CITY OF EAST ORANGE

POLICE DEPARTMENT

15 S Munn Avenue, East Orange. NJ 07019

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

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CHA PROJECT NO. 30993

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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 City of East Orange 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 energy conservation measures (ECMs) have also been identified in this study. This report details the results of the energy audit conducted for the building listed below:

Building Name	Address	Square Feet	Construction Date
Police Department	15 S Munn Avenue, East Orange. NJ 07019	43,212	2006

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

City Hall	Electric Savings (kWh)	NG Savings (therms)	Total Savings ($)	Payback (years)
Police Department	285,771	5,966	43,699	8.0

Each individual measure's annual savings are dependent on that measure alone, there are no interactive effects calculated. There are three options shown for lighting ECM savings; only one option can be chosen. The 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 further 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. This decision is generally based on the need to replace the piece(s) of equipment due to its age, such as a boiler.

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

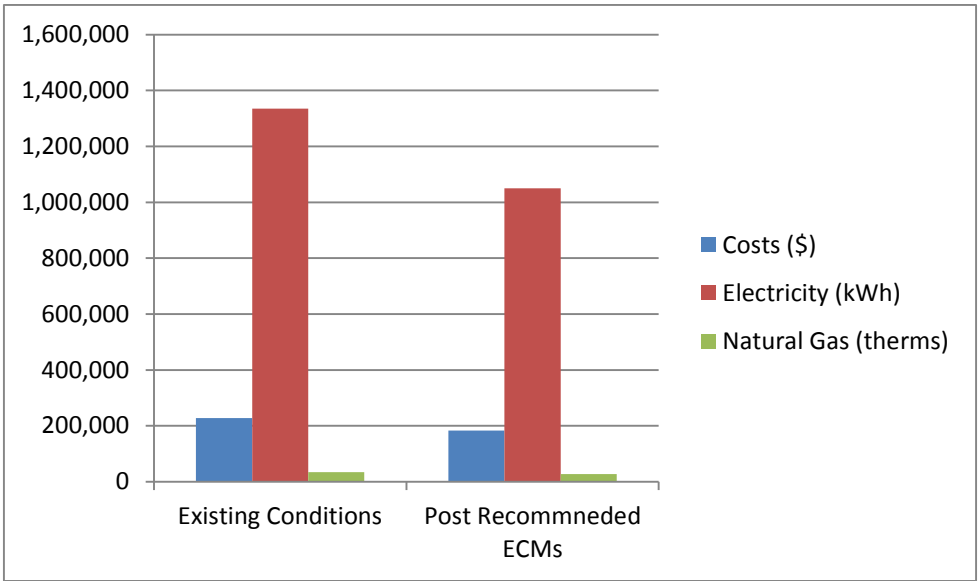
ECM #	Energy Conservation Measure	Est. Costs ($)	Est. Savings ($/year)	Payback w/o Incentive	Potential Incentive ($)*	Payback w/ Incentive	Recommended
ECM-1	Replace the Old Boiler with a Condensing Boiler	127,329	5,859	21.7	8,800	20.2	Y
ECM-2	Replace CHW Pump Motors with VFD Motors	13,618	960	14.2	200	14.0	Y
ECM-3	Replace HHW Pump Motors with VFD Motors	15,222	1,564	9.7	200	9.6	Y
ECM-4	Replace the DHW Heaters with Condensing Heaters	13,430	286	46.9	1,313	42.4	Y
ECM-L1	Lighting Replacements with Controls (Occupancy Sensors)	179,872	35,030	5.1	18,255	4.6	Y
Total**		**349,472**	**43,699**	**8.0**	**28,768**	**7.3**	
Total(Recommended)		**349,472**	**43,699**	**8.0**	**28,768**	**7.3**	

* Incentive shown is per the New Jersey SmartStart Program.

By implementing the recommended ECMs, it could result in a total reduction of 152 metric tons of the LIFFETIME greenhouse gas (GHG).

If the City of East Orange implements the recommended ECMs, energy savings would be as follows:

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	227,296	183,597	19%
Electricity (kWh)	1,335,300	1,049,529	21%
Natural Gas (therms)	33,798	27,832	18%
Site EUI (kbtu/SF/Yr)	183.6	147.3	



2.0 BUILDING INFORMATION AND EXISTING CONDITIONS

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

Building Name: Police Department
Address: 15 S Munn Avenue, East Orange. NJ 07019
Gross Floor Area: 43,212
Number of Floors: Four floors and a basement
Year Built: 2006

General

Description of Spaces: This is a police department which has police department offices, traffic department offices, inmate cells, restrooms, and mechanical rooms.
Description of Occupancy: The facility has 333 full time occupants. .
Number of Computers: There are 250 computers in the building.
Building Usage: The building operates 24/7.
Construction Materials: Brick, stone, concrete block and structure steel. It is believed that the wall has code compliant insulation when the building was constructed.

Roof: The building has a flat roof which is covered a with a black rubber membrane and a lower roof on the north-east side which is covered with a grey rubber membrane The roof is believed to be well insulated based on the age of the building. The roof is in good condition and therefore no ECMs associated with roof improvements are evaluated.
Windows: The majority of the windows are double pane windows which appear in good condition. Therefore, no ECM associated with window upgrade was evaluated.
Exterior Doors: Exterior doors include a steel door with glass panels and two 8' by 10' garage doors. These doors appear to be in good condition, therefore, there is are ECMs associated with the doors.

Heating Ventilation & Air Conditioning (HVAC) Systems

Heating: The building is heated by two Weil-McClain gas fired heating hot water boilers located in the basement. Each of the Weil-McClain boilers has a rated energy input of 4,474 MBH and maximum energy output of 3,550MBH which result in a nameplate efficiency of 79.3%. The hot water is circulated by two hot water circulation pumps driven by 7.5HP motors which serve the hot water baseboard heaters, heating coils in RTUs, make-up air unit (MAU) and AHUs throughout the building. ECMs related to boiler replacement and installing VFDs on the HHW pump motors are evaluated.

Cooling: This building has two Trane air cooled chillers located on the roof. Each of the chillers has a rated cooling capacity of 200 tons. The chillers were installed in 2006 and still appear to be in good condition. The chilled water is circulated by two chilled water pumps which are driven by a 5HP motor each. The chilled water is circulated to the two Trane RTUs, two AHUs and one MAU to provide cooling for the majority of the building. Apart from the central cooling system, there is also a split AC unit serving one office area. This Mitsubishi unit has a nameplate cooling capacity of .05 ton and EER of 11.2. An ECM related to installing VFDs on the chilled water pump motors was evaluated.

Ventilation: the ventilation of this building is provided by two RTUs, two AHUs and one MAU. The AHUs and MAU are located in the basement. The serving areas of each unit is shown in the table below:

Name	Manufacturer	Capacity	Location	Serving Area
Roof Top Unit	Trane	chilled water coils and hot water coils for heating, 15HP supply fan motors	Roof	2nd 3rd and 4th floor
Air Handling Unit	Trane	chilled water coils and hot water coils for heating, 15HP supply fan motors	Basement Boiler Room	Basement and 1st floor
Make-up Air Unit	Trane	provide fresh air for 2nd floor ventilation	Basement Boiler Room	2nd floor

In discussions with facility staff, it is believed that these units are already providing minimum amount of ventilation. Also, considering this building is mostly operational 24/7, therefore, no ECM related to reduce the amount of ventilation.

Exhaust: This building has a few fractional HP exhaust fans located on the roof serving restrooms and the locker room. The exhaust fans appear to be in good condition and therefore no ECMs associated with exhaust system were evaluated.

Controls Systems

The building has a central Direct Digital Control system. The central access computer was locked by the company that services the system and the facility staff do not have the password to access the control screen. The control computer was locked to prevent the set points were randomly changed. In discussions with the facility staff, it is believed that the room temperature is set to be best suitable for the function of this building which is about 70^{o}F. As this building houses critical operations, there does not appear to be substantial controls opportunities to save energy, therefore, no ECMs related to the control system were evaluated.

Domestic Hot Water Systems

A gas fired domestic water heater, by RBI, is installed in the mechanical room that provides domestic hot water to the restrooms and showers. The heater has a rated energy input of 750MBH and an energy output of 600MBH which results in a nameplate efficiency of 80%. An ECM associated with upgrading the water heater with a high efficiency condensing water heater is included.

Kitchen Equipment

The building has pantries with microwaves and residential refrigerators. There is no commercial kitchen in the building.

Plug Load

This building has computers, residential appliances (microwaves, refrigerators, etc.), and printers which contribute to the plug load. The computer monitors go into sleep mode when they are not used as do the copiers. Therefore, no ECMs are recommend however we have included and O & M measure to replace the small appliances with Energy Star rated appliances when the old ones reach the end of their useful life span

Plumbing Systems

The building was constructed in 2006 and the plumbing fixtures comply with the plumbing code at that time. These plumbing fixtures appear to be low flow fixtures and appear to be in good condition, therefore no ECMs associated with water conservation are evaluated.

Lighting Systems

This building has 32W T-8 fluorescent lighting, metal halide fixtures, CFLs lamps and incandescent lights. The majority of lighting fixtures are 32 watt T-8 fluorescent linear fixtures. There are thirteen outdoor metal halides which appear to be 400W. All of the interior lights are controlled by manual switches. An ECM is included for replacing all for the lighting with LED equivalent and controlled by occupancy sensors was evaluated.

3.0 UTILITIES

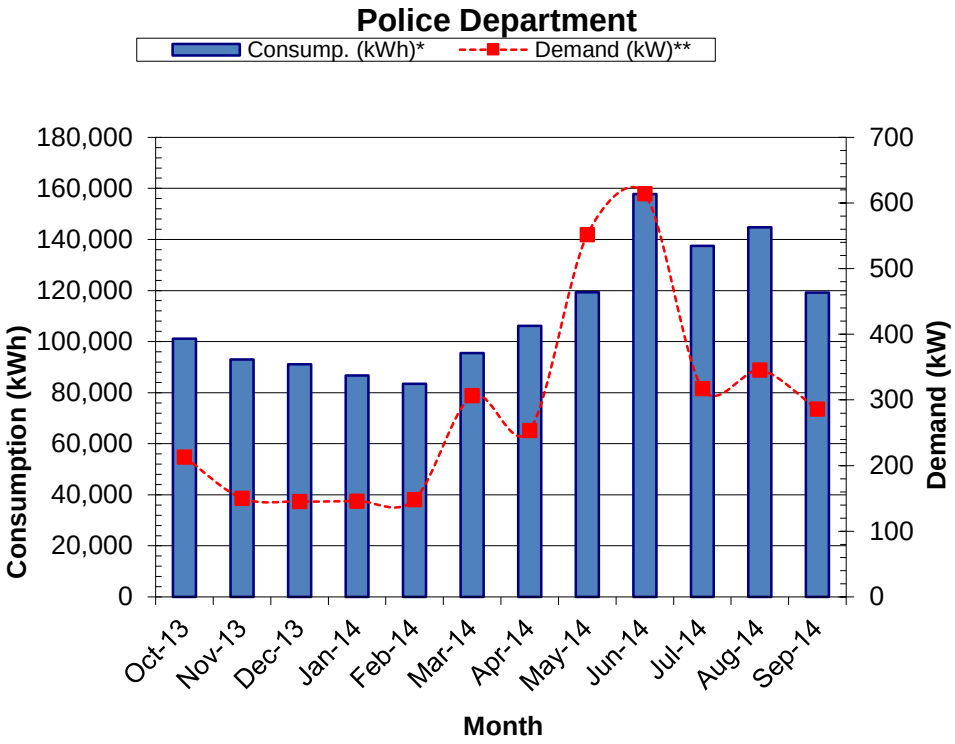
Natural gas, electricity and water are separately metered into this building. Utilities used by the building are delivered and supplied by the following utility companies:

	Electric	Natural Gas
Deliverer	PSE&G	PSE&G
Supplier	PSE&G	PSE&G

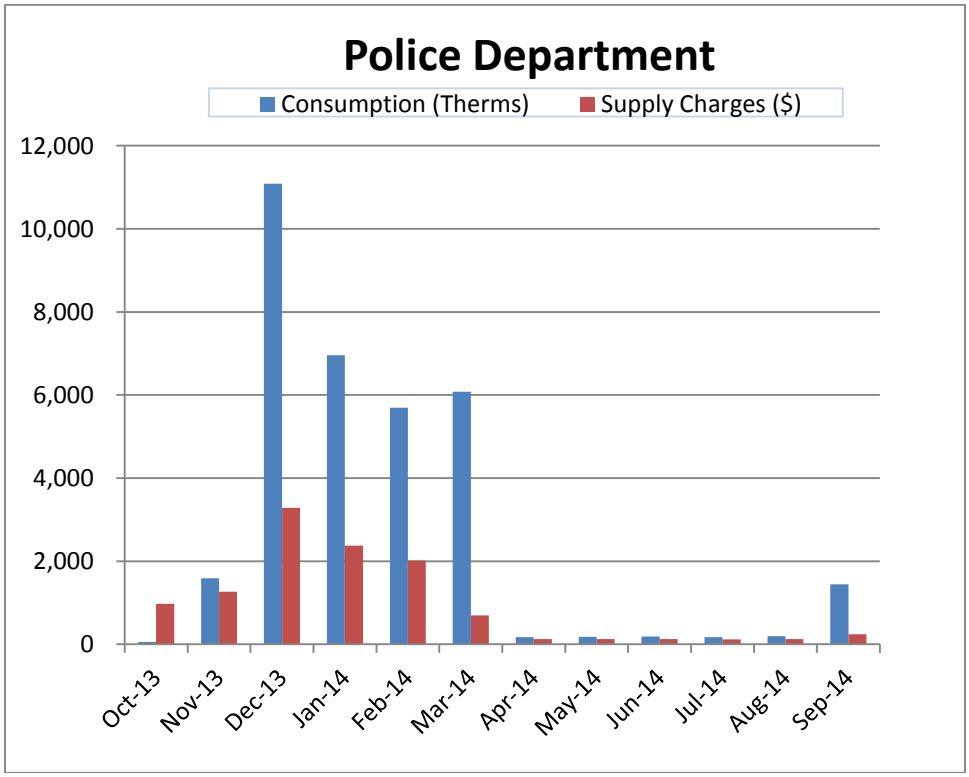
For the 12-month period ending in September 2014, the utilities usages and costs for the building were as follows:

Electric		
Annual Usage	1,335,300	kWh/yr
Annual Cost	192,472	$
Blended Rate	0.144	$/kWh
Peak Demand	614.0	kW
Min. Demand	145.3	kW
Avg. Demand	289.8	kW
Natural Gas		
Annual Usage	33,798	Therms/yr
Annual Cost	34,829	$
Rate	1.030	$/therm
Energy Summary		
Building Area	43,212	SF
Energy Usage Intensity (EUI)	184	KBtu/SF/yr
Energy Cost Index (ECI)	5.26	$/SF/yr
Total Annual Utility Costs	227,301	$

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 higher in summer season. The air conditioning contributes to the higher electric usage in the summer month. The remaining months are pretty consistent.



The natural gas usage in this building is used for heating and DHW production. The gas usage during the heating season is correlated to winter weather conditions summer usage is for domestic hot water only.

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	Average Rate	NJ Average Rate	
Electricity	$/kWh	$0.144	$0.13	Y
Natural Gas	$/Therm	$1.030	$0.96	Y

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

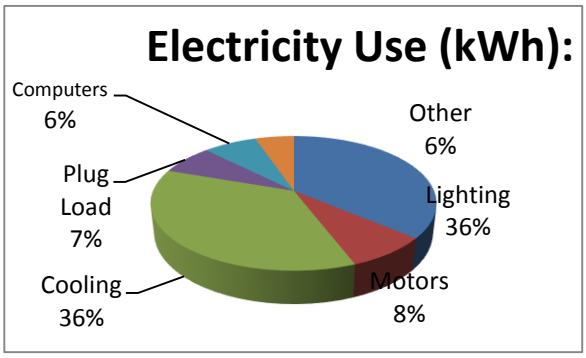
Additional information on selecting a third party energy supplier is available here:

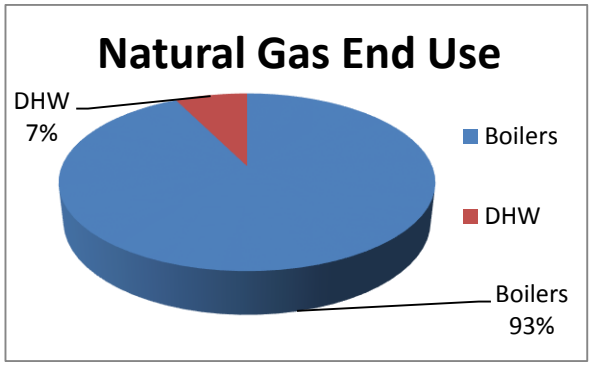
http://www.state.nj.us/bpu/commercial/shopping.html.

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





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 an 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 scores for all buildings types. The buildings that do not have energy ratings now are compared with national median EUI.

The sites EUI is the amount of heat and electricity consumed by a building as reflected in its 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 provides an equivalent measure for various types of buildings with differing energy sources. The results of the benchmarking is 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)
183.6	413.2	N/A

The national median site EUI is 68.6 kBtu/ft2/yr and source EUI is 154.4 kBtu/ft2/yr. The building has 168% higher than the national median source EUI for a police department. It is believed that the inefficient boiler, the inefficient HHW/CHW water circulation system and the 24/7 operation of the building cause the high EUI. It is expected that the EUI will be reduced by implementing the measures discussed in this report.

[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-cost 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 (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 the Boilers with Condensing Boilers

The building is heated by two Weil-McClain gas fired heating hot water boiler located in the basement. Each of the boilers has a rated energy input of 4,474 MBH and maximum energy output of 3,550MBH which result in a nameplate efficiency of 79.3%. There are high efficiency condensing boilers available that have better efficiencies, therefore, it is suggested one condensing boiler be added to use as the main boiler. New modulating condensing gas boilers are available that minimally operate at 88%, and can operate as high as 96%.

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

ECM-1 Replace the Boiler with a Condensing Boiler

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
127,329	0	0	5,689	5,859	0.2	8,800	21.7	20.2

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

This measure is recommended.

5.2 ECM-2 Install VFDs on CHW Pump Motors

The chilled water is circulated by two chilled water pumps which are driven by 5HP motors each. The chilled water is circulated to the two Trane RTUs, two AHUs and one MAU to provide cooling for the majority of the building. This measure evaluates installing VFDs on the HHW pumps and two-way valves/pressure transducers in the two HHW loops to utilize the energy savings from the VFD pumps.

The savings of this measure are calculated from the motor speed reduction when the HHW system is only partially loaded. The load percentage of the pumps is calculated by estimating the percentage of two-way valves open in each temperature bin. Therefore, partial energy savings in each bin can be calculated as the difference between the energy drawn by the full-load old motors and the energy drawn by the VFD driven motors.

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

ECM-2 Install VFDs on CHW Pump Motors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
13,618	0	7,879	0	960	0.3	200	14.2	14.0

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

This measure is recommended.

5.3 ECM-3 Install VFDs on HHW Pump Motors

The hot water is circulated by two hot water circulation pumps driven by 7.5HP motors to the hot water baseboard heaters, heating coils in RTUs, make-up air unit (MAU) and AHUs throughout the building. This measure evaluates installing VFDs on the HHW pumps and two-way valves/pressure transducers in the two HHW loops to utilize the energy savings from the VFD pumps.

The savings of this measure are calculated from the motor speed reduction when the HHW system is only partially loaded. The load percentage of the pumps is calculated by estimating the percentage of two-way valves open in each temperature bin. Therefore, partial energy savings in each bin can be calculated as the difference between the energy drawn by the full-load old motors and the energy drawn by the VFD driven motors.

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

ECM-3 Install VFDs on HHW Pump Motors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
15,222	0	13,011	0	1,564	0.8	200	9.7	9.6

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

This measure is recommended.

5.4 ECM-4 Replace the DHW Heater with Condensing Heater

A gas fired domestic water heater, by RBI, is installed in the mechanical room that provides domestic hot water to the restrooms and sinks. The heater has a rated energy input of 750MBH and an energy output of 600MBH which results in a nameplate efficiency of 80%. This ECM evaluates the energy savings associated with replacing the existing DHW heater with a condensing boiler/heat exchanger which has an efficiency of 96%.

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

ECM-4 Replace the DHW Heaters with Condensing Heaters

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
13,430	0	0	278	286	(0.6)	1,313	46.9	42.4

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

This measure is recommended.

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

This building has 32W T-8 fluorescent lighting, metal halide fixtures, CFLs lamps and incandescent lights. The majority of lighting fixtures are 32 watt T-8 fluorescent linear fixtures. There are thirteen outdoor metal halides which appear to be 400W. All of the interior lights are controlled by manual switches. The review of the comprehensive lighting survey determined that lighting in some areas could benefit from installation of occupancy sensors to turn off lights when they are unoccupied. This measure looks at replacing the lights with LED and installing occupancy sensors.

Overall energy consumption can be reduced by replacing inefficient bulbs and linear fluorescent bulbs with more efficient LED technology. To compute the annual savings for this ECM, the energy consumption of the current lighting fixtures was established and compared to the proposed fixture power requirement with the same annual hours of operation. The difference between the existing and proposed annual energy consumption was the energy savings. These calculations are based on 1 to 1 replacements of the fixtures, and do not take into account lumen output requirements for a given space. A more comprehensive engineering study should be performed to determine correct lighting levels.

Supporting calculations, including assumptions for lighting hours and annual energy usage for each fixture, are provided in Appendix C 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
179,872	34	264,882	0	35,030	1.3	18,255	5.1	4.6

* LED new fixtures are still qualified for prescribed incentives, however, LED retrofits must go through the custom incentive which is not calculated in LGEA study therefore, the potential incentive shown in the table is the possible prescribed incentive.

This measure is recommended.

5.6 Additional O&M Opportunities

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

- Purchase ENERGY STAR® appliances when needed
- Clean air filters regularly
- Retro-Commission the controls system

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.

Web URL: 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. It is then installed, 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 was 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.

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 200 kW. 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.

<u>Gas</u>

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

Incentive cap: 25% of total project cost

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

Electric

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

Gas

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

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

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.

We estimate the total source energy savings for the recommended package of measures to be 19.8%. The overall internal rate of return is estimated to be 11.4%.

Based on these preliminary estimates, this project likely would not meet the minimum requirements to be eligible for the Pay for Performance program.

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

Available Roof Area (Ft^2)	Potential PV Array Size (kW)
4,618	64

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

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey Solar Renewable Energy Certificates Program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. Payments that will be received by the PV producer will change from year to year dependent upon supply and demand. There is no definitive way to calculate an exact price that will be received by the PV producer for SREC credits over the next 15 years. Renewable Energy Consultants estimates an average of $204/SREC for January 2016 and this number was utilized in the cash flow for this report.

The system costs for PV installations were derived from recent solar contractor budgetary pricing in the state of New Jersey and include the total cost of the system installation (PV panels, inverters, wiring, ballast, controls). The cost of installation is currently about $4.00 per watt or $4,000 per kW of installed system, for a typical system. There are other considerations that have not been included in this pricing, such as the condition of the roof and need for structural reinforcement. Photovoltaic systems can be ground mounted if the roof is not suitable, however, this installation requires a substantial amount of open property (not wooded) and underground wiring, which adds more cost. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will most likely need to be replaced during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation –64kW System

Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable SREC	Payback (without SREC)	Payback (with SREC)	Recommended
	Electricity		Natural Gas					
$	kW	kWh	Therms	$	$	Years	Years	Y/N
$257,200	64	77,814	0	$10,194	$19,454	25.2	8.7	FS

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

7.1.2 Solar Thermal Hot Water Generation

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

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

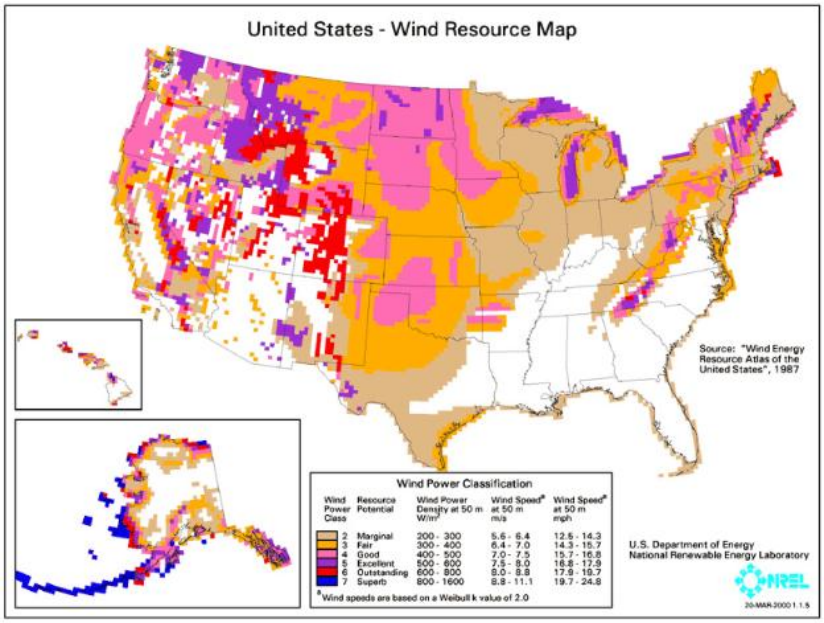
Several options exist for using active solar thermal systems for space heating. The most common method is called a passive solar hot water system involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system described above which requires pumping). The most practical system would transfer the heat from the panels to thermal storage tanks and then use the pre-heated water for domestic hot water production. DHW is presently produced by natural gas fired water heaters and, therefore, this measure would offer natural gas utility savings. Unfortunately, the amount of domestic hot water that is currently used by this building 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 building.

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 building.

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. This 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 facility 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 the 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 2014 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
614.0	145.3	289.8	N	N

*the demand is estimated from one month bill

This measure is not recommended due to the lack of generators.

8.0 CONCLUSIONS & RECOMMENDATIONS

The following section summarizes the LGEA energy audit conducted by CHA for City of East Orange.

The following projects should be considered for implementation:

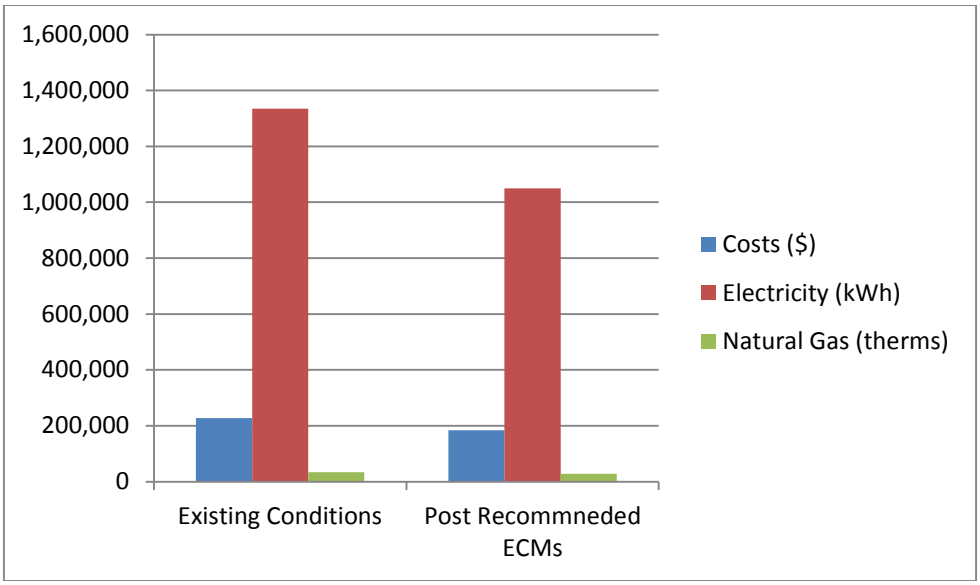
- Replace the Boilesr with Condensing Boilers
- Replace CHW Pump Motors with VFD Motors
- Replace HHW Pump Motors with VFD Motors
- Replace the DHW Heater with Condensing Water Heater
- Lighting Replacements with LED and add Controls (Occupancy Sensors)

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)
285,771	5,966	43,699	8.0

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

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	227,296	183,597	19%
Electricity (kWh)	1,335,300	1,049,529	21%
Natural Gas (therms)	33,798	27,832	18%
Site EUI (kbtu/SF/Yr)	183.6	147.3	



Next Steps: This energy audit has identified several areas of potential energy savings. City of East Orange can use this information to pursue incentives offered by the NJBPU's NJ Clean Energy Program. Additional meetings will be scheduled with city staff members to review possible options.

APPENDIX A

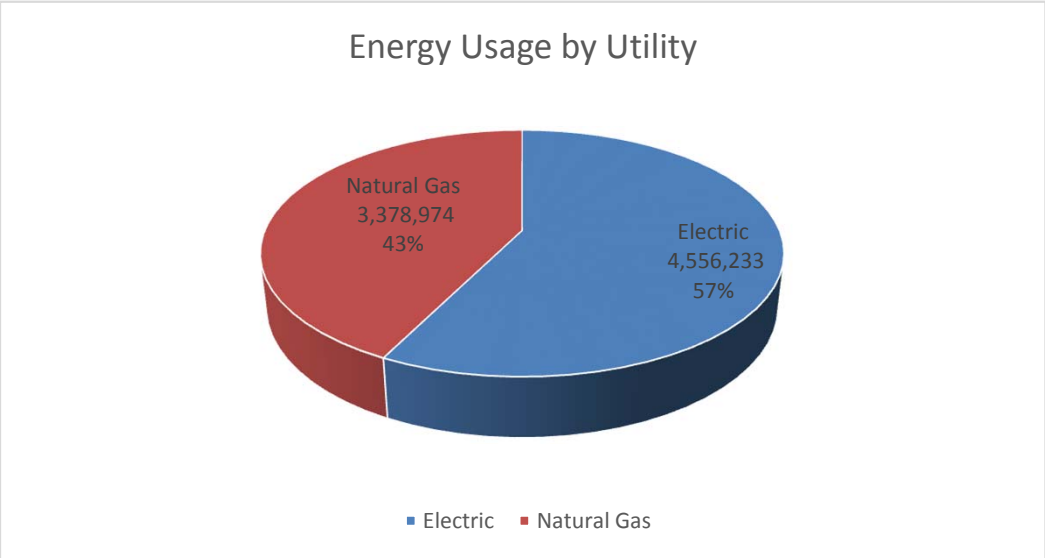
Utility Usage Analysis and Alternate Utility Suppliers

East Orange NJBPU LGEA
Police Department

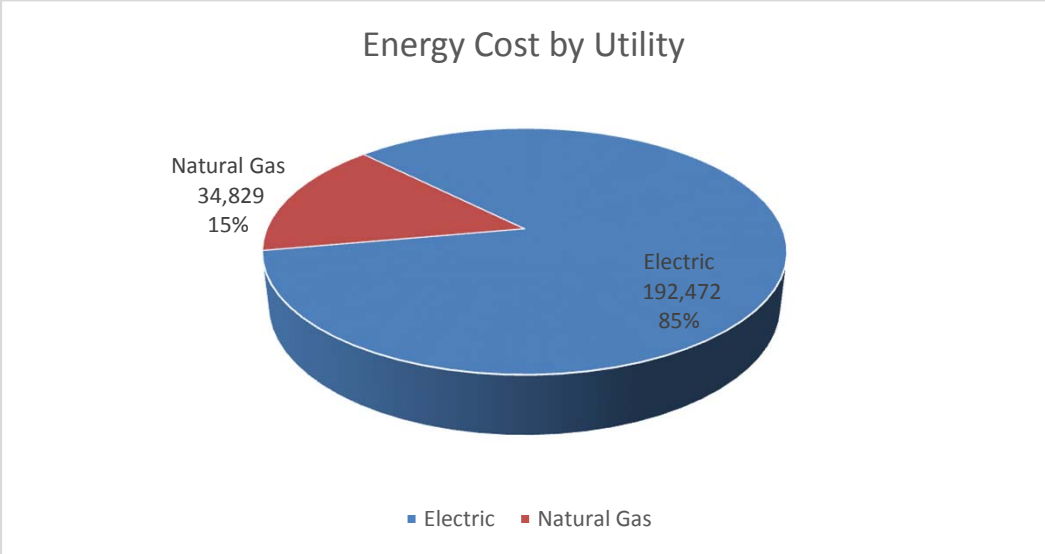
Annual Utilities
12-month Summary

Electric		
Annual Usage	1,335,300	kWh/yr
Annual Cost	192,472	$
Blended Rate	0.144	$/kWh
Peak Demand	614.0	kW
Min. Demand	145.3	kW
Avg. Demand	289.8	kW
Natural Gas		
Annual Usage	33,798	Therms/yr
Annual Cost	34,829	$
Rate	1.030	$/therm
Energy Summary		
Building Area	43,212	SF
Energy Usage Intensity (EUI)	184	KBtu/SF/yr
Energy Cost Index (ECI)	5.26	$/SF/yr
Total Annual Utility Costs	227,301	$

Utility	KBtu	%
Electric	4,556,233	57%
Natural Gas	3,378,974	43%
	7,935,207	100%



Utility	$	%
Electric	192,472	85%
Natural Gas	34,829	15%
	227,301	100%



East Orange NJBPU LGEA
Police Department

Electric Service

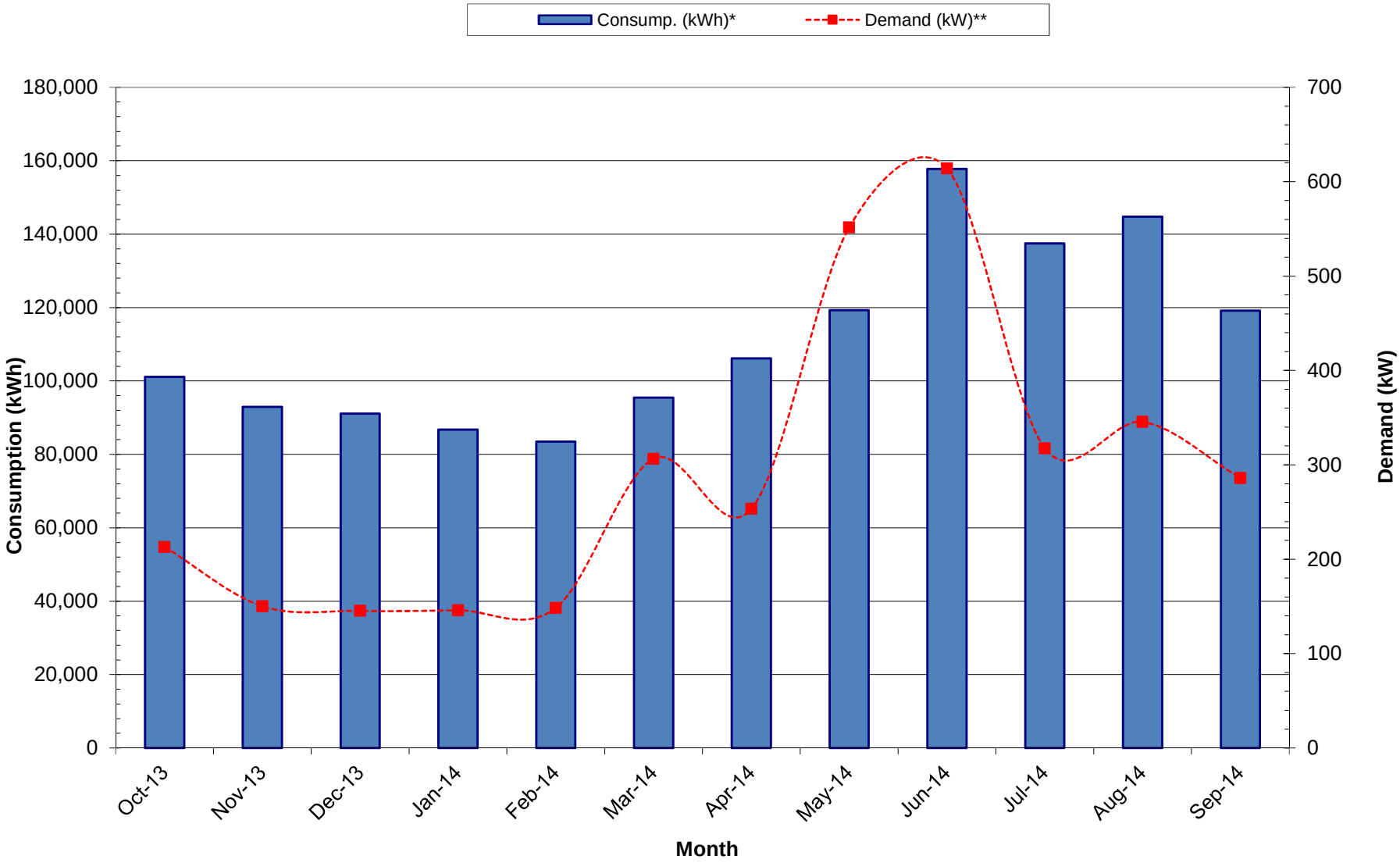
Account No.: 4200964309 **Delivery: PSE&G**
Meter No.: 778019781 **Rate LPLS**

			Provider Charges			Usage (kWh) vs. Demand (kW) Charges		Unit Costs				
Month	**Consump. (kWh)***	**Demand (kW)****	**Delivery ($)***	**Supplier ($)**	**Total ($)**	**Consumption ($)**	**Demand ($)**	**Delivery ($/kWh)**	**Supplier ($/kWh)**	**Consumption Rate ($/kWh)**	**Demand ($/kW)**	**Blended Rate ($/kWh)**
October-13	101,103	213	4,190	9,627.38	13,817.83	12113.83	1704.00	0.041	0.095	0.120	8.000	0.137
November-13	92,938	150	3,721	9,225.71	12,946.37	11744.77	1201.60	0.040	0.099	0.126	8.000	0.139
December-13	91,076	145	3,594	9,059.38	12,653.40	11491.00	1162.40	0.039	0.099	0.126	8.000	0.139
January-14	86,722	146	3,393	9,026.01	12,418.87	11251.67	1167.20	0.039	0.104	0.130	8.000	0.143
February-14	83,465	148	3,307	9,292.18	12,599.22	11412.02	1187.20	0.040	0.111	0.137	8.000	0.151
March-14	95,476	306	4,212	10,085.84	14,298.23	11847.03	2451.20	0.044	0.106	0.124	8.000	0.150
April-14	106,130	253	4,331	10,482.00	14,813.28	12786.88	2026.40	0.041	0.099	0.120	8.000	0.140
May-14	119,277	552	6,989	11,335.57	18,324.70	13911.90	4412.80	0.059	0.095	0.117	8.000	0.154
June-14	157,785	614	8,351	14,220.29	22,571.51	17659.51	4912.00	0.053	0.090	0.112	8.000	0.143
July-14	137,440	318	7,969	12,962.77	20,931.51	18391.51	2540.00	0.058	0.094	0.134	8.000	0.152
August-14	144,726	346	8,507	12,999.02	21,506.32	18742.32	2764.00	0.059	0.090	0.130	8.000	0.149
September-14	119,162	286	4,619	10,971.45	15,590.83	13302.83	2288.00	0.039	0.092	0.112	8.000	0.131
Total (All)	**1,335,300**	**614.00**	**$63,184.47**	**$129,287.60**	**$192,472.07**	**$164,655.27**	**$27,816.80**	**$0.05**	**$0.10**	**$0.12**	**$8.00**	**$0.14**
Notes	1	2	3	4	5			6	7			8

1.) Number of kWh of electric energy used per month
2.) Number of kW of power measured
3.) Electric charges from Delivery provider
4.) Electric charges from Supply provider - note, includes 8.875% tax
5.) Total charges (Delivery + Supplier)
6.) Delivery Charges ($) / Consumption (kWh)
7.) Supplier Charges ($) / Consumption (kWh)
8.) Total Charges ($) / Consumption (kWh)

* Based on combined numbers provided by client
** Addition of two accounts provided by client

Police Department

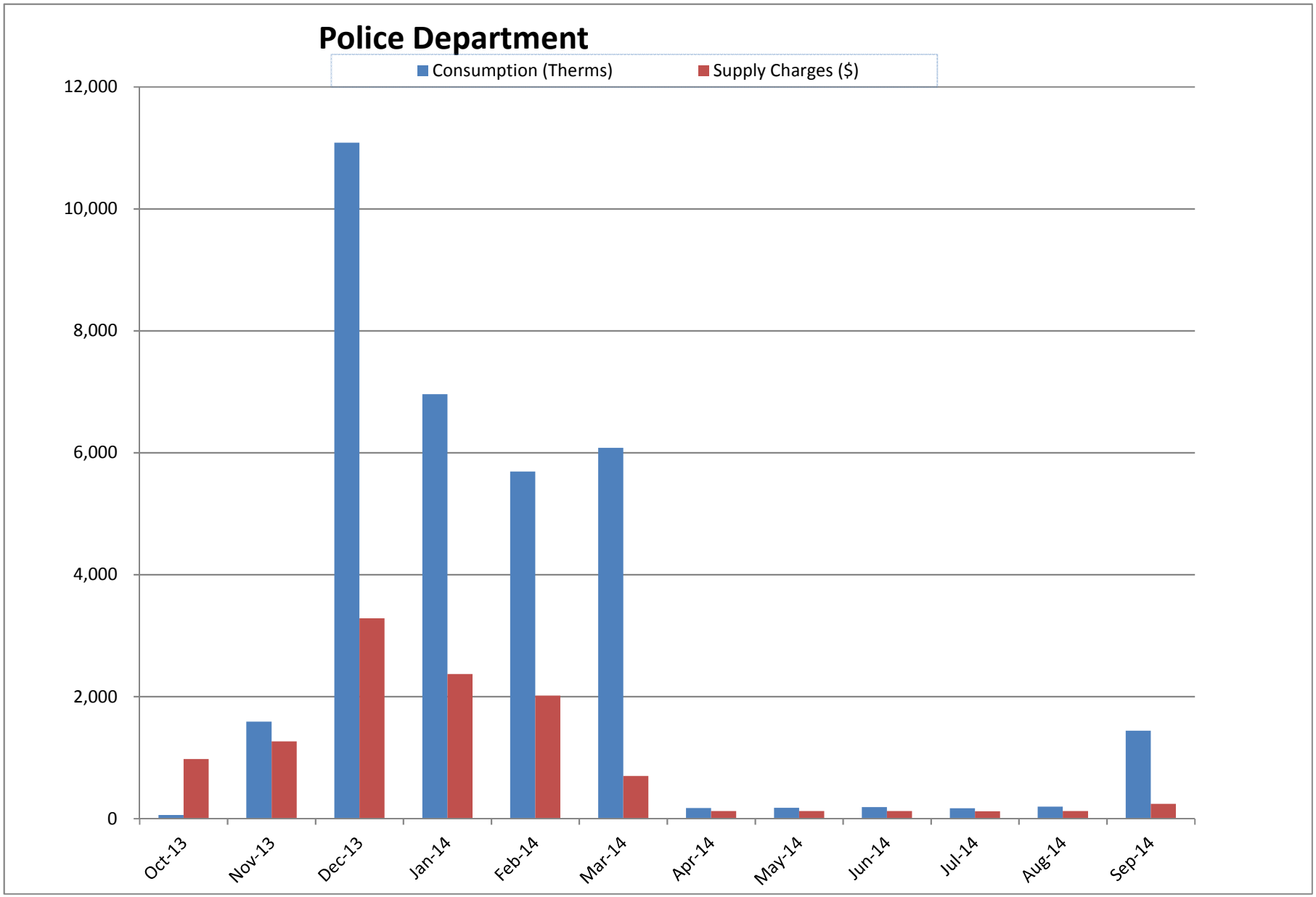


East Orange NJBPU LGEA
Police Department

Natural Gas Service

Account No.: 4200964309
Meter No: 3166087
Delivery: PSE&G
Rate LVG

Month	Consumption (Therms)	Delivery Charges ($)	Supply Charges ($)	Total Charges ($)	Rate ($/Therm)
October-13	56.82	974.09	31.91	1,006.00	17.70
November-13	1,589.97	1,263.62	909.28	2,172.90	1.37
December-13	11,082.87	3,282.54	7023.89	10,306.43	0.93
January-14	6,959.84	2,371.34	5153.78	7,525.12	1.08
February-14	5,691.57	2,013.94	4436.57	6,450.51	1.13
March-14	6,080.32	696.03	4335.46	5,031.49	0.83
April-14	170.46	123.08	118.36	241.44	1.42
May-14	175.53	123.13	122.48	245.61	1.40
June-14	187.03	122.99	126.42	249.41	1.33
July-14	169.16	120.34	107.38	227.72	1.35
August-14	194.22	122.86	117.94	240.80	1.24
September-14	1,440.04	242.15	888.94	1,131.09	0.79
Total (12 Months)	**33,798**	**$ 11,456.11**	**$ 23,372.41**	**$ 34,828.52**	**$ 1.03**


Police Department
Consumption (Therms)
Supply Charges ($)
12,000
10,000
8,000
6,000
4,000
2,000
0
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14

PSE&G ELECTRIC SERVICE TERRITORY
Last Updated: 7/21/15

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

Supplier	Telephone & Web Site	*Customer Class
Abest Power & Gas of NJ, LLC 202 Smith Street Perth Amboy, NJ 08861	(888)987-6937 www.AbestPower.com	**R/C/I** **ACTIVE**
AEP Energy, Inc. f/k/a BlueStar Energy Services 309 Fellowship Road, Fl. 2 Mount Laurel, NJ 08054	(866) 258-3782 www.aepenergy.com	**R/C/I** **ACTIVE**
Agera Energy, LLC 115 route 46, Building F Parsippany, NJ 07054	(844) 692-4372 www.ageraenergy.com	R/C/I
Alpha Gas and Electric, LLC 641 5th Street Lakewood, NJ 08701	(855) 553-6374 www.alphagasandelectric.com	**R/C** **ACTIVE**
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**
American Power & Gas of NJ, LLC - 10000 Lincoln Drive East – Suite 201Marlton, NJ 08053	(800) 205-7491 www.GoAPG.com	**R/C/I**
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com	**C/I** **ACTIVE**
Amerigreen Energy, Inc. 333 Sylvan Avenue, Suite 305 Englewood Cliffs, NJ 07632	888-559-4567 www.amerigreen.com	**C/I** **ACTIVE**
AP Gas & Electric, (NJ) LLC 10 North Park Place, Suite 420 Morristown, NJ 07960	(855) 544-4895 www.apgellc.com	**R/C/I** **ACTIVE**
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	(888)850-1872 www.AstralEnergyLLC.com	**R/C/I** **ACTIVE**

Barclays Capital Services, Inc. 70 Hudson Street Jersey City, NJ 07302-4585	(800) 526-7000 www.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** **ACTIVE**
Berkshire Energy Partners, LLC 9 Berkshire Road Landenberg, PA 19350 Attn: Dana A. LeSage, P.E.	(610) 255-5070 www.berkshireenergypartners.com	**C/I** **ACTIVE**
Blue Pilot Energy, LLC 197 State Rte. 18 South Ste. 3000 East Brunswick, NJ 08816	(800) 451-6356 www.bluepilotenergy.com	**R/C** **ACTIVE**
Brick Standard, LLC 235 Hudson Street Suite 1 Hoboken, NJ 07030	(201)706-8101 www.standardalternative.com	**C/I** **ACTIVE**
CCES LLC dba Clean Currents Energy Services 566 Terhune Street Teaneck, NJ 07666	(877) 933-2453 www.cleancurrents.com	**R/C** **ACTIVE**
Champion Energy Services, LLC 1200 Route 22 Bridgewater, NJ 08807	(888) 653-0093 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. 1744 Lexington Avenue Pennsauken, NJ 08110	(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/C** **ACTIVE**
Community Energy Inc. 51 Sandbrook Headquarters Road Stockton, NJ 08559	(866)946-3123 www.communityenergyinc.com	**R/C/I** **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**
ConocoPhillips Company 224 Strawbridge Drive Suite 107 Moorestown, NJ 08057	(800) 646-4427 www.conocophillips.com	**C/I** **ACTIVE**
Constellation New Energy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 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**
Constellation Energy Services, Inc. **116 Village Boulevard** **Suite 200** **Princeton, NJ 08540**	1 (800) 536-0151 www.integrysenergy.com	**R/C/I**
Corporate Services Support Corp. **665 Howard Avenue** **Somerset, NJ 08873**	1(800) 761-4000 www.morganstanley.com	**C**
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(800) 325-2000 www.creditsuisse.com	**C** **ACTIVE**
Direct Energy Business, LLC 1 Hess Plaza Woodbridge	(888) 925-9115 http://www.business.directenergy.com/	**C/I** **ACTIVE**
Direct Energy Business Marketing, LLC (fka Hess Energy Marketing) 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 http://www.business.directenergy.com/	**C/I** **ACTIVE**
Direct Energy Small Business, LLC (fka Hess Small Business Services, LLC) One Hess Plaza Woodbridge, NJ 07095	(888) 925-9115 http://www.business.directenergy.com/small-business	**C/I** **ACTIVE**

Direct Energy Services, LLC **1 Hess Plaza** **Woodbridge, NJ 07095**	1 (866) 348-4193 www.directenergy.com	**C/I** **INACTIVE**
Discount Energy Group, LLC 811 Church Road, Suite 149 Cherry Hill, New Jersey 08002	(800) 282-3331 www.discountenergygroup.com	**R/C** **ACTIVE**
DTE Energy Supply, Inc. One Gateway Center, Suite 2600 Newark, NJ 07102	(877) 332-2450 www.dtesupply.com	**C/I** **ACTIVE**
EDF Energy Services, LLC 1 Meadowlands Plaza Suite 200, Office No. 246 East Rutherford, NJ 07073	1 (877) 432-4530 www.edfenergyservices.com	**C/I**
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**
EnerPenn d/b/a **YEP Energy** 89 Headquarters Plaza North #1463 Morristown, NJ 07960	(855) 363-7736 www.yepenergyNJ.com	**R/C/I** **ACTIVE**
Ethical Electric Benefit Co. d/b/a Ethical Electric/d/b/a Clean Energy Option 100 Overlook Center, 2nd Fl. Princeton, NJ 08540	(888) 444-9452 www.ethicalelectric.com	**R/C** **ACTIVE**
Energy Service Providers, Inc., d/b/a New Jersey Gas & Electric 1 Bridge Plaza fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.njgande.com	**R/C** **ACTIVE**
Everyday Energy, LLC **One International Blvd., Suite 400** **Mahwah, NJ 07495-0400**	844-684-5506 www.energyrewards.comcast.com	**R/I**

FirstEnergy Solutions 150 West State Street Trenton, NJ 08608	(888) 254-63590- www.fes.com	**C/I** **ACTIVE**
First Point Power, LLC 90 Washington Valley Road Bedminister, NJ 07921	(888) 875-1711 www.firstpointpower.com	**R/C/I**
Frontier Utilities Northeast, LLC 199 New Road, Suite 61-187 Linwood, NJ 08221	(877) 437-6930 www.frontierutilities.com	**R/C/I**
Gateway Energy Services Corporation **1 Hess Plaza** **Woodbridge, NJ 07095**	(800) 805-8586 www.gesc.com	**R/C** **ACTIVE**
GDF SUEZ Energy Resources NA, Inc. 333 Thornall Street Sixth Floor Edison, NJ 08837	(866) 999-8374 www.gdfsuezenergyresources.com	**C/I** **ACTIVE**
GDF Suez Retail Energy Solutions LLC d/b/a THINK ENERGY 333 Thornall St. Sixth Floor Edison, NJ 08819	1-866-252-0078 www.mythinkenergy.com	**R/C/I** **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	**R/C/I** **ACTIVE**
Greenlight Energy, Inc. **2608 25th Road** **Astoria, NY 11102**	(888) 453-4427 www.greenlightenergy.us	**R**
Green Mountain Energy Company 211 Carnegie Center Drive Princeton, NJ 08540	(866) 767-5818 www.greenmountain.com/commercial-home	**C/I** **ACTIVE**

Harborside Energy LLC 101 Hudson Street Suite 2100 Jersey City, NJ 07302	(877) 940-3835 www.harborsideenergynj.com	**R/C** **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/I** **ACTIVE**
Holcim (US) Inc. 595 Morgan Boulevard Camden, NJ 08104	(800) 831-9507 ext. 4354 www.holcim.us	**I**
Hudson Energy Services, LLC 7 Cedar Street Ramsey, New Jersey 07466	(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 211 Carnegie Center Princeton, NJ 08540	(877) 235-6708 www.chooseindependence.com	**R/C** **ACTIVE**
Inspire Energy Holdings LLC 923 Haddonfield Road 3rd Fl. Building B2 Cherry Hill, NJ 08002	(866) 403-2620 www.inspireenergy.com	**R/C/I**
Integrys Energy Services, Inc. 33 Wood Ave, South, Suite 610 Iselin, NJ 08830	(800) 536-0151 www.integrysenergy.com	**C/I** **ACTIVE**
Jsynergy, LLC 445 Central Ave. Suite 204 Cedarhurst, NY 11516	(516) 331-2020 Jsynergyllc.com	**R/C/I** **ACTIVE**
Kuehne Chemical Company, Inc. 86 North Hackensack Avenue South Kearney, NJ 07032	(973) 589-0700 kuehnechemical@comcast.net	**I**

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	**R/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**
MP2 Energy NJ, LLC 111 River Street, Suite 1204 Hoboken, NJ 07030	(877) 238-5343 www.mp2energy.com	**R/C/I** **ACTIVE**
Natures Current, LLC 95 Fairmount Avenue Philadelphia, Pennsylvania 19123	(215) 464-6000 www.naturescurrent.com	**R/C/I** **ACTIVE**
MPower Energy NJ LLC One University Plaza, Suite 507 Hackensack, NJ 07601	(877) 286-7693 www.mpowerenergy.com	**R/C/I** **ACTIVE**
NATGASCO, Inc. (Supreme Energy, Inc.) 532 Freeman St. Orange, NJ 07050	(800) 840-4427 www.supremeenergyinc.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**
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**
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**

Nordic Energy Services, LLC 50 Tice Boulevard, Suite 340 Woodcliff Lake, NJ 07677	(877) 808-1027 www.nordiceenergy.us.com	**R/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**
North Eastern States, Inc. d/b/a Entrust Energy 90 Washington Valley Road Bedminster, NJ 07921	(888) 521-5861 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 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**
Park Power, LLC 1200 South Church St. Suite 23 Mount Laurel, NJ 08054	(856) 778-0079 www.parkpower.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**
Power Management Co., LLC b/b/a PMC Lightsavers Limited Liability Company 1600 Moseley Road Victor, NY 14564	(585) 249-1360 www.powermanagementco.com	**C/I** **ACTIVE**
PPL Energy Plus, LLC Shrewsbury Executive Offices 788 Shrewsbury Ave., Suite 2178 Tinton Falls, NJ 07724	(800) 281-2000 www.pplenergyplus.com	**C** **/I** **ACTIVE**
Progressive Energy Consulting, LLC PO Box 4582 Wayne, New Jersey 07474	(917) 837-7400 Progressivenrg@optionline.net	**R/C/I** **ACTIVE**

Prospect Resources, Inc. 208 W. State Street Trenton, NJ 08608-1002	(847) 673-1959 www.prospectresources.com	**C** **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**
Reliant Energy 211 Carnegie Center Princeton, NJ 08540	(877) 297-3795 (877) 297-3780 www.reliant.com	**R/C/I** **ACTIVE**
ResCom Energy LLC 18C Wave Crest Ave. Winfield Park, NJ 07036	(888) 238-4041 http://rescom-energy.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	(888) 625-6760 www.majorenergy.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**
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**
SmartEnergy Holdings, LLC 100 Overlook Center 2nd Floor Princeton, NJ NJ 08540 United States of America	(800) 443-4440 www.smartenergy.com	**R/C/I** **ACTIVE**
South Jersey Energy Company 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 266-6020 www.southjerseyenergy.com	**R/C/I** **ACTIVE**
Spark Energy Gas, LP/ Spark Energy	(713)600-2600	**R/C/I**

2105 City West Blvd. Suite 100 Houston, TX 77042	www.sparkenergy.com	**ACTIVE**
Sperian Energy Corp. 1200 Route 22 East, Suite 2000 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**
Starion Energy PA Inc. 101 Warburton Avenue Hawthorne, NJ 07506	(800) 600-3040 www.starionenergy.com	**R/C/I** **ACTIVE**
Stream Energy New Jersey, LLC 309 Fellowship Rd., 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**
Talen Energy Marketing, LLC **788 Shrewsbury Avenue, Suite 2178 Tinton Falls, NJ 07724**	(888) 289-7693 www.pplenergyplus.com/*	**R/C**
Texas Retail Energy LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663 Attn: Chris Hendrix	(866) 532-0761 Texasretailenergy.com	**C/I** **ACTIVE**
TransCanada Power Marketing Ltd. 190 Middlesex Essex Turnpike, Suite 200 Iselin, NJ 08830	(877) MEGAWAT www.transcanada.com/powermarketing	**C/I** **ACTIVE**
TriEagle Energy, LP 90 Washington Valley Rd Bedminster, NJ 07921	(877) 933-2453 www.trieagleenergy.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**
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 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. 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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***CUSTOMER CLASS** - **R – RESIDENTIAL C – COMMERCIAL I - INDUSTRIAL**

Supplier	Telephone & Web Site	*Customer Class
Agera Energy, LLC **115 route 46, Building F** **Parsippany, NJ 07054**	**(844) 692-4372** **www.ageraenergy.com**	**R/C/I**
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**
American Power & Gas of NJ, LLC 10000 Lincoln Drive East – Suite 201 Marlton, NJ 08053	(800) 2057491 www.GoAPG.com	**R/C/I**
Amerigreen Energy, Inc. 333 Sylvan Avenue Suite 305 Englewood Cliffs, NJ 07632	(888)559-4567 www.amerigreen.com	**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**
Constellation Energy Services Natural Gas, LLC **116 Village Boulevard**	1 (800) 536-0151	**C/I**

Suite 200 **Princeton, NJ 08540**	www.integrysenergy.com	
Direct Energy Business, LLC 1 Hess Plaza Woodbridge, NJ 07095	888-925-9115 http://www.business.directenergy.com/	**C/I** **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 Small Business, LLC (fka Hess Small Business Services, LLC) One Hess Plaza Woodbridge, NJ 07095	(888) 925-9115 http://www.business.directenergy.com/small-business	**C/I** **ACTIVE**
Direct Energy Services, LLC **1 Hess Plaza** **Woodbridge, NJ 07095**	1 (866) 348-4193 www.directenergy.com	**C/I** **INACTIVE**
Dominion Retail, Inc. d/b/a Dominion Energy Solutions **395 Route #70 West, Suite 125 Lakewood, NJ 08701**	(866)237-4765 www.dominionenergy.com	**R/C**
Everyday Energy, LLC **One International Blvd., Suite 400** **Mahwah, NJ 07495-0400**	844-684-5506 www.energyrewards.comcast.com	**R/I**
Frontier Utilities Northeast, LLC 199 New Road, Suite 61-187 Linwood, NJ 08221	(877) 437-6930 www.frontierutilities.com	**R/C/I**
Glacial Energy of New Jersey, Inc. 21 Pine Street, Suite 237 Rockaway, NJ 07866	888-452-2425 www.glacialenergy.com	**C/I** **ACTIVE**
Gateway Energy Services Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 805-8586 www.gesc.com	**R/C** **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 2608 25th Road Astoria, NY 11102	(888) 453-4427 www.greenlightenergy.us	**R** **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 07466	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) 521-5861 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**
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**
Star Energy Partners, LLC **CEO Corporate Center** **1812 Front Street** **Scotch Plains, NJ 07076**	(855427-7827 www.starenergypartners.com	**R/C/I**
South Jersey Energy Company 1 South Jersey Plaza, Route 54	800-266-6020 www.southjerseyenergy.com	**R/C/I** **ACTIVE**

Folsom, NJ 08037		
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**
Talen Energy Marketing, LLC **788 Shrewsbury Avenue, Suite 2178** **Tinton Falls, NJ 07724**	(888) 289-7693 www.pplenergyplus.com/*	**R/C**
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 PO Box 777 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	800-457-1121 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

CHA Project # 30993
City of East Orange
Police Department

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size /Efficiency	Efficiency	Location	Areas/Equipment Served	Date Installed	Remaining Useful Life (years)	Other Info.	Current year	Years Old	ASHRAE life expectancy
Boiler	2	Weil-McClain	1488	110336	HHW Boiler	4474 MBH Energy Input and 3550 MBH Energy Output	79.3% Efficiency	Basement Boiler Room	the whole building	2006	15		**2016**	**10**	**25**
Chiller	2	Trane	RTAC 200A UkON UAFN L1NY 2DDC NNoF	U05H03665	Air Cooled Chillers	200ton cooling capacity		Roof	the whole building	2006	15		**2016**	**10**	**25**
HHW Pump Motor	2	U S Electrical Motors	R341	D7P2B	HHW Circulation Pump	7.5HP	91% Eff.	Basement Boiler Room	the whole building	2006	10	Faded Name Tag	**2016**	**10**	**20**
CHW Pump Motor	2	A O Smith	7-B5	N/A	CHW Circulation Pump	5HP	85.50%	Basement Boiler Room	the whole building	2006	10	Faded Name Tag	**2016**	**10**	**20**
DHW Heater	1	RBI	DW0750NO2AOGA	N/A	DHW Heater	750MBH Input and 600MBH output	80% Efficiency	Basement Boiler Room	the whole building	2006	10		**2016**	10	20
Roof Top Unit	2	Trane	TSCB050	B6V495A	Roof top units	chilled water coils and hot water coils for heating, 15HP supply fan motors	N/A	Roof	2nd 3rd and 4th floor	2006	10		**2016**	10	20
Air Handling Unit	2	Trane	TSCB050	N/A	AHUs	chilled water coils and hot water coils for heating, 15HP supply fan motors	N/A	Basement Boiler Room	Basement and 1st floor	2006	10		**2016**	10	20
Make-up Air Unit	1	Trane	N/A	N/A	MAU	provide fresh air for 2nd floor ventilation	N/A	Basement Boiler Room	2nd floor	2006	10		2016	10	20
Split AC	1	Mitsubishi	MXZ-3A30NA	3002111	Split AC	3.05 ton	EER of 11.2	Office	Office	2006	10		2016	10	20

Energy Audit of City of East Orange
CHA Project No. 30993
Existing Lighting & Audit Input

Cost of Electricity: **$0.120** **$/kWh**
$8.00 **$/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
231LED	Outdoor	Outdoor Lighting	7	WP400MH1	MH400/1	458	3.21	SW	4368	14,004	NONE	
261	Outdoor	Outdoor Lighting	5	PAR 38 SP	H100/1	100	0.50	SW	4368	2,184	NONE	
25	Main Entrance	Hallways	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.17	SW	8736	1,468	C-OCC	
25	Main Entrance	Hallways	14	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.39	SW	8736	3,425	C-OCC	
25	Main Entrance	Hallways	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.08	SW	8736	734	C-OCC	
25	Main Entrance	Hallways	2	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.06	SW	8736	489	C-OCC	
25	Main Entrance	Hallways	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.08	SW	8736	734	C-OCC	
35LED	Report room	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
25	Office	Offices	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.08	SW	7280	612	C-OCC	
35LED	Office	Offices	17	T 32 R F 3 (ELE)	F43ILL/2	90	1.53	SW	7280	11,138	C-OCC	
5LED	Office	Offices	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.48	SW	7280	3,494	C-OCC	
35LED	Office	Offices	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.08	SW	7280	7,862	C-OCC	
35LED	Office	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	Office	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	
35LED	Women	Restroom	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	5824	1,572	C-OCC	
35LED	Men	Restroom	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	5824	1,572	C-OCC	
35LED	Closet	Storage Areas	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	5824	524	C-OCC	
35LED	115	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
5LED	Janitor	Storage Areas	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	5824	1,048	C-OCC	
35LED	Office	Offices	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	7280	1,966	C-OCC	
5LED	Office	Offices	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.30	SW	7280	2,184	C-OCC	
35LED	Office	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	
25	Hallway	Hallways	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.08	SW	8736	734	C-OCC	
32LED	116	Offices	2	1T 32 R F 2 (ELE)	F42LL	60	0.12	SW	7280	874	C-OCC	
32LED	114	Offices	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	7280	437	C-OCC	
34LED	Hallway	Hallways	6	1T 32 C F 2 (ELE)	F42ILL	59	0.35	SW	8736	3,093	C-OCC	
5LED	Hallway	Hallways	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.48	SW	8736	4,193	C-OCC	
25	Hallway	Hallways	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.14	SW	8736	1,223	C-OCC	
25	125	Offices	4	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.11	SW	7280	815	C-OCC	
25	Office	Offices	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.14	SW	7280	1,019	C-OCC	
5LED	Office	Offices	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	7280	874	C-OCC	
71LED	Office	Offices	3	I 60	I60/1	60	0.18	SW	7280	1,310	C-OCC	R22 is inaccessible
25	Office	Offices	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.17	SW	7280	1,223	C-OCC	
25	Office	Offices	4	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.11	SW	7280	815	C-OCC	
25	Office	Offices	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.17	SW	7280	1,223	C-OCC	Light facing up and invisible
261	Office	Offices	2	PAR 38 SP	H100/1	100	0.20	SW	7280	1,456	C-OCC	
35LED	Office	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	Office	Offices	8	T 32 R F 3 (ELE)	F43ILL/2	90	0.72	SW	7280	5,242	C-OCC	
35LED	Office	Offices	14	T 32 R F 3 (ELE)	F43ILL/2	90	1.26	SW	7280	9,173	C-OCC	
35LED	Office	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	7280	2,621	C-OCC	
35LED	Office	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
5LED	Basement Stair	Hallways	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	8736	524	C-OCC	
32LED	Women	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	
32LED	Women	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	
32LED	Women	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	
32LED	Women	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	
32LED	Men	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	
32LED	Men	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	
32LED	Men	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	facing up
32LED	Men	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	
35LED	Hallway	Hallways	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	8736	786	C-OCC	
71LED	Janitor	Storage Areas	1	I 60	I60/1	60	0.06	SW	5824	349	C-OCC	
35LED	Office	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
32LED	Boiler Room	Mechanical Room	25	1T 32 R F 2 (ELE)	F42LL	60	1.50	SW	8736	13,104	NONE	
32LED	35	Offices	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	7280	437	C-OCC	
35LED	33	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
25	Hallway	Hallways	20	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.56	SW	8736	4,892	C-OCC	
32LED	Office	Offices	2	1T 32 R F 2 (ELE)	F42LL	60	0.12	SW	7280	874	C-OCC	
32LED	Office	Offices	2	1T 32 R F 2 (ELE)	F42LL	60	0.12	SW	7280	874	C-OCC	
35LED	Interview Room	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	Interview Room	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
32LED	Female Cell	Detain Cell	6	1T 32 R F 2 (ELE)	F42LL	60	0.36	SW	5824	2,097	NONE	
5LED	Hallway	Hallways	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.30	SW	8736	2,621	C-OCC	
32LED	Men	Restroom	1	1T 32 R F 2 (ELE)	F42LL	60	0.06	SW	5824	349	C-OCC	
35LED	49	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	Process	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	7280	2,621	C-OCC	
25	Process	Offices	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.08	SW	7280	612	C-OCC	
35LED	Shower	Restroom	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	5824	1,048	C-OCC	
32LED	Cell	Detain Cell	2	1T 32 R F 2 (ELE)	F42LL	60	0.12	SW	5824	699	NONE	
35LED	Office	Offices	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	7280	1,966	C-OCC	
35LED	Office	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
25	Elevator	Hallways	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.17	SW	8736	1,468	C-OCC	
35LED	2nd floor 223	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	
35LED	206	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	
35LED	207	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	

Energy Audit of City of East Orange
CHA Project No. 30993
Existing Lighting & Audit Input

Cost of Electricity: **$0.120** **$/kWh**
$8.00 **$/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	Mens Locker	Restroom	57	T 32 R F 3 (ELE)	F43ILL/2	90	5.13	SW	5824	29,877	C-OCC	
196LED	Mens Locker	Restroom	2	W 32 C F 4 (ELE)	F44ILL	112	0.22	SW	5824	1,305	C-OCC	
196LED	218	Offices	14	W 32 C F 4 (ELE)	F44ILL	112	1.57	SW	7280	11,415	C-OCC	
35LED	restroom	Restroom	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	5824	524	C-OCC	
5LED	restroom	Restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	5824	349	C-OCC	
35LED	214	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
196LED	214	Offices	1	W 32 C F 4 (ELE)	F44ILL	112	0.11	SW	7280	815	C-OCC	
25	216	Offices	8	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.22	SW	7280	1,631	C-OCC	
25	216	Offices	16	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.45	SW	7280	3,261	C-OCC	
35LED	215	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	
25	217	Offices	15	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.42	SW	7280	3,058	C-OCC	
25	217	Offices	18	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.50	SW	7280	3,669	C-OCC	
25	217	Offices	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.08	SW	7280	612	C-OCC	
5LED	Hallway	Hallways	9	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.54	SW	8736	4,717	C-OCC	
5LED	220	Storage Areas	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	5824	349	C-OCC	
5LED	Men	Restroom	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	5824	1,048	C-OCC	
20LED	Men	Restroom	1	S 28 P F 1 (ELE)	F41ILL	31	0.03	SW	5824	181	C-OCC	
20LED	Women	Restroom	1	S 28 P F 1 (ELE)	F41ILL	31	0.03	SW	5824	181	C-OCC	
5LED	Women	Restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	5824	349	C-OCC	
35LED	207	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	7280	2,621	C-OCC	
5LED	207	Offices	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	7280	874	C-OCC	
35LED	201	Offices	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.08	SW	7280	7,862	C-OCC	
5LED	201	Offices	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.30	SW	7280	2,184	C-OCC	
35LED	203	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
5LED	203	Offices	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.24	SW	7280	1,747	C-OCC	
5LED	restroom	Restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	5824	349	C-OCC	
35LED	202	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	3rd Floor 307	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	
5LED	Hallway	Hallways	18	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.08	SW	8736	9,435	C-OCC	
35LED	306	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	
35LED	302	Offices	7	T 32 R F 3 (ELE)	F43ILL/2	90	0.63	SW	7280	4,586	C-OCC	
5LED	302	Offices	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.36	SW	7280	2,621	C-OCC	
35LED	304	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
5LED	304	Offices	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	7280	437	C-OCC	
35LED	307	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
35LED	305	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	7280	2,621	C-OCC	
35LED	317	Offices	25	T 32 R F 3 (ELE)	F43ILL/2	90	2.25	SW	7280	16,380	C-OCC	
35LED	322	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	301	Offices	9	T 32 R F 3 (ELE)	F43ILL/2	90	0.81	SW	7280	5,897	C-OCC	
35LED	301	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	301	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
5LED	301	Offices	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	7280	437	C-OCC	
35LED	321	Offices	8	T 32 R F 3 (ELE)	F43ILL/2	90	0.72	SW	7280	5,242	C-OCC	
35LED	319	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	7280	2,621	C-OCC	
35LED	318	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
5LED	Hallway	Hallways	9	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.54	SW	8736	4,717	C-OCC	
5LED	Men	Restroom	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	5824	1,048	C-OCC	
20LED	Men	Restroom	1	S 28 P F 1 (ELE)	F41ILL	31	0.03	SW	5824	181	C-OCC	
20LED	Women	Restroom	1	S 28 P F 1 (ELE)	F41ILL	31	0.03	SW	5824	181	C-OCC	
5LED	Women	Restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	5824	349	C-OCC	
5LED	307	Offices	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	7280	437	C-OCC	
35LED	4th Floor 421	Offices	9	T 32 R F 3 (ELE)	F43ILL/2	90	0.81	SW	7280	5,897	C-OCC	203B Not Accessible
35LED	420	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
35LED	418	Offices	8	T 32 R F 3 (ELE)	F43ILL/2	90	0.72	SW	7280	5,242	C-OCC	
5LED	418	Offices	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	7280	437	C-OCC	
35LED	419	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	7280	2,621	C-OCC	
35LED	416	Offices	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.36	SW	7280	2,621	C-OCC	
35LED	Gym	Offices	9	T 32 R F 3 (ELE)	F43ILL/2	90	0.81	SW	7280	5,897	C-OCC	213 not accessible
5LED	Gum	Offices	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	7280	437	C-OCC	
5LED	Men	Restroom	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	5824	1,048	C-OCC	
20LED	Men	Restroom	1	S 28 P F 1 (ELE)	F41ILL	31	0.03	SW	5824	181	C-OCC	
20LED	Women	Restroom	1	S 28 P F 1 (ELE)	F41ILL	31	0.03	SW	5824	181	C-OCC	
5LED	Women	Restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	5824	349	C-OCC	
35LED	408	Offices	9	T 32 R F 3 (ELE)	F43ILL/2	90	0.81	SW	7280	5,897	C-OCC	
5LED	restroom	Restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	5824	349	C-OCC	
35LED	404	Offices	17	T 32 R F 3 (ELE)	F43ILL/2	90	1.53	SW	7280	11,138	C-OCC	
5LED	404	Offices	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.18	SW	7280	1,310	C-OCC	
35LED	432	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	405	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
5LED	restroom	Restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.06	SW	5824	349	C-OCC	
35LED	403	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
5LED	403	Offices	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.24	SW	7280	1,747	C-OCC	
35LED	403	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	403	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
25	403	Offices	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.14	SW	7280	1,019	C-OCC	

Energy Audit of City of East Orange
CHA Project No. 30993
Existing Lighting & Audit Input

Cost of Electricity: **$0.120** **$/kWh**
$8.00 **$/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	401	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
5LED	Hallway	Hallways	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.12	SW	8736	1,048	C-OCC	
35LED	420	Offices	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.54	SW	7280	3,931	C-OCC	
5LED	420	Offices	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.30	SW	7280	2,184	C-OCC	
35LED	422	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	424	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
35LED	423	Offices	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.18	SW	7280	1,310	C-OCC	
5LED	Hallway	Offices	9	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.54	SW	7280	3,931	C-OCC	
35LED	409	Offices	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.09	SW	7280	655	C-OCC	
231LED	Outdoor	Outdoor Lighting	2	WP400MH1	MH400/1	458	0.92	SW	4368	4,001	NONE	
231LED	Outdoor	Outdoor Lighting	11	WP400MH1	MH400/1	458	5.04	SW	4368	22,006	NONE	
	Total		**771**				**61.34**			**415,615**		

APPENDIX C

ECM Calculations

Energy Audit of City of East Orange
CHA Project No. 30993
ECM-L3 Lighting Replacements with Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
231LED	Outdoor	7	WP400MH1	MH400/1	458	3.2	SW	4368	14,004	7	WPLED2T78	WPLED2T78	91	0.6	NONE	4,368	2,782	11,221	2.6	$ 1,593.19	$ 7,169.34	$ 700	4.5	4.1
261	Outdoor	5	PAR 38 SP	H100/1	100	0.5	SW	4368	2,184	5	PAR 38 SP	H100/1	100	0.5	NONE	4,368	2,184	-	0.0	$ -	$ -	$ -		
25	Main Entrance	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	SW	8736	1,468	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	C-OCC	8,736	1,468	-	0.0	$ -	$ 135.00	$ 20		
25	Main Entrance	14	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.4	SW	8736	3,425	14	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.4	C-OCC	8,736	3,425	-	0.0	$ -	$ 135.00	$ 20		
25	Main Entrance	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	8736	734	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	8,736	734	-	0.0	$ -	$ 135.00	$ 20		
25	Main Entrance	2	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	8736	489	2	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	8,736	489	-	0.0	$ -	$ 135.00	$ 20		
25	Main Entrance	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	8736	734	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	8,736	734	-	0.0	$ -	$ 135.00	$ 20		
35LED	Report room	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
25	Office	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	7280	612	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	5,096	428	183	0.0	$ 22.01	$ 135.00	$ 20	6.1	5.2
35LED	Office	17	T 32 R F 3 (ELE)	F43ILL/2	90	1.5	SW	7280	11,138	17	T 59 R LED	RTLED38	38	0.6	C-OCC	5,096	3,292	7,846	0.9	$ 1,026.43	$ 4,151.25	$ 445	4.0	3.6
5LED	Office	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	7280	3,494	8	2T 25 R LED	2RTLED	25	0.2	C-OCC	5,096	1,019	2,475	0.3	$ 323.90	$ 1,755.00	$ 140	5.4	5.0
35LED	Office	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.1	SW	7280	7,862	12	T 59 R LED	RTLED38	38	0.5	C-OCC	5,096	2,324	5,539	0.6	$ 724.54	$ 2,970.00	$ 320	4.1	3.7
35LED	Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	Office	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
35LED	Women	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	5824	1,572	3	T 59 R LED	RTLED38	38	0.1	C-OCC	4,077	465	1,108	0.2	$ 147.90	$ 843.75	$ 95	5.7	5.1
35LED	Men	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	5824	1,572	3	T 59 R LED	RTLED38	38	0.1	C-OCC	4,077	465	1,108	0.2	$ 147.90	$ 843.75	$ 95	5.7	5.1
35LED	Closet	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	5824	524	1	T 59 R LED	RTLED38	38	0.0	C-OCC	4,077	155	369	0.1	$ 49.30	$ 371.25	$ 45	7.5	6.6
35LED	115	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
5LED	Janitor	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	5824	1,048	3	2T 25 R LED	2RTLED	25	0.1	C-OCC	4,077	306	743	0.1	$ 99.19	$ 742.50	$ 65	7.5	6.8
35LED	Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	7280	1,966	3	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	581	1,385	0.2	$ 181.13	$ 843.75	$ 95	4.7	4.1
5LED	Office	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	7280	2,184	5	2T 25 R LED	2RTLED	25	0.1	C-OCC	5,096	637	1,547	0.2	$ 202.44	$ 1,147.50	$ 95	5.7	5.2
35LED	Office	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
25	Hallway	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	8736	734	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	8,736	734	-	0.0	$ -	$ 135.00	$ 20		
32LED	116	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	7280	874	2	STLED4	STLED4	40	0.1	C-OCC	5,096	408	466	0.0	$ 59.75	$ 848.40	$ 50	14.2	13.4
32LED	114	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	7280	437	1	STLED4	STLED4	40	0.0	C-OCC	5,096	204	233	0.0	$ 29.88	$ 491.70	$ 35	16.5	15.3
34LED	Hallway	6	1T 32 C F 2 (ELE)	F42ILL	59	0.4	SW	8736	3,093	6	4 ft LED Tube	200732x2	30	0.2	C-OCC	8,736	1,572	1,520	0.2	$ 199.11	$ 1,537.20	$ 230	7.7	6.6
5LED	Hallway	8	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	8736	4,193	8	2T 25 R LED	2RTLED	25	0.2	C-OCC	8,736	1,747	2,446	0.3	$ 320.41	$ 1,755.00	$ 140	5.5	5.0
25	Hallway	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	8736	1,223	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	8,736	1,223	-	0.0	$ -	$ 135.00	$ 20		
25	125	4	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	7280	815	4	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	5,096	571	245	0.0	$ 29.35	$ 135.00	$ 20	4.6	3.9
25	Office	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	7280	1,019	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	5,096	713	306	0.0	$ 36.69	$ 135.00	$ 20	3.7	3.1
5LED	Office	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	7280	874	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	5,096	255	619	0.1	$ 80.98	$ 540.00	$ 50	6.7	6.1
71LED	Office	3	I 60	I60/1	60	0.2	SW	7280	1,310	3	LED15W	LED15W	15	0.0	C-OCC	5,096	229	1,081	0.1	$ 142.69	$ 155.25	$ 20	1.1	0.9
25	Office	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	SW	7280	1,223	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	C-OCC	5,096	856	367	0.0	$ 44.03	$ 135.00	$ 20	3.1	2.6
25	Office	4	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	7280	815	4	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	5,096	571	245	0.0	$ 29.35	$ 135.00	$ 20	4.6	3.9
25	Office	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	SW	7280	1,223	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	C-OCC	5,096	856	367	0.0	$ 44.03	$ 135.00	$ 20	3.1	2.6
261	Office	2	PAR 38 SP	H100/1	100	0.2	SW	7280	1,456	2	PAR 38 SP	H100/1	100	0.2	C-OCC	5,096	1,019	437	0.0	$ 52.42	$ 135.00	$ 20	2.6	2.2
35LED	Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	Office	8	T 32 R F 3 (ELE)	F43ILL/2	90	0.7	SW	7280	5,242	8	T 59 R LED	RTLED38	38	0.3	C-OCC	5,096	1,549	3,692	0.4	$ 483.03	$ 2,025.00	$ 220	4.2	3.7
35LED	Office	14	T 32 R F 3 (ELE)	F43ILL/2	90	1.3	SW	7280	9,173	14	T 59 R LED	RTLED38	38	0.5	C-OCC	5,096	2,711	6,462	0.7	$ 845.30	$ 3,442.50	$ 370	4.1	3.6
35LED	Office	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	7280	2,621	4	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	775	1,846	0.2	$ 241.51	$ 1,080.00	$ 120	4.5	4.0
35LED	Office	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
5LED	Basement Stair	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	8736	524	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	8,736	218	306	0.0	$ 40.05	$ 337.50	$ 35	8.4	7.6
32LED	Women	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
32LED	Women	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
32LED	Women	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
32LED	Women	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
32LED	Men	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
32LED	Men	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
32LED	Men	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
32LED	Men	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
35LED	Hallway	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	8736	786	1	T 59 R LED	RTLED38	38	0.0	C-OCC	8,736	332	454	0.1	$ 59.50	$ 371.25	$ 45	6.2	5.5
71LED	Janitor	1	I 60	I60/1	60	0.1	SW	5824	349	1	LED15W	LED15W	15	0.0	C-OCC	4,077	61	288	0.0	$ 38.91	$ 141.75	$ 20	3.6	3.1
35LED	Office	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
32LED	Boiler Room	25	1T 32 R F 2 (ELE)	F42LL	60	1.5	SW	8736	13,104	25	STLED4	STLED4	40	1.0	NONE	8,736	8,736	4,368	0.5	$ 572.16	$ 8,917.50	$ 375	15.6	14.9
32LED	35	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	7280	437	1	STLED4	STLED4	40	0.0	C-OCC	5,096	204	233	0.0	$ 29.88	$ 491.70	$ 35	16.5	15.3
35LED	33	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
25	Hallway	20	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.6	SW	8736	4,892	20	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.6	C-OCC	8,736	4,892	-	0.0	$ -	$ 135.00	$ 20		
32LED	Office	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	7280	874	2	STLED4	STLED4	40	0.1	C-OCC	5,096	408	466	0.0	$ 59.75	$ 848.40	$ 50	14.2	13.4
32LED	Office	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	7280	874	2	STLED4	STLED4	40	0.1	C-OCC	5,096	408	466	0.0	$ 59.75	$ 848.40	$ 50	14.2	13.4
35LED	Interview Room	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	Interview Room	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
32LED	Female Cel	6	1T 32 R F 2 (ELE)	F42LL	60	0.4	SW	5824	2,097	6	STLED4	STLED4	40	0.2	NONE	5,824	1,398	699	0.1	$ 95.39	$ 2,140.20	$ 90	22.4	21.5
5LED	Hallway	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	8736	2,621	5	2T 25 R LED	2RTLED	25	0.1	C-OCC	8,736	1,092	1,529	0.2	$ 200.26	$ 1,147.50	$ 95	5.7	5.3
32LED	Men	1	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	349	1	STLED4	STLED4	40	0.0	C-OCC	4,077	163	186	0.0	$ 24.28	$ 491.70	$ 35	20.2	18.8
35LED	49	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	Process	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	7280	2,621	4	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	775	1,846	0.2	$ 241.51	$ 1,080.00	$ 120	4.5	4.0
25	Process	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	7280	612	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	5,096	428	183	0.0	$ 22.01	$ 135.00	$ 20	6.1	5.2
35LED	Shower	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	5824	1,048	2	T 59 R LED	RTLED38	38	0.1	C-OCC	4,077	310	738	0.1	$ 98.60	$ 607.50	$ 70	6.2	5.5
32LED	Cell	2	1T 32 R F 2 (ELE)	F42LL	60	0.1	SW	5824	699	2	STLED4	STLED4	40	0.1	NONE	5,824	466	233	0.0	$ 31.80	$ 713.40	$ 30	22.4	21.5
35LED	Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	7280	1,966	3	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	581	1,385	0.2	$ 181.13	$ 843.75	$ 95	4.7	4.1
35LED	Office	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
25	Elevator	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	SW	8736	1,468	6	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	C-OCC	8,736	1,468	-	0.0	$ -	$ 135.00	$ 20		
35LED	2nd floor 223	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
35LED	206	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
35LED	207	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
35LED	Mens Locker	57	T 32 R F 3 (ELE)	F43ILL/2	90	5.1	SW	5824	29,877	57	T 59 R LED	RTLED38	38	2.2	C-OCC	4,077	8,830	21,047	3.0	$ 2,810.16	$ 13,601.25	$ 1,445	4.8	4.3
196LED	Mens Locker	2	W 32 C F 4 (ELE)	F44ILL	112	0.2	SW	5824	1,305	2	T 50 R LED	RTLED50	50	0.1	C-OCC	4,077	408	897	0.1	$ 119.53	$ 607.50	$ 120	5.1	4.1
196LED	218	14	W 32 C F 4 (ELE)	F44ILL	112	1.6	SW	7280	11,415	14	T 50 R LED	RTLED50	50	0.7	C-OCC	5,096	3,567	7,848	0.9	$ 1,025.07	$ 3,442.50	$ 720	3.4	2.7
35LED	restroom	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	5824	524	1	T 59 R LED	RTLED38	38	0.0	C-OCC	4,077	155	369	0.1	$ 49.30	$ 371.25	$ 45	7.5	6.6
5LED	restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	5824	349	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	4,077	102	248	0.0	$ 33.06	$ 337.50	$ 35	10.2	9.1
35LED	214	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
196LED	214	1	W 32 C F 4 (ELE)	F44ILL	112	0.1	SW	7280	815	1	T 50 R LED	RTLED50	50	0.1	C-OCC	5,096	255	561	0.1	$ 73.22	$ 371.25	$ 70	5.1	4.1
25	216	8	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	SW	7280	1,631	8	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.2	C-OCC	5,096	1,142	489	0.0	$ 58.71	$ 135.00	$ 20	2.3	2.0
25	216	16	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.4	SW	7280	3,261	16	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.4	C-OCC	5,096	2,283	978	0.0	$ 117.41	$ 135.00	$ 20	1.1	1.0
35LED	215	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
25	217	15	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.4	SW	7280	3,058	15	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.4	C-OCC	5,096	2,140	917	0.0	$ 110.07	$ 135.00	$ 20	1.2	1.0
25	217	18	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.5	SW	7280	3,669	18	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.5	C-OCC	5,096	2,568	1,101	0.0	$ 132.09	$ 135.00	$ 20	1.0	0.9
25	217	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	7280	612	3	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	5,096	428	183	0.0	$ 22.01	$ 135.00	$ 20	6.1	5.2
5LED	Hallway	9	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	8736	4,717	9	2T 25 R LED	2RTLED	25	0.2	C-OCC	8,736	1,966	2,752	0.3	$ 360.46	$ 1,957.50	$ 155	5.4	5.0
5LED	220	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	5824	349	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	4,077	102	248	0.0	$ 33.06	$ 337.50	$ 35	10.2	9.1
5LED	Men	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	5824	1,048	3	2T 25 R LED	2RTLED	25	0.1	C-OCC	4,077	306	743	0.1	$ 99.19	$ 742.50	$ 65	7.5	6.8
20LED	Men	1	S 28 P F 1 (ELE)	F41ILL	31	0.0	SW	5824	181	1	4 ft LED Tube	200732x1	15	0.0	C-OCC	4,077	61	119	0.0	$ 15.86	$ 280.20	$ 35	17.7	15.5
20LED	Women	1	S 28 P F 1 (ELE)	F41ILL	31	0.0	SW	5824	181	1	4 ft LED Tube	200732x1	15	0.0	C-OCC	4,077	61	119	0.0	$ 15.86	$ 280.20	$ 35	17.7	15.5
5LED	Women	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	5824	349	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	4,077	102	248	0.0	$ 33.06	$ 337.50	$ 35	10.2	9.1
35LED	207	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	7280	2,621	4	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	775	1,846	0.2	$ 241.51	$ 1,080.00	$ 120	4.5	4.0
5LED	207	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	7280	874	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	5,096	255	619	0.1	$ 80.98	$ 540.00	$ 50	6.7	6.1
35LED	201	12	T 32 R F 3 (ELE)	F43ILL/2	90	1.1	SW	7280	7,862	12	T 59 R LED	RTLED38	38	0.5	C-OCC	5,096	2,324	5,539	0.6	$ 724.54	$ 2,970.00	$ 320	4.1	3.7
5LED	201	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	7280	2,184	5	2T 25 R LED	2RTLED	25	0.1	C-OCC	5,096	637	1,547	0.2	$ 202.44	$ 1,147.50	$ 95	5.7	5.2
35LED	203	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
5LED	203	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	7280	1,747	4	2T 25 R LED	2RTLED	25	0.1	C-OCC	5,096	510	1,238	0.1	$ 161.95	$ 945.00	$ 80	5.8	5.3
5LED	restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	5824	349	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	4,077	102	248	0.0	$ 33.06	$ 337.50	$ 35	10.2	9.1
35LED	202	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	3rd Floor 307	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
5LED	Hallway	18	2T 32 R F 2 (u) (ELE)	FU2LL	60	1.1	SW	8736	9,435	18	2T 25 R LED	2RTLED	25	0.5	C-OCC	8,736	3,931	5,504	0.6	$ 720.92	$ 3,780.00	$ 290	5.2	4.8
35LED	306	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
35LED	302	7	T 32 R F 3 (ELE)	F43ILL/2	90	0.6	SW	7280	4,586	7	T 59 R LED	RTLED38	38	0.3	C-OCC	5,096	1,356	3,231	0.4	$ 422.65	$ 1,788.75	$ 195	4.2	3.8
5LED	302	6	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.4	SW	7280	2,621	6	2T 25 R LED	2RTLED	25	0.2	C-OCC	5,096	764	1,856	0.2	$ 242.93	$ 1,350.00	$ 110	5.6	5.1
35LED	304	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
5LED	304	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	7280	437	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	5,096	127	309	0.0	$ 40.49	$ 337.50	$ 35	8.3	7.5
35LED	307	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
35LED	305	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	7280	2,621	4	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	775	1,846	0.2	$ 241.51	$ 1,080.00	$ 120	4.5	4.0
35LED	317	25	T 32 R F 3 (ELE)	F43ILL/2	90	2.3	SW	7280	16,380	25	T 59 R LED	RTLED38	38	1.0	C-OCC	5,096	4,841	11,539	1.3	$ 1,509.46	$ 6,041.25	$ 645	4.0	3.6
35LED	322	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	301	9	T 32 R F 3 (ELE)	F43ILL/2	90	0.8	SW	7280	5,897	9	T 59 R LED	RTLED38	38	0.3	C-OCC	5,096	1,743	4,154	0.5	$ 543.40	$ 2,261.25	$ 245	4.2	3.7
35LED	301	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	301	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
5LED	301	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	7280	437	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	5,096	127	309	0.0	$ 40.49	$ 337.50	$ 35	8.3	7.5
35LED	321	8	T 32 R F 3 (ELE)	F43ILL/2	90	0.7	SW	7280	5,242	8	T 59 R LED	RTLED38	38	0.3	C-OCC	5,096	1,549	3,692	0.4	$ 483.03	$ 2,025.00	$ 220	4.2	3.7
35LED	319	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	7280	2,621	4	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	775	1,846	0.2	$ 241.51	$ 1,080.00	$ 120	4.5	4.0
35LED	318	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
5LED	Hallway	9	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	8736	4,717	9	2T 25 R LED	2RTLED	25	0.2	C-OCC	8,736	1,966	2,752	0.3	$ 360.46	$ 1,957.50	$ 155	5.4	5.0
5LED	Men	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	5824	1,048	3	2T 25 R LED	2RTLED	25	0.1	C-OCC	4,077	306	743	0.1	$ 99.19	$ 742.50	$ 65	7.5	6.8

Energy Audit of City of East Orange
CHA Project No. 30993
ECM-L3 Lighting Replacements with Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Smart Start Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	**Unique description of the location - Room number/Room name: Floor number (if applicable)**	**No. of fixtures before the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Fixt No.)**	**Pre-inst. control device**	**Estimated daily hours for the usage group**	**(kW/space) * (Annual Hours)**	**No. of fixtures after the retrofit**	**Lighting Fixture Code**	**Code from Table of Standard Fixture Wattages**	**Value from Table of Standard Fixture Wattages**	**(Watts/Fixt) * (Number of Fixtures)**	**Retrofit control device**	**Estimated annual hours for the usage group**	**(kW/space) * (Annual Hours)**	**(Original Annual kWh) - (Retrofit Annual kWh)**	**(Original Annual kW) - (Retrofit Annual kW)**	**(kWh Saved) * ($/kWh)**	**Cost for renovations to lighting system**	**Prescriptive Lighting Measures**	**Length of time for renovations cost to be recovered**	**Length of time for renovations cost to be recovered**
20LED	Men	1	S 28 P F 1 (ELE)	F41ILL	31	0.0	SW	5824	181	1	4 ft LED Tube	200732x1	15	0.0	C-OCC	4,077	61	119	0.0	$ 15.86	$ 280.20	$ 35	17.7	15.5
20LED	Women	1	S 28 P F 1 (ELE)	F41ILL	31	0.0	SW	5824	181	1	4 ft LED Tube	200732x1	15	0.0	C-OCC	4,077	61	119	0.0	$ 15.86	$ 280.20	$ 35	17.7	15.5
5LED	Women	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	5824	349	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	4,077	102	248	0.0	$ 33.06	$ 337.50	$ 35	10.2	9.1
5LED	307	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	7280	437	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	5,096	127	309	0.0	$ 40.49	$ 337.50	$ 35	8.3	7.5
35LED	4th Floor 421	9	T 32 R F 3 (ELE)	F43ILL/2	90	0.8	SW	7280	5,897	9	T 59 R LED	RTLED38	38	0.3	C-OCC	5,096	1,743	4,154	0.5	$ 543.40	$ 2,261.25	$ 245	4.2	3.7
35LED	420	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
35LED	418	8	T 32 R F 3 (ELE)	F43ILL/2	90	0.7	SW	7280	5,242	8	T 59 R LED	RTLED38	38	0.3	C-OCC	5,096	1,549	3,692	0.4	$ 483.03	$ 2,025.00	$ 220	4.2	3.7
5LED	418	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	7280	437	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	5,096	127	309	0.0	$ 40.49	$ 337.50	$ 35	8.3	7.5
35LED	419	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	7280	2,621	4	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	775	1,846	0.2	$ 241.51	$ 1,080.00	$ 120	4.5	4.0
35LED	416	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	7280	2,621	4	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	775	1,846	0.2	$ 241.51	$ 1,080.00	$ 120	4.5	4.0
35LED	Gym	9	T 32 R F 3 (ELE)	F43ILL/2	90	0.8	SW	7280	5,897	9	T 59 R LED	RTLED38	38	0.3	C-OCC	5,096	1,743	4,154	0.5	$ 543.40	$ 2,261.25	$ 245	4.2	3.7
5LED	Gum	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	7280	437	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	5,096	127	309	0.0	$ 40.49	$ 337.50	$ 35	8.3	7.5
5LED	Men	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	5824	1,048	3	2T 25 R LED	2RTLED	25	0.1	C-OCC	4,077	306	743	0.1	$ 99.19	$ 742.50	$ 65	7.5	6.8
20LED	Men	1	S 28 P F 1 (ELE)	F41ILL	31	0.0	SW	5824	181	1	4 ft LED Tube	200732x1	15	0.0	C-OCC	4,077	61	119	0.0	$ 15.86	$ 280.20	$ 35	17.7	15.5
20LED	Women	1	S 28 P F 1 (ELE)	F41ILL	31	0.0	SW	5824	181	1	4 ft LED Tube	200732x1	15	0.0	C-OCC	4,077	61	119	0.0	$ 15.86	$ 280.20	$ 35	17.7	15.5
5LED	Women	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	5824	349	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	4,077	102	248	0.0	$ 33.06	$ 337.50	$ 35	10.2	9.1
35LED	408	9	T 32 R F 3 (ELE)	F43ILL/2	90	0.8	SW	7280	5,897	9	T 59 R LED	RTLED38	38	0.3	C-OCC	5,096	1,743	4,154	0.5	$ 543.40	$ 2,261.25	$ 245	4.2	3.7
5LED	restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	5824	349	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	4,077	102	248	0.0	$ 33.06	$ 337.50	$ 35	10.2	9.1
35LED	404	17	T 32 R F 3 (ELE)	F43ILL/2	90	1.5	SW	7280	11,138	17	T 59 R LED	RTLED38	38	0.6	C-OCC	5,096	3,292	7,846	0.9	$ 1,026.43	$ 4,151.25	$ 445	4.0	3.6
5LED	404	3	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	7280	1,310	3	2T 25 R LED	2RTLED	25	0.1	C-OCC	5,096	382	928	0.1	$ 121.46	$ 742.50	$ 65	6.1	5.6
35LED	432	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	405	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
5LED	restroom	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	5824	349	1	2T 25 R LED	2RTLED	25	0.0	C-OCC	4,077	102	248	0.0	$ 33.06	$ 337.50	$ 35	10.2	9.1
35LED	403	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
5LED	403	4	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.2	SW	7280	1,747	4	2T 25 R LED	2RTLED	25	0.1	C-OCC	5,096	510	1,238	0.1	$ 161.95	$ 945.00	$ 80	5.8	5.3
35LED	403	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	403	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
25	403	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	SW	7280	1,019	5	R 13 C CF 2 (ELE)	CFQ13/2-L	28	0.1	C-OCC	5,096	713	306	0.0	$ 36.69	$ 135.00	$ 20	3.7	3.1
35LED	401	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
5LED	Hallway	2	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	8736	1,048	2	2T 25 R LED	2RTLED	25	0.1	C-OCC	8,736	437	612	0.1	$ 80.10	$ 540.00	$ 50	6.7	6.1
35LED	420	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	7280	3,931	6	T 59 R LED	RTLED38	38	0.2	C-OCC	5,096	1,162	2,769	0.3	$ 362.27	$ 1,552.50	$ 170	4.3	3.8
5LED	420	5	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.3	SW	7280	2,184	5	2T 25 R LED	2RTLED	25	0.1	C-OCC	5,096	637	1,547	0.2	$ 202.44	$ 1,147.50	$ 95	5.7	5.2
35LED	422	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	424	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
35LED	423	2	T 32 R F 3 (ELE)	F43ILL/2	90	0.2	SW	7280	1,310	2	T 59 R LED	RTLED38	38	0.1	C-OCC	5,096	387	923	0.1	$ 120.76	$ 607.50	$ 70	5.0	4.5
5LED	Hallway	9	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.5	SW	7280	3,931	9	2T 25 R LED	2RTLED	25	0.2	C-OCC	5,096	1,147	2,785	0.3	$ 364.39	$ 1,957.50	$ 155	5.4	4.9
35LED	409	1	T 32 R F 3 (ELE)	F43ILL/2	90	0.1	SW	7280	655	1	T 59 R LED	RTLED38	38	0.0	C-OCC	5,096	194	462	0.1	$ 60.38	$ 371.25	$ 45	6.1	5.4
231LED	Outdoor	2	WP400MH1	MH400/1	458	0.9	SW	4368	4,001	2	WPLED2T78	WPLED2T78	91	0.2	NONE	4,368	795	3,206	0.7	$ 455.20	$ 2,048.38	$ 200	4.5	4.1
231LED	Outdoor	11	WP400MH1	MH400/1	458	5.0	SW	4368	22,006	11	WPLED2T78	WPLED2T78	91	1.0	NONE	4,368	4,372	17,634	4.0	$ 2,503.59	$ 11,266.10	$ 1,100	4.5	4.1
															0	#N/A								#VALUE!
															0	#N/A								#VALUE!
															0	#N/A								#VALUE!
															0	#N/A								#VALUE!
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															0	#N/A								#VALUE!
															0	#N/A								#VALUE!
S	**Total**	**771**				**61.3**			**415,615**	**771**				**27.5**			**150,733**		**33.8**	**35,030**	**179,872**	**$18,255**		
S																	**Demand Savings**			**33.8**	**$3,244**			
S																	**kWh Savings**			**264,882**	**$31,786**			
S																	**Total Savings**				**$35,030**		**5.1**	**4.6**

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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
$ 0.144	$/kWh blended			0.000420205	43,212	$ 192,467	$ 34,829	
$ 0.120	$/kWh supply		1,335,300	0.000420205				
$ 8.00	$/kW		614.0	0				
$ 1.03	$/Therm		33,798	0.00533471				
water $ 5.00	$/kgals			0				
	$/Gal							

Police Department

Recommend? Y or N		Item	Savings kW	kWh	therms	No. 2 Oil gal	Water kgal	$	Cost	Simple Payback	Life Expectancy	GHG Reduction (Metric tons)	NJ Smart Start Incentives	Direct Install Eligible (Y/N)	Payback w/ Incentives	Simple Projected Lifetime Savings kW	kWh	therms	kgal/yr	$	ROI	NPV	IRR
Y	ECM-1	Replace the Old Boiler with a Condensing Boiler	0.0	0	5,689	0	0	5,859	$ 127,329	21.7	25	30.3	$ 8,800	N	20.2	0.0	0	142,217	0	$ 146,484	0.2	($16,500)	1.7%
Y	ECM-2	Replace CHW Pump Motors with VFD Motors	0.2	7,879	0	0	0	960	$ 13,618	14.2	15	3.3	$ 200	N	14.0	2.3	118,178	0	0	$ 17,242	0.3	($1,953)	0.9%
Y	ECM-3	Replace HHW Pump Motors with VFD Motors	0.0	13,011	0	0	0	1,564	$ 15,222	9.7	15	5.5	$ 200	N	9.6	0.4	195,159	0	0	$ 28,142	0.8	$3,647	6.2%
Y	ECM-4	Replace the DHW Heaters with Condensing Heaters	0.0	0	278	0	0	286	$ 13,430	46.9	20	1.5	$ 1,313	N	42.4	0.0	0	5,556	0	$ 5,722	(0.6)	($7,861)	-6.3%
Y	ECM-L1	Lighting Replacements with Controls (Occupancy Sensors)	33.8	264,882	0	0	0	35,030	179,872	5.1	10	111.3	$ 18,255	N	4.6	337.9	2,648,820	0	0	$ 413,868	1.3	$137,193	17.3%
		Total	**34.0**	**285,771**	**5,966**	**0**	**0**	**$ 43,699**	**$ 349,472**	**8.0**	**17.0**	**152**	**$ 28,768**		**7.3**	**341**	**2,962,157**	**147,773**	**-**	**$ 611,458**	**0.7**	**114,527**	**11.5%**
		Recommended Measures (highlighted green above)	**34.0**	**285,771**	**5,966**	**0**	**0**	**$ 43,699**	**$ 349,472**	**8.0**	**17.0**	**152**	**$ 28,768**	**0**	**7.3**	**341**	**2,962,157**	**147,773**	**-**	**$ 611,458**	**0.7**	**114,527**	**11.5%**
		% of Existing	**6%**	**21%**	**18%**	**0**	**0**																

	City:	Newark, NJ				
Occupied Hours/Week		168				
		Building	Auditorium	Gymnasium	Library	Classrooms
	Enthalpy	Operating	Occupied	Occupied	Occupied	Occupied
Temp	h (Btu/lb) Bin Hours	Hours	Hours	Hours	Hours	Hours
102.5						
97.5	35.4 6	6	0	0	0	0
92.5	37.4 31	31	0	0	0	0
87.5	35.0 131	131	0	0	0	0
82.5	33.0 500	500	0	0	0	0
77.5	31.5 620	620	0	0	0	0
72.5	29.9 664	664	0	0	0	0
67.5	27.2 854	854	0	0	0	0
62.5	24.0 927	927	0	0	0	0
57.5	20.3 600	600	0	0	0	0
52.5	18.2 730	730	0	0	0	0
47.5	16.0 491	491	0	0	0	0
42.5	14.5 656	656	0	0	0	0
37.5	12.5 1,023	1,023	0	0	0	0
32.5	10.5 734	734	0	0	0	0
27.5	8.7 334	334	0	0	0	0
22.5	7.0 252	252	0	0	0	0
17.5	5.4 125	125	0	0	0	0
12.5	3.7 47	47	0	0	0	0
7.5	2.1 34	34	0	0	0	0
2.5	1.3 1	1	0	0	0	0
-2.5						
-7.5						

Multipliers	
Material:	1.027
Labor:	1.246
Equipment:	1.124

Heating System Efficiency	78%
Cooling Eff (kW/ton)	1.2

Heating		
Hours	9,454	Hrs
Weighted Avg	2	F
Avg	25	F

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

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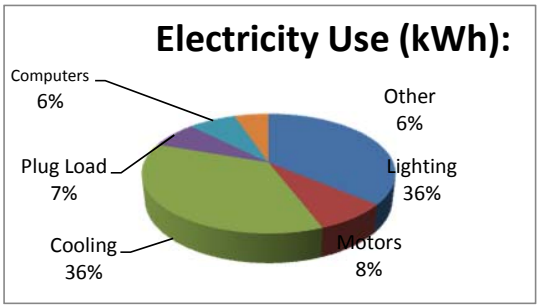
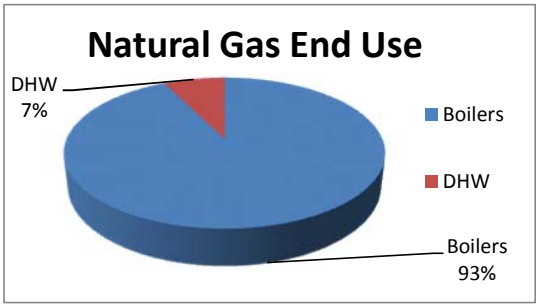
Utility End Use Analysis			
Electricity Use (kWh):		**Notes/Comments:**	
1,335,300	Total	Based on utility analysis	
450,000	Lighting	From Lighting Calculations	34%
100,000	Motors	Estimated	7%
450,000	Cooling	Calculated from Cooling Capacity	34%
90,000	Plug Load	Estimated	7%
90,000	Computers	Estimated	7%
65,300	Other	Remaining	5%
Natural Gas Use (Therms):		**Notes/Comments:**	
33,798	Total	Based on utility analysis	
31,298	Boilers		93%
2,500	DHW	Based on utility analysis	7%





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ECM-1 Replace the Old Boiler with a Condensing Boiler

Description: This ECM evaluates replacing the existing boiler with a high efficiency condensing boiler.

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 1.03	/ Therm	Natural Gas
Baseline Fuel Cost		/ Gal	No. 2 Oil
FORMULA CONSTANTS			
Oversize Factor	0.8		
Hours per Day	24		
Infrared Conversion Factor	1.0		1.0 if Boiler, 0.8 if Infrared Heater
EXISTING			
Capacity	3,550,000	btu/hr	Estimated Boiler Load % and Capacity
Heating Combustion Efficiency	78%		Estimated averaged Efficiency
Heating Degree-Day	2,783	Degree-day	
Design Temperature Difference	57	F	
Fuel Conversion	100,000	btu/therm	
PROPOSED			
Capacity	3,550,000	btu/hr	
Efficiency	90%		
SAVINGS			
Fuel Savings	5,689	therms	NJ Protocols Calculation
Fuel Cost Savings	$ 5,859		

Savings calculation formulas are taken from NJ Protocols document for Occupancy Controlled Thermostats

Algorithms

$$Gas\ Savings\ (Therms) = \frac{OF \times ((CAPY_{Bi} \times EFF_Q) - (CAPY_{Qi} \times EFF_B \times ICF)) \times HDD_{mod} \times 24}{\Delta T \times HC_{fuel} \times EFF_B \times ICF \times EFF_Q}$$

Definition of Variables

OF = Oversize factor of standard boiler or furnace (OF=0.8)

$CAPY_{Bi}$ = Total input capacity of the baseline furnace, boiler or heater in Btu/hour

$CAPY_{Qi}$ = Total input capacity of the qualifying furnace, boiler or heater in Btu/hour

HDD_{mod} = HDD by zone and building type

24 = Hours/Day

ΔT = design temperature difference

HC_{fuel} = Conversion from Btu to therms of gas or gallons of oil or propane (100,000 btu/therm; 138,700 btu/gal of #2 oil; 92,000 btu/gal of propane)

EFF_Q = Efficiency of qualifying heater(s) (AFUE %)

EFF_B = Efficiency of baseline heaters (AFUE %)

ICF = Infrared Compensation Factor (ICF = 0.8 for IR Heaters, 1.0 for furnaces/boilers)[2]

Furnaces and Boilers

Component	Type	Value	Source
$AFUE_q$	Variable		Application
$AFUE_b$	Fixed	Furnaces: 78% Boilers: 80% Infrared: 78%	EPACT Standard for furnaces and boilers
$CAPY_{in}$	Variable		Application
ΔT	Variable	See Table Below	1
HDD_{mod}	Fixed	See Table Below	1

Sources:

1. KEMA, *Smartstart Program Protocol Review*. 2009.
2. http://www.spaceray.com/1_space-ray_faqs.php

Adjusted Heating Degree Days by Building Type

Building Type	Heating Energy Density (kBtu/sf)	Degree Day Adjustment Factor	Atlantic City (HDD)	Newark (HDD)	Philadelphia (HDD)	Monticello (HDD)
Education	29.5	0.55	2792	2783	2655	3886
Food Sales	35.6	0.66	3369	3359	3204	4689
Food Service	39.0	0.73	3691	3680	3510	5137
Health Care	53.6	1.00	5073	5057	4824	7060
Lodging	15.0	0.28	1420	1415	1350	1976
Retail	29.3	0.55	2773	2764	2637	3859
Office	28.1	0.52	2660	2651	2529	3701
Public Assembly	33.8	0.63	3199	3189	3042	4452
Public Order/Safety	24.1	0.45	2281	2274	2169	3174
Religious Worship	29.1	0.54	2754	2745	2619	3833
Service	47.8	0.89	4524	4510	4302	6296
Warehouse/Storage	20.2	0.38	1912	1906	1818	2661

Heating Degree Days and Outdoor Design Temperature by Zone

Weather Station	HDD	Outdoor Design Temperature (F)
Atlantic City	5073	13
Newark	5057	14
Philadelphia, PA	4824	15
Monticello, NY	7060	8

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ECM-1 Replace the Old Boiler with a Condensing Boiler-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.		
BMK 2.0 NG Condensing Boiler	2	EA	$ 32,000	$ 6,000		$ 65,728	$ 14,952	$ -	$ 80,680	Vendor Estimate
Flue Installation	2	LS	$1,000.0	$ 1,000.0		$ 2,054	$ 2,492	$ -	$ 4,546	Estimated
controls	2	EA	$1,000.0	$ 1,000.0		$ 2,054	$ 2,492	$ -	$ 4,546	Estimated
Miscellaneous Electrical	2	LS	$ 500.0	$ 500.0		$ 1,027	$ 1,246	$ -	$ 2,273	Estimated
Miscellaneous HW Piping	2	LS	$ 500.0	$ 500.0		$ 1,027	$ 1,246	$ -	$ 2,273	Estimated
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

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

$ 94,318	Subtotal
$ 33,011	35% Contingency
$ 127,329	**Total**

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Police Department

ECM-2 Replace CHW Pump Motors with VFD Motors

Variable Inputs

Supply Electric Rate	$0.120
Demand Rate	$8.000
Cooling System "On" Point	65
VFD Efficiency	98.5%

Electric Savings		**7,879**
Demand Savings		**0.2**
Cost Savings	**$**	**960**

This measure evaluates the potential energy savings for installing variable frequency drives on the two chilled water pump motors. A more detailed hydraulic calculation should be carried out to size the pump and motor properly if this measure is approved

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	
CHWP	**1**	**5.0**	**5.0**	**85.5%**	**89.5%**	**3.49**	**3.33**	*two pumps run at lead/lag
					Total:	**3.49**	**3.33**	

SAVINGS ANALYSIS

OAT - DB Avg Temp F	Annual Hours in Bin	Cooling Hours Bin	Pump Load %	Existing Pump kWh	Proposed Pump kW	Speed efficiency %	Proposed Pump kWh	Proposed Savings kWh
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**
		=IF(A>TP,0,C)		**=D*AA**	**=BB*E^3.0/CC**		**=C*F/G**	**=E-H**
See Note 3	**See Note 3**				**See Note 5**			
102.5	0	0	0%	0	0.0	0.0%	0	0
97.5	6	6	100%	21	3.4	100.0%	20	1
92.5	31	31	93%	108	2.7	100.0%	84	24
87.5	131	131	79%	457	1.6	99.3%	217	241
82.5	500	500	64%	1,745	0.9	93.0%	484	1,261
77.5	620	620	50%	2,164	0.4	81.5%	322	1,842
72.5	664	664	50%	2,317	0.4	81.5%	345	1,973
67.5	854	854	50%	2,981	0.4	81.5%	443	2,537
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	0	0%	0	0.0	0.0%	0	0
47.5	491	0	0%	0	0.0	0.0%	0	0
42.5	656	0	0%	0	0.0	0.0%	0	0
37.5	1,023	0	0%	0	0.0	0.0%	0	0
32.5	734	0	0%	0	0.0	0.0%	0	0
27.5	334	0	0%	0	0.0	0.0%	0	0
22.5	252	0	0%	0	0.0	0.0%	0	0
17.5	125	0	0%	0	0.0	0.0%	0	0
12.5	47	0	0%	0	0.0	0.0%	0	0
7.5	34	0	0%	0	0.0	0.0%	0	0
2.5	1	0	0%	0	0.0	0.0%	0	0
-2.5	5,027	0	0%	0	0.0	0.0%	0	0
-7.5	0	0	0%	0	0.0	0.0%	0	0
	13,787	**2,806**		**9,793**			**1,915**	**7,879**

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 NOAA for Newark, NJ
4) The pump load is estimated at 100% at 95 deg. OAT and 0% at 60 deg. OAT and varies linearly in between.
5) The required VFD motor draw is based on a 3 power relationship to load.

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ECM-2 Replace CHW Pump Motors with VFD Motors - 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.		
						$ -	$ -	$ -	$ -	
VFD	2	ea	$ 1,706	$ 431		$ 3,504	$ 1,074	$ -	$ 4,578	RS Means 2012
Motor	2	ls	$ 373	$ 79		$ 766	$ 197	$ -	$ 963	RS Means 2012
Electrical - misc.	2	ls	$ 1,000	$ 1,000		$ 2,054	$ 2,492	$ -	$ 4,546	RS Means 2012
						$ -	$ -	$ -	$ -	

$ 10,087	Subtotal
$ 3,531	35% Contingency
$ 13,618	**Total**

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

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ECM-3 Replace HHW Pump Motors with VFD Motors

Variable Inputs

Supply Electric Rate	$0.120
Demand Rate	$8.000
Heating System "On" Point	55
VFD Efficiency	98.5%

Electric Savings		**13,011**
Demand Savings		**0.0**
Cost Savings	**$**	**1,564**

This measure looks at replacing the 5HP and 10HP HHW pumps (2 different loops) which are running at constant speed and install variable frequency drives/ 2 way valves to reduce speed when the heating load is reduced. It should be noted that there is another HHW loop which has 3 HP pumps motors which is not included in this study. According to ASHRAE stardards, only the 5HP and above are considered for the VFDs in this study.

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	
HHWP-	**1**	**7.5**	**7.5**	**91.0%**	**91.5%**	**4.92**	**4.89**	*two pumps run at lead/lag
					Total:	**4.92**	**4.89**	

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)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**
See Note 3	**See Note 3**	**=IF(A>TP,0,C)**	**=0.5+0.5*(55-A)/(55-12)) See Note 4**	**=D*AA**	**=BB*E^3.0/CC See Note 5**		**=C*F/G**	**=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	53%	3,591	0.7	84.3%	637	2,953
47.5	491	491	59%	2,415	1.0	89.1%	554	1,861
42.5	656	656	65%	3,227	1.3	93.1%	940	2,287
37.5	1,023	1,023	70%	5,032	1.7	96.3%	1,837	3,195
32.5	734	734	76%	3,610	2.2	98.6%	1,634	1,977
27.5	334	334	82%	1,643	2.7	100.0%	914	729
22.5	252	252	88%	1,240	3.4	100.0%	847	393
17.5	125	125	94%	615	4.1	100.0%	509	106
12.5	47	47	99%	231	4.9	99.2%	231	0
7.5	34	34	100%	167	5.0	99.0%	171	-3
2.5	1	1	100%	5	5.0	99.0%	5	0
-2.5	5,027	5,027	100%	24,726	5.0	99.0%	25,212	-486
-7.5	0	0	0%	0	0.0	0.0%	0	0
	13,787	**9,454**		**46,501**			**33,491**	**13,011**

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 NOAA for Newark, NJ
4) The pump load is estimated at 100% at 12 deg. OAT and 50% at 55 deg. OAT and varies linearly in between.
5) The required VFD motor draw is based on a 3 power relationship to load.

City of East Orange
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ECM-3 Replace HHW Pump Motors with VFD Motors - Cost

Multipliers	
Material:	1.03
Labor:	1.25
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
VFD	2	ea	$ 2,021	$ 509		$ 4,151	$ 1,268	$ -	$ 5,420	RS Means 2012
Motor	2	ea	$ 536	$ 84		$ 1,101	$ 209	$ -	$ 1,310	RS Means 2012
Electrical - misc.	2	ls	$ 1,000	$ 1,000		$ 2,054	$ 2,492	$ -	$ 4,546	RS Means 2012
						$ -	$ -	$ -	$ -	

$ 11,276	Subtotal
$ 3,947	35% Contingency
$ 15,222	**Total**

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

City of East Orange
CHA Project Number: 30993
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ECM-4 Replace the DHW Heaters with Condensing Heaters

Description: This ECM evaluates the energy savings associated with replacing the existing DHW heater with a condensing heater

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	**208**	Therms/month	Calculated from utility bill
Total Annual Utility Demand by Water Heater	250,000	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	80%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	200,000	MBTU/yr	
Existing Tank Size	100	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)	1.5	MBH	
Annual Standby Hot Water Load	13,031	MBTU/yr	
New Tank Size	100	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)	1.5	MBH	
Annual Standby Hot Water Load	13,031	MBTU/yr	
Total Annual Hot Water Demand	200,000	MBTU/yr	
Proposed Avg. Hot water heater efficiency	90%		Estimated
Proposed Fuel Use	2,222	Therns	Standby Losses and inefficient DHW heater eliminated
Utility Cost	$1.03	$/Therm	
Existing Operating Cost of DHW	$2,575	$/yr	
Proposed Operating Cost of DHW	$2,289	$/yr	

Savings Summary:

Utility	Energy Savings	Cost Savings
Therms/yr	278	$286

City of East Orange
CHA Project Number: 30993
Police Department

ECM-4 Replace the DHW Heaters with Condensing Heaters - 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.		
Condensing Heater	1	EA	$ 7,500	$ 1,000		$ 7,703	$ 1,246	$ -	$ 8,949	From Internet Price/ Estimated Cost*
Miscellaneous Electrical/Controls	1	LS				$ -	$ -	$ -	$ 1,000	Estimated

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

$ 9,949	Subtotal
$ 3,482	35% Contingency
$ 13,430	**Total**

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CHA Project Number: 30993
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New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2012.
Building must have a minimum average electric demand of 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)	43,212
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)	$192,467	$34,829
Existing Usage (from utility)	1,335,300	33,798
Proposed Savings	285,771	5,966
Existing Total MMBtus	8,102	
Proposed Savings MMBtus	1,601	
% Energy Reduction	**19.8%**	
Proposed Annual Savings	$43,699	

	Min (Savings = 15%)		Increase (Savings > 15%)		Max Incentive		Achieved Incentive	
	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm
Incentive #2	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.11	$1.14
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.11	$1.14

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$5,000
Incentive #2	$31,435	$6,790	$38,225
Incentive #3	$31,435	$6,790	$38,225
Total All Incentives	**$62,870**	**$13,579**	**$81,449**

Total Project Cost	$349,472

		Allowable Incentive
% Incentives #1 of Utility Cost*	2.2%	$5,000
% Incentives #2 of Project Cost**	10.9%	$38,225
% Incentives #3 of Project Cost**	10.9%	$38,225
Total Eligible Incentives***	**$81,449**	
Project Cost w/ Incentives	$268,023	

Project Payback (years)	
w/o Incentives	w/ Incentives
8.0	6.1

* 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

APPENDIX D

Photovoltaic Analysis

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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

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

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

RESULTS

77,814 kWh per Year *

System output may range from 74,849 to 81,510kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	2.39	4,116	535
February	3.16	4,880	634
March	4.06	6,810	885
April	4.83	7,579	985
May	5.69	8,965	1,165
June	5.93	8,805	1,145
July	5.77	8,748	1,137
August	5.37	8,096	1,052
September	4.65	6,953	904
October	3.61	5,737	746
November	2.34	3,739	486
December	2.01	3,385	440
Annual	**4.15**	**77,813**	**$ 10,114**

Location and Station Identification

Requested Location	15 South Munn Avenue East Orange, NJ 07019
Weather Data Source	(TMY2) NEWARK, NJ 3.2 mi
Latitude	40.7° N
Longitude	74.17° W

PV System Specifications *(Commercial)*

DC System Size	64.3 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	10°
Array Azimuth	190°
System Losses	14%
Inverter Efficiency	96%
DC to AC Size Ratio	1.1

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.13 $/kWh
Initial Cost	2.60 $/Wdc
Cost of Electricity Generated by System	0.14 $/kWh

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

City of East Orange
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Cost of Electricity	$0.131	/kWh
Electricity Usage	339,360	kWh/yr
System Unit Cost	$4,000	/kW

Photovoltaic (PV) Solar Power Generation - Screening Assessment

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	Federal Tax Credit	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$257,200	**64.3**	**77,814**	**0**	**$10,194**	**0**	**$10,194**	**$0**	**$19,454**	**25.2**	**8.7**

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

Area Output*
429 m2
4,618 ft2

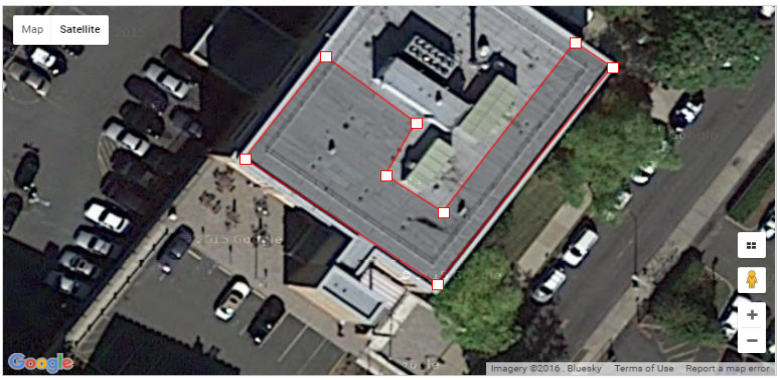
Perimeter Output*
m
0 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 85%
~~3,925~~ ft2

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

8 watt/ft2
~~36,942~~ DC watts
64 kW From PV Watts

System Capacity: 64.3 kWdc (429 m^2)



PV Watts Inputs***

Array Tilt Angle	10	Enter into PV Watts (always 20 if flat, if pitched - enter estimated roof angle)
Array Azimuth	190	Enter into PV Watts (default)
Zip Code	07019	Enter into PV Watts
DC/AC Derate Factor	0.83	Enter info PV Watts

PV Watts Output
77,814 annual kWh calculated in PV Watts program

% Offset Calc

Usage	339,360	(from utilities)
PV Generation	77,814	(generated using PV Watts)
% offset	23%	

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

APPENDIX E

Photos

Existing Boiler

Excising Pumps

Existing DHW Heater

APPENDIX F

EPA Benchmarking Report

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Police Department

Primary Property Type: Police Station
Gross Floor Area (ft²): 43,212
Built: 2006

For Year Ending: September 30, 2014
Date Generated: April 20, 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
Police Department 15 S Munn Avenue East Orange, New Jersey 07019	_____ , (____)____-_____	____ _____ , (____)____-_____ _____

Property ID: 4940115

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
183.6 kBtu/ft²

Source EUI
413.2 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	3,379,783 (43%)
Electric - Grid (kBtu)	4,556,044 (57%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	68.6
National Median Source EUI (kBtu/ft²)	154.4
% Diff from National Median Source EUI	168%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	789

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)