5	Y
	Total**	**241,281**	**14,049**	**15.8**	**11,116**	**16.4**	
	Total(Recommended)	**159,203**	**13,931**	**10.4**	**11,116**	**10.6**	

* Incentive shown is per the New Jersey SmartStart Program.
** These ECMs are not included in the Total, as they are alternate measures not recommended.

By implementing the recommended ECMs, the building could result in a total of 43 metric tons of greenhouse gas (GHG) reduction.

CHA has evaluated the potential energy production for the installation of solar photovoltaic panels on the roofs of Bowne Munro Elementary. The summary of results are as follows:

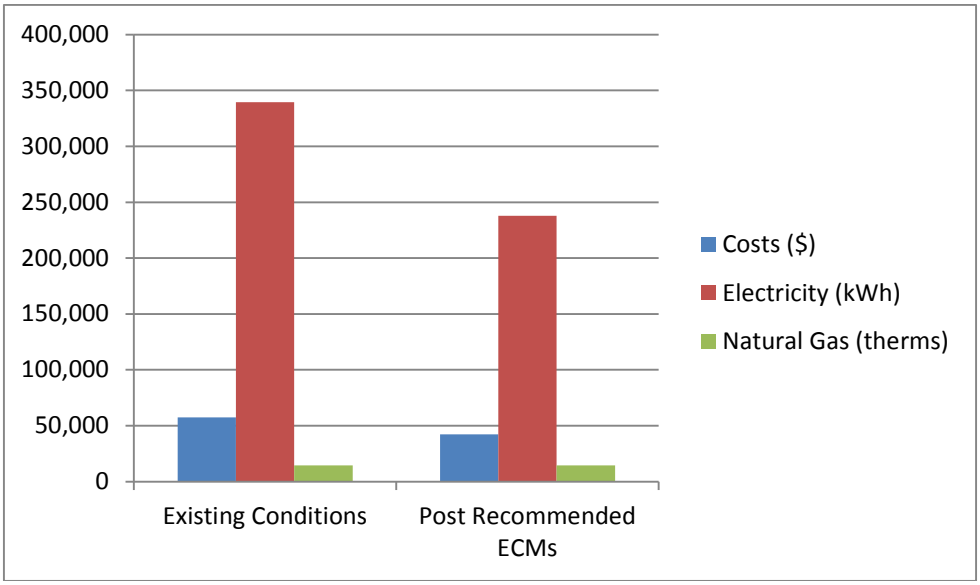
Photovoltaic (PV) Rooftop Solar Power Generation – 60 kW System

Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable SREC	Payback (without SREC)	Payback (with SREC)	**Recommended**
	Electricity		Natural Gas					
$	kW	kWh	therms	$	$	Years	Years	Y/N
$240,000	**60.0**	**72,568**	**-**	**$9,506**	**$18,142**	**25.2**	**8.7**	FS

See alternative energy measure *Solar PV Electricity Generation* in Section 7.0 for detailed information on potential photovoltaic savings

If East Brunswick Board Of Education implements the recommended ECMs, energy savings would be as follows:

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	57,557	43,625	24%
Electricity (kWh)	339,360	237,787	30%
Natural Gas (therms)	14,656	14,656	0%
Site EUI (kbtu/SF/Yr)	80.1	69.6	



2.0 BUILDING INFORMATION AND EXISTING CONDITIONS

The following is a summary of building information related to HVAC, plumbing, building envelope, lighting, kitchen equipment and domestic hot water systems as observed during CHAs site visit. See Appendix B for detailed information on mechanical equipment, including capacities, model numbers and age. See appendix D for representative photos of some of the existing conditions observed while onsite.

Building Name: Bowne Munro Elementary School
Address: 120 Main Street, East Brunswick NJ 08816
Gross Floor Area: 32,738 square feet
Number of Floors: Single story
Year Built: The original construction of the building was completed in 1953. In the early 1970s the school added an additional wing

General

Description of Spaces: The building houses classrooms, office spaces, all-purpose/gym, library, computer lab, media center, cafeteria, mechanical room, and storage space.
Description of Occupancy: There are about 200 students enrolled with about 30-40 staff personnel.
Building Usage: The school operates Monday through Friday usually from 6:30 AM to 3:30 PM, with janitors occupying the facility until 11:00 PM. Typically there are no weekend operations.
Construction Materials: The outside walls are constructed of 8” CMU, 2” insulation and 4” face brick.
Roof: The roof is flat, insulated and in good condition. A portion of the roof was replaced in 2013. No ECMs associated with roof replacement are evaluated.

Windows: In general the windows are double pane with aluminum frames. The windows appear to be in good condition, therefore no ECMs pertaining to window replacements have been evaluated.
Exterior Doors: The exterior main entrance doors are full length glass storefront with aluminum frames. All other egress doors are steel doors with steel frames; all observed to be in good condition. No ECM associated with replacing the doors has been evaluated.

Heating Ventilation & Air Conditioning (HVAC) Systems

Heating:
Heating to most areas in the school is provided by (3) Aerco 1,000 MBTU input condensing gas fired boilers which were installed in 2006. The boilers produce heating hot water which is distributed to classroom unit ventilators and other terminal units located throughout the building by (2) 5HP constant speed HHW pumps operating in lead lag fashion. The boilers are higher efficiency and appear to be in good overall condition.

There are also (4) packaged heating and cooling roof top units that use natural gas for heating and electricity for cooling which serve the Resource Room, Computer Lab, Media Center and All Purpose Room. These units are in poor condition having been installed in 1997. An ECM has included to evaluate replacing the packaged roof top units.

Cooling: In addition to above mentioned roof top units, cooling is also provided by 4 window type AC units that serve the Nurse's office, kindergarten classrooms, student assistant room, room-1 Math, and the staff room.

The main office and the Principal Office utilize DX ductless split systems for cooling.

Ventilation: The fresh air for ventilation is provided through roof top equipment. As ventilation rates are assumed to be minimum, there are no ECMs associated with the ventilation system.

Exhaust: This building has few fractional HP exhaust fans serving restrooms, science rooms, kitchen and general exhaust located on the roof. The fans are enclosed and therefore the capacities of fan motors are unknown. No ECMs were evaluated for the exhaust fans.

Controls Systems

Boiler EMS Metasys controls exists that are capable of temperature settings and scheduling. Typical heating temperature is 70 F and cooling is 74F.

Domestic Hot Water Systems

Domestic Hot Water is produced by a Bradford White gas fired 80 gallon capacity Magnum model unit and is circulated by a fractional HP inline pump.

Kitchen Equipment

Operations are mainly warming up and serving. There is no dish washer. Hood is manually operated during cooking only. The kitchen equipment includes food warmers, various small appliances, and a walk-in refrigerator.

Plug Load

The facility has computers, copiers, printers, and kitchen appliances that contribute to the plug load in the building. We have evaluated that the plug loads have minimal impact compared to other electric consuming devices therefore no ECMs associated with plug loads have been evaluated.

Plumbing Systems

There are numerous restrooms in the building. Due to minimal savings from having a fixed water utility cost, no ECM associated with plumbing fixtures were evaluated.

Lighting Systems

Indoor lighting predominantly consists of standard T-8s and some, CFLs and few incandescent bulbs. The multi-purpose gym room has Induction lamps. In general lighting is operated on switches; however some rooms have occupancy sensors. Outdoors lighting consists of wall mounted CFLs and the parking lot has post mounted HPS.

3.0 UTILITIES

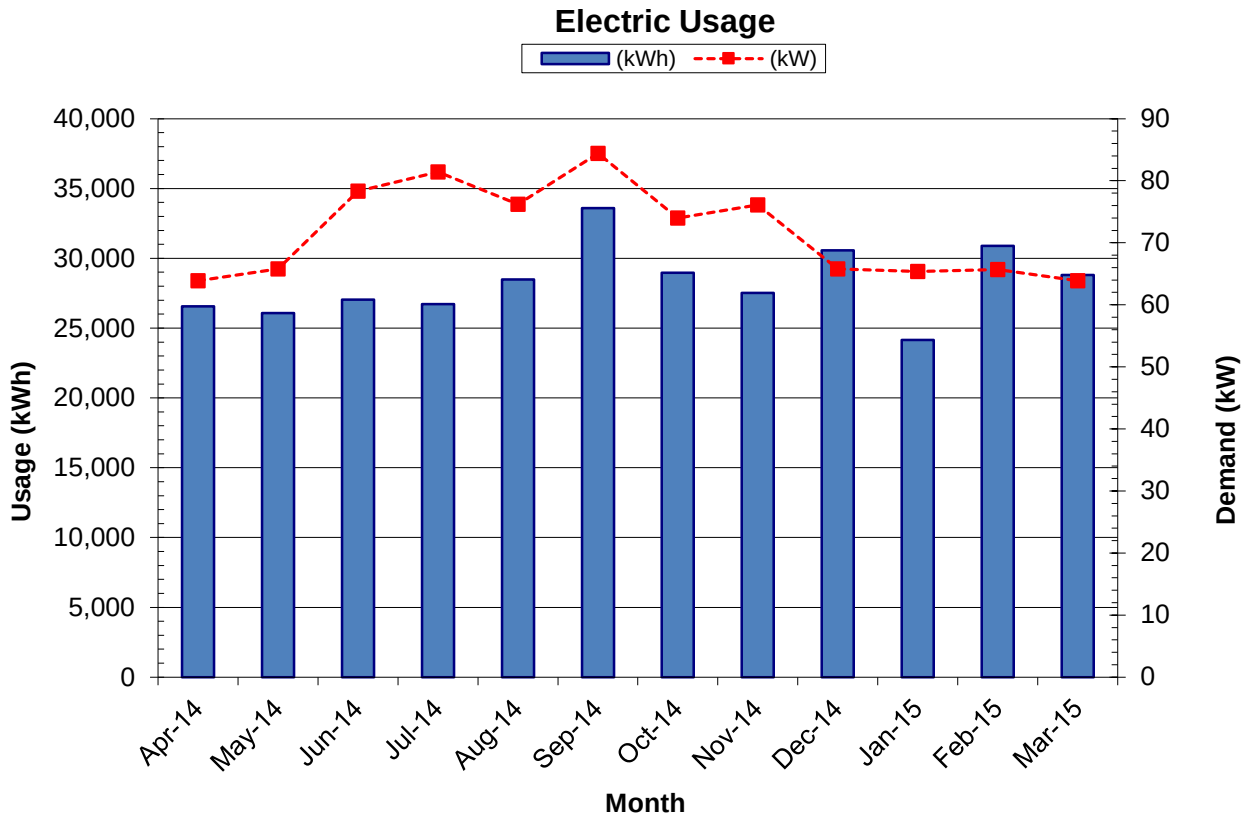
Natural gas, electricity and water are separately metered into this building. Utilities used by the building are delivered and supplied by the following utility companies:

	Electric	Natural Gas	Water
Deliverer	Jersey Central Power & Light	PSE&G	Township of East Brunswick
Supplier	Jersey Central Power & Light	Direct Energy	N/A

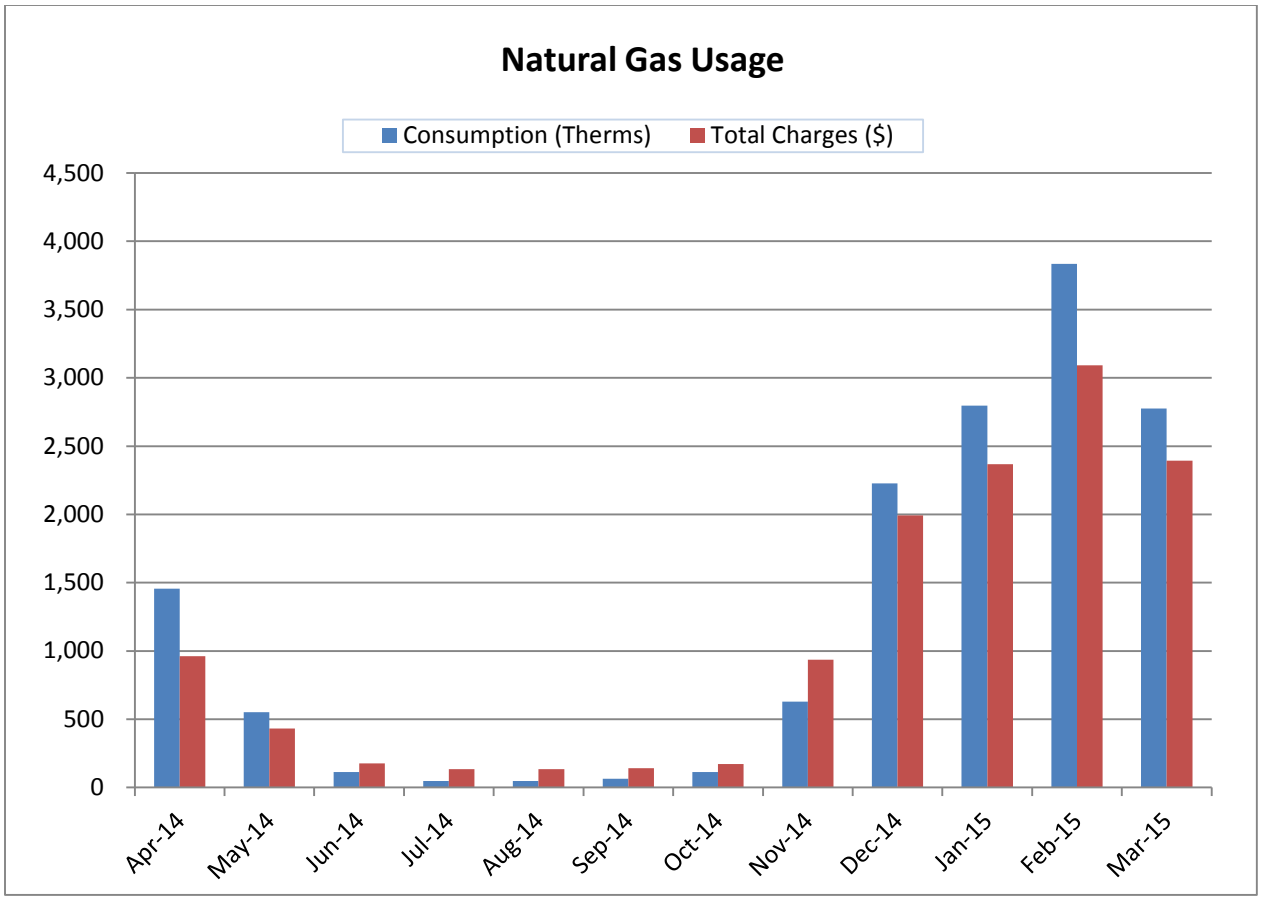
For the 12-month period ending in March 2015, the utilities usages and costs for the building were as follows:

Electric		
Annual Usage	339,360	kWh/yr
Annual Cost	44,625	$
Blended Rate	0.131	$/kWh
Natural Gas		
Annual Usage	14,656	Therms/yr
Annual Cost	12,932	$
Rate	0.882	$/therm

Blended Rate: Average rate charged determined by the annual cost / annual usage
Supply Rate: Actual rate charged for electricity usage in kWh (based on most recent electric bill)
Demand Rate: Rate charged for actual electrical demand in kW (based on most recent electric bill)
*Some months that do not have utility data and the missing demand usage are estimated and highlighted in the utility spreadsheet



The electric usage is pretty consistent throughout the year and varies with the usage of the building. This building has minimal cooling therefore there is little peak in the KWh in the cooling season; however, this equipment's use can be seen in the peak KW rise in the cooling season.



The natural gas usage in this building is for heating and DHW production, and therefore the usage in summer months is relatively small compared with heating months. The gas usage during the heating season is correlated to winter weather conditions.

It was observed form the gas utility bills supplied to CHA that there were imbalance charges which were effecting the data to have higher cost and uses appearing as peaks in utility usage. After research it was found that the reasons for this imbalance comes from the daily contracted quantities (DCQ). Below is a description of the DCQ and an explanation of how it causes imbalances.

***Daily Contracted Quantities (DCQ's)**

Residential, Commercial and Industrial customers will have DCQ's (Daily Contracted Quantities) posted to the account, one for each month of the year. These DCQ's are based upon the customer's weather-normalized historical usage, prorated from their meter reading periods to calendar months and then divided by the number of days in the calendar month. These 12 monthly DCQ's are what Public Service would expect the customer to consume, under normal weather conditions and if the customer utilized his gas equipment in the same manner as was utilized historically. However, weather is rarely normal, so we expect that there will be a difference between actual usage and the DCQ's. This imbalance is used to adjust the DCQ delivery in the second succeeding month. For example, an imbalance from the billing period in February will adjust April's calendar month delivery; March's imbalance will adjust

May's delivery. The DCQ's will be updated each year on the anniversary date in which they were originally posted, to correctly reflect any changes in a customer usage pattern or change in equipment.

TPS's must deliver the Aggregate Daily Contract Quantity for its customers as set forth in PSE&G's Gas Tariff -Third Party Supplier Requirements.
*Information taken from PSE&G Third Party Supplier Gas Choice Operating Manual

See Appendix A for utility analysis.

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.

Comparison of Utility Rates to NJ State Average Rates*				Recommended to Shop for Third Party Supplier?
Utility	Units	School Average Rate	NJ Average Rate	
Electricity	$/kWh	$0.131	$0.13	Y
Natural Gas	$/Therm	$0.882	$0.96	N

* Per U.S. Energy Information Administration (2013 data – Electricity and Natural Gas, 2012 data – Fuel Oil)

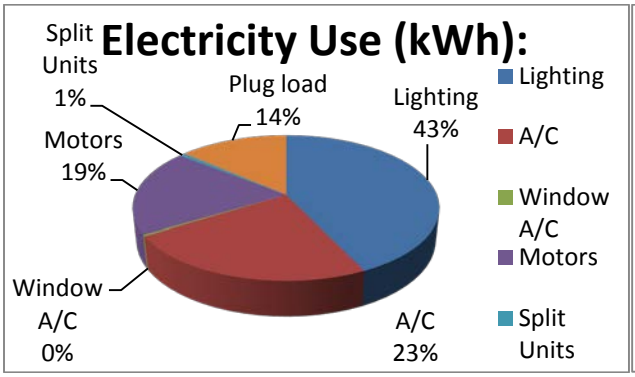
Additional information on selecting a third party energy supplier is available here:

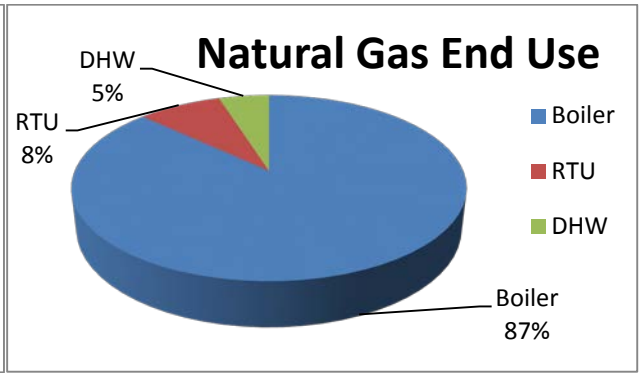
http://www.state.nj.us/bpu/commercial/shopping.html.

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.

The charts below represent estimated utility end-use utility profiles for the building. The values used within the charts were estimated from a review of the utility analysis and the energy savings calculations.

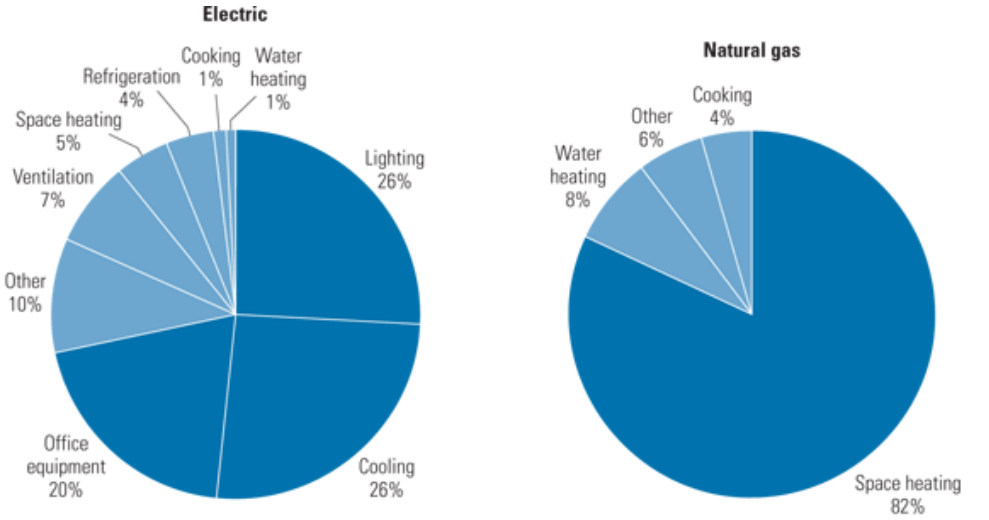
Site End-Use Utility Profile





Most of the electricity consumed by educational facilities is used to for lighting, cooling, and plug loads such as computers and copiers; most of the natural gas is used for space heating. Each school's energy profile is different, and the following charts represent typical utility profiles for K-12 schools per U.S. Department of Energy.

Typical End-Use Utility Profile for Educational Facilities



Courtesy: E SOURCE; from Commercial Building Energy Consumption Survey, 1999 data

4.0 BENCHMARKING

The EPA Portfolio Manager benchmarking tool 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/ft2/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. However, the EPA does not have score for all types of buildings. The buildings that do not have energy rating now are compared with national median EUI.

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 benchmarking are contained in the table below. Copies of the benchmarking report are available in Appendix F.

Site EUI kBtu/ft^2/yr	Source EUI (kBtu/ft^2/yr)	Energy Star Rating (1-100)
80.1	158.1	58

The school has a slightly above average Energy Star Rating Score (50 being the median score), and as such by implementing the measures discussed in this report, it is expected that the EUI can be further reduced and the Energy Star Rating further increased.

EPA Portfolio Manager can be accessed with the following:

Web URL: https://portfoliomanager.energystar.gov/pm/login.html

[redacted]

[redacted]

5.0 ENERGY CONSERVATION MEASURES

The following types of energy savings opportunities are identified in this section of the report:

- Energy conservation measures (ECMs) are energy savings recommendations that typically require a financial investment. For these areas of opportunity, CHA prepared detailed calculations, as summarized in this section and in Appendix C. In general, additional savings may exist from reductions in maintenance activities associated with new equipment or better controls; however for conservatism, maintenance savings are not accounted for in this report; instead the only savings which are reported are those derived directly from reductions in energy which can be tracked by the utility bills.

- Operational and Maintenance measures (O&M) consist of low- or no-cost operational opportunities, which if implemented would have positive impacts on overall building operation, comfort levels, and/or energy usage. There are no estimated savings, costs or paybacks associated with the O&M measures included as part of this study.

Energy savings were quantified in the form of:

- electrical usage (kWh=Kilowatt-hour),
- electrical demand (kW=kilowatts),
- natural gas (therms=100,000 Btu),
- propane gas (gallons=91,650 Btu),
- fuel oil (gallons =138,700 Btu), and
- water (kgal=1,000 gallons).

These recommendations are influenced by the time period that it takes for a proposed project to "break even" referred to as "Simple Payback". Simple payback is calculated by dividing the estimated cost of implementing the ECM by the energy cost savings (in dollars) of that ECM.

Another financial indicator of the performance of a particular ECM is the Return on Investment or ROI, which represents the benefit (annual savings over the life of a project) of an investment divided by the cost of the investment. The result is expressed as a percentage or ratio.

Two other financial analyses included in this report are Internal Rate of Return (IRR) and Net Present Value (NPV). Internal Rate of Return is the discount rate at which the present value of a project costs equals the present value of the project savings. Net Present Value is the difference between present value of an investment's future net cash flows and the initial investment. If the NPV equals "0", the project would equate to investing the same amount of dollars at the desired rate. NPV is sometimes referred to as Net Present Worth. These values are provided in the Summary Tab in Appendix C.

5.1 ECM-1 Replace RTUs with High Efficiency RTUs

The school has 4 rooftop units installed in 1997. The 4 units are either at the end of their useful life or past their useful life. This ECM evaluates the energy savings associated with replacing older less efficient rooftop units with modern high efficiency rooftop units of the same capacities. Calculations show savings in electric power consumption only as it is assumed that the gas furnaces will have the same efficiencies.

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

ECM-1 Replace RTUs with High Efficiency RTUs

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
32,300	4.8	8,157	0	1,323	(0.3)	1,336	24.4	23.4

* Incentive shown, if available, is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities.

This measure is recommended due to age and condition of the equipment.

5.2 ECM-2 Install Walk-in Cooler / Freezer Controls

Presently there is one (1) walk-in cooler and one (1) walk-in freezer in this building.

Installing a walk-in cooler/ freezer control system was assessed. The system will monitor both dry and wet bulb temperature within the walk-in unit and allow evaporators and compressors to modulate up and down based on enthalpy set points rather than by dry bulb temperature alone. Savings is a result of reduced run time of evaporator fans, compressors and door heaters.

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

ECM-2 Install Walk-in Cooler / Freezer Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
22,275	0	6,791	0	890	(0.6)	0	25.0	25.0

* Incentive shown is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities.

This measure is recommended.

5.3 ECM-3 Install VFD & Premium Efficiency Motors

Presently two (2) 5 HP Hot Water Pumps provide heating hot water to the air unit ventilators. The pumps currently operate in lead/lag fashion with only one pump operating at a time. The pumps operate at constant speed regardless of the heating demands of the building. Installing a single VFD and premium efficiency motors will save energy when full load operation is not required. As the heating load is reduced and the VFD will slow the motor down to maintain the required system pressure and the energy consumption of the HHW pump motors will be reduced.

The intent is to install a single VFD with a bypass and selector switch to control both pumps based on pressure. New VFD ready motors will be required that will replace existing low efficiency motors with premium efficiency motors.

The savings of this measure are calculated from the motor efficiency improvement and the motor speed reduction the results when the HHW system is only partially loaded.

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

ECM-3 Install VFDs & Premium Efficiency Motors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
11,172	2.5	893	0	304	(0.6)	1,550	36.7	31.6

* Incentive shown is per the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities.

This measure is recommended.

5.4 ECM-4 Replace High Flow Plumbing Fixtures

The plumbing fixtures in this building are older high flow fixtures. The water savings associated from replacing existing high flow fixtures with low-flow fixtures was calculated by taking the difference of the annual water usage for the proposed and base case. The basis of this calculation is the estimate usage of each fixture, gallons per use, and number of fixtures. Replacing the existing fixtures in the restrooms with 1.28 Gals/flush toilets, 1.0 gal/flush urinals, and 0.5 gpm faucets will conserve water which will result in lower annual water and sewer charges. However, for this building there is a fixed water cost and thus there are little to no cost savings from the measure, only water savings.

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

ECM-4 Replace High Flow Plumbing Fixtures

Budgetary Cost	Annual Utility Savings					ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Water	Total				
$	kW	kWh	Therms	kGal	$		$	Years	Years
82,078	0	0	11	251	1	(1.0)	0	N/A	N/A

* Does not qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

This measure is not recommended due to the water costs being fixed for this facility leaving a long payback period.

5.5 ECM-L1 Lighting Replacements with Controls

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

ECM-L1 Lighting Replacements with Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
93,456	19.5	85,732	0	11,414	0.4	8,230	8.2	7.5

This measure is recommended.

5.6 Additional O&M Opportunities

This list of operations and maintenance (O&M) - type measures represent low-cost or no-cost opportunities, which if implemented will have a positive impact on the overall building operations, comfort and/or energy consumption. The recommended O&M measures for this building are as follows:

- Install window A/C covers in winter
- Purchase Energy Star rated appliances
- Replace filters in air handling equipment and window A/C units regularly
- Add an insulation jacket to domestic water heaters
- Check exhaust fans for backdraft dampers and install dampers if they are not present
- Purchase ENERGY STAR® labeled window air conditioners as they fail

6.0 PROJECT INCENTIVES

6.1 Incentives Overview

The following sections give detailed information on available incentive programs including New Jersey Smart Start, Direct Install, New Jersey Pay for Performance (P4P) and Energy Savings Improvement Plan (ESIP). If the School District wishes to and is eligible to participate in the Energy Savings Improvement Plan (ESIP) program and/or the Pay for Performance Incentive Program (P4P), it cannot participate in either the Smart Start or Direct Install Programs. More details can be found at the NJ Clean Energy Program website (http://www.njcleanenergy.com/commercial-industrial/home/home).

6.1.1 New Jersey Smart Start Program

For this energy audit, The New Jersey Smart Start Incentives are used in the energy savings calculations, where applicable. This program is intended for medium and large energy users and provides incentives for:

- Electric Chillers
- Gas Chillers
- Gas Heating
- Unitary HVAC
- Ground Source Heat Pumps
- Variable frequency Drives/ motors
- Refrigeration
- Prescriptive and performance lighting and lighting controls

The equipment is procured using a typical bid- build method, installed and paid for and then the incentives are reimbursed to the owner.

6.1.2 Direct Install Program

The Direct Install Program applies to smaller facilities that have a peak electrical demand of 200 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 Direct Install program has specific HVAC equipment and lighting requirements and is generally applicable only to smaller package HVAC units, small boilers and lighting retrofits.

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 an approved Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website. Contractors will coordinate with the applicant to arrange installation of recommended measures identified in a previous energy assessment, such as this energy audit. The incentive is reimbursed to the Owner upon successful replacement and payment of the equipment.

The building does qualify for this program since the peak electric demand during the 12 month evaluated period was less than 200 KW.

6.1.3 New Jersey Pay For Performance Program (P4P)

This building may 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 to offset the cost of energy conservation projects for facilities that pay the Societal Benefits Charge (SBC) and whose demand (kW) in any of the preceding 12 months exceeds 100 kW. This demand minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations and *is not applicable to public schools*. 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). Additionally, the overall return on investment (ROI) must exceed 10%. 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). The ERP must include a detailed energy audit of the desired ECMs, energy savings calculations (using building modeling software) and inputting of all utility bills into the EPA Portfolio Manager website.

- 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. The ERP must be completed by a Certified Energy Manager (CEM) and submitted along with the project application.

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.

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.

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.

For the purpose of demonstrating the eligibility of the ECM's to meet the minimum savings requirement of 15% annual savings and 10% ROI for the Pay for Performance Program, all ECM's identified in this report have been included in the incentive calculations. The results for the building are shown in Appendix C.

6.1.4 Energy Savings Improvement Plan

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" (ESO) to pay for the capital costs of energy improvements to their facilities. ESIP loans have a maximum loan term of 15 year. ESOs 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. 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.

6.1.5 Renewable Energy Incentive Program

The Renewable Energy Incentive Program (REIP) is part of New Jersey's efforts to reach its Energy Master Plan goals of striving to use 30 percent of electricity from renewable sources by 2020.

Incentives for sustainable bio-power projects and for energy storage projects are currently under development, with competitive solicitations for each of those technologies expected to begin in the first quarter of 2014. The wind program is currently on hold.

New solar projects are no longer eligible for REIP incentives, but can register for Solar Renewable Energy Certificates (SRECs) through the SREC Registration Program (SRP).

7.0 ALTERNATIVE ENERGY SCREENING EVALUATION

7.1 Solar

7.1.1 Photovoltaic Rooftop Solar Power Generation

The building 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 amount of available area determines how large of a solar array can be installed on any given space. The table below summarizes the approximate area available and the associated solar array size that can be installed.

Available Roof Area (Ft^2)	**Potential PV Array Size** (kW)
8,258	60

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 by the PV producer will change from year to year dependent upon supply and demand. There is no definitive way to calculate an exact price that will be received by the PV producer for SREC credits over the next 15 years. Renewable Energy Consultants estimates an average of $230/SREC for 2015 and this number was utilized in the cash flow for this report.

The system costs for PV installations were derived from recent solar contractor budgetary pricing in the state of New Jersey and include the total cost of the system installation (PV panels, inverters, wiring, ballast, controls). The cost of installation is currently about $4.00 per watt or $4,000 per kW of installed system, for a typical system. There are other considerations that have not been included in this pricing, such as the condition of the roof and need for structural reinforcement. Photovoltaic systems can be ground mounted if the roof is not suitable, however, this installation requires a substantial amount of open property (not wooded) and underground wiring, which adds more cost. 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 most likely need to be replaced 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 – 60 kW System

Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable SREC	Payback (without SREC)	Payback (with SREC)	**Recommended**
	Electricity		Natural Gas					
$	kW	kWh	therms	$	$	Years	Years	Y/N
$240,000	**60.0**	**72,568**	**0**	**$9,506**	**$18,142**	**25.2**	**8.7**	FS

Note: CHA typically recommends a more detailed evaluation be conducted for the installation of PV Solar arrays when the screening evaluation shows a payback of less than 20 years. Therefore, this ECM is recommended for further study. Before implementation is pursued, the school should consult with a certified solar PV contractor.

7.1.2 Solar Thermal Hot Water Generation

Active solar thermal systems use solar collectors to gather the sun's energy to heat a fluid. An absorber in the collector (usually black colored piping) converts the sun's energy into heat. The heat is transferred to circulating water, antifreeze, or air for immediate use or is storage for later utilization. Applications for active solar thermal energy include supplementing domestic hot water, heating swimming pools, space heating or preheating air in residential and commercial buildings.

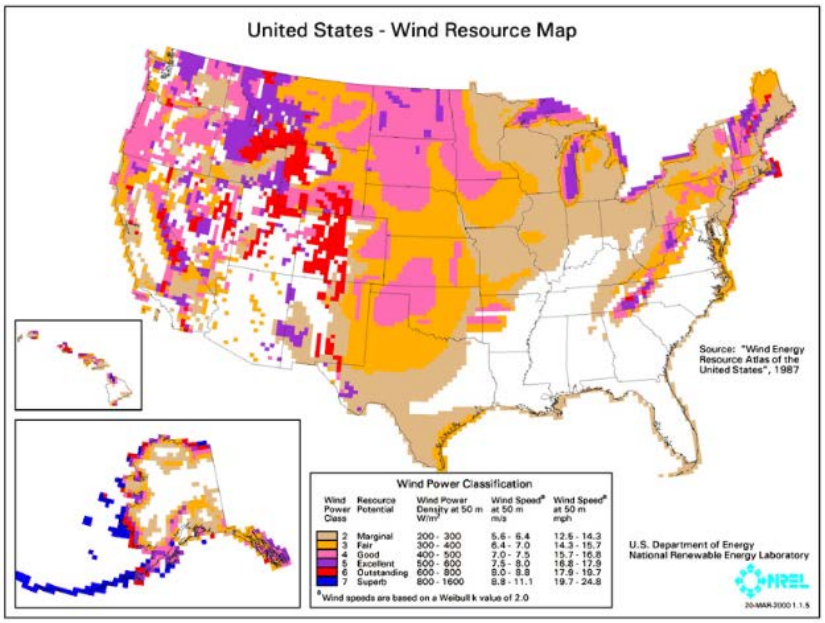
A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually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

Several options exist for using active solar thermal systems for space heating. The most common method is called a passive solar hot water system involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system described above which requires pumping). The most practical system would transfer the heat from the panels to thermal storage tanks and then use the pre-heated water for domestic hot water production. DHW is presently produced by natural gas fired water heaters and, therefore, this measure would offer natural gas utility savings. Unfortunately, the amount of domestic hot water that is currently used by this school is very small. Installing a solar domestic hot water system is not recommended due to the limited amount of domestic hot water presently consumed by the school.

This measure is not recommended due to the relatively low domestic hot water usage.

7.2 Wind Powered Turbines

Wind power is the conversion of kinetic energy from wind into mechanical power that is used to drive a generator which creates electricity by means of a wind turbine. A wind turbine consists of rotor and blades connected to a gearbox and generator that are mounted onto a tower. Newer wind turbines also use advanced technology to generate electricity at a variety of frequencies depending on the wind speed, convert it to DC and then back to AC before sending it to the grid. Wind turbines range from 50 – 750 kW for utility scale turbines down to below 50 kW for residential use. On a scale of 1 (the lowest) to 7 (the highest), Class 3 and above (wind speeds of 13 mph or greater) are generally considered "good wind resource" according to the Wind Energy Development Programmatic EIS Information Center hosted by the Bureau of Land Management. According to the map below, published by NREL, Newark, NJ is classified as Class 1 at 50m, meaning the city would not be a good candidate for wind power.



This measure is not recommended due to the location of the school.

7.3 Combined Heat and Power Plant

Combined heat and power (CHP), 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 building has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter; however thermal usage during the summer months does not exist. 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. CHP is not recommended due to the building's limited summer thermal demand.

This measure is not recommended due to the absence of year-round thermal loads which are needed for efficiency CHP operation. However, a mini-size CHP could be an option for the school to consider. The sizing and energy savings of the mini-size CHP require further study.

7.4 Demand Response Curtailment

Presently, electricity is delivered by 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 October 2014 through September 2015 the following table summarizes the electricity load profile for the building.

Building Electric Load Profile

Peak Demand kW	Min Demand kW	Avg Demand kW	Onsite Generation Y/N	Eligible? Y/N
84.4	63.9	71.7	Y	N

*the demand is estimated from one month bill

This measure is not recommended due to this site not meeting the eligibility requirements.

8.0 CONCLUSIONS & RECOMMENDATIONS

The following section summarizes the LGEA energy audit conducted by CHA for Bowne Munro Elementary School.

The following projects should be considered for implementation:

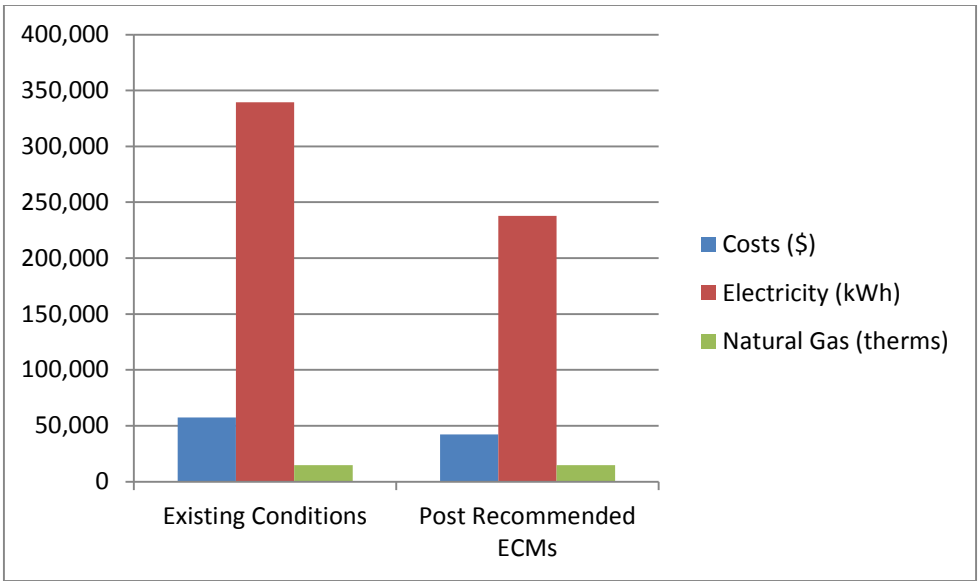
- Replace RTUs with high efficiency RTUs
- Install walk-in cooler / freezer controls
- Install VFD & premium efficiency motors
- Lighting replacements / upgrades w/ controls

The potential annual energy and cost savings for the recommended ECMs are shown in the following table.

Electric Savings (kWh)	Natural Gas Savings (therms)	Total Savings ($)	Payback (years)
101,573	0	11,414	10.6

If the school implements the recommended ECMs, energy savings would be as follows:

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	57,557	43,625	24%
Electricity (kWh)	339,360	237,787	30%
Natural Gas (therms)	14,656	14,656	0%
Site EUI (kbtu/SF/Yr)	80.1	69.6	



Next Steps: This energy audit has identified several areas of potential energy savings. East Brunswick Board Of Education can use this information to pursue incentives offered by the NJBPU's NJ Clean Energy Program. A close-out meeting will be scheduled with school staff members to review the ECMs and possible incentive options.

APPENDIX A

Utility Usage Analysis and Alternate Utility Suppliers

Local Government Energy Audit
East Brunswick Board of Education
Bowne-Munro Elementary School

Utility Bills: Account Numbers

Account Number	Building	Type
100012779953	Bowne-Munro Elementary School	Electric
6640823101	Bowne-Munro Elementary School	Gas

Local Government Energy Audit
East Brunswick Board of Education
Bowne-Munro Elementary School

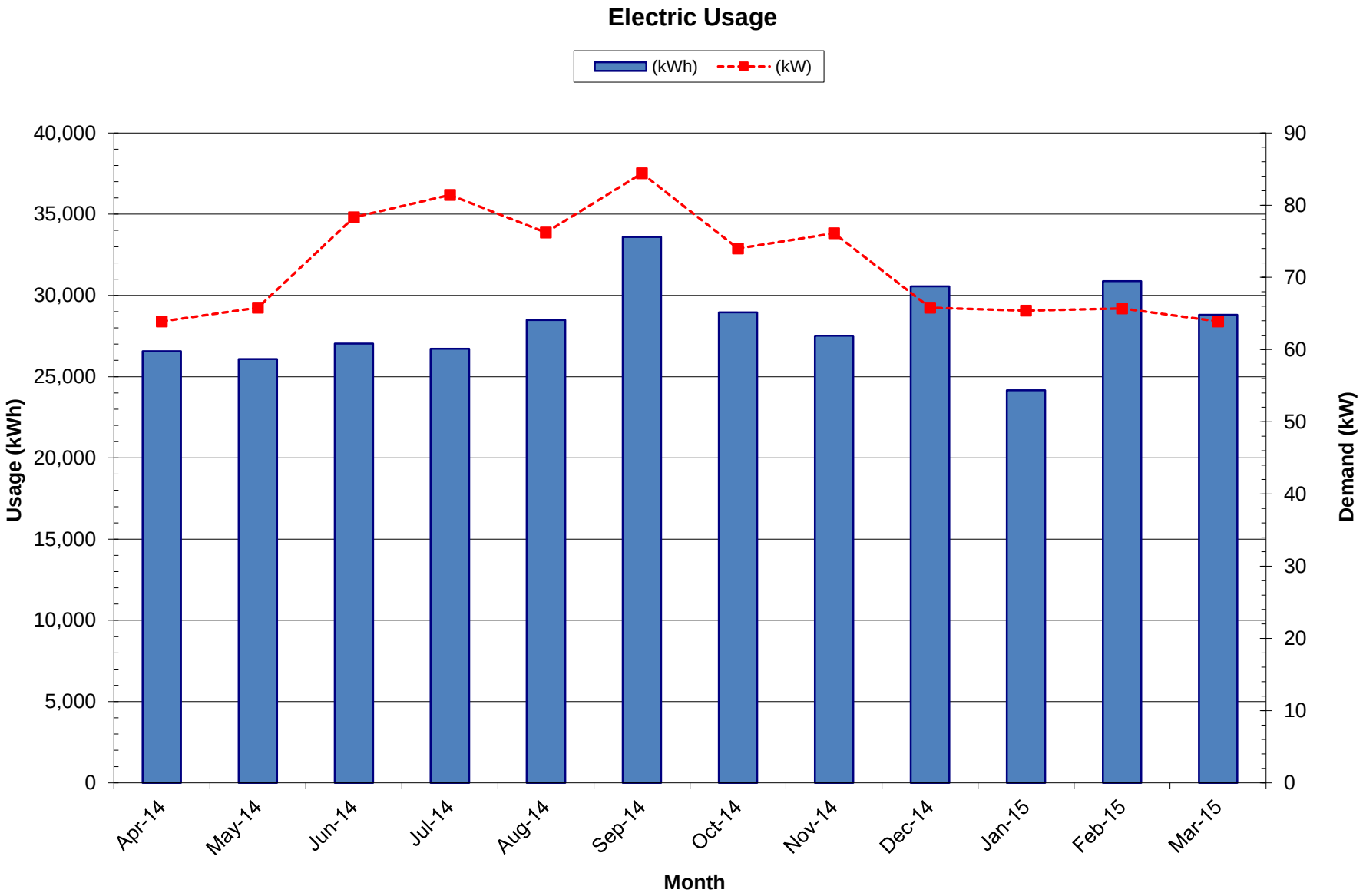
Electric Service

For Service at: **Bowne-Munro Elementary School**
Account No.: **100012779953**
Meter No.: **G28370843**

Delivery: **Jersy Central Power & Light**
Supply: **Jersy Central Power & Light**

					Provider Charges			**Unit Costs**				
	Consumption		**Demand**		**Delivery**	**Supplier**	**Total**	**Demand**	**Consumption**	**Delivery**	**Supplier**	**Blended Rate**
Month	**(kWh)**	**($)**	**(kW)**	**($)**	**($)**	**($)**	**($)**	**($/kW)**	**($/kWh)**	**($/kWh)**	**($/kWh)**	**($/kWh)**
April-14	26,560	3,133.74	63.9	413.43	880.04	2,667.13	3,547.17	6.470	0.118	0.033	0.100	0.134
May-14	26,080	3,078.26	65.8	425.73	885.06	2,618.93	3,503.99	6.470	0.118	0.034	0.100	0.134
June-14	27,040	3,240.33	78.3	543.40	1,082.91	2,700.82	3,783.73	6.940	0.120	0.040	0.100	0.140
July-14	26,720	3,205.30	81.4	564.92	1,038.58	2,731.64	3,770.22	6.940	0.120	0.039	0.102	0.141
August-14	28,480	2,472.80	76.2	528.83	907.92	2,093.71	3,001.63	6.940	0.087	0.032	0.074	0.105
September-14	33,600	3,993.53	84.4	585.74	1,176.47	3,402.80	4,579.27	6.940	0.119	0.035	0.101	0.136
October-14	28,960	3,296.53	74.0	478.78	998.10	2,777.21	3,775.31	6.470	0.114	0.034	0.096	0.130
November-14	27,520	3,129.82	76.1	492.37	983.07	2,639.12	3,622.19	6.470	0.114	0.036	0.096	0.132
December-14	30,560	3,522.37	65.8	425.73	963.57	2,984.53	3,948.10	6.470	0.115	0.032	0.098	0.129
January-15	24,160	2,845.93	65.4	423.14	861.77	2,407.30	3,269.07	6.470	0.118	0.036	0.100	0.135
February-15	30,880	3,633.70	65.7	425.08	981.90	3,076.88	4,058.78	6.470	0.118	0.032	0.100	0.131
March-15	28,800	3,351.87	63.9	413.43	952.66	2,812.64	3,765.30	6.470	0.116	0.033	0.098	0.131
Total (All)	**339,360**	**$38,904.18**	**84.4**	**5,720.58**	**$11,712.05**	**$32,912.71**	**$44,624.76**	**$6.645**	**$0.115**	**$0.035**	**$0.097**	**$0.131**
Total (last 12-months)	**339,360**	**$38,904.18**	**84.4**	**5,721**	**$11,712.05**	**$32,912.71**	**$44,624.76**	**$6.645**	**$0.115**	**$0.035**	**$0.097**	**$0.131**
Notes	1A	1B	2A	2B	3	4	5	6	7	8	9	9

1A.) Number of kWh of electric energy used per month
1B.) Consumption charges ($)
2A.) Number of kW of power measured
2B.) Demand charges ($)
3.) Electric charges from Delivery provider
4.) Electric charges from Supply provider - note, includes 8.875% tax
5.) Total charges (Delivery + Supplier)
6.) Demand charges ($) / Demand (kW)
7.) Consumption charges ($) / Consumption (kWh)
8.) Delivery Charges ($) / Consumption (kWh) — 26% of blended rate (fixed portion of the bill that can't be negotiated)
9.) Supplier Charges ($) / Consumption (kWh) — 74% of blended rate (portion of the bill that can be negotiated)
10.) Total Charges ($) / Consumption (kWh)

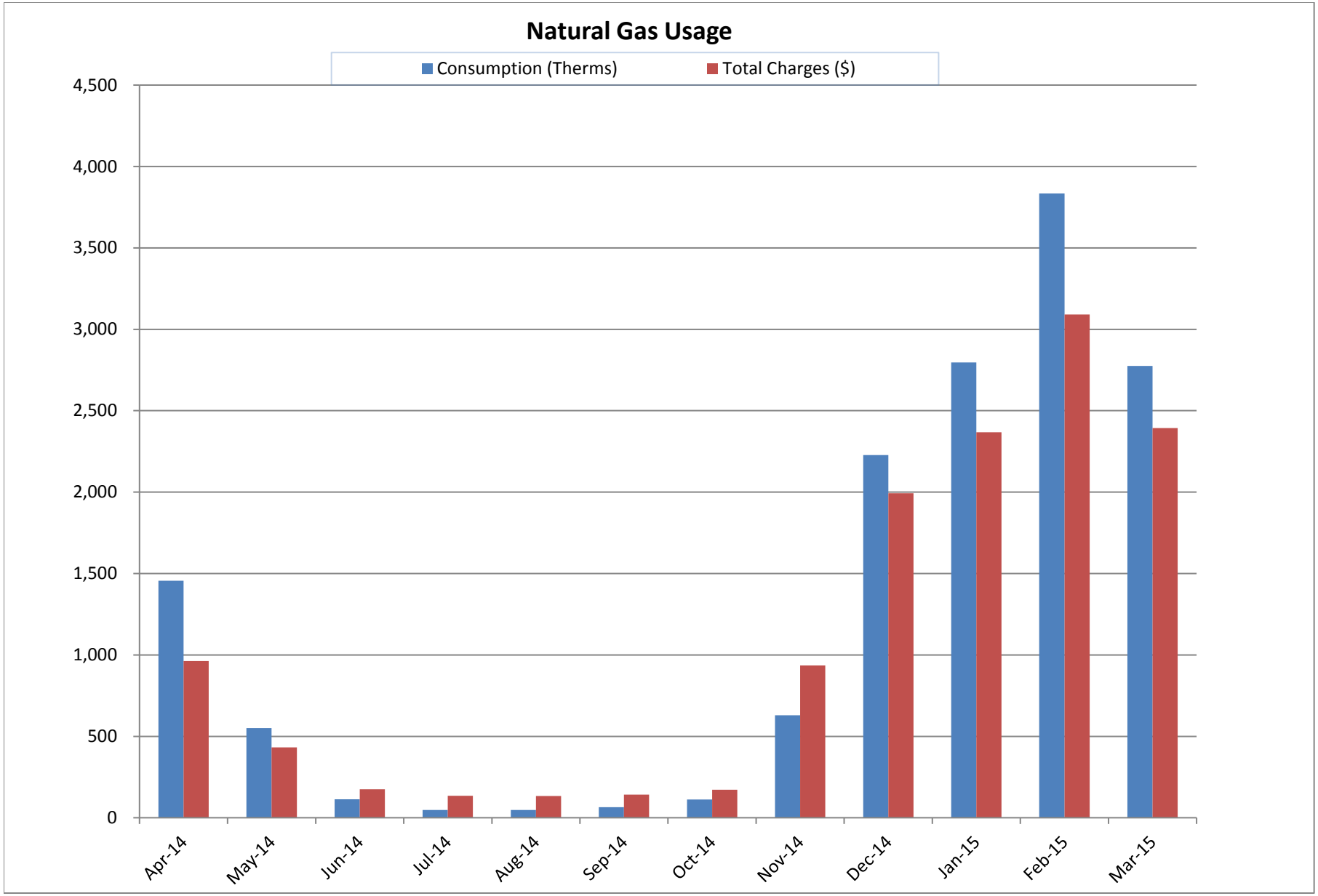

Electric Usage
(kWh)
(kW)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Usage (kWh)
90
80
70
60
50
40
30
20
10
0
Demand (kW)
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15
Month

Local Government Energy Audit
East Brunswick Board of Education
Bowne-Munro Elementary School

Natural Gas Service

For Service at: **Bowne-Munro Elementary School**
Account No.: **6640823101**
Meter No: **2415160**
Delivery: **PSE&G**
Supply: **Direct Energy**

Month	Consumption (Therms)	Supply Charge ($)	Delivery Charge ($)	Total Charges ($)	Supply Rate ($/Therm)	Delivery Rate ($/Therm)	Total Rate ($/Therm)
April-14	1,455.0	693.57	268.81	962.38	0.477	0.185	0.661
May-14	551.0	261.91	170.65	432.56	0.475	0.310	0.785
June-14	114.0	59.98	115.56	175.54	0.526	1.014	1.540
July-14	48.2	27.16	107.83	134.99	0.564	2.239	2.803
August-14	48.2	25.13	108.16	133.29	0.521	2.244	2.765
September-14	64.5	32.22	109.80	142.02	0.500	1.704	2.203
October-14	112.0	57.05	114.43	171.48	0.509	1.021	1.530
November-14	629.6	320.60	614.88	935.48	0.509	0.977	1.486
December-14	2,227.9	1,134.43	858.17	1,992.60	0.509	0.385	0.894
January-15	2,796.2	1,423.77	943.86	2,367.63	0.509	0.338	0.847
February-15	3,834.4	1,952.46	1,138.70	3,091.16	0.509	0.297	0.806
March-15	2,775.0	1,413.03	979.89	2,392.92	0.509	0.353	0.862
Total (All)	**14,656.1**	**$7,401.31**	**$5,530.74**	**$12,932.05**	**0.505**	**0.377**	**0.882**
Total (last 12-months)	**14,656.1**	**$7,401.31**	**$5,530.74**	**$12,932.05**	**0.505**	**0.377**	**0.882**
		57.2%	42.8%	100.0%			


Natural Gas Usage
Consumption (Therms)
Total Charges ($)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15

PSE&G ELECTRIC SERVICE TERRITORY
Last Updated: 10/24/12

***CUSTOMER CLASS - R – RESIDENTIAL C – COMMERCIAL I –INDUSTRIAL**

Supplier	Telephone & Web Site	*Customer Class
AEP Energy, Inc. 309 Fellowship Road, Fl. 2 Mount Laurel, NJ 08054	(866) 258-3782 www.aepenergy.com	**C/I** **ACTIVE**
Alpha Gas and Electric, LLC 641 5th Street Lakewood, NJ 08701	(855) 553-6374 www.alphagasandelectric.com	**R/C** **ACTIVE**
Ambit Northeast, LLC 103 Carnegie Center Suite 300 Princeton, NJ 08540	(877)-30-AMBIT (877) 302-6248 www.ambitenergy.com	**R/C** **ACTIVE**
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com	**C** **ACTIVE**
Amerigreen Energy, Inc. 1463 Lamberton Road Trenton, NJ 08611	888-423-8357 www.amerigreen.com	**R/C** **ACTIVE**
AP Gas & Electric, LLC 10 North Park Place, Suite 420 Morristown, NJ 07960	(855) 544-4895 www.apge.com	**R/C/I** **ACTIVE**
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	(201) 384-5552 www.astralenergyllc.com	**R/C/I** **ACTIVE**
Barclays Capital Services, Inc. 70 Hudson Street Jersey City, NJ 07302-4585	(888) 978-9974 www.group.barclays.com	**C** **ACTIVE**
BBPC, LLC d/b/a Great Eastern Energy 116 Village Blvd. Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateasternenergy.com	**C/I** **ACTIVE**
Champion Energy Services, LLC 72 Avenue L Newark, NJ 07105	(877) 653-5090 www.championenergyservices.com	**R/C/I** **ACTIVE**

Choice Energy, LLC 4257 US Highway 9, Suite 6C Freehold, NJ 07728	888-565-4490 www.4choiceenergy.com	**R/C** **ACTIVE**
Clearview Electric, Inc. 505 Park Drive Woodbury, NJ 08096	(888) CLR-VIEW (800) 746-4702 www.clearviewenergy.com	**R/C/I** **ACTIVE**
Commerce Energy, Inc. 7 Cedar Terrace Ramsey, NJ 07446	1-866-587-8674 www.commerceenergy.com	**R** **ACTIVE**
ConEdison Solutions Cherry Tree Corporate Center 535 State Highway Suite 180 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com	**C/I** **ACTIVE**
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(866) 237-7693 www.constellation.com	**R/C/I** **ACTIVE**
Constellation Energy 900A Lake Street, Suite 2 Ramsey, NJ 07446	(877) 997-9995 www.constellation.com	**R** **ACTIVE**
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com	**C** **ACTIVE**
Direct Energy Business, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(888) 925-9115 www.directenergybusiness.com	**C/I** **ACTIVE**
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 348-4193 www.directenergy.com	**R** **ACTIVE**
Discount Energy Group, LLC 811 Church Road, Suite 149 Cherry Hill, New Jersey 08002	(800) 282-3331 www.discountenergygroup.com	**R/C** **ACTIVE**
Dominion Retail, Inc. **d/b/a Dominion Energy Solutions** 395 Route #70 West Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.dom.com/products	**R/C** **ACTIVE**

DTE Energy Supply, Inc. One Gateway Center, Suite 2600 Newark, NJ 07102	(877) 332-2450 www.dtesupply.com	**C/I** **ACTIVE**
Energy.me Midwest LLC 90 Washington Blvd Bedminster, NJ 07921	(855) 243-7270 www.energy.me	**R/C/I** **ACTIVE**
Energy Plus Holdings LLC 309 Fellowship Road East Gate Center, Suite 200 Mt. Laurel, NJ 08054	(877) 866-9193 www.energypluscompany.com	**R/C** **ACTIVE**
Ethical Electric Benefit Co. d/b/a Ethical Electric 100 Overlook Center, 2nd Fl. Princeton, NJ 08540	(888) 444-9452 www.ethicalelectric.com	**R/C** **ACTIVE**
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07962	(800) 977-0500 www.fes.com	**C/I** **ACTIVE**
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com	**R/C/I** **ACTIVE**
GDF SUEZ Energy Resources NA, Inc. 333 Thornall Street Sixth Floor Edison, NJ 08837	(866) 999-8374 www.gdfsuezenergyresources.com	**C/I** **ACTIVE**
Glacial Energy of New Jersey, Inc. 75 Route 15 Building E Lafayette, NJ 07848	(888) 452-2425 www.glacialenergy.com	**C/I** **ACTIVE**
Global Energy Marketing LLC 129 Wentz Avenue Springfield, NJ 07081	(800) 542-0778 www.globalp.com	**C/I** **ACTIVE**
Green Mountain Energy Company 211 Carnegie Center Drive Princeton, NJ 08540	(866) 767-5818 www.greenmountain.com/commercial-home	**C/I** **ACTIVE**

Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com	**C/I** **ACTIVE**
HIKO Energy, LLC 655 Suffern Road Teaneck, NJ 07666	(888) 264-4908 www.hikoenergy.com	**R/C** **ACTIVE**
HOP Energy, LLC d/b/a Metro Energy, HOP Fleet Fueling, HOP Energy Fleet Fueling 1011 Hudson Avenue Ridgefield, NJ 07657	(877) 390-7155 www.hopenergy.com	**R/C/I** **ACTIVE**
Hudson Energy Services, LLC 7 Cedar Street Ramsey, New Jersey 07446	(877) Hudson 9 www.hudsonenergyservices.com	**C** **ACTIVE**
IDT Energy, Inc. 550 Broad Street Newark, NJ 07102	(877) 887-6866 www.idtenergy.com	**R/C** **ACTIVE**
Independence Energy Group, LLC 3711 Market Street, 10th Fl. Philadelphia, PA 19104	(877) 235-6708 www.chooseindependence.com	**R/C** **ACTIVE**
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com	**C/I** **ACTIVE**
Keil & Sons, Inc. **d/b/a Systrum Energy** 1 Bergen Blvd. Fairview, NJ 07022	(877) 797-8786 www.systrumenergy.com	**R/C/I** **ACTIVE**
Liberty Power Delaware, LLC 1973 Highway 34, Suite 211 Wall, NJ 07719	(866) 769-3799 www.libertypowercorp.com	**C/I** **ACTIVE**
Liberty Power Holdings, LLC 1973 Highway 34, Suite 211 Wall, NJ 07719	(866) 769-3799 www.libertypowercorp.com	**C/I** **ACTIVE**

Linde Energy Services 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.linde.com	**C/I** **ACTIVE**
Marathon Power LLC 302 Main Street Paterson, NJ 07505	(888) 779-7255 www.mecny.com	**R/C/I** **ACTIVE**
MXenergy Electric Inc. 900 Lake Street Ramsey, NJ 07446	(800) 785-4374 www.mxenergy.com	**R/C/I** **ACTIVE**
NATGASCO, Inc. 532 Freeman St. Orange, NJ 07050	(973) 678-1800 x. 251 www.supremeenergyinc.com	**R/C** **ACTIVE**
NextEra Energy Services New Jersey, LLC 651 Jernee Mill Road Sayreville, NJ 08872	(877) 528-2890 Commercial (800) 882-1276 Residential www.nexteraenergyservices.com	**R/C/I** **ACTIVE**
New Jersey Gas & Electric 1 Bridge Plaza fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NJGandE.com	**R/C** **ACTIVE**
Noble Americas Energy Solutions The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.noblesolutions.com	**C/I** **ACTIVE**
North American Power and Gas, LLC 222 Ridgedale Avenue Cedar Knolls, NJ 07927	(888) 313-9086 www.napower.com	**R/C/I** **ACTIVE**
Palmco Power NJ, LLC One Greentree Centre 10,000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	(877) 726-5862 www.PalmcoEnergy.com	**R/C/I** **ACTIVE**
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) ENERGY-9 (363-7499) www.pepco-services.com	**C/I** **ACTIVE**
Plymouth Rock Energy, LLC 338 Maitland Avenue Teaneck, NJ 07666	(855) 32-POWER (76937) www.plymouthenergy.com	**R/C/I** **ACTIVE**

PPL Energy Plus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com	**C/I** **ACTIVE**
Public Power & Utility of New Jersey, LLC 39 Old Ridgebury Rd. Suite 14 Danbury, CT 06810	(888) 354-4415 www.ppandu.com	**R/C/I** **ACTIVE**
Reliant Energy 211 Carnegie Center Princeton, NJ 08540	(877) 297-3795 (877) 297-3780 www.reliant.com/pjm	**R/C/I** **ACTIVE**
ResCom Energy LLC 18C Wave Crest Ave. Winfield Park, NJ 07036	(888) 238-4041 http://rescomenergy.com	**R/C/I** **ACTIVE**
Respond Power LLC 10 Regency CT Lakewood, NJ 08701	(877) 973-7763 www.respondpower.com	**R/C/I** **ACTIVE**
South Jersey Energy Company 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 266-6020 www.southjerseyenergy.com	**C/I** **ACTIVE**
Sperian Energy Corp. 1200 Route 22 East, Suite 2000 Bridgewater, NJ 08807	(888) 682-8082	**R/C/I** **ACTIVE**
S.J. Energy Partners, Inc. 208 White Horse Pike, Suite 4 Barrington, N.J. 08007	(800) 695-0666 www.sjnaturalgas.com	**R/C** **ACTIVE**
Spark Energy, L.P. 2105 CityWest Blvd., Ste 100 Houston, Texas 77042	(800) 441-7514 www.sparkenergy.com	**R/C/I** **ACTIVE**
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com	**C/I** **ACTIVE**
Starion Energy PA Inc. 101 Warburton Avenue Hawthorne, NJ 07506	(800) 600-3040 www.starionenergy.com	**R/C/I** **ACTIVE**
Stream Energy 309 Fellowship Rd., Suite 200 Mt. Laurel, NJ 08054	(877) 39-8150 www.streamenergy.net	**R** **ACTIVE**

UGI Energy Services, Inc. d/b/a GASMARK 224 Strawbridge Drive Suite 107 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com	**C/I** **ACTIVE**
Verde Energy USA, Inc. 50 East Palisades Avenue Englewood, NJ 07631	(800) 388-3862 www.lowcostpower.com	**R/C/I** **ACTIVE**
Viridian Energy 2001 Route 46, Waterview Plaza Suite 310 Parsippany, NJ 07054	(866) 663-2508 www.viridian.com	**R/C/I** **ACTIVE**
Xoom Energy New Jersey, LLC 744 Broad Street Newark, NJ 07102	(888) 997-8979 www.xoomenergy.com	**R/C/I** **ACTIVE**
YEP Energy 89 Headquarters Plaza North #1463 Morristown, NJ 07960	(855) 363-7736 www.yepenergyNJ.com	**R/C/I** **ACTIVE**
Your Energy Holdings, LLC One International Boulevard Suite 400 Mahwah, NJ 07495-0400	(855) 732-2493 www.thisisyourenergy.com	**R/C/I** **ACTIVE**

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PSE&G GAS SERVICE TERRITORY
Last Updated: 12/11/14

***CUSTOMER CLASS** - **R – RESIDENTIAL C – COMMERCIAL I - INDUSTRIAL**

Supplier	Telephone & Web Site	*Customer Class
Ambit Northeast, LLC d/b/a Ambit Energy 103 Carnegie Center Suite 300 Princeton, NJ 08540	877-282-6284 www.ambitenergy.com	**R/C** **ACTIVE**
Amerigreen Energy, Inc. **333 Sylvan Avenue Suite 206** **Englewood Cliffs, NJ 07632**	(888)559-4567 www.amerigreen.com	**R/C/I** **ACTIVE**
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	888-850-1872 www.AstralEnergyLLC.com	**R/C/I** **ACTIVE**
BBPC, LLC Great Eastern Energy 116 Village Blvd. Suite 200 Princeton, NJ 08540	888-651-4121 www.greateasternenergy.com	**C** **ACTIVE**
Choice Energy, LLC **4257 US Highway 9, Suite 6C** **Freehold, NJ 07728**	(888) 565-4490 www.4choiceenergy.com	**R/C/I**
Clearview Electric Inc. **d/b/a Clearview Gas** 1744 Lexington Ave. Pennsauken, NJ 08110	800-746-4720 www.clearviewenergy.com	**R/C** **ACTIVE**
Colonial Energy, Inc. 83 Harding Road Wyckoff, NJ 07481	845-429-3229 www.colonialgroupinc.com	**C/I** **ACTIVE**
Commerce Energy, Inc. 7 Cedar Terrace Ramsey, NJ 07746	888 817-8572 www.commerceenergy.com	**R** **ACTIVE**
Compass Energy Services, Inc. 33 Wood Avenue South, 610 Iselin, NJ 08830	866-867-8328 www.compassenergy.net	**C/I** **ACTIVE**

Compass Energy Gas Services, LLC 33 Wood Avenue South Suite 610 Iselin, NJ 08830	866-867-8328 www.compassenergy.net	**C/I** **ACTIVE**
ConocoPhillips Company 224 Strawbridge Drive, Suite 107 Moorestown, NJ 08057	800-646-4427 www.conocophillips.com	**C/I** **ACTIVE**
Consolidated Edison Energy, Inc. **d/b/a Con Edison Solutions** 535 State Highway 38, Suite 140 Cherry Hill, NJ 08002	888-686-1383 x2130 www.conedenergy.com	
Consolidated Edison Solutions, Inc. Cherry Tree Corporate Center 535 State Highway 38, Suite 140 Cherry Hill, NJ 08002	888-665-0955 www.conedsolutions.com	**C/I** **ACTIVE**
Constellation NewEnergy-Gas Division, LLC 116 Village Boulevard, Suite 200 Princeton, NJ 08540	800-785-4373 www.constellation.com	**C/I** **ACTIVE**
Constellation Energy Gas Choice, Inc. 116 Village Blvd., Suite 200 Princeton, NJ 08540	800-785-4373 www.constellation.com	**R/C/I** **ACTIVE**
Direct Energy Business, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	888-925-9115 http://www.business.directenergy.com/	**R** **ACTIVE**
Direct Energy Business Marketing, LLC (fka Hess Energy Marketing) One Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 http://www.business.directenergy.com/	**C/I** **ACTIVE**
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(888) 925-9115 www.directenergy.com	**R** **ACTIVE**

Direct Energy Small Business, LLC (fka Hess Small Business Services, LLC) One Hess Plaza Woodbridge, NJ 07095	(888) 464-4377 http://www.business.directenergy.com/	**C/I** **ACTIVE**
Gateway Energy Services Corp. 120 Wood Avenue Suite 611 Iselin, NJ 08830	(866) 348-4193 www.gesc.com	**R/C** **ACTIVE**
Glacial Energy of New Jersey, Inc. 21 Pine Street, Suite 237 Rockaway, NJ 07866	888-452-2425 www.glacialenergy.com	**C/I** **ACTIVE**
Global Energy Marketing, LLC 129 Wentz Avenue Springfield, NJ 07081	800-542-0778 www.globalp.com	**C/I** **ACTIVE**
Great Eastern Energy 116 Village Blvd., Suite 200 Princeton, NJ 08540	888-651-4121 www.greateastern.com	**C/I** **ACTIVE**
Greenlight Energy 330 Hudson Street, Suite 4 Hoboken, NJ 07030	718-204-7467 www.greenlightenergy.us	**C** **ACTIVE**
Harborside Energy LLC 101 Hudson Street, Suite 2100 Jersey City, NJ 07302	877-940-3835 www.harborsideenergynj.com	**R/C** **ACTIVE**
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095	800-437-7872 www.hess.com	**C/I** **ACTIVE**
HIKO Energy, LLC 655 Suffern Road Teaneck, NJ 07666	888 264-4908 www.hikoenergy.com	**R/C/I** **ACTIVE**
Hudson Energy Services, LLC 7 Cedar Street Ramsey, NJ 07446	877- Hudson 9 www.hudsonenergyservices.com	**C** **ACTIVE**
IDT Energy, Inc. 550 Broad Street Newark, NJ 07102	877-887-6866 www.idtenergy.com	**R/C** **ACTIVE**

Infinite Energy dba Intelligent Energy 1200 Route 22 East Suite 2000 Bridgewater, NJ 08807-2943	(800) 927-9794 www.InfiniteEnergy.com	**R/C/I** **ACTIVE**
Integrys Energy Services-Natural Gas, LLC 101 Eisenhower Parkway Suite 300 Roseland, NJ 07068	(800) 536-0151 www.integrysenergy.com	**C/I** **ACTIVE**
Jsynergy LLC 445 Cental Ave. Suite 204 Cedarhurst, NY 11516	(516) 331-2020 www.Jsnergyllc.com	**R/C/I** **ACTIVE**
Major Energy Services, LLC 1001 East Lawn Drive Teaneck NJ 07666	888-625-6760 www.majorenergy.com	**R/C/I** **ACTIVE**
Marathon Power LLC 302 Main Street Paterson, NJ 07505	888-779-7255 www.mecny.com	**R/C/I** **ACTIVE**
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	1-877-750-7046 www.metromediaenergy.com	**C/I** **ACTIVE**
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	888-53-Metro www.metroenergy.com	**R/C** **ACTIVE**
MPower Energy NJ LLC One University Plaza, Suite 507 Hackensack, NJ 07601	877-286-7693 www.mpowerenergy.com	**R/C/I** **ACTIVE**
NATGASCO (Supreme Energy, Inc.) 532 Freeman Street Orange, NJ 07050	800-840-4427 www.supremeenergyinc.com	**R/C/I** **ACTIVE**
New Energy Services LLC 101 Neptune Avenue Deal, New Jersey 07723	800-660-3643 www.newenergyservicesllc.com	**R/C/I** **ACTIVE**
New Jersey Gas & Electric 10 North Park Place Suite 420 Morristown, NJ 07960	866-568-0290 www.njgande.com	**R/C** **ACTIVE**

Noble Americas Energy Solutions The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095	877-273-6772 www.noblesolutions.com	**C/I** **ACTIVE**
North American Power & Gas, LLC d/b/a North American Power 197 Route 18 South Ste. 300 New Brunswick, NJ 08816	888- 313-8086 www.napower.com	**R/C/I** **ACTIVE**
North Eastern States, Inc. d/b/a Entrust Energy 90 Washington Valley Road Bedminster, NJ 07921	(888) 535-6340 www.entrustenergy.com	**R/C/I** **ACTIVE**
Oasis Power, LLC d/b/a Oasis Energy 11152 Westheimer, Suite 901 Houston, TX 77042	(800)324-3046 www.oasisenergy.com	**R/C** **ACTIVE**
Palmco Energy NJ, LLC One Greentree Centre 10,000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	877-726-5862 www.PalmcoEnergy.com	**R/C/I** **ACTIVE**
Plymouth Rock Energy, LLC 338 Maitland Avenue Teaneck, NJ 07666	855-32-POWER (76937) www.plymouthenergy.com	**R/C/I** **ACTIVE**
PPL EnergyPlus, LLC Shrewsbury Executive Offices 788 Shrewsbury Avenue Suite 2200 Tinton Falls, NJ 07724	(732) 741-0505 www.pplenergyplus.com	**C/I** **ACTIVE**
PPL EnergyPlus Retail, LLC Shrewsbury Executive Offices 788 Shrewsbury Avenue, Suite 220 Tinton Falls, NJ 07724	(732) 741-0505 – 2000 www.pplenergyplus.com	**C/I** **ACTIVE**
Public Power & Utility of New Jersey, LLC One International Blvd, Suite 400 Mahwah, NJ 07495	(888) 354-4415 www.ppandu.com	**R/C/I** **ACTIVE**

Residents Energy, LLC 550 Broad Street Newark, NJ 07102	(888) 828-7374 www.residentsenergy.com	**R/C**
Respond Power LLC 1001 East Lawn Drive Teaneck, NJ 07666	(877) 973-7763 www.respondpower.com	**R/C/I** **ACTIVE**
Save on Energy, LLC 1101 Red Ventures Drive Fort Mill, SC 29707	1 (877) 658-3183 www.saveonenergy.com	**R/C** **ACTIVE**
SFE Energy One Gateway Center Suite 2600 Newark, NJ 07012	1 (877) 316-6344 www.sfeenergy.com	**R/C/I** **ACTIVE**
S.J. Energy Partners, Inc. 208 White Horse Pike, Suite 4 Barrington, NJ 08007	(800) 695-0666 www.sjnaturalgas.com	**C** **ACTIVE**
South Jersey Energy Company 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	800-266-6020 www.southjerseyenergy.com	**R/C/I** **ACTIVE**
SouthStar Energy d/b/a New Jersey Energy 1085 Morris Avenue, Suite 155 Union, NJ 07083	(866) 477-8823 www.newjerseyenergy.com	**R/C** **ACTIVE**
Spark Energy Gas, LP/ Spark Energy 2105 City West Blvd. Suite 100 Houston, TX 77042	(713)600-2600 www.sparkenergy.com	**R/C/I** **ACTIVE**
Sperian Energy Corp. Bridgewater Center 1200 Route 22 East Bridgewater, NJ 08807	888-682-8082 www.sperianenergy.com	**R/C/I** **ACTIVE**
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	855-466-2842 www.spragueenergy.com	**C/I** **ACTIVE**
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	800-640-6457 www.stuyfuel.com	**C** **ACTIVE**

Stream Energy New Jersey, LLC 309 Fellowship Road Suite 200 Mt. Laurel, NJ 08054	(877) 369-8150 www.streamenergy.net	**R/C** **ACTIVE**
Summit Energy Services, Inc. 10350 Ormsby Park Place Suite 400 Louisville, KY 40223	1 (800) 90-SUMMIT www.summitenergy.com	**C/I** **ACTIVE**
Systrum Energy 1 Bergen Blvd. Fairview, NJ 07022	877-797-8786 www.systrumenergy.com	**R/C/I** **ACTIVE**
Tiger Natural Gas, Inc. dba Tiger, Inc. 234 20th Avenue Brick, NJ 008724	888-875-6122 www.tigernaturalgas.com	**R/C/I** **ACTIVE**
UGI Energy Services, Inc. dba UGI Energy Link 224 Strawbridge Drive, Suite 107 Moorestown, NJ 08057	800-427-8545 www.ugienergylink.com	**C/I** **ACTIVE**
UGI Energy Services, Inc. d/b/a GASMARK 224 Strawbridge Drive, Suite 107 Moorestown, NJ 08057	856-273-9995 www.ugienergylink.com	**C/I** **ACTIVE**
Verde Energy USA, Inc. 2001 Route 46 Waterview Plaza, Suite 301 Parsippany, NJ 07054	800-388-3862 www.lowcostpower.com	**R/C** **ACTIVE**
Viridian Energy PA LLC 2001 Route 46, Waterview Plaza Suite 230 Parsippany, NJ 07054	866-663-2508 www.viridian.com	**R/C** **ACTIVE**
Vista Energy Marketing, L.P. 197 State Route 18 South, Suite 3000 South Wing East Brunswick, NJ 08816	888-508-4782 www.vistaenergymarketing.com	**R/C/I** **ACTIVE**
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	800-557-1121 www.woodruffenergy.com	**R/C/I** **ACTIVE**

Woodruff Energy US LLC 73 Water Street, P.O. Box 777 Bridgeton, NJ 08302	856-455-1111 800-557-1121 www.woodruffenergy.com	**C/I** **ACTIVE**
XOOM Energy New Jersey, LLC 744 Broad Street. 16th Floor Newark, NJ 07102	888-997-8979 www.xoomenergy.com	**R/C/I** **ACTIVE**
Your Energy Holdings, LLC One International Boulevard Suite 400 Mahwah, NJ 07495-0400	855-732-2493 www.thisisyourenergy.com	**R/C/I** **ACTIVE**

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APPENDIX B

Equipment Inventory

East Brunswick Board of Education
CHA Project# 31007
Bowne Elementary School

Estimated

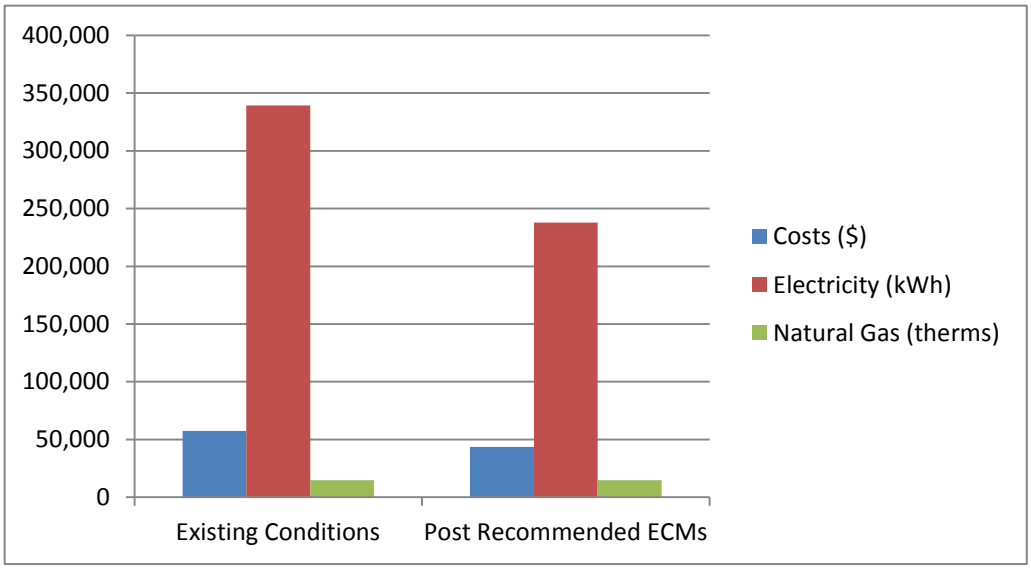
Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size	Efficiency	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)	Other Info.
Boiler	3	Aerco	KC Series	N/A	Heating/NG	1000000BTU	86%-93%	Boiler Room	School	2006	20	
Domestic Hot Water Heater	1	Bradford White	Magnum	N/A	Gas	80 gal/80000BTU	80%	Boiler Room	School	2007	6	
Hot Water Pump Motor	2	Marathon	184TTDB4026BR	T001COXON000302615	Electric Motor	5HP	87.5%	Boiler Room	School	2006	5	
Rooftop Unit	1	Carrier	48HJF007-M-531NB	1197G20410	Heating/Cooling	150,000BTU/6T	81%/11EER	Roof	School	1997	-4	
Rooftop Unit	1	Carrier	48HJF007-M-531NB	1197G20411	Heating/Cooling	150,000BTU/6T	81%/11EER	Roof	School	1997	-4	
Rooftop Unit	1	Carrier	48HJF0067-M-531NB	1197G20407	Heating/Cooling	130,000BTU/5T	81%/11EER	Roof	School	1997	-4	
Rooftop Unit	1	ITT	RSH20M33-G2RHEA00A00A	75024A3573	AHU	N/A	N/A	Roof	School	1997	-4	
Refigerator	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Stove	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

APPENDIX C

ECM Calculations

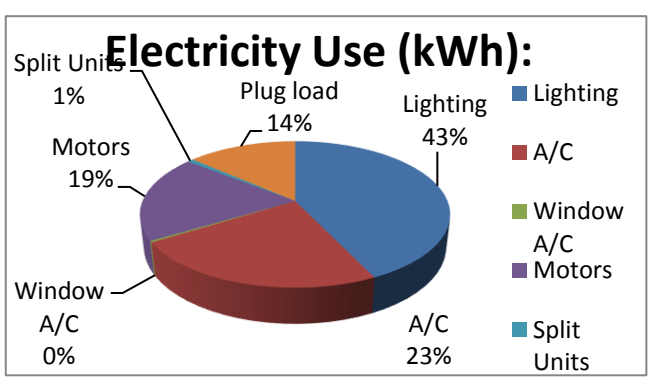
East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

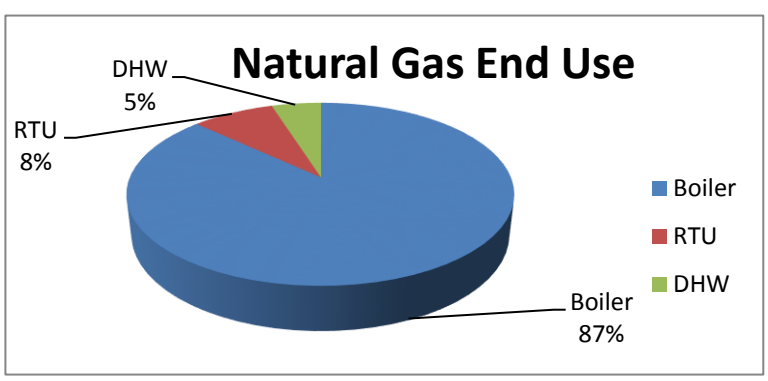
	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	57,557	43,625	24%
Electricity (kWh)	339,360	237,787	30%
Natural Gas (therms)	14,656	14,656	0%
Site EUI (kbtu/SF/Yr)	80.1	69.6	



East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

Utility End Use Analysis			
Electricity Use (kWh):		**Notes/Comments:**	
339,360	Total	Based on utility analysis	
145,466	Lighting	From Lighting Calculations	43%
78,945	A/C	From utilities	23%
1,050	Window A/C	Estimate	0%
65,249	Motors	Estimate	19%
2,468	Split Units	Estimate	1%
46,182	Plug load	Estimate	14%
			100%
Natural Gas Use (Therms):		**Notes/Comments:**	
14,656	Total	Based on utility analysis	
12,736	Boiler	Estimate	86.9%
1,200	RTU	Estimate	8.2%
720	DHW	From utilities	4.9%





East Brunswick BOE
CHA Project Number: 31007

Rate of Discount (used for NPV) 3.0%

Utility Costs		Yearly Usage	Metric Ton Carbon Dioxide Equivalent	Building Area	Annual Utility Cost		
$ 0.131	$/kWh blended		0.000420205	32,738	Electric	Natural Gas	Fuel Oil
$ 0.115	$/kWh supply	339,360	0.000420205		$ 44,625	$ 12,932	
$ 6.65	$/kW	84.4	0				
$ 0.88	$/Therm	14,656	0.00533471				
$ -	$/kgals		0				
	$/Gal						

Bowne Munro Elementary School

Recommend? Y or N		Item	Savings kW	kWh	therms	No. 2 Oil gal	Water kgal	$	Cost	Simple Payback	Life Expectancy	Equivalent CO_2 (Metric tons)	NJ Smart Start Incentives	Direct Install Eligible (Y/N)	Payback w/ Incentives	Simple Projected Lifetime Savings kW	kWh	therms	kgal/yr	$	ROI	NPV	IRR
Y	ECM-1	Replace RTUs with High Efficiency RTUs	4.8	8,157	0	0	0	1,323	$ 32,300	24.4	15.0	3.4	$ 1,336	N	23.4	72.5	122,354	0	0	$ 21,808	(0.3)	($15,166)	-5.1%
Y	ECM-2	Install Walk-In Controls	0.0	6,791	0	0	0	890	$ 22,275	25.0	10.0	2.9	$ -	N	25.0	0.0	67,912	0	0	$ 8,896	(0.6)	($14,686)	-14.0%
Y	ECM-3	Install VFDs on HHW Pumps	2.5	893	0	0	0	304	$ 11,172	36.7	15.0	0.4	$ 1,550	N	31.6	37.9	13,392	0	0	$ 4,779	(0.6)	($5,989)	-8.1%
N	ECM-4	Install Low Flow Plumbing Fixtures	0.0	0	134	0	251	118	$ 82,078	696.9	30.0	0.7	$ -	N	696.9	0.0	0	4,006	7,524	$ 3,533	(1.0)	($79,769)	-14.2%
Y	ECM-L1	Lighting Replacement With Controls	19.5	85,732	0	0	0	11,414	$ 93,456	8.2	10.0	36.0	$ 8,230	N	7.5	195.0	857,320	0	0	$127,858	0.4	$12,139	5.7%
		Total	**26.9**	**101,573**	**134**	**0**	**251**	**$ 14,049**	**$ 241,281**	**17.2**	**16.0**	**43**	**$ 11,116**		**16.4**	**305**	**1,060,978**	**4,006**	**7,524**	**$166,875**	**(0.3)**	**($53,692)**	**-0.3%**
		Recommended Measures (highlighted green above)	**26.9**	**101,573**	**0**	**0**	**0**	**$ 13,931**	**$ 159,203**	**11.4**	**12.5**	**43**	**$ 11,116**	**0**	**10.6**	**305**	**1,060,978**	**-**	**-**	**$163,341**	**0.0**	**($9,414)**	**1.9%**
		% of Existing	**32%**	**29.93%**	**0.00%**	**#DIV/0!**	**#DIV/0!**																

	City:	Newark, NJ				
	Occupied Hours/Week	45	70	70	70	50
		Building Operating Hours	Auditorium Occupied Hours	Gymnasium Occupied Hours	Library Occupied Hours	Classrooms Occupied Hours
Temp	Enthalpy h (Btu/lb)	Bin Hours				
102.5						
97.5	35.4	6	2	3	3	3	2
92.5	37.4	31	8	13	13	13	9
87.5	35.0	131	35	55	55	55	39
82.5	33.0	500	134	208	208	208	149
77.5	31.5	620	166	258	258	258	185
72.5	29.9	664	178	277	277	277	198
67.5	27.2	854	229	356	356	356	254
62.5	24.0	927	248	386	386	386	276
57.5	20.3	600	161	250	250	250	179
52.5	18.2	730	196	304	304	304	217
47.5	16.0	491	132	205	205	205	146
42.5	14.5	656	176	273	273	273	195
37.5	12.5	1,023	274	426	426	426	304
32.5	10.5	734	197	306	306	306	218
27.5	8.7	334	89	139	139	139	99
22.5	7.0	252	68	105	105	105	75
17.5	5.4	125	33	52	52	52	37
12.5	3.7	47	13	20	20	20	14
7.5	2.1	34	9	14	14	14	10
2.5	1.3	1	0	0	0	0	0
-2.5							
-7.5							

Multipliers	
Material:	1.027
Labor:	1.246
Equipment:	1.124

Heating System Efficiency	88%
Cooling Eff (kW/ton)	1.09

Heating		
Hours	4,427	Hrs
Weighted Avg	40	F
Avg	28	F

Cooling		
Hours	4,333	Hrs
Weighted Avg	68	F
Avg	78	F

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

ECM-1: Replace Unitary HVAC Equipment With More Efficient Unitary Equipment

Description: This ECM evaluates the energy savings associated with replacing older less efficient heating and cooling equipment with modern high efficiency unitary equipment havings the same capacity

	Quantity	Capacity (Tons)	Equipment Description	General Type	Total Cooling Capacity (Btu/h)	Total Heating Capacity (Btu/h)	EER
	1	5	RTU	HVAC	60,000	96,000	11
	2	6	RTU	HVAC	144,000	192,000	11
Total	3	11			204000	288000	11

Item	Value	Units	Formula/Comments	
Demand Rate	$ 6.65	/ kW		
Electricity Rate	$ 0.12	/kWh		
FORMULA CONSTANTS				
Coincidence Factor	0.67		NJ Protocols	
Conversion	3.412	btu/kW		
COOLING - HVAC				
Cooling Capacity	204,000	btu/hr		btuh
Baseline EER	11.0		See Table Below	EERb
Proposed EER	18.0		Equipment	EERq
Equivalent Full Load Hours	1,131	hrs	NJ Protocols	
Demand Savings	4.83	kW		
Energy Savings	8,157	kWh		
HEATING - Heat Pump				
Heating Capacity	-	btu/h		
Baseline Heating EER	11.0		See Table Below	
Proposed Heating EER	18.0		Equipment	
Equivalent Full Load Hours	800	hrs	NJ Protocols	
Heating Savings	-	kWh		
COOLING - Heat Pump				
Cooling Capacity	-	btu/h		
Baseline Cooling EER	11.0		See Table Below	
Proposed Cooling EER	18.0		Equipment	
Equivalent Full Load Hours	381	hrs	NJ Protocols	
Cooling Savings	-	kWh		
SAVINGS				
Demand Savings	4.83	kW		
Energy Savings	8,157	kWh		

Savings calculation formulas are taken from NJ Protocols document for Electric HVAC Equipment

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.12

ECM-1: Replace Unitary HVAC Equipment With More Efficient Unitary Equipment

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Demolition of (3) existing units	4	EA	$ -	$ 500	$ -	$ -	$ 2,492	$ -	$ 2,492	ENG Est
(2) ACs, 6.0 ton air conditioner condensing units	2	EA	$ 4,000	$ 750	$ -	$ 8,216	$ 1,869	$ -	$ 10,085	Internet Price
(1) AC, 5.0 ton air conditioner condensing unit	1	EA	$ 3,000	$ 750	$ -	$ 3,081	$ 935	$ -	$ 4,016	Internet Price
Electrical - misc.	3	EA	$ 250	$ 250	$ -	$ 770	$ 935	$ -	$ 1,705	ENG Est
Equipment	1	EA	$ -	$ -	$ 5,000	$ -	$ -	$ 5,620	$ 5,620	

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

$ 23,917	Subtotal
$ 8,371	35% Contingency
$ 32,300	**Total**

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

ECM-2: Walk-in Cooler & Freezer EC Motor Retrofits

ECM Description :
For kitchens that contain walk-in coolers and freezers, CoolTrol is a controller that reduces energy consumption by controlling off of dewpoint temperature. Compressor cycling is reduced and the evaporator fans run 25% to 80% less. Door and frame heaters are also installed and controlled by store dew point temperature; this can reduce run time by up to 95% in coolers and 60% in freezers. The evaporator fan motors are also replaced with hi-efficiency fan motors saving 40% to 70% in energy. The proposed system comprises of an anti-sweat door controller, evaporator fan motor replacement and CoolTrol Cooler Control System.

Utility Cost

$0.13 $/kWh Blended

EXISTING CONDITIONS			
Walk-In Freezer(s)			
Existing Freezer Controls?	N		
Quantity of Walk-In Freezers	1		
Nameplate Amps of Freezer Evaporator Fan	4		AmpsEF
Nameplate Volts of Freezer Evaporator Fan	208		VoltsEF
Phase of Evaporator Fan	1		PhaseEF
Power Factor of Evaporator Fan	0.55		PFEF
Operating Hours	8,760	hrs	
Load Reduction	65%		LR
Electricity Savings (Evaporator Fan)	2,345	kWh	kWhEF
Electricity Savings (Evaporator Fan Reduced Heat)	1,051	kWh	kWhRH
Total Walk-In Freezer(s) Electricity Savings	3,396	kWh	
Walk-In Cooler(s)			
Existing Cooler Controls?	N		
Quantity of Walk-In Coolers	1		
Nameplate Amps of Cooler Evaporator Fan	4		
Nameplate Volts of Cooler Evaporator Fan	208		
Phase of Evaporator Fan	1		
Power Factor of Evaporator Fan	0.55		
Operating Hours	8,760	hrs	
Load Reduction	65%		
Electricity Savings (Evaporator Fan)	2,345	kWh	
Electricity Savings (Evaporator Fan Reduced Heat)	1,051	kWh	
Total Walk-In Cooler(s) Electricity Savings	3,396	kWh	
SAVINGS			
Total Electricity Savings	**6,791**	**kWh**	

Savings calculation formulas are taken from NJ Protocols document for Walk-in Controller

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

ECM-2: Walk-in Cooler & Freezer EC Motor Retrofits - Cost

Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.12

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
									$ -	
Turnkey Walk-In Controller & Equipment	1	EA	$ 10,000	$ 5,000	$ -	$ 10,270	$ 6,230	$ -	$ 16,500	Vendor Estimate
						$ -	$ -	$ -	$ -	

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

$ 16,500	Subtotal
$ 5,775	35% Contingency
$ 22,275	**Total**

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

ECM-3: Add VFDs to HHW Pumps

Description: This ECM evaluates the energy (electrical) savings associated with adding variable frequency drives to the HHW pump and controlling motor speed based on pressure differential. As well as replacing the current motors with High efficiency motors. The calculation methodology compares the motor KWh at content speed to the proposed reduced Kwh with the VFD installed and the increase in motor efficiency.

Variable Inputs

Electric Rate	$0.13	**$/kWh**
Demand Rate	$6.65	**$/kW**

MOTOR SCHEDULE										Savings Factor		Existing Motor Energy		Proposed Motor Energy		Energy Savings	
Motor ID	Motor Type	Qty	HP	Total HP	Upgrade Motor	Load Factor	Existing Motor Eff.	New Motor Eff.	Annual Hours	Demand Savings Factor	Energy Savings Factor	Demand Energy (kW)	Electrical Energy (kWh)	Demand Energy (kW)	Electrical Energy (kWh)	Peak Demand Savings (kW)	Annual Energy Savings (kWh)
1	HHW Pump	1	5.0	5.0	Y	0.75	87.5%	90.4%	2,167	0.216	0.240	3.2	6,928	0.7	6,035	2.5	893
2	HHW Pump	0	5.0	0.0	Y	0.75	87.5%	90.4%	2,167	0.216	0.240	-	-	-	-	-	-
															Total:	2.5	892.8

Savings calculation formulas are taken from NJ Protocols document for VFDs

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

ECM-3: Add VFDs to HHW Pumps - Cost

Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
VFDs	2	EA	$ 1,706	$ 431	$ -	$ 3,504	$ 1,074	$ -	$ 4,578	RS Means
5 HP Motors	2	EA	$ 373	$ 79	$ -	$ 766	$ 197	$ -	$ 963	RS Means
Differential Pressure Switch and Wiring	1	LS	$ 350	$ 1,200		$ 359	$ 1,495	$ -	$ 1,855	RS Means
Controls	1	EA	$ 250	$ 500	$ -	$ 257	$ 623	$ -	$ 880	RS Means
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 8,276	Subtotal
$ 2,896	35% Contingency
$ 11,172	**Total**

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

ECM-4A: Replace urinals and flush valves with low flow

Description: This ECM evaluates the water savings associated with replacing/ upgrading urinals with 0.125 GPF urinals and or flush valves.

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$0.00	$ / kGal
Urinals in Building to be replaced	4	
Average Flushes / Urinal (per Day)	30	Based on # of occupants
Average Gallons / Flush	1.0	Gal

PROPOSED CONDITIONS		
Proposed Urinals to be Replaced	2	
Proposed Gallons / Flush	0.125	Gal
Proposed Material Cost of new urinal & valve	$1,200	RS Means 2012
Proposed Installation Cost of new urinal & valve	$1,000	RS Means 2012
Total cost of new urinals & valves		

SAVINGS		
Current Urinal Water Use	22.80	kGal / year
Proposed Urinal Water Use	12.83	kGal / year
Water Savings	9.98	kGal / year
Cost Savings	$0	/ year

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

ECM-4B: Replace toilets and flush valves with low flow

Description: This ECM evaluates the water savings associated with repalcing/ upgrading toilets to 1.28 GPF fixtures and/or flush valves.

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$0.00	$ / kGal
Toilets in Building	21	
Average Flushes / Toilet (per Day)	29	Based on # of occupants
Average Gallons / Flush	1.6	Gal

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	21	
Proposed Gallons / Flush	1.28	Gal

SAVINGS		
Current Toilet Water Use	182.40	kGal / year
Proposed Toilet Water Use	145.92	kGal / year
Water Savings	36.48	kGal / year
Cost Savings	$0	/ year

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

ECM-4C: Replace faucets with low flow

Description; This ECM evaluates the water savings resulting from replacing/ upgrading faucets to 0.5 gallon per minute flow

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$0.00	$ / kGal
Faucets in Building	19	
Average Uses / Faucet (per day)	38	Based on # of occupants
Average Time of Use	10.0	seconds
Average Flowrate	2.0	gpm

PROPOSED CONDITIONS		
Proposed Faucets to be Replaced	19	
Proposed Flowrate	0.5	gpm

HEATING SAVINGS		
Fuel Cost	$ 0.13	/kwh
Number of Faucets	19	
Hours per Day of Usage	2.0	hrs
Days per Year of Facility Usage	190	days
Average Flowrate	2.0	gpm
Proposed Flowrate	0.5	gpm
Heat Content of Water	8.33	Btu/gal/F
Temperature Difference (Intake and Output)	75	F
Water Heating Equipment Efficiency	80%	
Conversion Factor	100,000	Btu/kwh
SAVINGS		
Current Faucet Water Use	45.60	kGal / year
Proposed Faucet Water Use	11.40	kGal / year
Water Savings	34.20	kGal / year
Heating Savings	134	Therms
Cost Savings	$17	/ year

Savings calculation formulas are taken from NJ Protocols document for Faucet

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

Replace Plumbing Fixtures with Low-Flow Equivalents - Cost

Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.12

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
									$ -	
Low-Flow Urinal	2	EA	$ 1,200	$ 1,000	$ -	$ 2,465	$ 2,492	$ -	$ 4,957	Vendor Estimate
Low-Flow Toilet	21	EA	$ 1,400	$ 1,000	$ -	$ 30,194	$ 26,166	$ -	$ 56,360	Vendor Estimate
Low-Flow Faucet	19	EA	$ 700	$ 300	$ -	$ 13,659	$ 7,102	$ -	$ 20,761	Vendor Estimate
						$ -	$ -	$ -	$ -	

**Cost Estimates are for Energy Savings calculations only, do not use for procurement

$ 82,078	Subtotal
$ 28,727	35% Contingency
$ 110,805	**Total**

East Brunswick BOE
CHA Project Number: 31007
Bowne Munro Elementary School

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2015.
Building must have a minimum average electric demand of 200 kW and minimum area of building is 50,000 ft to be most cost-effective for commercial and industrial buildings. However, multifamily buildings with peak demand over 100kW are still eligible. Market manager has the discretion to approve applications that fall below 200kW minimum.

At a minimum, all recommended measures were used for this calculation. To qualify for P4P incentives, the following P4P requirements must be met:

- At least 15% source energy savings
- No more than 50% savings from lighting measures
- up to 70% of lighting savings may be considered but performance target will increase by 1% for each percent over 50%
- Scope should includes two or more unique measures
- Project has at least a 10% internal rate of return
- At least 50% of the source energy savings must come from investor-owned electricity and/or natural gas (note: exemption for fuel conversions)

Total Building Area (Square Feet)	32,738
Is this audit funded by NJ BPU (Y/N)	Yes

Board of Public Utilites (BPU)

Incentive #1		
Audit is funded by NJ BPU	$0.05	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$44,625	$12,932
Existing Usage (from utility)	339,360	14,656
Proposed Savings	101,573	0
Existing Total MMBtus	2,696	
Proposed Savings MMBtus	346	
% Energy Reduction	**12.8%**	
Proposed Annual Savings	$13,931	

	Source to S
Electric Grid	3.14
Electric Onsite	1
Natural Gas	1.05
Fuel Oil/Propane	1.01
District Steam/HHW	1.2
District CHW	1
Other	1

	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	$0.00	$0.00
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.00	$0.00

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$0
Incentive #2	$0	$0	$0
Incentive #3	$0	$0	$0
Total All Incentives	**$0**	**$0**	**$0**

Total Project Cost	$159,203

		Allowable Incentive
% Incentives #1 of Utility Cost*	0.0%	$0
% Incentives #2 of Project Cost**	0.0%	$0
% Incentives #3 of Project Cost**	0.0%	$0
Total Eligible Incentives***	**$0**	
Project Cost w/ Incentives	$159,203	

Project Payback (years)	
w/o Incentives	w/ Incentives
11.4	11.4

* Maximum allowable incentive is 50% of annual utility cost if not funded by NJ BPU, and %25 if LGEA is funded by NJBPU.
** Maximum allowable amount of Incentive #2 is 50% of total project cost.
**Maximum allowable amount of Incentive #3 is 50% 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

Energy Audit of Bowne-Munro Elementary School
CHA Project No. 31007
Existing Lighting & Audit Input

Cost of Electricity: **$0.115** **$/kWh**
$6.65 **$/kW**

			EXISTING CONDITIONS									Retrofit Control	
	Area Description	Usage	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	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	(kW/space) * (Annual Hours)	Retrofit control device	Notes
272LED	Outdoor	Outdoor Lighting	12	1T 32 P F 6	F46ILL	175	2.10	SW	3000	6,300	NONE	
133	Outdoor	Outdoor Lighting	2	CF 26	CFQ26/1-L	27	0.05	SW	3000	162	NONE	
18LED	10	Classroom	11	T 32 R F 4 (ELE)	F44ILL	112	1.23	SW	3750	4,620	OCC	
7LED	10	Classroom	2	2T 32 R F 2 (u)	FU2LL	60	0.12	SW	3750	450	OCC	
18LED	9	Classroom	12	T 32 R F 4 (ELE)	F44ILL	112	1.34	SW	3750	5,040	OCC	
133	9rr	Bathroom	1	CF 26	CFQ26/1-L	27	0.03	SW	1820	49	OCC	
71LED	10rr	Bathroom	1	I 60	I60/1	60	0.06	SW	1820	109	OCC	
18LED	11	Classroom	12	T 32 R F 4 (ELE)	F44ILL	112	1.34	SW	3750	5,040	OCC	
18LED	12	Classroom	12	T 32 R F 4 (ELE)	F44ILL	112	1.34	SW	3750	5,040	OCC	
18LED	Hall	Hallway	3	T 32 R F 4 (ELE)	F44ILL	112	0.34	SW	6000	2,016	NONE	
18LED	8	Classroom	8	T 32 R F 4 (ELE)	F44ILL	112	0.90	SW	3750	3,360	OCC	
18LED	13	Classroom	20	T 32 R F 4 (ELE)	F44ILL	112	2.24	SW	3750	8,400	OCC	
7LED	Hall	Hallway	3	2T 32 R F 2 (u)	FU2LL	60	0.18	SW	6000	1,080	NONE	
18LED	18	Classroom	5	T 32 R F 4 (ELE)	F44ILL	112	0.56	SW	3750	2,100	OCC	
7LED	18	Classroom	2	2T 32 R F 2 (u)	FU2LL	60	0.12	SW	3750	450	OCC	
18LED	15	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	3750	2,520	OCC	
7LED	15	Classroom	2	2T 32 R F 2 (u)	FU2LL	60	0.12	SW	3750	450	OCC	
18LED	14	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	3750	2,520	OCC	
7LED	14	Classroom	2	2T 32 R F 2 (u)	FU2LL	60	0.12	SW	3750	450	OCC	
71LED	15rr	Bathroom	1	I 60	I60/1	60	0.06	SW	1820	109	OCC	
71LED	14rr	Bathroom	1	I 60	I60/1	60	0.06	SW	1820	109	OCC	
18LED	17	Classroom	12	T 32 R F 4 (ELE)	F44ILL	112	1.34	SW	3750	5,040	OCC	
71LED	17rr	Bathroom	1	I 60	I60/1	60	0.06	SW	1820	109	OCC	
18LED	18	Classroom	8	T 32 R F 4 (ELE)	F44ILL	112	0.90	SW	3750	3,360	OCC	
7LED	18	Classroom	1	2T 32 R F 2 (u)	FU2LL	60	0.06	SW	3750	225	OCC	
71LED	18rr	Bathroom	1	I 60	I60/1	60	0.06	SW	1820	109	OCC	
35led	entry	Hallway	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	6000	1,080	NONE	
35led	Hall	Hallway	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	6000	2,160	NONE	
35led	Hall	Hallway	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	6000	2,160	NONE	
18LED	Main Office	Offices	4	T 32 R F 4 (ELE)	F44ILL	112	0.45	SW	3750	1,680	OCC	
18LED	Principal	Offices	4	T 32 R F 4 (ELE)	F44ILL	112	0.45	SW	3750	1,680	OCC	
18LED	Math	Classroom	4	T 32 R F 4 (ELE)	F44ILL	112	0.45	SW	3750	1,680	OCC	
18LED	2	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	3750	2,520	OCC	
18LED	Boys RM	Bathroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	1820	408	OCC	
18LED	Boys RM	Bathroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	1820	408	OCC	
18LED	Girls RM	Bathroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	1820	408	OCC	
18LED	Study Assist	Classroom	3	T 32 R F 4 (ELE)	F44ILL	112	0.34	SW	3750	1,260	OCC	
18LED	6	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	3750	2,520	OCC	
18LED	HAll	Hallway	12	T 32 R F 4 (ELE)	F44ILL	112	1.34	SW	6000	8,064	NONE	
34led	7	Classroom	1	1T 32 C F 2 (ELE)	F42ILL	59	0.06	SW	3750	221	OCC	
34led	7rr	Bathroom	1	1T 32 C F 2 (ELE)	F42ILL	59	0.06	SW	1820	107	OCC	
18LED	k	Classroom	8	T 32 R F 4 (ELE)	F44ILL	112	0.90	SW	3750	3,360	OCC	
18LED	4	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	3750	2,520	OCC	
18LED	3	Classroom	8	T 32 R F 4 (ELE)	F44ILL	112	0.90	SW	3750	3,360	OCC	
18LED	Hall	Hallway	1	T 32 R F 4 (ELE)	F44ILL	112	0.11	SW	6000	672	NONE	
133	Hall / Entry	Hallway	12	CF 26	CFQ26/1-L	27	0.32	SW	6000	1,944	NONE	
7LED	Stairs	Hallway	2	2T 32 R F 2 (u)	FU2LL	60	0.12	SW	6000	720	NONE	
18LED	Faculty	Offices	5	T 32 R F 4 (ELE)	F44ILL	112	0.56	SW	3750	2,100	OCC	
133	Storage	Storage	4	CF 26	CFQ26/1-L	27	0.11	SW	2000	216	OCC	
34led	Boiler Room	Mechanical Rooms	7	1T 32 C F 2 (ELE)	F42ILL	59	0.41	SW	2500	1,033	NONE	
34led	Math Room	Classroom	3	1T 32 C F 2 (ELE)	F42ILL	59	0.18	SW	3750	664	OCC	
35led	Math Room	Classroom	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	3750	1,013	OCC	
35led	Library	Library	46	T 32 R F 3 (ELE)	F43ILL/2	90	4.14	SW	3750	15,525	OCC	
35led	MDF Room	Classroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	3750	1,350	OCC	
35led	Storage	Storage	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	2000	180	OCC	
35led	Media Center	Classroom	25	T 32 R F 3 (ELE)	F43ILL/2	90	2.25	SW	3750	8,438	OCC	
34led	Book Room	Classroom	8	1T 32 C F 2 (ELE)	F42ILL	59	0.47	SW	3750	1,770	OCC	
34led	Speech Room	Classroom	4	1T 32 C F 2 (ELE)	F42ILL	59	0.24	SW	3750	885	OCC	
133	Gym	Gymnasium	4	CF 26	CFQ26/1-L	27	0.11	SW	3750	405	NONE	
274	Gym	Gymnasium	8	22" Aluminum High Bay Induction	19300-AL-UNV	315	2.52	SW	3750	9,450	NONE	
7LED	Gym	Gymnasium	7	2T 32 R F 2 (u)	FU2LL	60	0.42	SW	3750	1,575	NONE	
34led	Gym	Gymnasium	1	1T 32 C F 2 (ELE)	F42ILL	59	0.06	SW	3750	221	NONE	
34led	Kitchen	Kitchen	3	1T 32 C F 2 (ELE)	F42ILL	59	0.18	SW	2500	443	OCC	
34LED	Kitchen	Kitchen	12	1T 32 C F 2 (ELE)	F42ILL	59	0.71	SW	2500	1,770	OCC	
18LED	Kitchen	Kitchen	1	T 32 R F 4 (ELE)	F44ILL	112	0.11	SW	2500	280	OCC	
	Total		**387**				**38.34**			**145,466**		

Energy Audit of Bowne-Munro Elementary School
CHA Project No. 31007
ECM-L3 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
272LED	Outdoor	12	1T 32 P F 6	F46ILL	175	2.1	SW	3000	6,300	12	4 ft LED Tube	200732x6	90	1.1	NONE	3,000	3,240	3,060	1.0	$ 433.23	$ 8,602.20	$ 360	19.9	19.0
133	Outdoor	2	CF 26	CFQ26/1-L	27	0.1	SW	3000	162	2	CF 26	CFQ26/1-L	27	0.1	NONE	3,000	162	-	0.0	$ -	$ -	$ -		
18LED	10	11	T 32 R F 4 (ELE)	F44ILL	112	1.2	SW	3750	4,620	11	T 74 R LED	RTLED50	50	0.6	OCC	2,813	1,547	3,073	0.7	$ 407.79	$ 2,727.00	$ 295	6.7	6.0
7LED	10	2	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	3750	450	2	2T 25 R LED	2RTLED	25	0.1	OCC	2,813	141	309	0.1	$ 41.16	$ 533.25	$ 60	13.0	11.5
18LED	9	12	T 32 R F 4 (ELE)	F44ILL	112	1.3	SW	3750	5,040	12	T 74 R LED	RTLED50	50	0.6	OCC	2,813	1,688	3,353	0.7	$ 444.86	$ 2,963.25	$ 320	6.7	5.9
133	9rr	1	CF 26	CFQ26/1-L	27	0.0	SW	1820	49	1	CF 26	CFQ26/1-L	27	0.0	OCC	1,365	37	12	0.0	$ 1.41	$ 128.25	$ 20	90.8	76.6
71LED	10rr	1	I 60	I60/1	60	0.1	SW	1820	109	1	A19LED	A19LED	15	0.0	OCC	1,365	20	89	0.0	$ 13.79	$ 141.75	$ 30	10.3	8.1
18LED	11	12	T 32 R F 4 (ELE)	F44ILL	112	1.3	SW	3750	5,040	12	T 74 R LED	RTLED50	50	0.6	OCC	2,813	1,688	3,353	0.7	$ 444.86	$ 2,963.25	$ 320	6.7	5.9
18LED	12	12	T 32 R F 4 (ELE)	F44ILL	112	1.3	SW	3750	5,040	12	T 74 R LED	RTLED50	50	0.6	OCC	2,813	1,688	3,353	0.7	$ 444.86	$ 2,963.25	$ 320	6.7	5.9
18LED	Hall	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	6000	2,016	3	T 74 R LED	RTLED50	50	0.2	NONE	6,000	900	1,116	0.2	$ 143.17	$ 708.75	$ 75	5.0	4.4
18LED	8	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	3750	3,360	8	T 74 R LED	RTLED50	50	0.4	OCC	2,813	1,125	2,235	0.5	$ 296.58	$ 2,018.25	$ 220	6.8	6.1
18LED	13	20	T 32 R F 4 (ELE)	F44ILL	112	2.2	SW	3750	8,400	20	T 74 R LED	RTLED50	50	1.0	OCC	2,813	2,813	5,588	1.2	$ 741.44	$ 4,853.25	$ 520	6.5	5.8
7LED	Hall	3	2T 32 R F 2 (u)	FU2LL	60	0.2	SW	6000	1,080	3	2T 25 R LED	2RTLED	25	0.1	NONE	6,000	450	630	0.1	$ 80.82	$ 607.50	$ 60	7.5	6.8
18LED	18	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	3750	2,100	5	T 74 R LED	RTLED50	50	0.3	OCC	2,813	703	1,397	0.3	$ 185.36	$ 1,309.50	$ 145	7.1	6.3
7LED	18	2	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	3750	450	2	2T 25 R LED	2RTLED	25	0.1	OCC	2,813	141	309	0.1	$ 41.16	$ 533.25	$ 60	13.0	11.5
18LED	15	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	3750	2,520	6	T 74 R LED	RTLED50	50	0.3	OCC	2,813	844	1,676	0.4	$ 222.43	$ 1,545.75	$ 170	6.9	6.2
7LED	15	2	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	3750	450	2	2T 25 R LED	2RTLED	25	0.1	OCC	2,813	141	309	0.1	$ 41.16	$ 533.25	$ 60	13.0	11.5
18LED	14	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	3750	2,520	6	T 74 R LED	RTLED50	50	0.3	OCC	2,813	844	1,676	0.4	$ 222.43	$ 1,545.75	$ 170	6.9	6.2
7LED	14	2	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	3750	450	2	2T 25 R LED	2RTLED	25	0.1	OCC	2,813	141	309	0.1	$ 41.16	$ 533.25	$ 60	13.0	11.5
71LED	15rr	1	I 60	I60/1	60	0.1	SW	1820	109	1	A19LED	A19LED	15	0.0	OCC	1,365	20	89	0.0	$ 13.79	$ 141.75	$ 30	10.3	8.1
71LED	14rr	1	I 60	I60/1	60	0.1	SW	1820	109	1	A19LED	A19LED	15	0.0	OCC	1,365	20	89	0.0	$ 13.79	$ 141.75	$ 30	10.3	8.1
18LED	17	12	T 32 R F 4 (ELE)	F44ILL	112	1.3	SW	3750	5,040	12	T 74 R LED	RTLED50	50	0.6	OCC	2,813	1,688	3,353	0.7	$ 444.86	$ 2,963.25	$ 320	6.7	5.9
71LED	17rr	1	I 60	I60/1	60	0.1	SW	1820	109	1	A19LED	A19LED	15	0.0	OCC	1,365	20	89	0.0	$ 13.79	$ 141.75	$ 30	10.3	8.1
18LED	18	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	3750	3,360	8	T 74 R LED	RTLED50	50	0.4	OCC	2,813	1,125	2,235	0.5	$ 296.58	$ 2,018.25	$ 220	6.8	6.1
7LED	18	1	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	3750	225	1	2T 25 R LED	2RTLED	25	0.0	OCC	2,813	70	155	0.0	$ 20.58	$ 330.75	$ 40	16.1	14.1
71LED	18rr	1	I 60	I60/1	60	0.1	SW	1820	109	1	A19LED	A19LED	15	0.0	OCC	1,365	20	89	0.0	$ 13.79	$ 141.75	$ 30	10.3	8.1
35led	entry	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	6000	1,080	2	T 59 R LED	RTLED38	38	0.1	NONE	6,000	456	624	0.1	$ 80.05	$ 472.50	$ 30	5.9	5.5
35led	Hall	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	6000	2,160	4	T 59 R LED	RTLED38	38	0.2	NONE	6,000	912	1,248	0.2	$ 160.11	$ 945.00	$ 60	5.9	5.5
35led	Hall	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	6000	2,160	4	T 59 R LED	RTLED38	38	0.2	NONE	6,000	912	1,248	0.2	$ 160.11	$ 945.00	$ 60	5.9	5.5
18LED	Main Office	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	3750	1,680	4	T 74 R LED	RTLED50	50	0.2	OCC	2,813	563	1,118	0.2	$ 148.29	$ 1,073.25	$ 120	7.2	6.4
18LED	Principal	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	3750	1,680	4	T 74 R LED	RTLED50	50	0.2	OCC	2,813	563	1,118	0.2	$ 148.29	$ 1,073.25	$ 120	7.2	6.4
18LED	Math	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	3750	1,680	4	T 74 R LED	RTLED50	50	0.2	OCC	2,813	563	1,118	0.2	$ 148.29	$ 1,073.25	$ 120	7.2	6.4
18LED	6	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	3750	2,520	6	T 74 R LED	RTLED50	50	0.3	OCC	2,813	844	1,676	0.4	$ 222.43	$ 1,545.75	$ 170	6.9	6.2
18LED	Boys RM	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1820	408	2	T 74 R LED	RTLED50	50	0.1	OCC	1,365	137	271	0.1	$ 41.07	$ 600.75	$ 70	14.6	12.9
18LED	Boys RM	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1820	408	2	T 74 R LED	RTLED50	50	0.1	OCC	1,365	137	271	0.1	$ 41.07	$ 600.75	$ 70	14.6	12.9
18LED	Girls RM	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1820	408	2	T 74 R LED	RTLED50	50	0.1	OCC	1,365	137	271	0.1	$ 41.07	$ 600.75	$ 70	14.6	12.9
18LED	Study Assist	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	3750	1,260	3	T 74 R LED	RTLED50	50	0.2	OCC	2,813	422	838	0.2	$ 111.22	$ 837.00	$ 95	7.5	6.7
18LED	6	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	3750	2,520	6	T 74 R LED	RTLED50	50	0.3	OCC	2,813	844	1,676	0.4	$ 222.43	$ 1,545.75	$ 170	6.9	6.2
18LED	HAll	12	T 32 R F 4 (ELE)	F44ILL	112	1.3	SW	6000	8,064	12	T 74 R LED	RTLED50	50	0.6	NONE	6,000	3,600	4,464	0.7	$ 572.69	$ 2,835.00	$ 300	5.0	4.4
34led	7	1	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	3750	221	1	4 ft LED Tube	200732x2	30	0.0	OCC	2,813	84	137	0.0	$ 18.05	$ 361.95	$ 30	20.0	18.4
34led	7rr	1	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	1820	107	1	4 ft LED Tube	200732x2	30	0.0	OCC	1,365	41	66	0.0	$ 9.95	$ 361.95	$ 30	36.4	33.4
18LED	k	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	3750	3,360	8	T 74 R LED	RTLED50	50	0.4	OCC	2,813	1,125	2,235	0.5	$ 296.58	$ 2,018.25	$ 220	6.8	6.1
18LED	4	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	3750	2,520	6	T 74 R LED	RTLED50	50	0.3	OCC	2,813	844	1,676	0.4	$ 222.43	$ 1,545.75	$ 170	6.9	6.2
18LED	3	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	3750	3,360	8	T 74 R LED	RTLED50	50	0.4	OCC	2,813	1,125	2,235	0.5	$ 296.58	$ 2,018.25	$ 220	6.8	6.1
18LED	Hall	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	6000	672	1	T 74 R LED	RTLED50	50	0.1	NONE	6,000	300	372	0.1	$ 47.72	$ 236.25	$ 25	5.0	4.4
133	Hall / Entry	12	CF 26	CFQ26/1-L	27	0.3	SW	6000	1,944	12	CF 26	CFQ26/1-L	27	0.3	NONE	6,000	1,944	-	0.0	$ -	$ -	$ -		
7LED	Stairs	2	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	6000	720	2	2T 25 R LED	2RTLED	25	0.1	NONE	6,000	300	420	0.1	$ 53.88	$ 405.00	$ 40	7.5	6.8
18LED	Faculty	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	3750	2,100	5	T 74 R LED	RTLED50	50	0.3	OCC	2,813	703	1,397	0.3	$ 185.36	$ 1,309.50	$ 145	7.1	6.3
133	Storage	4	CF 26	CFQ26/1-L	27	0.1	SW	2000	216	4	CF 26	CFQ26/1-L	27	0.1	OCC	1,500	162	54	0.0	$ 6.21	$ 128.25	$ 20	20.7	17.4
34led	Boiler Room	7	1T 32 C F 2 (ELE)	F42ILL	59	0.4	SW	2500	1,033	7	4 ft LED Tube	200732x2	30	0.2	NONE	2,500	525	508	0.2	$ 74.55	$ 1,635.90	$ 70	21.9	21.0
34led	Math Room	3	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	3750	664	3	4 ft LED Tube	200732x2	30	0.1	OCC	2,813	253	411	0.1	$ 54.16	$ 829.35	$ 50	15.3	14.4
35led	Math Room	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	3750	1,013	3	T 59 R LED	RTLED38	38	0.1	OCC	2,813	321	692	0.2	$ 92.01	$ 837.00	$ 65	9.1	8.4
35led	Library	46	T 32 R F 3 (ELE)	F43ILL/2	90	4.1	SW	3750	15,525	46	T 59 R LED	RTLED38	38	1.7	OCC	2,813	4,916	10,609	2.4	$ 1,410.74	$ 10,995.75	$ 710	7.8	7.3
35led	MDF Room	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	3750	1,350	4	T 59 R LED	RTLED38	38	0.2	OCC	2,813	428	923	0.2	$ 122.67	$ 1,073.25	$ 80	8.7	8.1
35led	Storage	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	2000	180	1	T 59 R LED	RTLED38	38	0.0	OCC	1,500	57	123	0.1	$ 18.29	$ 364.50	$ 35	19.9	18.0
35led	Media Center	25	T 32 R F 3 (ELE)	F43ILL/2	90	2.3	SW	3750	8,438	25	T 59 R LED	RTLED38	38	1.0	OCC	2,813	2,672	5,766	1.3	$ 766.71	$ 6,034.50	$ 395	7.9	7.4
34led	Book Room	8	1T 32 C F 2 (ELE)	F42ILL	59	0.5	SW	3750	1,770	8	4 ft LED Tube	200732x2	30	0.2	OCC	2,813	675	1,095	0.2	$ 144.42	$ 1,997.85	$ 100	13.8	13.1
34led	Speech Room	4	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	3750	885	4	4 ft LED Tube	200732x2	30	0.1	OCC	2,813	338	548	0.1	$ 72.21	$ 1,063.05	$ 60	14.7	13.9
133	Gym	4	CF 26	CFQ26/1-L	27	0.1	SW	3750	405	4	CF 26	CFQ26/1-L	27	0.1	NONE	3,750	405	-	0.0	$ -	$ -	$ -		
274	Gym	8	22" Aluminum High Bay Induction	19300-AL-UNV	315	2.5	SW	3750	9,450	8	22" Aluminum High Bay Induction	19300-AL-UNV	315	2.5	NONE	3,750	9,450	-	0.0	$ -	$ -	$ -		
7LED	Gym	7	2T 32 R F 2 (u)	FU2LL	60	0.4	SW	3750	1,575	7	2T 25 R LED	2RTLED	25	0.2	NONE	3,750	656	919	0.2	$ 125.19	$ 1,417.50	$ 140	11.3	10.2
34led	Gym	1	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	3750	221	1	4 ft LED Tube	200732x2	30	0.0	NONE	3,750	113	109	0.0	$ 14.82	$ 233.70	$ 10	15.8	15.1
34led	Kitchen	3	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	2500	443	3	4 ft LED Tube	200732x2	30	0.1	OCC	1,875	169	274	0.1	$ 38.42	$ 829.35	$ 50	21.6	20.3
34LED	Kitchen	12	1T 32 C F 2 (ELE)	F42ILL	59	0.7	SW	2500	1,770	12	4 ft LED Tube	200732x2	30	0.4	OCC	1,875	675	1,095	0.3	$ 153.67	$ 2,932.65	$ 140	19.1	18.2
18LED	Kitchen	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2500	280	1	T 74 R LED	RTLED50	50	0.1	OCC	1,875	94	186	0.1	$ 26.36	$ 364.50	$ 45	13.8	12.1
															0	#N/A								#VALUE!
															0	#N/A								#VALUE!
S	**Total**	**387**				**38.3**			**145,466**	**387**				**18.9**				**59,734**		**19.5**	**11,413**	**94,232**	**$8,270**		
S																		**Demand Savings**			**19.5**	**$1,554**			
S																		**kWh Savings**			**85,732**	**$9,859**			
S																		**Total Savings**				**$11,413**		**8.3**	**7.5**

APPENDIX D

Photos

Boiler – 3 Total

DHW HEATE

HHW Pumps

RTU 1 – 3 Total

Split System

RTU 2

APPENDIX E

Photovoltaic Analysis

East Brunswick Schools
Bowne-Munro Elementary School

Cost of Electricity	$0.131	/kWh
Electricity Usage	339,360	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
$240,000	**60.0**	**72,568**	**0**	**$9,506**	**0**	**$9,506**	**$0**	**$18,142**	**25.2**	**8.7**

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $250 /1000kwh

Area Output*
2,137 m2
23,002 ft2

Perimeter Output*
405 m
1,329 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 85%
8,258 ft2

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

8	watt/ft2	
66,063	DC watts	
60	kW	Enter into PV Watts

PV Watts Inputs***

Array Tilt Angle	10	Enter into PV Watts (always 20 if flat, if pitched - enter estimated roof angle)
Array Azimuth	165	Enter into PV Watts (default)
Zip Code	08816	Enter into PV Watts
DC/AC Derate Factor	0.83	Enter info PV Watts

PV Watts Output
72,568 annual kWh calculated in PV Watts program

% Offset Calc

Usage	339,360	(from utilities)
PV Generation	72,568	(generated using PV Watts)
% offset	21%	

* http://www.freemaptools.com/area-calculator.htm
** http://www.flettexchange.com
*** http://gisatnrel.nrel.gov/PVWatts_Viewer/index.html

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at http://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

72,568 kWh per Year *

System output may range from 69,803 to 76,015kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	2.37	3,808	499
February	3.15	4,547	596
March	4.06	6,353	832
April	4.83	7,072	926
May	5.69	8,365	1,096
June	5.94	8,232	1,078
July	5.76	8,148	1,067
August	5.37	7,553	989
September	4.64	6,484	849
October	3.60	5,351	701
November	2.35	3,506	459
December	2.00	3,149	413
Annual	**4.15**	**72,568**	**$ 9,505**

Location and Station Identification

Requested Location	730 18 north east brunswick, nj
Weather Data Source	(TMY2) NEWARK, NJ 23 mi
Latitude	40.7° N
Longitude	74.17° W

PV System Specifications *(Commercial)*

DC System Size	60 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	10°
Array Azimuth	165°
System Losses	14%
Inverter Efficiency	96%
DC to AC Size Ratio	1.1

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.13 $/kWh
Initial Cost	4.00 $/Wdc
Cost of Electricity Generated by System	0.12 $/kWh

Selected Incentives

Residential Renewable Energy Tax Credit

Investment Tax Credit (ITC)	Percent of Cost: 30%

These values can be compared to get an idea of the cost-effectiveness of this system. However, system costs, system financing options (including 3rd party ownership) and complex utility rates can significantly change the relative value of the PV system.

APPENDIX F

EPA Benchmarking Report

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Bowne Munro Elementary School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 32,738
Built: 1953

For Year Ending: March 31, 2015
Date Generated: February 05, 2016

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Bowne Munro Elementary School 120 Main Street East Brunswick, New Jersey 08816	_____ , (___)___-_____	____ _____ , (___)___-_____ _____

Property ID: 4794891

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
80.1 kBtu/ft²

Source EUI
158.1 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	1,465,600 (56%)
Electric - Grid (kBtu)	1,157,896 (44%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	86.3
National Median Source EUI (kBtu/ft²)	170.2
% Diff from National Median Source EUI	-7%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	233

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____Date: _____

Licensed Professional

____ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)