EAST BRUNSWICK BOARD OF EDUCATION

CHITTICK ELEMENTARY SCHOOL

5 Flagler 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 Public Schools 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
Chittick Elementary School	5 Flagler Street, East Brunswick, NJ 08816	52,241	1972

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)
Chittick Elementary School	164,750	1,606	27,276	12.1

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

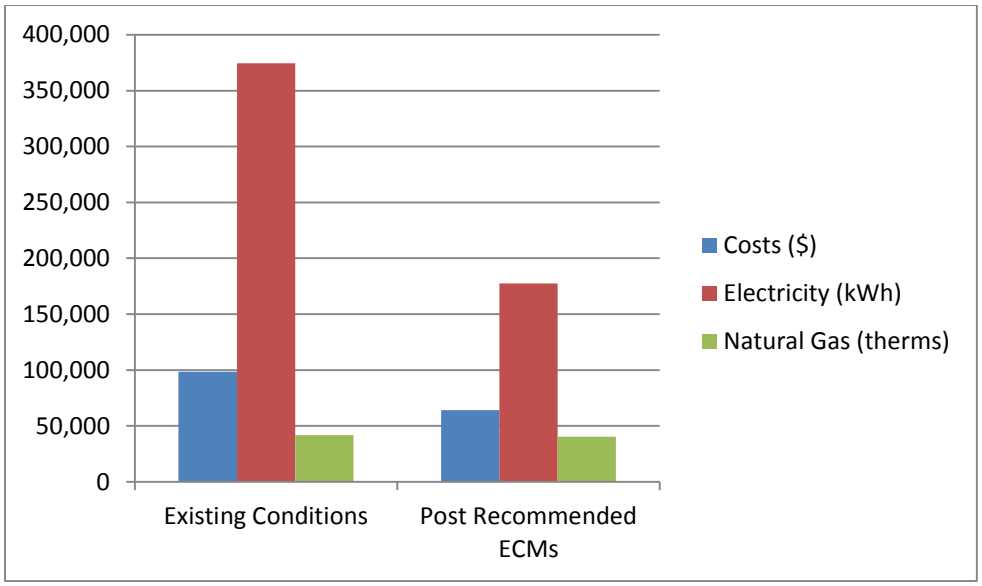
ECM #	Energy Conservation Measure	Est. Costs ($)	Est. Savings ($/year)	Payback w/o Incentive	Potential Incentive ($)*	Payback w/ Incentive	Recommended
ECM-1	Replace Windows with Double Pane Windows	226,200	1,626	139.1	-	139.1	N
ECM-2	Install VFD for Heating Hot Water Pumps	18,522	2,612	7.1	2,400	6.2	Y
ECM-3	Install Kitchen Hood Controls	36,981	1,198	30.9	225	30.7	Y
ECM-4	Walk-in Freezer/Cooler Controls	22,275	1,066	20.9	-	20.9	Y
ECM-5	Replace Rooftop Units	94,900	3,485	27.2	1,282	26.9	Y
ECM-6	Replace Domestic Hot Water Heater	7,524	427	17.6	300	16.9	Y
ECM-L1	Replacement of Lighting and Controls	168,731	18,488	9.1	15,415	8.3	Y
Total**		**575,133**	**28,902**	**19.9**	**19,622**	**19.2**	
Total(Recommended)		**348,933**	**27,276**	**12.8**	**19,622**	**12.1**	

* 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 78 metric tons of greenhouse gas (GHG) reduction.

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

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	98,416	71,140	28%
Electricity (kWh)	374,531	209,781	44%
Natural Gas (therms)	41,912	40,307	4%
Site EUI (kbtu/SF/Yr)	104.7	90.9	



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: Chittick Elementary School
Address: 5 Flagler Street, East Brunswick, NJ 08816
Gross Floor Area: 52,241 square feet
Number of Floors: One floor with utility basement room
Year Built: 1972

General

Description of Spaces: Besides classrooms and office spaces, this school has a gym, library, computer room, cafeteria, mechanical rooms, and storage spaces
Description of Occupancy: There are 495 students and 45 staff personnel.
Building Usage: The school operates Monday to Friday usually from 6:30 AM to 3:00 PM, with janitors occupying the facility from 3:00 PM until 11:00 PM.
Construction Materials: The outside walls are constructed of 4" face brick, 8" CMU and insulation.
Roof: The roof is flat, insulated and was renovated about 2 years ago. No ECM associated with roof upgrades has been identified.
Windows: The facility has mixture of double and single pane windows set in aluminum frames. An ECM pertaining to windows has been evaluated.
Exterior Doors: All exterior doors of the facility are steel doors and observed to be in good condition. NO ECM associate with doors has been evaluated.

Heating Ventilation & Air Conditioning (HVAC) Systems

Heating: Heating to most areas comes from (2) Aerco Benchmark 2.0 gas fired boilers installed in 2007 producing heating hot water and distributed to unit ventilators located throughout the building. There are (2) 10 HP constant speed HHW pumps operating in lead lag mode and (2) constant speed 3 HP cooling water pumps.

The newer section is heated and cooled with (7) Roof Top Units (RTUs).

Cooling: As mentioned above the newer section is cooled with RTUs. Currently a new cooling central chilled water system is being installed that will serve other portions of the building. The chilled water will be delivered by a Daikin 90 Tons air cooled chiller. An ECM associated with replacing the RTUs has been evaluated.

Ventilation: The fresh air for ventilation was partially provided through unit ventilators that are ducted to outside air intake louvers. However, currently a new HVAC system is being installed, therefore there are no ECMs associated with the ventilation system.

Exhaust: This building has multiple fractional HP exhaust fans serving restrooms, science rooms, kitchen and general exhaust located on the roof. Due to the current HVAC upgrade no ECMs were evaluated.

Controls Systems

There is a front end full EMS capable of setting schedules for temperature setbacks. Typical heating and cooling temperatures are 72 F.

Domestic Hot Water Systems

The domestic hot water for the building is provided by a single 81 gallon A.O Smith gas fired water heater installed in 2005 and located in the basement. An ECM associated with replacing the DHW heater was evaluated.

Kitchen Equipment

The kitchen equipment in the building includes various small electric appliances, refrigerators, commercial coolers, walk-in freezer, kitchen hood, industrial mixers, stove, large food warmers and various small appliances. ECMs associated with installing controls on the kitchen hood and walk-ins were evaluated.

Plug Load

The facility has computers, copiers, printers, and residential appliances (microwave, refrigerator) that contribute to the plug load in the building. We have calculated the plug load to have minimal impact compared to other electric consuming devices hence no ECMs associated with plug loads have been evaluated.

Plumbing Systems

There are (16) restrooms in the building, (2) of which are main restrooms with the rest are individual restrooms. The toilets, and urinals are high water consuming plumbing fixtures. The toilets use about 3.5 and urinals use about 1.5 gallons per flush. The sinks are high flow fixtures however most are self-metering. No ECM associated with plumbing fixtures has been included.

Lighting Systems

The lighting throughout the facility is primarily T-8 32 watt fixtures. There are some T-12 75-watt fluorescent lamps in the boiler room. The lighting fixtures in the building are manually controlled by switches, however many lighting sensors are located through the building. The exterior lights consist of many CFLs bulbs in enclosures and about 9 metal halides fixtures mounted on the lighting poles. The exterior lighting is on automatic controls. An ECM related to replacing the lights with LED lights and adding occupancy sensors to the proposed LED lights has been included.

3.0 UTILITIES

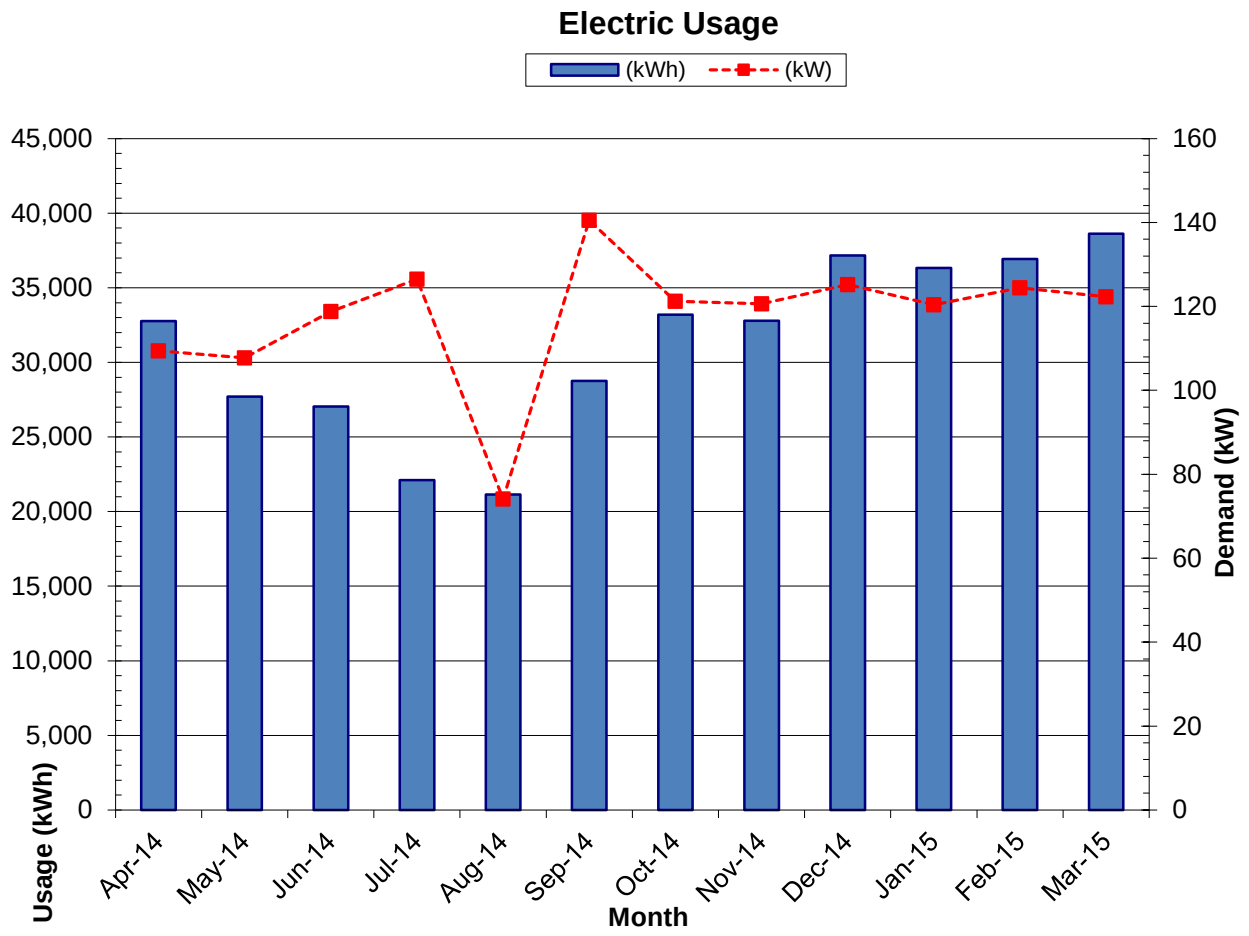
Natural gas, electricity and water are separately metered into this building. Utilities used by the building are delivered and supplied by the following utility companies:

	Electric	Natural Gas	Water
Deliverer	PSE&G	PSE&G	Town of East Brunswick
Supplier	Direct Energy	Direct Energy	N/A

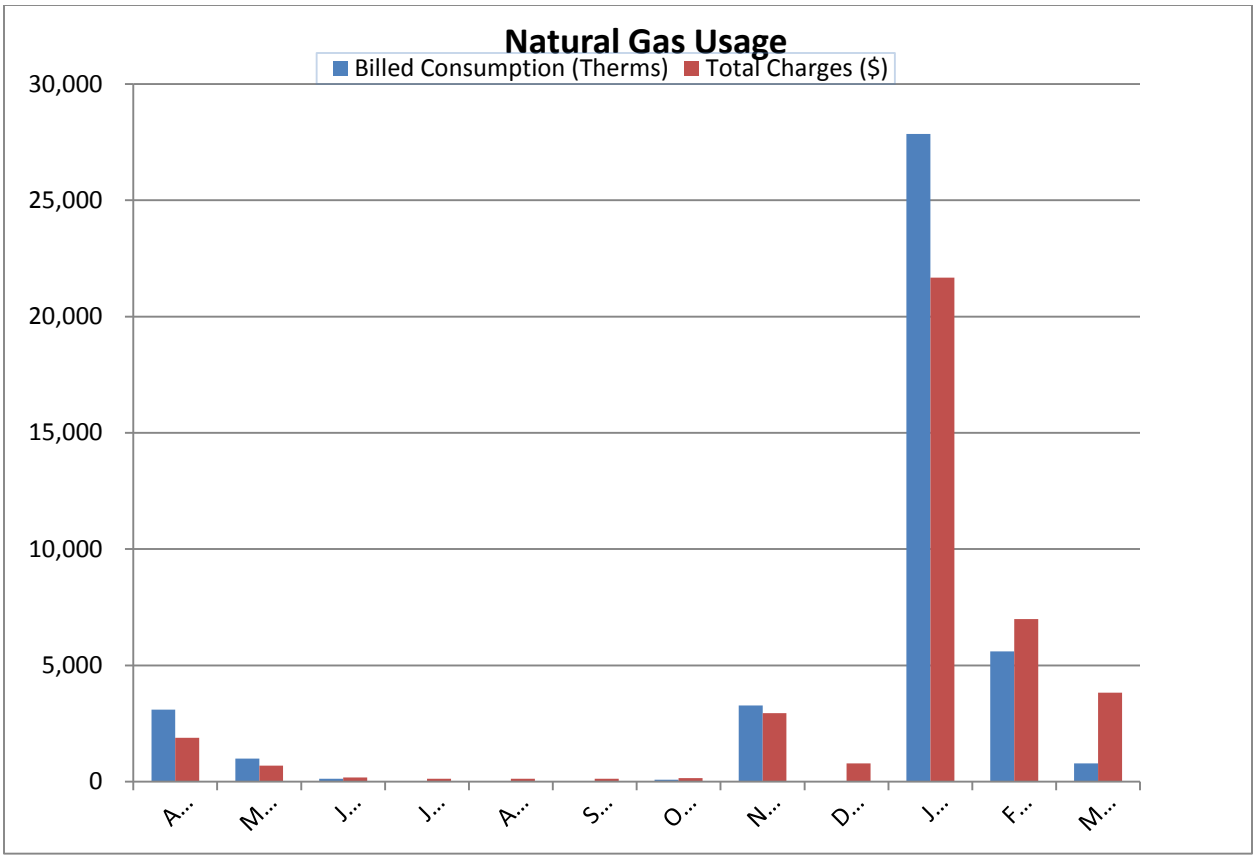
For the 12-month period ending in March 2015, the utilities usages and costs for the building were as follows:

Electric		
Annual Usage	374,531	kWh/yr
Annual Cost	58,890	$
Blended Rate	0.157	$/kWh
Consumption Rate	0.133	$/kWh
Demand Rate	6.35	$/kW
Peak Demand	140.5	kW
Min. Demand	74.1	kW
Avg. Demand	117.6	kW
Natural Gas		
Annual Usage	41,912	Therms/yr
Annual Cost	39,526	$
Blended Rate	0.943	$/therm
Consumption Rate	0.437	$/therm
Demand Rate	0.506	$/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 somewhat with the seasons. This building is minimally cooled and thus is not typically used during the cooling season, shown above. However, a new chiller is in the process of being installed.



The natural gas deliveries for all months were applied to January's bill. The billed monthly costs are not reflecting actual values that would correspond to the actual consumptions.

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	$0.157	$0.13	Y
Natural Gas	$/Therm	$0.94	$0.96	N

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

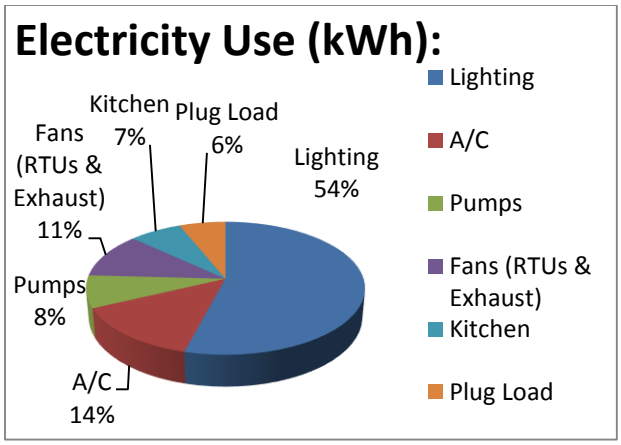
Additional information on selecting a third party energy supplier is available here:

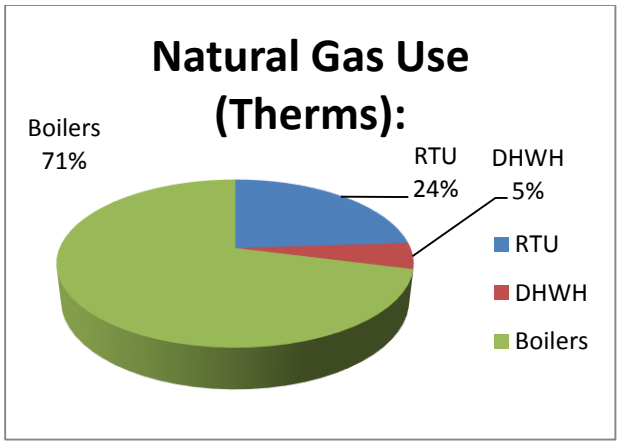
http://www.state.nj.us/bpu/commercial/shopping.html.

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.

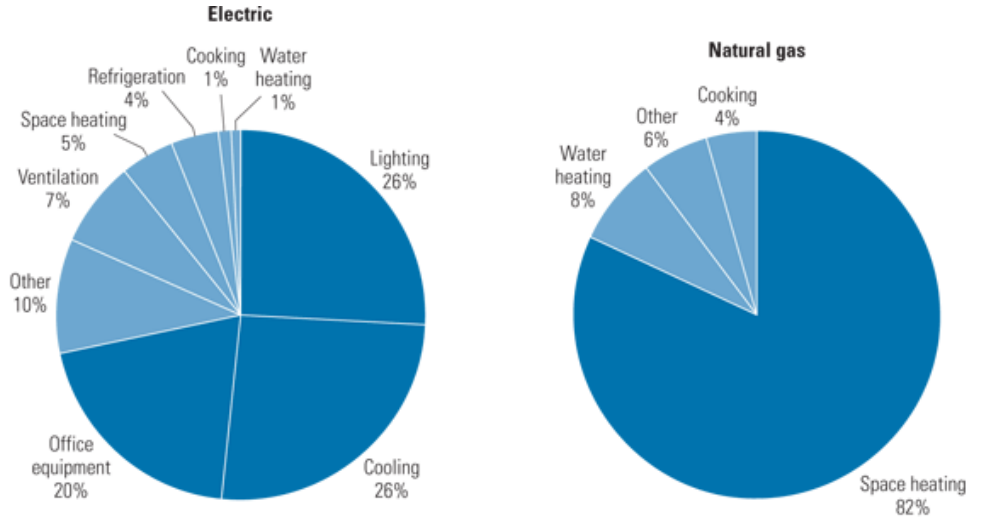
Site End-Use Utility Profile





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)
104.7	161	37

The school has a below 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 Windows with Double Pane Glazed Windows

The existing window system at the building is comprised of single pane aluminum in-fill panels or in some cases double pane windows. The window system is part of the original building(s) construction.
The ECM proposes to replace the existing single-pane window system with a new energy efficient system. The new window system will be comprised of new double-pane, low emissivity ("low-e"), high-performance glass with aluminum trim, which has a U-Value of 0.45 and a shading coefficient (SC) of 0.55.
Implementation of this measure will reduce heat losses in the winter and heat gains in the summer, as well as reducing infiltration losses, thereby producing energy savings all year long. The occupants will benefit from improved comfort, especially when seated near windows. In addition, the new window system will greatly improve the aesthetic appearance of the building.

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

ECM-1 Replace Windows with Double Pane Glazed Windows

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
226,200	-	230	1,686	1,626	(0.9)	-	139.1	139.1

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

This measure is not recommended.

5.2 ECM-2 Install VFD & Premium Efficiency Motors

Presently two 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 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 two VFDs 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-2 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
18,522	0.2	19,549	-	2,612	1.5	2,400	7.1	6.2

* Does qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities

This measure is recommended.

5.3 ECM-3 Install Kitchen Hood Controls

Installing a Melink hood control system was evaluated. Upon activation of the Melink system, the hood lights will turn on and the fans reach a preset minimum speed of 10 and 50 percent. When cooking appliances are turned on, the fan speed will increase based on temperature sensed in the exhaust duct. During actual cooking, an optical sensor will sense particulates entering the hood and the speed will increase to 100 percent until smoke and heat are removed.

Energy saving is calculated from reduction of exhaust fan speed and the amount of heated air supplied by the kitchen's make-up air unit (MUA).

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

ECM-3 Install Kitchen Hood Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
36,981	-	707	1,153	1,198	(0.5)	225	30.9	30.7

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

This measure is recommended.

5.4 ECM-4 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. Implementation will include the installation of one (1)

walk-in control system which can control multiple different units. The vendor costs associated with this are turn-key but usually range between $15,000 - $18,000.

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

ECM-4 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	-	6,791	-	1,066	(0.3)	-	20.9	20.9

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

This measure is recommended

5.5 ECM-5 Replace RTUs with High Efficiency RTUs

The school has 7 rooftop units installed in 1997. The 7 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-5 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
94,900	11.6	19,562	-	3,485	(0.4)	1,282	27.2	26.9

* 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.

5.6 ECM-6 Replace DHW Heaters with High Efficiency Condensing Units

The existing domestic hot water heating system consists of one (1) natural gas fired DHW heaters with 81 gallons of storage capacity each. The DHW heaters have a thermal efficiency of 80%. Implementation of this ECM will entail replacing the existing DHW heater with a high efficiency condensing water heaters. The proposed DHW heaters include one (1) high efficiency condensing heater with 81 gallon storage capacity which will operate as high as 96% efficiency.

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

ECM-6 Replace DHW Heaters with High Efficiency Condensing Units

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
7,524	-	-	453	427	(0.1)	300	17.6	16.9

* Does qualify for Incentive from the New Jersey SmartStart Program. See section 6.0 for other incentive opportunities.

This measure is recommended.

5.7 ECM-L1 Lighting Replacements with Controls (Occupancy Sensors)

This measure evaluates replacement/upgrades of the current lighting fixtures to more efficient LED lights and also installing occupancy sensors to control the proposed lights. The interactive effects of installing higher efficiency lights as well as occupancy sensors leads to the energy and cost savings for this measure to not be equivalent to the sum of replacing the lighting fixtures or occupancy sensors separately. The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-L1 Lighting Replacements with Controls (Occupancy Sensors)

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
168,731	36.4	118,141	-	18,488	0.3	15,415	12.8	12.1

This measure is recommended.

5.8 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:

- Purchase Energy Star rated appliances
- Replace filters in air handling equipment regularly
- Add an insulation jacket to domestic water heaters
- Check exhaust fans for backdraft dampers and install dampers if they are not present

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 not qualify for this program since the peak electric demand during the 12 month evaluated period was more 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.

<u>Electric</u>

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

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.

Due to the large amount of existing obstructions on the roof, and the new AC system installed on the uppermost roof, CHA does not recommend a PV installation for this site. The different elevations of the roofs and existing obstructions cast too much shade to provide an efficient and successful PV system for Chittick School.

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.

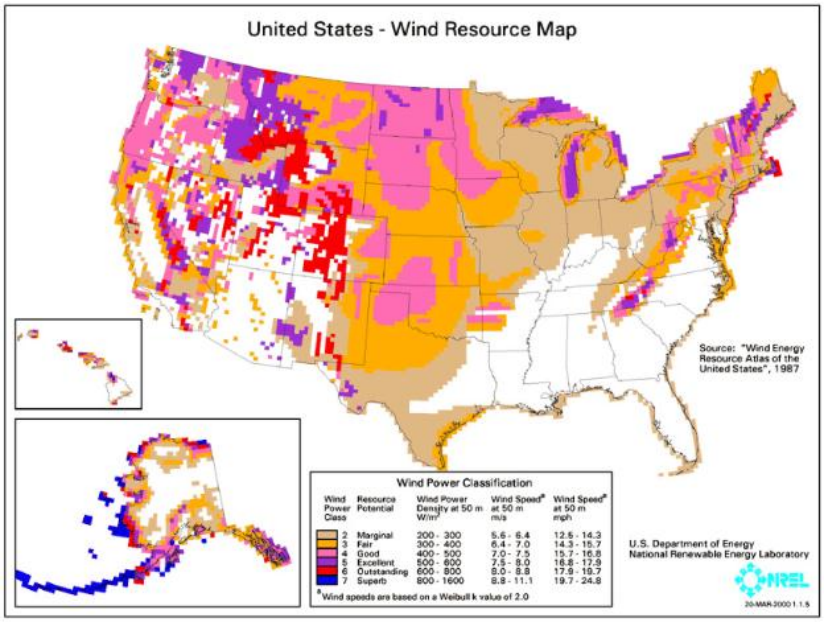
Several options exist for using active solar thermal systems for space heating. The most common method is called a passive solar hot water system involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system described above which requires pumping). 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
140.5	74.1	117.6	Y	Y

*the demand is estimated from one month bill

This measure is not recommended due to the lack of enough onsite generation.

8.0 CONCLUSIONS & RECOMMENDATIONS

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

The following projects should be considered for implementation:

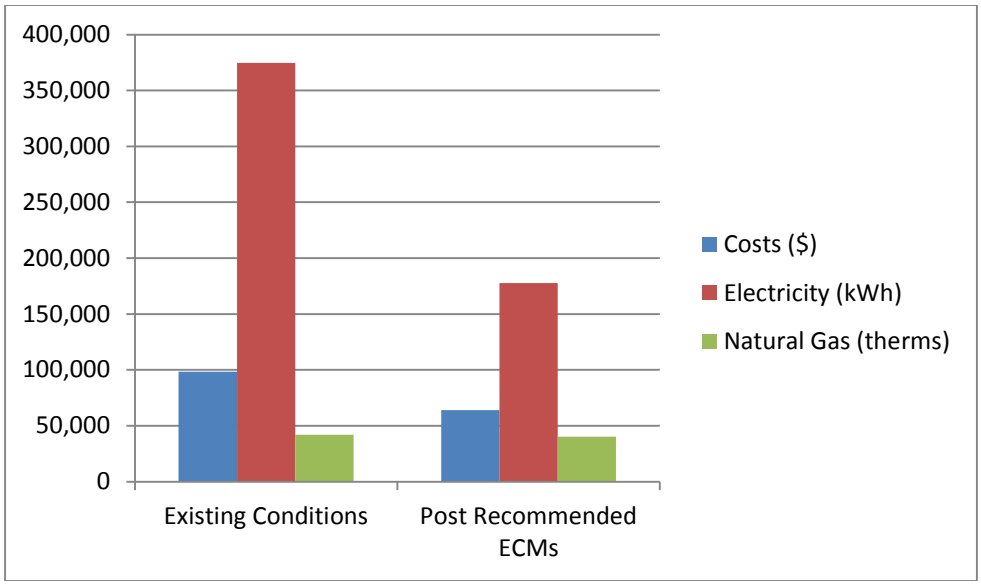
- Install VFDs and premium efficiency motors
- Install kitchen hood controls
- Install walk-in freezer/cooler controls
- Replace (RTUs) Rooftop Units
- Replace Domestic Hot Water Heater
- Lighting Replacements / Upgrades W/ Controls

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)
164,750	1,437	27,276	12.1

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

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	98,416	71,140	28%
Electricity (kWh)	374,531	209,781	44%
Natural Gas (therms)	41,912	40,307	4%
Site EUI (kbtu/SF/Yr)	104.7	90.9	



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
Murray A. Chittick Elementary School

Utility Bills: Account Numbers

Account Number	Building	Type
4200829509	Murray A. Chittick Elementary School	Electric
4200829509	Murray A. Chittick Elementary School	Gas

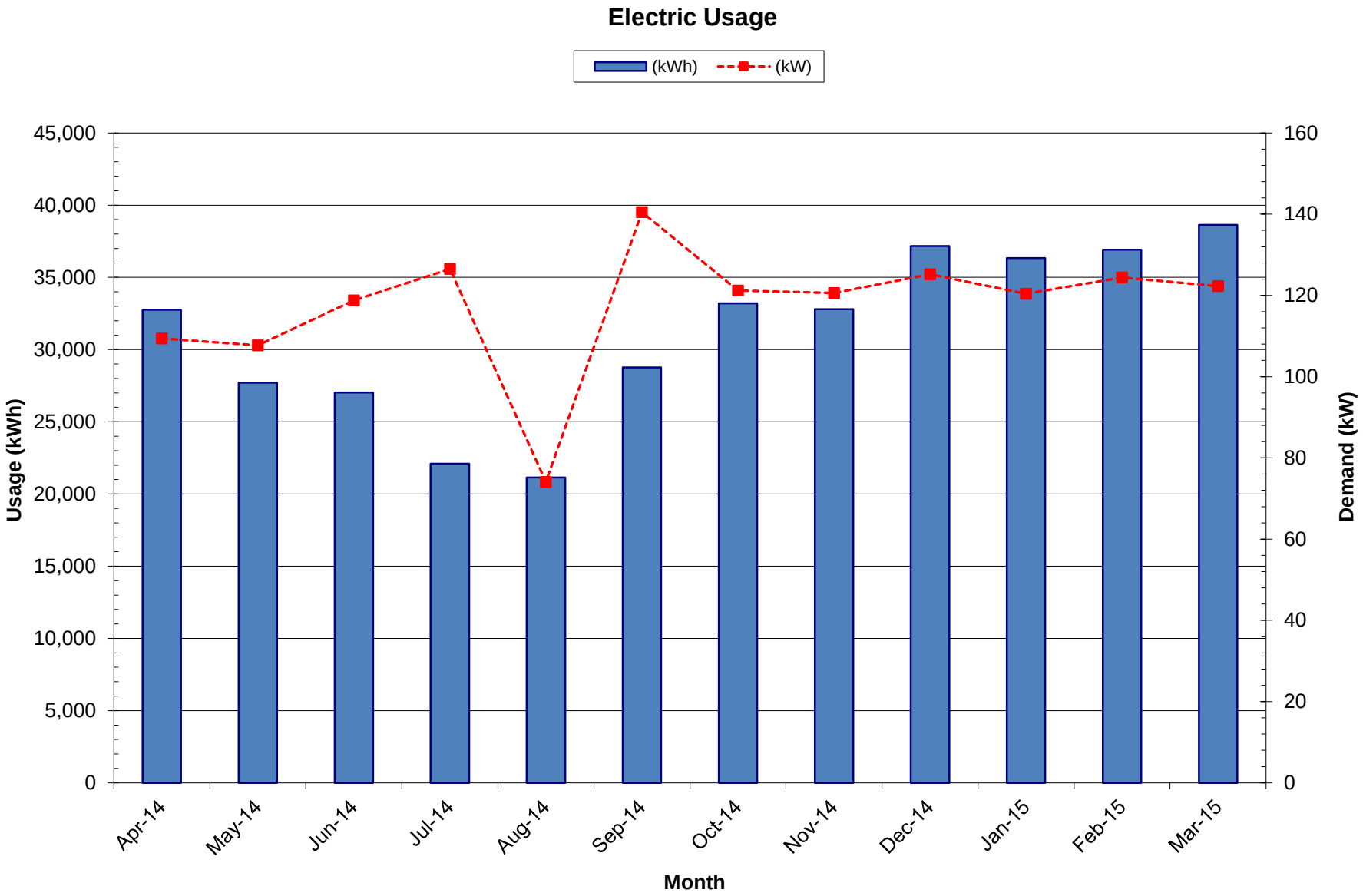
Local Government Energy Audit
East Brunswick Board of Education
Murray A. Chittick Elementary School

Electric Service

For Service at: **Murray A. Chittick Elementary School**
Account No.: **4200829509** **Delivery:** **PSE&G**
Meter No.: **9207639** **Supply:** **Direct Energy**

						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	32,765	4,285.15	109.4	387.76	1,706.63	2,966.28	4,672.91	3.544	0.131	0.052	0.091	0.143
May-14	27,703	3,680.99	107.7	381.73	1,554.71	2,508.01	4,062.72	3.544	0.133	0.056	0.091	0.147
June-14	27,032	3,578.94	118.8	1,418.90	2,550.66	2,447.18	4,997.84	11.944	0.132	0.094	0.091	0.185
July-14	22,101	2,973.60	126.5	1,520.94	2,493.66	2,000.88	4,494.54	12.023	0.135	0.113	0.091	0.203
August-14	21,134	2,859.70	74.1	901.24	1,847.70	1,913.24	3,760.94	12.162	0.135	0.087	0.091	0.178
September-14	28,765	3,757.90	140.5	1,708.82	2,862.65	2,604.07	5,466.72	12.162	0.131	0.100	0.091	0.190
October-14	33,205	4,274.08	121.2	436.24	1,704.27	3,006.05	4,710.32	3.599	0.129	0.051	0.091	0.142
November-14	32,793	5,363.48	120.6	601.97	1,683.09	4,282.36	5,965.45	4.991	0.164	0.051	0.131	0.182
December-14	37,161	4,910.22	125.2	285.41	1,831.48	3,364.15	5,195.63	2.280	0.132	0.049	0.091	0.140
January-15	36,328	4,633.39	120.4	433.36	1,777.93	3,288.82	5,066.75	3.599	0.128	0.049	0.091	0.139
February-15	36,920	4,704.05	124.4	447.77	1,809.41	3,342.41	5,151.82	3.599	0.127	0.049	0.091	0.140
March-15	38,624	4,903.92	122.3	440.84	1,848.15	3,496.61	5,344.76	3.605	0.127	0.048	0.091	0.138
Total (All)	**374,531**	**$49,925.42**	**140.5**	**8,964.98**	**$23,670.34**	**$35,220.06**	**$58,890.40**	**$6.353**	**$0.133**	**$0.063**	**$0.094**	**$0.157**
Total (last 12-months)	**374,531**	**$49,925.42**	**140.5**	**8,965**	**$23,670.34**	**$35,220.06**	**$58,890.40**	**$6.353**	**$0.133**	**$0.063**	**$0.094**	**$0.157**
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 ($) / Consumption (kWh) 40% of blended rate (fixed portion of the bill that can't be negotiated)
9.) Supplier Charges ($) / Consumption (kWh) 60% of blended rate (portion of the bill that can be negotiated)
10.) Total Charges ($) / Consumption (kWh)

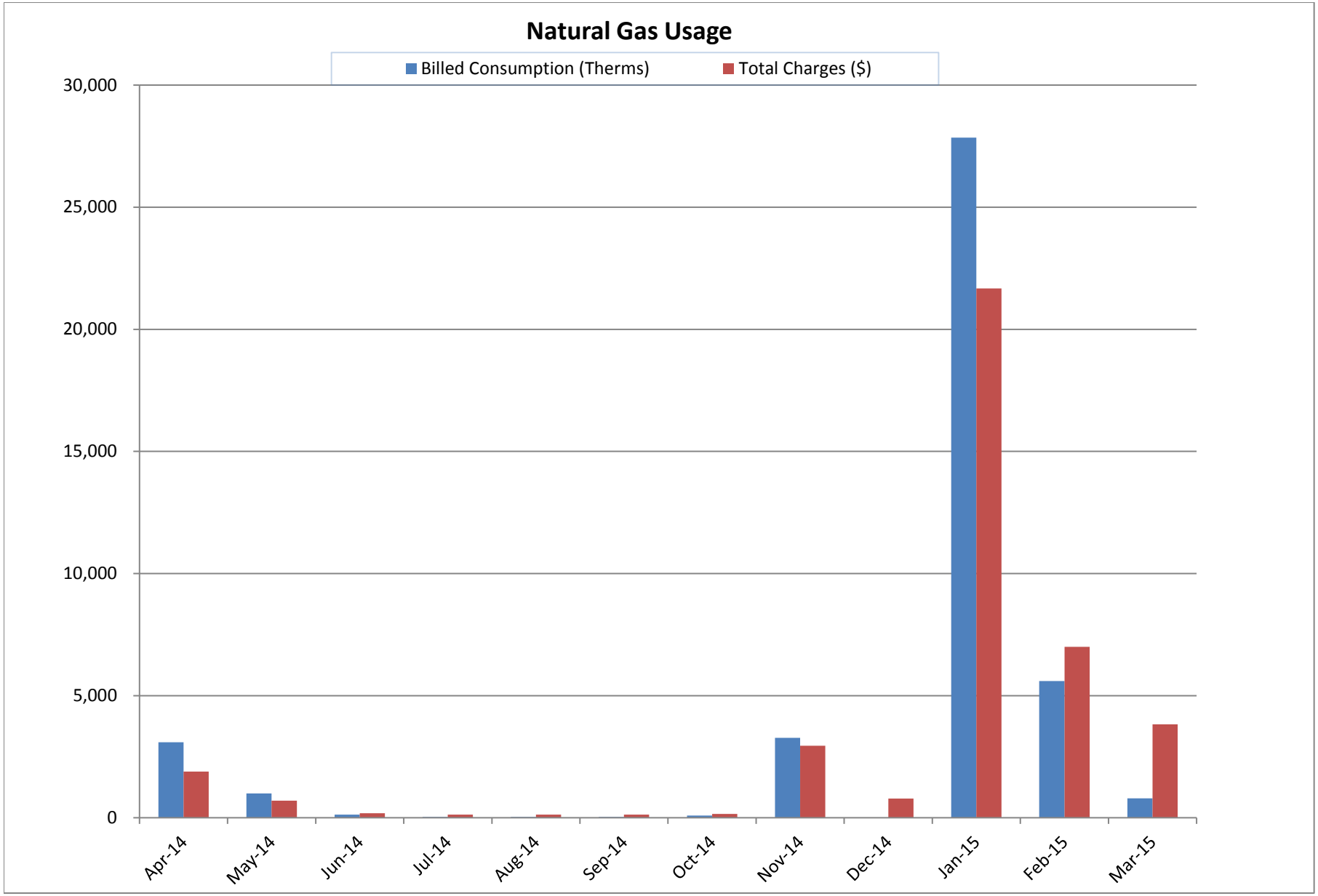

Electric Usage
(kWh)
(kW)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
160
140
120
100
80
60
40
20
0
Usage (kWh)
Demand (kW)
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15
Month

Local Government Energy Audit
East Brunswick Board of Education
Murray A. Chittick Elementary School

Natural Gas Service

For Service at: **Murray A. Chittick Elementary School**
Account No.: **4200829509**
Meter No: **2523580**
Delivery: **PSE&G**
Supply: **Direct Energy**

Month	Billed Consumption (Therms)	Supply Charge ($)	Delivery Charge ($)	Total Charges ($)	Supply Rate ($/Therm)	Delivery Rate ($/Therm)	Total Rate ($/Therm)
April-14	3,094.3	1,470.05	420.23	1,890.28	0.475	0.136	0.611
May-14	992.1	472.63	225.79	698.42	0.476	0.228	0.704
June-14	124.7	64.24	116.95	181.19	0.515	0.938	1.453
July-14	34.3	19.44	106.25	125.69	0.567	3.100	3.667
August-14	31.0	16.31	106.44	122.75	0.526	3.430	3.955
September-14	32.2	16.05	106.55	122.60	0.498	3.306	3.804
October-14	86.1	43.82	111.88	155.70	0.509	1.299	1.808
November-14	3,274.1	1,667.12	1,282.45	2,949.57	0.509	0.392	0.901
December-14	0.0	0.00	783.87	783.87	#DIV/0!	#DIV/0!	#DIV/0!
January-15	27,848.6	14,180.23	7,490.45	21,670.68	0.509	0.269	0.778
February-15	5,599.9	2,851.40	4,146.89	6,998.29	0.509	0.741	1.250
March-15	794.9	404.71	3,422.33	3,827.04	0.509	4.306	4.815
Total (All)	**41,912.2**	**$21,206.00**	**$18,320.08**	**$39,526.08**	**0.506**	**0.437**	**0.943**
Total (last 12-months)	**41,912.2**	**$21,206.00**	**$18,320.08**	**$39,526.08**	**0.506**	**0.437**	**0.943**
		53.7%	46.3%	100.0%			


Natural Gas Usage
Billed Consumption (Therms)
Total Charges ($)
30,000
25,000
20,000
15,000
10,000
5,000
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 Estimated
Chittick Elementary School

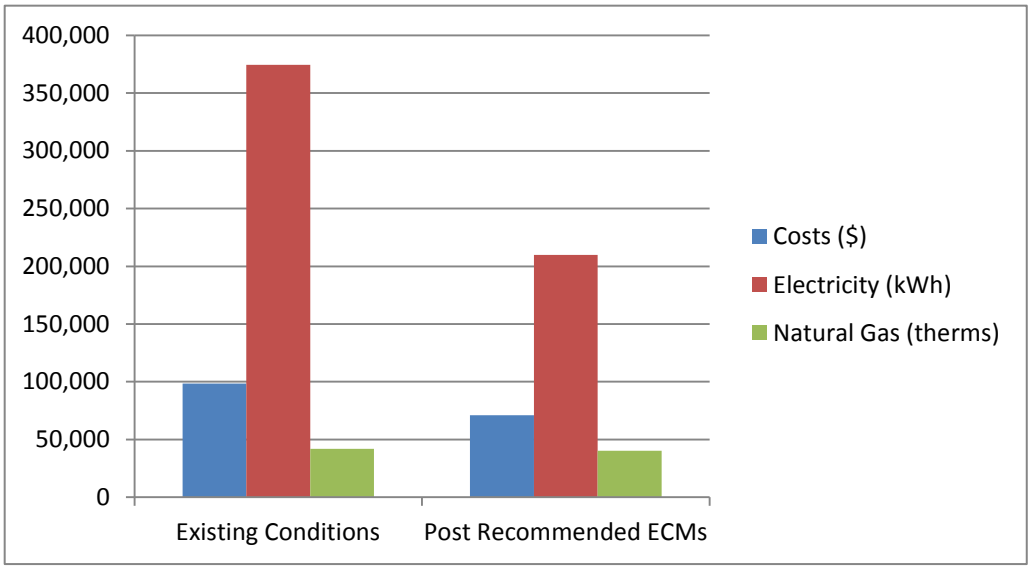
Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size	Efficiency	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)	Other Info.
Boiler	2	Aerco	Benchmark 2.0	NB47980	Heating/NG	2,000,000BTU	85%	Boiler Room	School	2007	21	
Domestic Hot Water Heater	1	AO Smith	BTR154 110	L05M005409	Gas	81 gal/154,000BTU		Boiler Room	School	2005	4	
Hot Water Pump Motor	1	Baldor	M33137	378101Y514H1	Electric Motor	10HP	89.5%	Boiler Room	School	2001	0	
Hot Water Pump Motor	1	Baldor	M3313T	37B101S13H1	Electric Motor	3HP	89.5%	Boiler Room	School	2001	0	
Cooling Pump Motor	2	WEG	00180T3P182T-S	TO01COX0N0000302084	Electric Motor	55000BTU/5T	Unkonwn	Boiler Room	School	2006	5	
Hot Water Unit Heater	1	AirTherm	HA-043	J07768750200	Heating/Cooling	34,000BTU		Boiler Room	School	1997	-4	
Air Cooled Chiller	1	Daikin	AGZ07DBHNN-ER10	STNU15080006	Cooling/Electric	90T		Outdoor	School	2015	14	
Rooftop Unit	1	Lennox	GCS20V-511-125-1P	5697F06141	Heating/Cooling	125,000BTU/3.8T	78.3%/10.7EER	Roof	School	1997	-4	
Rooftop Unit	1	Lennox	GCS20V-511-125-1P	5697F06142	Heating/Cooling	125,000BTU/3.8T	78.3%/10.7EER	Roof	School	1997	-4	
Rooftop Unit	1	Lennox	GCS24-813-130-2Y	5697F02192	Heating/Cooling	130,000BTU/5T	78%/8.9EER	Roof	School	1997	-4	
Rooftop Unit	1	Lennox	GCS24-653-130-1Y	5697F03489	Heating/Cooling	130,000BTU/5T	78%/8.9EER	Roof	School	1997	-4	
Rooftop Unit	1	Lennox	GCS24-813-130-2Y	5697F02180	Heating/Cooling	130,000BTU/5T	78%/8.9EER	Roof	School	1997	-4	
Rooftop Unit	1	Lennox	GCS24-813-130-2Y	5697F05404	Heating/Cooling	130,000BTU/5T	78%/8.9EER	Roof	School	1997	-4	
Rooftop Unit	1	Carrier	50TM-012-A-501	5105G10647	Cooling	10T	10.3EER	Roof	School	2005	4	
Refigerator	1	Magic Chef	RB170RV	11700713QK	Coolling/Freezer	N/A	N/A	N/A	N/A	N/A	N/A	
Stove	1	Garland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

APPENDIX C

ECM Calculations

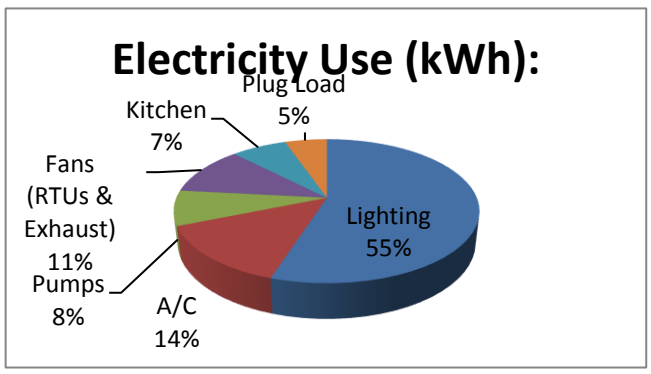
East Brunswick BOE
CHA Project Number: 31007
Murray A. Chittick Elementary School

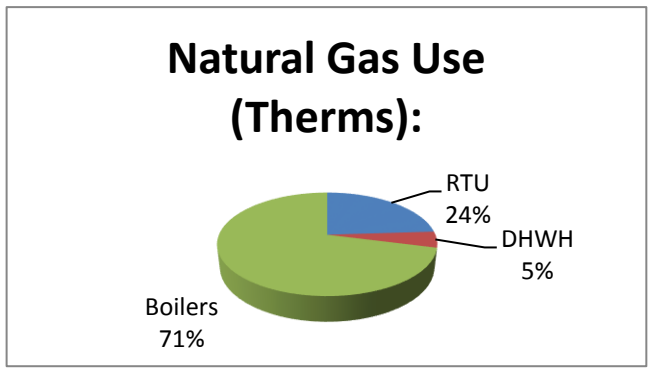
	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	98,416	71,140	28%
Electricity (kWh)	374,531	209,781	44%
Natural Gas (therms)	41,912	40,307	4%
Site EUI (kbtu/SF/Yr)	104.7	90.9	



East Brunswick BOE
CHA Project Number: 31007
Murray A. Chittick Elementary School

Utility End Use Analysis			
Electricity Use (kWh):		**Notes/Comments:**	
374,531	Total	Based on utility analysis	
205,911	Lighting	From Lighting Calculations	55%
51,796	A/C	Estimated	14%
29,519	Pumps	Estimated	8%
41,198	Fans (RTUs & Exhaust)	Estimated	11%
26,217	Kitchen	Estimated	7%
19,890	Plug Load	Estimated	5%
			100%
Natural Gas Use (Therms):		**Notes/Comments:**	
41,912	Total	Based on utility analysis	
10,059	RTU	Estimated	24%
2,096	DHWH	Estimated	5%
29,758	Boilers	Estimated	71%
			100%





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		
					Electric	Natural Gas	Fuel Oil
$ 0.157	$/kWh blended		0.000420205	52,241	$ 58,890	$ 39,526	
$ 0.133	$/kWh supply	374,531	0.000420205				
$ 6.35	$/kW	140.5	0				
$ 0.94	$/Therm	41,912	0.00533471				
	$/kgals		0				
	$/Gal						

Murray A. Chittick 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
N	ECM-1	Replace Windows with Double Pane Windows	0.0	230	1,686	0	0	1,626	226,200	139.1	15	9.1	$ -	N	139.1	0.0	3,452	25,287	0	$ 24,388	(0.9)	($206,791)	-20.1%
Y	ECM-2	Install VFD for Heating Hot Water Pumps	0.2	19,549	0	0	0	2,612	18,522	7.1	15.0	8.2	$ 2,400	N	6.2	2.4	293,234	0	0	$ 46,221	1.5	$15,062	13.9%
y	ECM-3	Install Kitchen Hood Controls	0.0	707	1,153	0	0	1,198	36,981	30.9	15.0	6.4	$ 225	N	30.7	0.0	10,606	17,294	0	$ 17,973	(0.5)	($22,452)	-7.8%
y	ECM-4	Walk-in Freezer/Cooler Controls	0.0	6,791	0	0	0	1,066	22,275	20.9	15.0	2.9	$ -	N	20.9	0.0	101,868	0	0	$ 15,993	(0.3)	($9,547)	-3.9%
y	ECM-5	Replace RTUs	11.6	19,562	0	0	0	3,485	94,900	27.2	15.0	8.2	$ 1,282	N	26.9	173.8	293,431	0	0	$ 59,321	(0.4)	($52,012)	-6.5%
y	ECM-6	Replace Domestic Hot Water Heater	0.0	0	453	0	0	427	7,524	17.6	15.0	2.4	$ 300	N	16.9	0.0	0	6,790	0	$ 6,403	(0.1)	$0	#NUM!
Y	ECM-L1	Replacement of Lighting and Controls	36.4	118,141	0	0	0	18,488	168,731	9.1	10.0	49.6	$ 15,415	N	8.3	364.0	1,181,410	0	0	$ 213,231	0.3	$4,388	3.6%
		Total	**48.1**	**164,980**	**3,291**	**0**	**0**	**28,902**	**575,133**	**19.9**	**14.3**	**87**	**$ 19,622**		**19.2**	**540**	**1,884,000**	**49,371**	**-**	**$ 383,530**	**(0.3)**	**($229,028)**	**-4.0%**
		Recommended Measures (highlighted green	**48.1**	**164,750**	**1,606**	**0**	**0**	**27,276**	**348,933**	**12.8**	**14.2**	**78**	**$ 19,622**	**0**	**12.1**	**540**	**1,880,548**	**24,084**	**-**	**$ 359,142**	**0.0**	**($21,194)**	**2.0%**
		% of Existing	**34%**	**43.99%**	**3.83%**	**#DIV/0!**	**#DIV/0!**																

	City:	Newark, NJ				
	Occupied Hours/Week	50	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	9	13	13	13	9
87.5	35.0	131	39	55	55	55	39
82.5	33.0	500	149	208	208	208	149
77.5	31.5	620	185	258	258	258	185
72.5	29.9	664	198	277	277	277	198
67.5	27.2	854	254	356	356	356	254
62.5	24.0	927	276	386	386	386	276
57.5	20.3	600	179	250	250	250	179
52.5	18.2	730	217	304	304	304	217
47.5	16.0	491	146	205	205	205	146
42.5	14.5	656	195	273	273	273	195
37.5	12.5	1,023	304	426	426	426	304
32.5	10.5	734	218	306	306	306	218
27.5	8.7	334	99	139	139	139	99
22.5	7.0	252	75	105	105	105	75
17.5	5.4	125	37	52	52	52	37
12.5	3.7	47	14	20	20	20	14
7.5	2.1	34	10	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	92%
Cooling Eff (kW/ton)	1.2

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

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

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ECM-1 Window Replacements

Existing: The building has single pane windows in the courtyard area that have higher heating/cooling losses than double pane windows. This ECM evaluates repalcing these windows with insulated double pane windows
Proposed: Replace single pane windows with double windows.

Linear Feet of panel Edge	1,228.0 LF	Cooling System Efficiency	1.2 kW/ton	Heating System Efficiency	92%			
Area of Panel	1,596.0 SF	Ex Occupied Clng Temp.	72 *F	Heating On Temp.	55 *F			
Existing Infiltration Factor	**0.20 cfm/LF**	Ex Unoccupied Clng Temp.	80 *F	Ex Occupied Htg Temp.	72 *F			
Proposed Infiltration Factor	**0.10 cfm/LF**	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb	Ex Unoccupied Htg Temp.	65 *F			
Existing U Value	**1.13 Btuh/SF/°F**	Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb	Electricity	$ 0.157 $/kWh			
Proposed U Value	**0.45 Btuh/SF/°F**			Natural Gas	$ 0.94 $/therm			

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	Unoccupied	Occupied	Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Panel Infiltration & Heat Load BTUH	Panel Infiltration & Heat Load BTUH	Panel Infiltration & Heat Load BTUH	Panel Infiltration & Heat Load BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy Therms	Proposed Heating Energy Therms
A		B	C	D	E	F	G	H	I	J	K	L
102.5	50.1	0	0	0	-79,984	-65,556	-34,394	-28,648	0	0	0	0
97.5	42.5	6	2	4	-62,567	-48,139	-26,603	-20,858	31	14	0	0
92.5	39.5	31	9	22	-50,234	-35,806	-21,354	-15,609	124	54	0	0
87.5	36.6	131	39	92	-38,011	-23,583	-16,161	-10,415	365	159	0	0
82.5	34.0	500	149	351	-26,120	-11,693	-11,133	-5,387	799	355	0	0
77.5	31.6	620	185	435	-14,450	0	-6,216	0	267	115	0	0
72.5	29.2	664	198	466	-2,781	0	-1,299	0	55	26	0	0
67.5	27.0	854	254	600	0	0	0	0	0	0	0	0
62.5	24.5	927	276	651	0	0	0	0	0	0	0	0
57.5	21.4	600	179	421	0	0	0	0	0	0	0	0
52.5	18.7	730	217	513	40,340	25,859	16,591	10,635	0	0	239	98
47.5	16.2	491	146	345	50,684	36,203	20,845	14,889	0	0	216	89
42.5	14.4	656	195	461	61,027	46,546	25,099	19,144	0	0	363	149
37.5	12.6	1,023	304	719	71,371	56,890	29,353	23,398	0	0	681	280
32.5	10.7	734	218	516	81,715	67,234	33,608	27,652	0	0	571	235
27.5	8.6	334	99	235	92,058	77,577	37,862	31,906	0	0	297	122
22.5	6.8	252	75	177	102,402	87,921	42,116	36,160	0	0	253	104
17.5	5.5	125	37	88	112,746	98,265	46,370	40,414	0	0	139	57
12.5	4.1	47	14	33	123,089	108,608	50,624	44,668	0	0	58	24
7.5	2.6	34	10	24	133,433	118,952	54,878	48,922	0	0	46	19
2.5	1.0	1	0	1	143,777	129,296	59,132	53,177	0	0	1	1
-2.5	0.0	0	0	0	154,120	139,639	63,386	57,431	0	0	0	0
-7.5	-1.5	0	0	0	164,464	149,983	67,641	61,685	0	0	0	0
TOTALS		**8,760**	**2,607**	**6,153**					1642	721	**2,864**	**1,178**

Existing Panel Infiltration	**246**	**cfm**	
Existing Panel Heat Transfer	**1,803**	**Btuh/°F**	
Proposed Panel Infiltration	**123**	**cfm**	
Proposed Panel Heat Transfer	**718**	**Btuh/°F**	

Savings	**1,686**	**Therms**
	230	**kWh**

Panel ID	Location	Quantity	Width (ft)	Height (ft)	Linear Feet (LF)	Area (SF)	Infiltration Rate (CFM/LF)	U Value (Btuh/SF/°F)	Infiltration (CFM)	Heat Transfer (Btuh/°F)
1	North Walls	5	6	6	120.0	180.0	0.2	1.13	24.0	203.4
		9	4	6	180.0	216.0	0.2	1.13	36.0	244.1
	East Walls	14	4	6	280.0	336.0	0.2	1.13	56.0	379.7
		1	6	6	24.0	36.0	0.2	1.13	4.8	40.7
	South	4	4	6	80.0	96.0	0.2	1.13	16.0	108.5
		5	6	6	120.0	180.0	0.2	1.13	24.0	203.4
	West Walls	19	4	6	380.0	456.0	0.2	1.13	76.0	515.3
		1	16	6	44.0	96.0	0.2	1.13	8.8	108.5
2					0.0	0.0	0.2	1.13	0.0	0.0
Total		**0**	**0**	**0**	**1,228.0**	**1,596.0**	**0.20**	**1.13**	**245.6**	**1803.5**

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ECM-1 Window Replacements - 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.		
Window Replacement	1,596	sqft	$ 65	$ 40	$ -	$103,740	$ 63,840	$ -	$ 167,580	Vendor Est per SF

Cost estimated are for Energy Savings only- do not use for procurement

$ 167,580	Subtotal
$ 58,653	35% Contingency
$ 226,200	**Total**

East Brunswick BOE
CHA Project Number: 31007
Murray A. Chittick Elementary School

ECM-2: Install Variable Speed Drives - HW Pump

Variable Inputs

Blended Electric Rate	$0.16
Heating System "On" Point	55
VFD Efficiency	98.5%

ECM Description Summary

Two 10 HP secondary Hot Water Pumps provide cosntant flow heating hot water to the unit ventilators and other terminal units. This ECM evaluates the energy savings for replacing the pump motors with higher efficiency motors and adding variabe speed drives. The pumps currently operate in lead/lag fashion with only one pump operating at a time, therfore the saving is only for one pump. Pressure differential sensors will need to be installed to operate the VFDs.

PUMP SCHEDULE

Pump ID	Qty	HP	Total HP	Existing Motor Motor Eff.	New Motor Motor Eff.	Exist. Motor kW Note 1	New Motor kW Note 2
	1	10.0 10.0	10.0 0.0	89.5%	91.7%	6.67	6.51
					Total:	6.67	6.51

SAVINGS ANALYSIS

OAT - DB Avg Temp F	Annual Hours in Bin	Heating Hours Bin	Pump Load %	Existing Pump kWh	Proposed Pump kW	Speed efficiency %	Proposed Pump kWh	Proposed Savings kWh
(A) See Note 3	(B) See Note 3	(C) =IF(A>TP,0,C)	(D) =0.5+0.5*(50-A)/(50-10)) See Note 4	(E) =D*AA	(F) =BB*E^2.5/CC See Note 5	(G)	(H) =C*F/G	(I) =E-H
102.5	0	0	0%	0	0.0	0.0%	0	0
97.5	6	0	0%	0	0.0	0.0%	0	0
92.5	31	0	0%	0	0.0	0.0%	0	0
87.5	131	0	0%	0	0.0	0.0%	0	0
82.5	500	0	0%	0	0.0	0.0%	0	0
77.5	620	0	0%	0	0.0	0.0%	0	0
72.5	664	0	0%	0	0.0	0.0%	0	0
67.5	854	0	0%	0	0.0	0.0%	0	0
62.5	927	0	0%	0	0.0	0.0%	0	0
57.5	600	0	0%	0	0.0	0.0%	0	0
52.5	730	730	48%	4,868	1.0	78.9%	950	3,918
47.5	491	491	53%	3,274	1.3	83.9%	772	2,502
42.5	656	656	58%	4,374	1.7	88.2%	1,232	3,142
37.5	1,023	1,023	63%	6,822	2.0	91.8%	2,273	4,548
32.5	734	734	68%	4,894	2.5	94.9%	1,914	2,981
27.5	334	334	73%	2,227	3.0	97.2%	1,016	1,211
22.5	252	252	78%	1,680	3.5	99.0%	889	791
17.5	125	125	83%	834	4.1	100.0%	511	323
12.5	47	47	88%	313	4.7	100.0%	222	91
7.5	34	34	93%	227	5.4	100.0%	185	42
2.5	1	1	98%	7	6.2	99.7%	6	0
-2.5	0	0	0%	0	0.0	0.0%	0	0
-7.5	0	0	0%	0	0.0	0.0%	0	0
	8,760	**4,427**		**29,520**			**9,971**	**19,549**

1952

Notes:

1) Existing motor power was determined using motor nameplate data. Formula: Motor HP x 0.746 x 0.8 / Exist. Motor Eff.
2) New motor power is the same as existing motor power adjusted for the new efficiency, if a new motor is proposed.
3) Weather data from Newark, NJ
4) The pump load is estimated at 100% at X deg. OAT and 50% at X deg. OAT and varies linearly in between.
5) The required VFD motor draw is based on a 2.5 power relationship to load.

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ECM-2: Install Variable Speed Drives - HW Pump

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.		
						$ -	$ -	$ -	$ -	
VFD	2	ea	$ 2,675	$ 655		$ 5,494	$ 1,632	$ -	$ 7,127	RS Means
Motor	2	ea	$ 990	$ 109		$ 2,033	$ 272	$ -	$ 2,305	RS Means
Differential Pressure Switch and wiring	2	ls	$ 350	$ 1,200		$ 719	$ 2,990	$ -	$ 3,709	RS Means
Misc	2	ea	$ 100	$ 150		$ 205	$ 374	$ -	$ 579	RS Means
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 13,720	Subtotal
$ 4,802	35% Contingency
$ 18,522	**Total**

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

East Brunswick BOE
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Murray A. Chittick Elementary School

ECM-3: Kitchen Hood Control

Description: This ECM evaluates the thermal and electrical energy savings associated with the implementation of a variable flow controlled exhaust hood (Fan) and make-up air unit. The Hood controller uses infrared heat sensors to detect the level of smoke produced by the cooking operations and automatically adjsustes the

Item	Value	Units	Formula/Comments	
Fuel Cost	$ 0.94	/ Therm		
Electricity Cost	$ 0.16	/kWh		
FORMULA CONSTANTS				
Conversion	0.746	HP/kW		
Constant	24	hrs/day		
Constant	1.08	(btu/hr)/CFM·F		
Conversion	3,412	btu/kWh		
ELECTRIC FAN SAVINGS				
Facility Type	School			
Quantity of Kitchen Hood Fan Motors	1			Q
Kitchen Hood Fan Motor HP	0.75	HP		HP
Motor Load Factor	0.90		NJ Protocols	LF
Efficiency of Fan Motor(s)	86.5%			FEFF
Kitchen Hood Fan Run Hours	2,080			RH
Fan Motor Power Reduction (From VFD)	0.584			PR
Fan Electricity Savings	707	kWh		
HEATING SAVINGS				
Kitchen is Heated?	Y			
Square Footage of Kitchen	484	ft^2	Estimated	SF
Code Required Ventilation Rate	0.70	CFM/ft^2	NJ Protocols	CFM/SF
Ventilation Oversize Factor	1.40		NJ Protocols	OF
Flow Reductuion (from VFD/Control)	0.310			FR
Heating Degree Day	2,783		NJ Protocols Table	HDD
Heating System Efficiency	92%		AFUE (%)	HEFF
Heating Savings	115	MMbtu		
Heating Savings	1,153	Therms		
COOLING SAVINGS				
Kitchen is Cooled?	N			
Cooling Degree Day	-		NJ Protocols Table	CDD
Cooling System Efficiency	-		COP	CEFF
Cooling Savings	-	kWh		
TOTAL SAVINGS				
Electricity Savings	707	kWh		
Fuel Savings	1,153	Therms		
Cost Savings	$ 1,198			

Savings calculation formulas are taken from NJ Protocols document for Kitchen Hood

East Brunswick BOE
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ECM-3: Kitchen Hood Control

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.		
Me-Link Kitchen Hood Control System	1	EA	$ 15,000	$ 2,000		$ 15,405	$ 2,492	$ -	$ 17,897	Vendor Estimation
Electrical - misc.	1	LS	$ 5,000	$ 3,500		$ 5,135	$ 4,361	$ -	$ 9,496	Vendor Estimation
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

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

$ 27,393	Subtotal
$ 9,588	35% Contingency
$ 36,981	**Total**

East Brunswick BOE
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Murray A. Chittick Elementary School

ECM-4: 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

$0.16 $/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	Estimated	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**	
Total Cost Savings	**$ 1,066**		
Estimated Cost	$ 22,275		
Simple Payback	20.9	**years**	

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

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Murray A. Chittick Elementary School

ECM-4: 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**

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ECM-5: Replace Unitary HVAC 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	Cooling Capacity (Btu/h)	Heating Capacity (Btu/h)	EER
Lennox GCS24	4	5	RTU	HVAC	240,000	104,000	9.5
Trane	1	10	RTU	HVAC	120,000	96,000	10.3
Lennox GCS20V	2	4	RTU	HVAC	96,000	104,000	10.7
Total	7	19			456,000	304,000	10.0

Item	Value	Units	Formula/Comments	
Demand Rate	$ 6.35	/ kW		
Electricity Rate	$ 0.13	/kWh		
FORMULA CONSTANTS				
Coincidence Factor	0.67		NJ Protocols	
Conversion	3.412	btu/kW		
COOLING - HVAC				
Cooling Capacity	456,000	btu/hr		btuh
Baseline EER	10.0		See Table Below	EERb
Proposed EER	16.0		Equipment	EERq
Equivalent Full Load Hours	1,131	hrs	NJ Protocols	
Demand Savings	11.59	kW		
Energy Savings	19,562	kWh		
HEATING				
Heating Capacity	-	btu/h		
Baseline Heating EER	10.0		See Table Below	
Proposed Heating EER	16.0		Equipment	
Equivalent Full Load Hours		hrs	NJ Protocols	
Heating Savings	-	kWh		
COOLING				
Cooling Capacity	-	btu/h		
Baseline Cooling EER	10.0		See Table Below	
Proposed Cooling EER	16.0		Equipment	
Equivalent Full Load Hours		hrs	NJ Protocols	
Cooling Savings	-	kWh		
SAVINGS				
Demand Savings	11.59	kW		
Energy Savings	19,562	kWh		

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

HVAC Baseline Table						
Equipment Type	Baseline	Efficiency	PROPOSED	Efficiency	Demand Savings / Btu/hr	Energy Savings / Btu/hr

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CHA Project Number: 31007
Murray A. Chittick Elementary School

ECM-5: Replace Unitary HVAC Equipment

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.		
						$ -	$ -	$ -	$ -	
Existing RTU demolition	7	EA	$ -	$ 250	$ 1,000	$ -	$ 2,181	$ 7,868	$ 10,049	Eng Est
RTU-Gas Heat/Electric Cool 5 Ton	4	EA	$ 5,125	$ 1,525	$ -	$ 21,054	$ 7,601	$ -	$ 28,654	Internet price
RTU-Gas Heat/Electric Cool 10 Ton	1	EA	$ 6,500	$ 1,750	$ -	$ 6,676	$ 2,181	$ -	$ 8,856	Internet price
RTU-Gas Heat/Electric Cool 4 Ton	2	EA	$ 3,500	$ 1,500	$ -	$ 7,189	$ 3,738	$ -	$ 10,927	Internet price
Reconnect piping	7	EA	$ 100	$ 500	$ -	$ 719	$ 4,361	$ -	$ 5,080	Eng Est
Controls	7	EA	$ 75	$ 250	$ -	$ 539	$ 2,181	$ -	$ 2,720	Eng Est
Electrical - misc.	7	EA	$ 250	$ 250	$ -	$ 1,797	$ 2,181	$ -	$ 3,978	Eng Est
			$ -	$ -		$ -	$ -	$ -	$ -	

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

$ 70,263	Subtotal
$ 24,592	35% Contingency
$ 94,900	**Total**

East Brunswick BOE
CHA Project Number: 31007
Murray A. Chittick Elementary School

ECM-6: Replace Gas-Fired DHW Heater w/ Tankless Condensing Gas-Fired DHW Heater

Description: This ECM evaluates the energy savings associated with replacing a gas fired tank type water heater with an equivalent capacity instantaneous water heater.

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	**175**	Therms/month	Calculated from utility bill
Total Annual Utility Demand by Water Heater	209,561	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	80%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	167,649	MBTU/yr	
Existing Tank Size	80	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	140	˚F	Per building personnel
Room Temperature	72	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	1.2	MBH	
Annual Standby Hot Water Load	10,549	MBTU/yr	
New Tank Size	0	Gallons	Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	140	˚F	
Room Temperature	72	˚F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.1	MBH	
Annual Standby Hot Water Load	621	MBTU/yr	
Total Annual Hot Water Demand	157,721	MBTU/yr	
Proposed Avg. Hot water heater efficiency	96%		Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Proposed Fuel Use	1,643	Therns	Standby Losses and inefficient DHW heater eliminated
Utility Cost	$0.94	$/Therm	
Existing Operating Cost of DHW	$1,976	$/yr	
Proposed Operating Cost of DHW	$1,549	$/yr	

Savings Summary:

Utility	Energy Savings	Cost Savings
Therms/yr	453	$427

East Brunswick BOE
CHA Project Number: 31007
Murray A. Chittick Elementary School

ECM-6: Replace Gas-Fired DHW Heater w/ Tankless Condensing Gas-Fired DHW Heater

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.		
Instantaneous Gas-Fired DHW Heater	1	EA	$ 2,500	$ 1,000		$ 2,568	$ 1,246	$ -	$ 3,814	RS Means
piping and ventig	1	LS	$ 500	$ 500		$ 514	$ 623	$ -	$ 1,137	RS Means
electric	1	EA		$ 500		$ -	$ 623	$ -	$ 623	RS Means

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

$ 5,573	Subtotal
$ 1,951	35% Contingency
$ 7,524	**Total**

East Brunswick BOE
CHA Project Number: 31007
Murray A. Chittick 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)	52,241
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)	$58,890	$39,526
Existing Usage (from utility)	374,531	41,912
Proposed Savings	164,750	1,606
Existing Total MMBtus	5,678	
Proposed Savings MMBtus	730	
% Energy Reduction	**12.9%**	
Proposed Annual Savings	$18,488	

	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	$348,933

		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	$348,933	

Project Payback (years)	
w/o Incentives	w/ Incentives
18.9	18.9

* 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 Chittick Elementary School
CHA Project No. 31007
Existing Lighting & Audit Input

Cost of Electricity: **$0.133** **$/kWh**
$6.35 **$/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
35LED	11	Classroom	20	T 32 R F 3 (ELE)	F43ILL/2	90	1.80	SW	2300	4,140	OCC	
35LED	12	Classroom	20	T 32 R F 3 (ELE)	F43ILL/2	90	1.80	SW	2300	4,140	OCC	
35LED	9a	Classroom	10	T 32 R F 3 (ELE)	F43ILL/2	90	0.90	SW	2300	2,070	OCC	
35LED	9	Classroom	10	T 32 R F 3 (ELE)	F43ILL/2	90	0.90	SW	2300	2,070	OCC	
35LED	10a	Classroom	10	T 32 R F 3 (ELE)	F43ILL/2	90	0.90	SW	2300	2,070	OCC	
35LED	10	Classroom	10	T 32 R F 3 (ELE)	F43ILL/2	90	0.90	SW	2300	2,070	OCC	
35LED	7	Classroom	15	T 32 R F 3 (ELE)	F43ILL/2	90	1.35	SW	2300	3,105	OCC	
35LED	8	Classroom	15	T 32 R F 3 (ELE)	F43ILL/2	90	1.35	SW	2300	3,105	OCC	
35LED	Hall	Hallways	7	T 32 R F 3 (ELE)	F43ILL/2	90	0.63	SW	5520	3,478	None	
18LED	5	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2300	1,546	OCC	
18LED	5	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	6	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2300	1,546	OCC	
18LED	6	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	3	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2300	1,546	OCC	
18LED	3	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	4	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2300	1,546	OCC	
18LED	4	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	Hall	Hallways	5	T 32 R F 4 (ELE)	F44ILL	112	0.56	SW	5520	3,091	None	
18LED	1K	Classroom	11	T 32 R F 4 (ELE)	F44ILL	112	1.23	SW	2300	2,834	OCC	
18LED	2K	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
34LED	Hall	Hallways	4	1T 32 C F 2 (ELE)	F42ILL	59	0.24	SW	5520	1,303	None	
34LED	Hall	Hallways	8	1T 32 C F 2 (ELE)	F42ILL	59	0.47	SW	5520	2,605	None	
34LED	Stop	Hallways	3	1T 32 C F 2 (ELE)	F42ILL	59	0.18	SW	5520	977	None	
34LEd	Boiler RM	Mechanical Room	2	1T 32 C F 2 (ELE)	F42ILL	59	0.12	SW	1150	136	None	
34LEd	Boiler RM	Mechanical Room	7	1T 32 C F 2 (ELE)	F42ILL	59	0.41	SW	1150	475	None	
34LEd	Hall	Hallways	10	1T 32 C F 2 (ELE)	F42ILL	59	0.59	SW	5520	3,257	None	
232LED	Stage	Classroom	1	R 60 C I 1	I60/1	60	0.06	SW	2300	138	OCC	
18LED	Stage	Classroom	12	T 32 R F 4 (ELE)	F44ILL	112	1.34	SW	2300	3,091	OCC	
35LED	Media 13	Classroom	32	T 32 R F 3 (ELE)	F43ILL/2	90	2.88	SW	2300	6,624	OCC	
34LED	Media 13	Classroom	2	1T 32 C F 2 (ELE)	F42ILL	59	0.12	SW	2300	271	OCC	
35LED	14	Classroom	27	T 32 R F 3 (ELE)	F43ILL/2	90	2.43	SW	2300	5,589	OCC	
198LED	14	Classroom	1	2T 17 R F 2 (ELE)	F22LL	31	0.03	SW	2300	71	OCC	
X4	14	Classroom	6	CF26W	CF26/4-L	108	0.65	SW	2300	1,490	OCC	
18LED	16	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	16	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	18	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	18	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	19	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	19	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	17	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	17	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	15	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	15	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
34LED	15	Classroom	3	1T 32 C F 2 (ELE)	F42ILL	59	0.18	SW	2300	407	OCC	
18LED	Hall	Hallways	5	T 32 R F 4 (ELE)	F44ILL	112	0.56	SW	5520	3,091	None	
35LED	Hall	Hallways	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	5520	2,981	None	
18LED	Hall	Hallways	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	5520	1,236	None	
18LED	Hall	Hallways	3	T 32 R F 4 (ELE)	F44ILL	112	0.34	SW	5520	1,855	None	
18LED	Hall	Hallways	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	5520	1,236	None	
232LED	Closet	Storage	1	R 60 C I 1	I60/1	60	0.06	SW	1840	110	OCC	
34LED	139	Classroom	2	1T 32 C F 2 (ELE)	F42ILL	59	0.12	SW	2300	271	OCC	
18LED	20	Classroom	16	T 32 R F 4 (ELE)	F44ILL	112	1.79	SW	2300	4,122	OCC	
18LED	20	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	22	Classroom	16	T 32 R F 4 (ELE)	F44ILL	112	1.79	SW	2300	4,122	OCC	
18LED	22	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	23	Classroom	16	T 32 R F 4 (ELE)	F44ILL	112	1.79	SW	2300	4,122	OCC	
18LED	23	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	HAll	Hallways	8	T 32 R F 4 (ELE)	F44ILL	112	0.90	SW	5520	4,946	None	
18LED	Art	Classroom	16	T 32 R F 4 (ELE)	F44ILL	112	1.79	SW	2300	4,122	OCC	
34LED	Hall	Hallways	3	1T 32 C F 2 (ELE)	F42ILL	59	0.18	SW	5520	977	None	
18LED	Entry	Hallways	12	T 32 R F 4 (ELE)	F44ILL	112	1.34	SW	5520	7,419	None	
34LED	Hall	Hallways	6	1T 32 C F 2 (ELE)	F42ILL	59	0.35	SW	5520	1,954	None	
18LED	Office	Offices	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2760	1,855	OCC	
18LED	Principal	Offices	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2760	618	OCC	
34LED	Principal	Offices	1	1T 32 C F 2 (ELE)	F42ILL	59	0.06	SW	2760	163	OCC	
34LED	Principal	Offices	1	1T 32 C F 2 (ELE)	F42ILL	59	0.06	SW	2760	163	OCC	
18LED	Principal	Offices	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2760	1,855	OCC	
18LED	Nurse	Offices	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2760	1,855	OCC	
18LED	123	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	123	Classroom	1	T 32 R F 4 (ELE)	F44ILL	112	0.11	SW	2300	258	OCC	
18LED	Faculty	Break/Lunch Rooms	1	T 32 R F 4 (ELE)	F44ILL	112	0.11	SW	1840	206	OCC	

Energy Audit of Chittick Elementary School
CHA Project No. 31007
Existing Lighting & Audit Input

Cost of Electricity: **$0.133** **$/kWh**
$6.35 **$/kW**

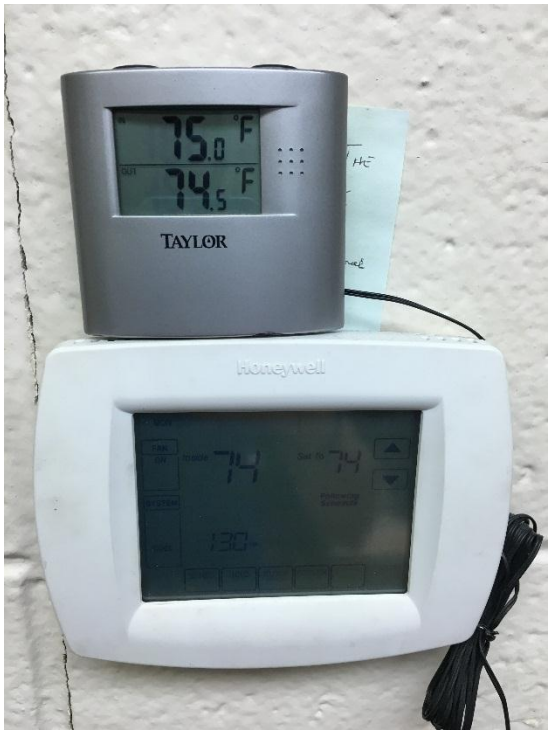
			EXISTING CONDITIONS									Retrofit Control	
	Area Description	Usage	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh		
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	Describe Usage 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
18LED	Faculty	Break/Lunch Rooms	4	T 32 R F 4 (ELE)	F44ILL	112	0.45	SW	1840	824	OCC	
18LED	26	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2300	1,546	OCC	
18LED	28	Classroom	4	T 32 R F 4 (ELE)	F44ILL	112	0.45	SW	2300	1,030	OCC	
34LEd	Hall	Hallways	6	1T 32 C F 2 (ELE)	F42ILL	59	0.35	SW	5520	1,954	None	
34LEd	Hall	Hallways	6	1T 32 C F 2 (ELE)	F42ILL	59	0.35	SW	5520	1,954	None	
18LED	Hall	Hallways	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	5520	1,236	None	
34LED	116	Classroom	3	1T 32 C F 2 (ELE)	F42ILL	59	0.18	SW	2300	407	OCC	
18LED	25	Classroom	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	2300	515	OCC	
18LED	27	Classroom	4	T 32 R F 4 (ELE)	F44ILL	112	0.45	SW	2300	1,030	OCC	
34LED	112	Classroom	2	1T 32 C F 2 (ELE)	F42ILL	59	0.12	SW	2300	271	OCC	
34LED	Hall	Hallways	7	1T 32 C F 2 (ELE)	F42ILL	59	0.41	SW	5520	2,280	None	
34LED	Hall	Hallways	3	1T 32 C F 2 (ELE)	F42ILL	59	0.18	SW	5520	977	None	
34LED	Hall	Hallways	7	1T 32 C F 2 (ELE)	F42ILL	59	0.41	SW	5520	2,280	None	
18LED	32	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	30	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	31	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	33	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
7LED	Hall	Hallways	6	2T 32 R F 2 (u)	FU2LL	60	0.36	SW	5520	1,987	None	
18LED	Hall	Hallways	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	5520	1,236	None	
18LED	Hall	Hallways	3	T 32 R F 4 (ELE)	F44ILL	112	0.34	SW	5520	1,855	None	
18LED	35	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	37	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	36	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	39	Classroom	9	T 32 R F 4 (ELE)	F44ILL	112	1.01	SW	2300	2,318	OCC	
18LED	40	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2300	1,546	OCC	
18LED	40	Classroom	6	T 32 R F 4 (ELE)	F44ILL	112	0.67	SW	2300	1,546	OCC	
34LED	39st	Classroom	3	1T 32 C F 2 (ELE)	F42ILL	59	0.18	SW	2300	407	OCC	
34LEd	Storage	Storage	2	1T 32 C F 2 (ELE)	F42ILL	59	0.12	SW	1840	217	OCC	
232LED	Storage	Storage	1	R 60 C I 1	I60/1	60	0.06	SW	1840	110	OCC	
274	Gym	Gymnasium	24	22" Aluminum High Bay Induction	19300-AL-UNV	315	7.56	SW	2300	17,388	None	
18LED	Co	Hallways	2	T 32 R F 4 (ELE)	F44ILL	112	0.22	SW	5520	1,236	None	
262LED	outdoor	Outdoor Lighting	17	CF42/1	CF42/1-I	48	0.82	SW	4368	3,564	None	
142LED	outdoor	Outdoor Lighting	9	MH 100	MH100/1	128	1.15	SW	4368	5,032	None	
	Total		**702**				**73.15**			**205,911**		

Energy Audit of Chittick Elementary School
CHA Project No. 31007
ECM-L3 Lighting Replacements with Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
Field Code	Area Description Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of Fixtures No. of fixtures before the retrofit	Standard Fixture Code Lighting Fixture Code	Fixture Code Code from Table of Standard Fixture Wattages	Watts per Fixture Value from Table of Standard Fixture Wattages	kW/Space (Watts/Fixt) * (Fixt No.)	Exist Control Pre-inst. control device	Annual Hours Estimated daily hours for the usage group	Annual kWh (kW/space) * (Annual Hours)	Number of Fixtures No. of fixtures after the retrofit	Standard Fixture Code Lighting Fixture Code	Fixture Code Code from Table of Standard Fixture Wattages	Watts per Fixture Value from Table of Standard Fixture Wattages	kW/Space (Watts/Fixt) * (Number of Fixtures)	Retrofit Control Retrofit control device	Annual Hours Estimated annual hours for the usage group	Annual kWh (kW/space) * (Annual Hours)	Annual kWh Saved (Original Annual kWh) - (Retrofit Annual kWh)	Annual kW Saved (Original Annual kW) - (Retrofit Annual kW)	Annual $ Saved (kWh Saved) * ($/kWh)	Retrofit Cost Cost for renovations to lighting system	NJ Smart Start Lighting Incentive Prescriptive Lighting Measures	Simple Payback With Out Incentive Length of time for renovations cost to be recovered	Simple Payback Length of time for renovations cost to be recovered
35LED	11	20	T 32 R F 3 (ELE)	F43ILL/2	90	1.8	SW	2300	4,140	20	T 59 R LED	RTLED38	38	0.8	OCC	1,725	1,311	2,829	1.0	$ 455.51	$ 4,853.25	$ 320	10.7	10.0
35LED	12	20	T 32 R F 3 (ELE)	F43ILL/2	90	1.8	SW	2300	4,140	20	T 59 R LED	RTLED38	38	0.8	OCC	1,725	1,311	2,829	1.0	$ 455.51	$ 4,853.25	$ 320	10.7	10.0
35LED	9a	10	T 32 R F 3 (ELE)	F43ILL/2	90	0.9	SW	2300	2,070	10	T 59 R LED	RTLED38	38	0.4	OCC	1,725	656	1,415	0.5	$ 227.75	$ 2,490.75	$ 170	10.9	10.2
35LED	9	10	T 32 R F 3 (ELE)	F43ILL/2	90	0.9	SW	2300	2,070	10	T 59 R LED	RTLED38	38	0.4	OCC	1,725	656	1,415	0.5	$ 227.75	$ 2,490.75	$ 170	10.9	10.2
35LED	10a	10	T 32 R F 3 (ELE)	F43ILL/2	90	0.9	SW	2300	2,070	10	T 59 R LED	RTLED38	38	0.4	OCC	1,725	656	1,415	0.5	$ 227.75	$ 2,490.75	$ 170	10.9	10.2
35LED	10	10	T 32 R F 3 (ELE)	F43ILL/2	90	0.9	SW	2300	2,070	10	T 59 R LED	RTLED38	38	0.4	OCC	1,725	656	1,415	0.5	$ 227.75	$ 2,490.75	$ 170	10.9	10.2
35LED	7	15	T 32 R F 3 (ELE)	F43ILL/2	90	1.4	SW	2300	3,105	15	T 59 R LED	RTLED38	38	0.6	OCC	1,725	983	2,122	0.8	$ 341.63	$ 3,672.00	$ 245	10.7	10.0
35LED	8	15	T 32 R F 3 (ELE)	F43ILL/2	90	1.4	SW	2300	3,105	15	T 59 R LED	RTLED38	38	0.6	OCC	1,725	983	2,122	0.8	$ 341.63	$ 3,672.00	$ 245	10.7	10.0
35LED	Hall	7	T 32 R F 3 (ELE)	F43ILL/2	90	0.6	SW	5520	3,478	7	T 59 R LED	RTLED38	38	0.3	None	5,520	1,468	2,009	0.4	$ 294.97	$ 1,653.75	$ 105	5.6	5.3
18LED	5	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2300	1,546	6	T 74 R LED	RTLED50	50	0.3	OCC	1,725	518	1,028	0.4	$ 165.08	$ 1,545.75	$ 170	9.4	8.3
18LED	5	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	6	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2300	1,546	6	T 74 R LED	RTLED50	50	0.3	OCC	1,725	518	1,028	0.4	$ 165.08	$ 1,545.75	$ 170	9.4	8.3
18LED	6	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	3	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2300	1,546	6	T 74 R LED	RTLED50	50	0.3	OCC	1,725	518	1,028	0.4	$ 165.08	$ 1,545.75	$ 170	9.4	8.3
18LED	3	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	4	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2300	1,546	6	T 74 R LED	RTLED50	50	0.3	OCC	1,725	518	1,028	0.4	$ 165.08	$ 1,545.75	$ 170	9.4	8.3
18LED	4	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	Hall	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	5520	3,091	5	T 74 R LED	RTLED50	50	0.3	None	5,520	1,380	1,711	0.3	$ 251.21	$ 1,181.25	$ 125	4.7	4.2
18LED	1K	11	T 32 R F 4 (ELE)	F44ILL	112	1.2	SW	2300	2,834	11	T 74 R LED	RTLED50	50	0.6	OCC	1,725	949	1,885	0.7	$ 302.65	$ 2,727.00	$ 295	9.0	8.0
18LED	2K	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
34LED	Hall	4	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	5520	1,303	4	4 ft LED Tube	200732x2	30	0.1	None	5,520	662	640	0.1	$ 94.00	$ 934.80	$ 40	9.9	9.5
34LED	Hall	8	1T 32 C F 2 (ELE)	F42ILL	59	0.5	SW	5520	2,605	8	4 ft LED Tube	200732x2	30	0.2	None	5,520	1,325	1,281	0.2	$ 188.00	$ 1,869.60	$ 80	9.9	9.5
34LED	Stop	3	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	5520	977	3	4 ft LED Tube	200732x2	30	0.1	None	5,520	497	480	0.1	$ 70.50	$ 701.10	$ 30	9.9	9.5
34LEd	Boiler RM	2	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	1150	136	2	4 ft LED Tube	200732x2	30	0.1	None	1,150	69	67	0.1	$ 13.29	$ 467.40	$ 20	35.2	33.7
34LEd	Boiler RM	7	1T 32 C F 2 (ELE)	F42ILL	59	0.4	SW	1150	475	7	4 ft LED Tube	200732x2	30	0.2	None	1,150	242	233	0.2	$ 46.52	$ 1,635.90	$ 70	35.2	33.7
34LEd	Hall	10	1T 32 C F 2 (ELE)	F42ILL	59	0.6	SW	5520	3,257	10	4 ft LED Tube	200732x2	30	0.3	None	5,520	1,656	1,601	0.3	$ 235.00	$ 2,337.00	$ 100	9.9	9.5
232LED	Stage	1	R 60 C I 1	I60/1	60	0.1	SW	2300	138	1	A19LED	A19LED	15	0.0	OCC	1,725	26	112	0.0	$ 18.34	$ 141.75	$ 25	7.7	6.4
18LED	Stage	12	T 32 R F 4 (ELE)	F44ILL	112	1.3	SW	2300	3,091	12	T 74 R LED	RTLED50	50	0.6	OCC	1,725	1,035	2,056	0.7	$ 330.17	$ 2,963.25	$ 320	9.0	8.0
35LED	Media 13	32	T 32 R F 3 (ELE)	F43ILL/2	90	2.9	SW	2300	6,624	32	T 59 R LED	RTLED38	38	1.2	OCC	1,725	2,098	4,526	1.7	$ 728.81	$ 7,688.25	$ 500	10.5	9.9
34LED	Media 13	2	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	2300	271	2	4 ft LED Tube	200732x2	30	0.1	OCC	1,725	104	168	0.1	$ 26.75	$ 595.65	$ 40	22.3	20.8
35LED	14	27	T 32 R F 3 (ELE)	F43ILL/2	90	2.4	SW	2300	5,589	27	T 59 R LED	RTLED38	38	1.0	OCC	1,725	1,770	3,819	1.4	$ 614.93	$ 6,507.00	$ 425	10.6	9.9
198LED	14	1	2T 17 R F 2 (ELE)	F22LL	31	0.0	SW	2300	71	1	2T 25 R LED	2RTLED	25	0.0	OCC	1,725	43	28	0.0	$ 4.20	$ 330.75	$ 35	78.7	70.3
X4	14	6	CF26W	CF26/4-L	108	0.6	SW	2300	1,490	6	CF26W	CF26/4-L	108	0.6	OCC	1,725	1,118	373	0.0	$ 49.56	$ 128.25	$ 20	2.6	2.2
18LED	16	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	16	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	18	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	18	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	19	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	19	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	17	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	17	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	15	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	15	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
34LED	15	3	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	2300	407	3	4 ft LED Tube	200732x2	30	0.1	OCC	1,725	155	252	0.1	$ 40.13	$ 829.35	$ 50	20.7	19.4
18LED	Hall	5	T 32 R F 4 (ELE)	F44ILL	112	0.6	SW	5520	3,091	5	T 74 R LED	RTLED50	50	0.3	None	5,520	1,380	1,711	0.3	$ 251.21	$ 1,181.25	$ 125	4.7	4.2
35LED	Hall	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	5520	2,981	6	T 59 R LED	RTLED38	38	0.2	None	5,520	1,259	1,722	0.3	$ 252.83	$ 1,417.50	$ 90	5.6	5.3
18LED	Hall	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	5520	1,236	2	T 74 R LED	RTLED50	50	0.1	None	5,520	552	684	0.1	$ 100.48	$ 472.50	$ 50	4.7	4.2
18LED	Hall	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	5520	1,855	3	T 74 R LED	RTLED50	50	0.2	None	5,520	828	1,027	0.2	$ 150.73	$ 708.75	$ 75	4.7	4.2
18LED	Hall	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	5520	1,236	2	T 74 R LED	RTLED50	50	0.1	None	5,520	552	684	0.1	$ 100.48	$ 472.50	$ 50	4.7	4.2
232LED	Closet	1	R 60 C I 1	I60/1	60	0.1	SW	1840	110	1	A19LED	A19LED	15	0.0	OCC	1,380	21	90	0.0	$ 15.36	$ 141.75	$ 25	9.2	7.6
34LED	139	2	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	2300	271	2	4 ft LED Tube	200732x2	30	0.1	OCC	1,725	104	168	0.1	$ 26.75	$ 595.65	$ 40	22.3	20.8
18LED	20	16	T 32 R F 4 (ELE)	F44ILL	112	1.8	SW	2300	4,122	16	T 74 R LED	RTLED50	50	0.8	OCC	1,725	1,380	2,742	1.0	$ 440.22	$ 3,908.25	$ 420	8.9	7.9
18LED	20	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	22	16	T 32 R F 4 (ELE)	F44ILL	112	1.8	SW	2300	4,122	16	T 74 R LED	RTLED50	50	0.8	OCC	1,725	1,380	2,742	1.0	$ 440.22	$ 3,908.25	$ 420	8.9	7.9
18LED	22	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	23	16	T 32 R F 4 (ELE)	F44ILL	112	1.8	SW	2300	4,122	16	T 74 R LED	RTLED50	50	0.8	OCC	1,725	1,380	2,742	1.0	$ 440.22	$ 3,908.25	$ 420	8.9	7.9
18LED	23	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	HAll	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	5520	4,946	8	T 74 R LED	RTLED50	50	0.4	None	5,520	2,208	2,738	0.5	$ 401.94	$ 1,890.00	$ 200	4.7	4.2
18LED	Art	16	T 32 R F 4 (ELE)	F44ILL	112	1.8	SW	2300	4,122	16	T 74 R LED	RTLED50	50	0.8	OCC	1,725	1,380	2,742	1.0	$ 440.22	$ 3,908.25	$ 420	8.9	7.9
34LED	Hall	3	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	5520	977	3	4 ft LED Tube	200732x2	30	0.1	None	5,520	497	480	0.1	$ 70.50	$ 701.10	$ 30	9.9	9.5
18LED	Entry	12	T 32 R F 4 (ELE)	F44ILL	112	1.3	SW	5520	7,419	12	T 74 R LED	RTLED50	50	0.6	None	5,520	3,312	4,107	0.7	$ 602.91	$ 2,835.00	$ 300	4.7	4.2
34LED	Hall	6	1T 32 C F 2 (ELE)	F42ILL	59	0.4	SW	5520	1,954	6	4 ft LED Tube	200732x2	30	0.2	None	5,520	994	960	0.2	$ 141.00	$ 1,402.20	$ 60	9.9	9.5
18LED	Office	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2760	1,855	6	T 74 R LED	RTLED50	50	0.3	OCC	2,070	621	1,234	0.4	$ 192.43	$ 1,545.75	$ 170	8.0	7.1
18LED	Principal	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2760	618	2	T 74 R LED	RTLED50	50	0.1	OCC	2,070	207	411	0.1	$ 64.14	$ 600.75	$ 70	9.4	8.3
34LED	Principal	1	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	2760	163	1	4 ft LED Tube	200732x2	30	0.0	OCC	2,070	62	101	0.0	$ 15.61	$ 361.95	$ 30	23.2	21.3
34LED	Principal	1	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	2760	163	1	4 ft LED Tube	200732x2	30	0.0	OCC	2,070	62	101	0.0	$ 15.61	$ 361.95	$ 30	23.2	21.3
18LED	Principal	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2760	1,855	6	T 74 R LED	RTLED50	50	0.3	OCC	2,070	621	1,234	0.4	$ 192.43	$ 1,545.75	$ 170	8.0	7.1
18LED	Nurse	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2760	1,855	6	T 74 R LED	RTLED50	50	0.3	OCC	2,070	621	1,234	0.4	$ 192.43	$ 1,545.75	$ 170	8.0	7.1
18LED	123	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	123	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2300	258	1	T 74 R LED	RTLED50	50	0.1	OCC	1,725	86	171	0.1	$ 27.51	$ 364.50	$ 45	13.2	11.6
18LED	Faculty	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	1840	206	1	T 74 R LED	RTLED50	50	0.1	OCC	1,380	69	137	0.1	$ 22.96	$ 364.50	$ 45	15.9	13.9
18LED	Faculty	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	1840	824	4	T 74 R LED	RTLED50	50	0.2	OCC	1,380	276	548	0.2	$ 91.82	$ 1,073.25	$ 120	11.7	10.4
18LED	26	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2300	1,546	6	T 74 R LED	RTLED50	50	0.3	OCC	1,725	518	1,028	0.4	$ 165.08	$ 1,545.75	$ 170	9.4	8.3
18LED	28	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2300	1,030	4	T 74 R LED	RTLED50	50	0.2	OCC	1,725	345	685	0.2	$ 110.06	$ 1,073.25	$ 120	9.8	8.7
34LEd	Hall	6	1T 32 C F 2 (ELE)	F42ILL	59	0.4	SW	5520	1,954	6	4 ft LED Tube	200732x2	30	0.2	None	5,520	994	960	0.2	$ 141.00	$ 1,402.20	$ 60	9.9	9.5
34LEd	Hall	6	1T 32 C F 2 (ELE)	F42ILL	59	0.4	SW	5520	1,954	6	4 ft LED Tube	200732x2	30	0.2	None	5,520	994	960	0.2	$ 141.00	$ 1,402.20	$ 60	9.9	9.5
18LED	Hall	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	5520	1,236	2	T 74 R LED	RTLED50	50	0.1	None	5,520	552	684	0.1	$ 100.48	$ 472.50	$ 50	4.7	4.2
34LED	116	3	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	2300	407	3	4 ft LED Tube	200732x2	30	0.1	OCC	1,725	155	252	0.1	$ 40.13	$ 829.35	$ 50	20.7	19.4
18LED	25	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2300	515	2	T 74 R LED	RTLED50	50	0.1	OCC	1,725	173	343	0.1	$ 55.03	$ 600.75	$ 70	10.9	9.6
18LED	27	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2300	1,030	4	T 74 R LED	RTLED50	50	0.2	OCC	1,725	345	685	0.2	$ 110.06	$ 1,073.25	$ 120	9.8	8.7
34LED	112	2	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	2300	271	2	4 ft LED Tube	200732x2	30	0.1	OCC	1,725	104	168	0.1	$ 26.75	$ 595.65	$ 40	22.3	20.8
34LED	Hall	7	1T 32 C F 2 (ELE)	F42ILL	59	0.4	SW	5520	2,280	7	4 ft LED Tube	200732x2	30	0.2	None	5,520	1,159	1,121	0.2	$ 164.50	$ 1,635.90	$ 70	9.9	9.5
34LED	Hall	3	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	5520	977	3	4 ft LED Tube	200732x2	30	0.1	None	5,520	497	480	0.1	$ 70.50	$ 701.10	$ 30	9.9	9.5
34LED	Hall	7	1T 32 C F 2 (ELE)	F42ILL	59	0.4	SW	5520	2,280	7	4 ft LED Tube	200732x2	30	0.2	None	5,520	1,159	1,121	0.2	$ 164.50	$ 1,635.90	$ 70	9.9	9.5
18LED	32	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	30	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	31	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	33	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
7LED	Hall	6	2T 32 R F 2 (u)	FU2LL	60	0.4	SW	5520	1,987	6	2T 25 R LED	2RTLED	25	0.2	None	5,520	828	1,159	0.2	$ 170.18	$ 1,215.00	$ 120	7.1	6.4
18LED	Hall	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	5520	1,236	2	T 74 R LED	RTLED50	50	0.1	None	5,520	552	684	0.1	$ 100.48	$ 472.50	$ 50	4.7	4.2
18LED	Hall	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	5520	1,855	3	T 74 R LED	RTLED50	50	0.2	None	5,520	828	1,027	0.2	$ 150.73	$ 708.75	$ 75	4.7	4.2
18LED	35	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	37	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	36	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	39	9	T 32 R F 4 (ELE)	F44ILL	112	1.0	SW	2300	2,318	9	T 74 R LED	RTLED50	50	0.5	OCC	1,725	776	1,542	0.6	$ 247.63	$ 2,254.50	$ 245	9.1	8.1
18LED	40	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2300	1,546	6	T 74 R LED	RTLED50	50	0.3	OCC	1,725	518	1,028	0.4	$ 165.08	$ 1,545.75	$ 170	9.4	8.3
18LED	40	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2300	1,546	6	T 74 R LED	RTLED50	50	0.3	OCC	1,725	518	1,028	0.4	$ 165.08	$ 1,545.75	$ 170	9.4	8.3
34LED	39st	3	1T 32 C F 2 (ELE)	F42ILL	59	0.2	SW	2300	407	3	4 ft LED Tube	200732x2	30	0.1	OCC	1,725	155	252	0.1	$ 40.13	$ 829.35	$ 50	20.7	19.4
34LEd	Storage	2	1T 32 C F 2 (ELE)	F42ILL	59	0.1	SW	1840	217	2	4 ft LED Tube	200732x2	30	0.1	OCC	1,380	83	134	0.1	$ 22.28	$ 595.65	$ 40	26.7	24.9
232LED	Storage	1	R 60 C I 1	I60/1	60	0.1	SW	1840	110	1	A19LED	A19LED	15	0.0	OCC	1,380	21	90	0.0	$ 15.36	$ 141.75	$ 25	9.2	7.6
274	Gym	24	22" Aluminum High Bay Induction	19300-AL-UNV	315	7.6	SW	2300	17,388	24	22" Aluminum High Bay Induction	19300-AL-UNV	315	7.6	None	2,300	17,388	-	0.0	$ -	$ -	$ -		
18LED	Co	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	5520	1,236	2	T 74 R LED	RTLED50	50	0.1	None	5,520	552	684	0.1	$ 100.48	$ 472.50	$ 50	4.7	4.2
262LED	outdoor	17	CF42/1	CF42/1-I	48	0.8	SW	4368	3,564	17	6BLMWLED	6BLMWLED	13	0.2	None	4,368	965	2,599	0.6	$ 391.00	$ 2,754.00	$ 170	7.0	6.6
142LED	outdoor	9	MH 100	MH100/1	128	1.2	SW	4368	5,032	9	FXLED39	FXLED39/1	39	0.4	None	4,368	1,533	3,499	0.8	$ 526.37	$ 5,005.80	$ 900	9.5	7.8
															0	#N/A								#VALUE!
															0	#N/A								#VALUE!
S	**Total**	**702**				**73.2**			**205,911**	**702**				**36.8**			**87,770**		**36.4**	**18,483**	**168,731**	**$15,415**		
S																	**Demand Savings**			**36.4**	**$2,770**			
S																	**kWh Savings**			**118,141**	**$15,713**			
S																	**Total Savings**				**$18,483**		**9.1**	**8.3**

APPENDIX D

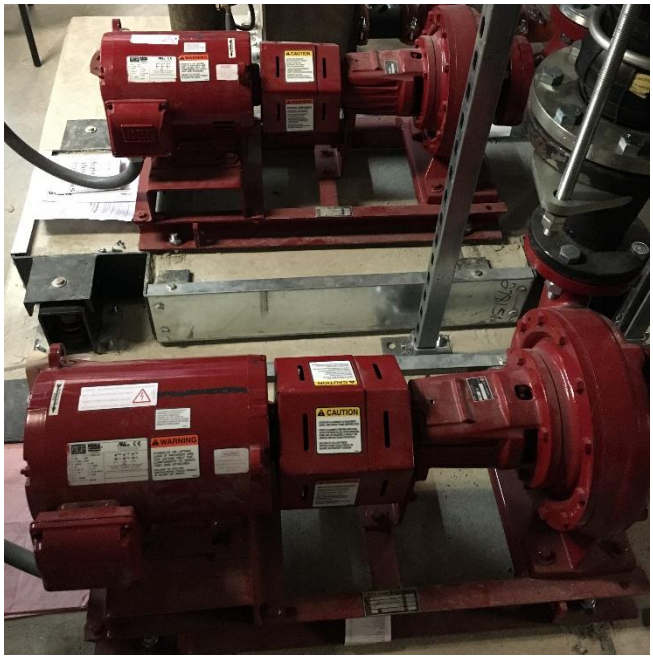
Photos



Thermostats

DHW HEATER

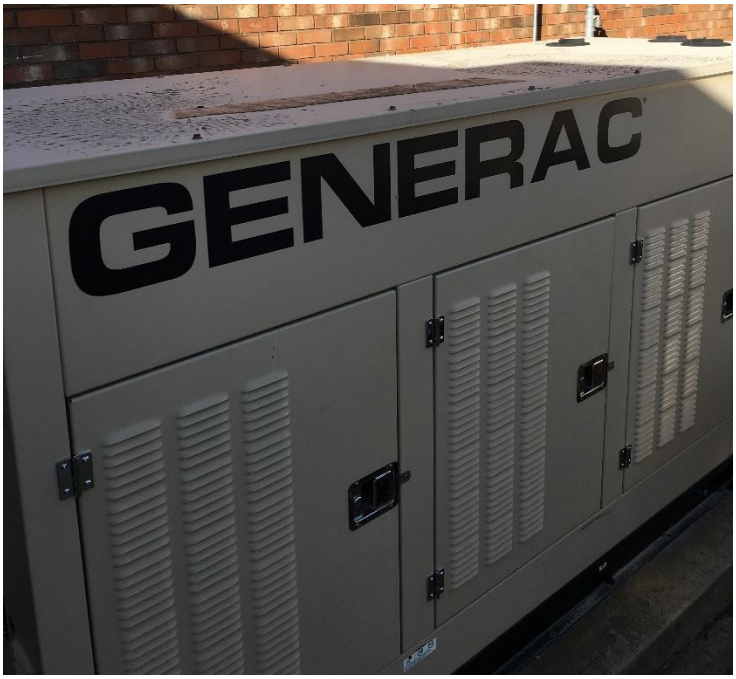
HHW Pumps



CHW Pumps

Boiler

RTU



Generator

Chiller

APPENDIX E

Photovoltaic Analysis

(Not Applicable For This Building)

APPENDIX F

EPA Benchmarking Report

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Chittick Elementary School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 52,241
Built: 1972

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
Chittick Elementary School 5 Flager Street East brunswick, New Jersey 08816	_____ , (____)____-_____	____ _____ , (____)____-_____ _____

Property ID: 4794997

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
104.7 kBtu/ft²

Source EUI
161 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	4,191,200 (77%)
Electric - Grid (kBtu)	1,277,900 (23%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	93.9
National Median Source EUI (kBtu/ft²)	144.5
% Diff from National Median Source EUI	12%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	394

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)