BOROUGH OF GLEN ROCK

DPW GARAGE

473 Doremus Avenue Glen Rock NJ, 07452

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

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CHA PROJECT NO. 30655

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REPORT DISCLAIMER

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

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

List of Common Energy Audit Abbreviations

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

1.0 EXECUTIVE SUMMARY

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

Building Name	Address	Square Feet	Construction Date
DPW Garage	473 Doremus Avenue, Glen Rock, NJ 07452	4,352	1970

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

Building Name	Electric Savings (kWh)	NG Savings (therms)	Total Savings ($)	Payback (years)
DPW Garage	5,973	1,367	$2,422	10.8

Each individual measure's annual savings are dependent on that measure alone, there are no interactive effects calculated. There are three options shown for Lighting ECM savings; only one option can be chosen. Incentives shown (if any) are based only on the SmartStart Incentive Program. Other NJBPU or local utility incentives may also be available/ applicable and are discussed in Section 6.0.

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

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

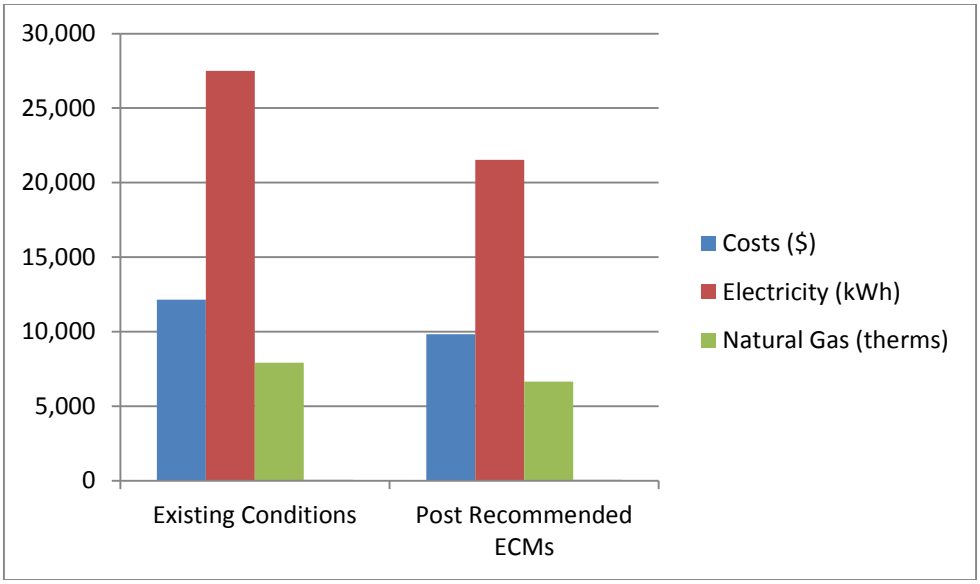
Summary of Energy Conservation Measures

ECM #	Energy Conservation Measure	Est. Costs ($)	Est. Savings ($/year)	Payback w/o Incentive	Potential Incentive ($)*	Payback w/ Incentive	Recommended
1	Replace windows	8,696	171	51.0	0	51.0	N
2	Replace roll up doors	10,842	650	16.7	0	16.7	Y
3	Install pipe insulation	4,188	730	5.7	0	5.7	Y
L1	Lighting Replacements / Upgrades	10,472	914	11.5	2,225	9.0	N
L2	Install Lighting Controls (Add Occupancy Sensors)	641	260	2.5	50	2.3	N
L3	Lighting Replacements with Controls (Occupancy Sensors)	11,113	1,042	10.7	2,275	8.5	Y
	Total**	**34,838**	**2,422**	**10.8**	**2,275**	**9.9**	
	Total(Recommended)	26,143	2,422	10.8	2,275	9.9	

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

If the Borough of Glen Rock implements the recommended ECMs, energy savings would be as follows:

	Existing Conditions	**Post Recommended ECMs**	**Percent Savings**
Costs ($)	12,152	9,731	20%
Electricity (kWh)	27,504	21,531	22%
Natural Gas (therms)	7,908	6,638	16%
Greenhouse Gas Reduction (MT CO2	54	44	17%
Site EUI (kbtu/SF/Yr)	203.3	169.4	


30,000
25,000
20,000
15,000
10,000
5,000
0
Existing Conditions
Post Recommended ECMs
Costs ($)
Electricity (kWh)
Natural Gas (therms)

2.0 BUILDING INFORMATION AND EXISTING CONDITIONS

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

Building Name: DPW (Department of Public Works) Garage
Address: 473 Doremus Avenue, Glen Rock, NJ 07452
Gross Floor Area: 4,352 sq. ft.
Number of Floors: Single story
Year Built: 1970

General

Description of Spaces: The building is used as a garage. It has garage, an office and a utility room.
Description of Occupancy: The facility has 14 permanent employees.
Building Usage: Operating hours for the garage are from 7.00 AM to 3.30 PM, Mondays to Fridays.
Construction: Concrete masonry unit walls. It is believed that the walls are insulated.
Roof: The building has a flat metal clad roof with sandwich insulation. There are 8 skylights in the roof. The roof appears to be in good condition. No ECM associated with the roof has been evaluated.

Windows: The building has single pane windows and they are in fair condition. An ECM related to window replacement has been evaluated.
Exterior Doors: The garage has three metal roll up doors. The roll up doors have no insulation. This results in increase of energy consumption to maintain space conditions during winter. The main door of the garage is a steel door with insulation and is in good condition. The door seals and sweeps are in good condition. An ECM related to replacing the roll up doors has been evaluated.

Heating Ventilation & Air Conditioning (HVAC) Systems

Heating: The garage is heated by a heating hot water system consisting of three Superior gas fired condensing boilers each of 223 MBH capacity, three Grundfos boiler circulating pumps and two hot water recirculation pumps. Heating hot water is circulated to six ceiling mounted Nesbitt unit heaters through a network of piping. The garage is also heated by two Superior gas radiant heaters each of 120 MBH capacity. The hot water boilers, hot water pumps, unit heaters and gas radiant heaters appear to be in good condition. The office is provided with an electric heater that appears to be in good condition. No ECM related to the heating units has been evaluated.

Cooling: A window air conditioner of 9000 MBH cooling capacity cools the office. The window air conditioner appears to be in good condition. To improve energy savings an ECM related to installing window ac controller has been evaluated.

Ventilation: Ventilation is natural ventilation through operable windows and frequent door openings. There are five ceiling fans and three air cleaners in the garage that continuously operate to provide filtered air to the garage spaces. There is no ECM associated with the ventilation system.

Exhaust: This building has a fractional HP exhaust fan serving the utility room. The fan is enclosed and therefore the capacity of fan motor is unknown. No ECM has been evaluated for the exhaust fan.

Controls Systems

The condensing boilers are equipped with integral control system that control and sequence the boiler operation. Unit heaters have no controls. The window air conditioner and the electric heater have built in thermostats.

Domestic Hot Water Systems

There is no domestic hot water system in this building.

Kitchen Equipment

There is no kitchen in this building.

Plug Load

This building has a Plymovent vehicle exhaust system, vehicle lifts, and several tools that contribute to the plug load in the building. The usage of the equipment and tools is not continuous and hence does not significantly impact the electric consumption. However, a recommendation

has been included in the O&M section to purchase Energy Star rated equipment when the old ones need replacement.

Plumbing Systems

There are no restrooms in the building.

Lighting Systems

Majority of the lights in the garage are T5 fluorescent lights. There are a few fluorescent T8 and T12 lights in some spaces of the garage, the office and utility room. Six metal halide wall mounted light fixtures are provided for exterior lighting of the building. All the lights in this building are controlled by manual switches except the exterior lights which are controlled by timer. LED lights are recommended in this study. We have provided three alternatives for the observed lighting that include adding occupancy sensors to the existing lights, replacing the lights with LED lights and a third ECM that evaluates adding occupancy sensors to the proposed LED lights.

3.0 UTILITIES

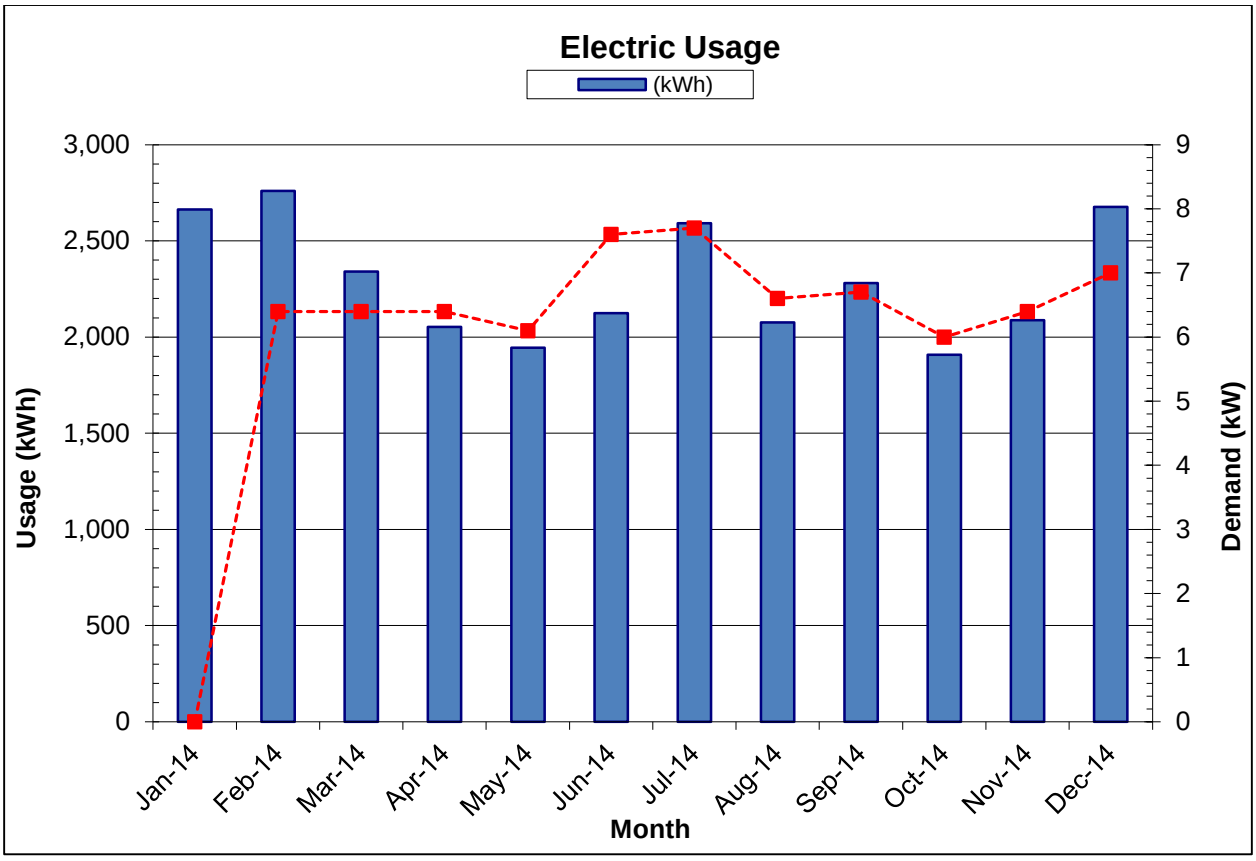
Natural gas and electricity are separately metered into this building. Utilities used by the building are delivered and supplied by the following utility companies:

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

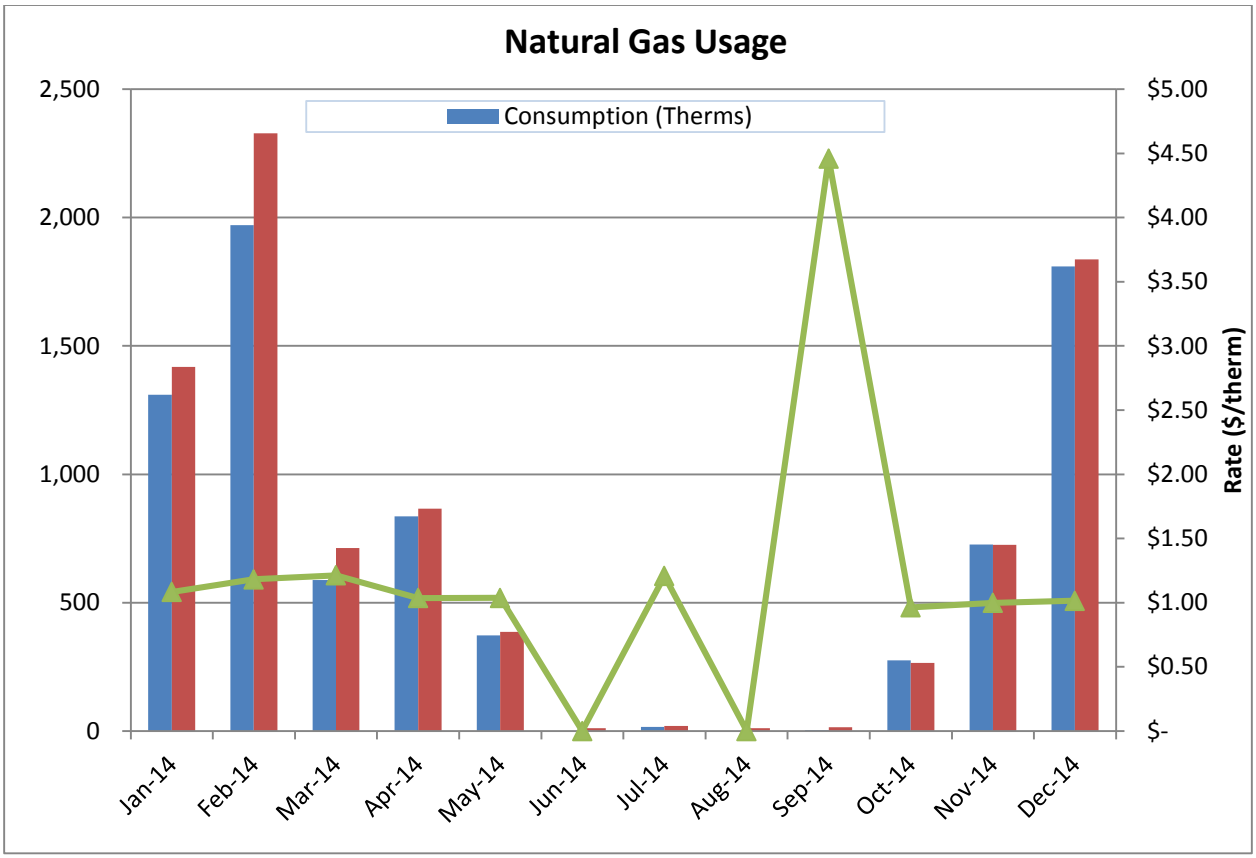
For the 12-month period ending in June 2014, the utilities usages and costs for the building were as follows:

Electric		
Annual Usage	27,504	kWh/yr
Annual Cost	3,999	$
Blended Rate	0.145	$/kWh
Consumption Rate	0.012	$/kWh
Demand Rate	7.43	$/kW
Peak Demand	7.7	kW
Min. Demand	6.0	kW
Avg. Demand	6.7	kW
Natural Gas		
Annual Usage	7,908	Therms/yr
Annual Cost	8,595	$
Blended Rate	1.087	$/therm

Blended Rate: Average rate charged determined by the annual cost / annual usage
Supply Rate: Estimated
Demand Rate: Rate charged for actual electrical demand in kW (based on most recent electric bill)



The electric usage fluctuates with the building usage. Although normally the electric consumption for buildings increases in the summertime, this facility has a significant amount of equipment used in the garage that contributes to an increased usage in the winter.



Natural gas in this building is used by the hot water boiler and domestic hot water heater (DHW). The gas usage in non-heating season is small and only for DHW heating. The gas usage during the heating season varies with winter weather conditions.

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	$0.145	$0.13	Y
Natural Gas	$/Therm	$1.087	$0.96	Y

* Per U.S. Energy Information Administration (2015 data – Electricity and Natural Gas, 2015 data – Fuel Oil)

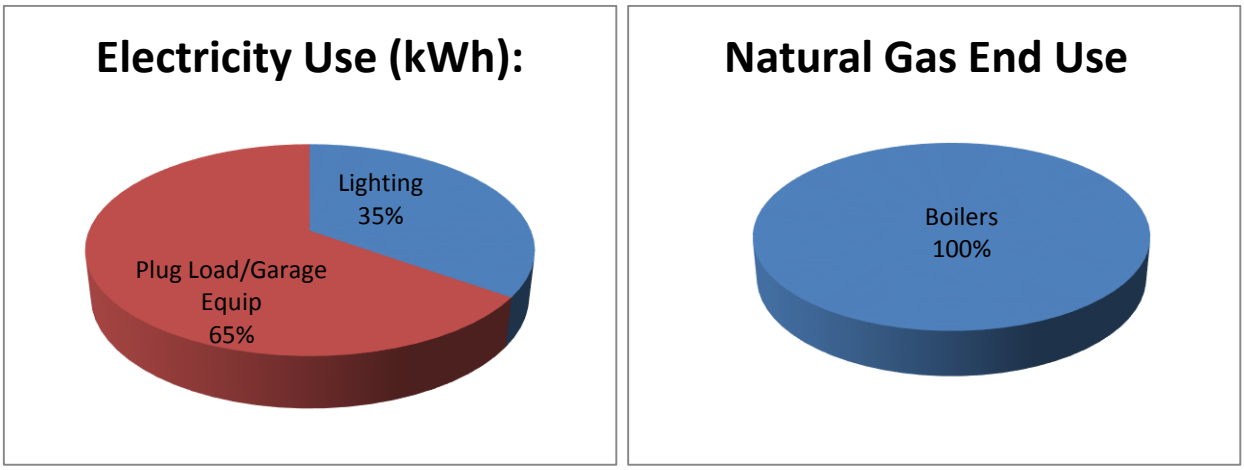
Additional information on selecting a third party energy supplier is available here:

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/ft^2/year, and the performance rating represents how energy efficient a building is on a scale of 1 to 100, with 100 being the most efficient. In order for a building to receive and Energy Star label, the energy benchmark rating must be at least 75. As energy use decreases from implementation of the proposed measures, the Energy Star rating will increase. However, the EPA does not have score for all types of buildings. The buildings that do not have energy rating now are compared with national median EUI.

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

Site EUI kBtu/ft^2/yr	Source EUI (kBtu/ft^2/yr)	Energy Star Rating (1-100)
203.2	258.4	NA

The building's Energy Star score is not available as this building is labeled in portfolio managers "other" category and does not closely match a category with enough available supporting benchmarking data. The score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide. A score of 50 represents median energy performance and a score of 75 or higher indicates that the building is a top performer. The site EUI of the building is 203.2 and source EUI is 258.4. The building has much higher EUIs than the national median EUIs (national median site EUI is 96.8 kBtu/ft^2 and national median source EUI is 123.1 kBtu/ft^2). The EUI of this building is (+)110% higher than national median. The EUI could be further reduced after implementing some of the proposed energy conservation measures.

5.0 ENERGY CONSERVATION MEASURES

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

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

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

Energy savings were quantified in the form of:

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

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

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

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

5.1 ECM-1 Replace Single Pane Windows with energy efficient Double Pane Windows

The building has old steel frame single pane windows which lead to large amount of the heating/cooling loss. Replacing these old windows with high heat resistance double pane windows will help reduce the energy loss and save energy.

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

ECM-1 Replace Single Pane Windows with energy efficient Double Pane Windows

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,696	0	0	157	171	(0.4)	0	51.0	51.0

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

This measure is not recommended due to the long payback period.

5.2 ECM-2 Replace Roll Up Doors

The garage has three metal roll up doors. The roll up doors have no insulation. This results in increase of energy consumption to maintain space conditions during winter. This measure proposes to replace the roll up doors with new insulated composite doors. These new doors will reduce the total heating load to be met by the heating system, therefore reducing total natural gas consumption.

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

ECM-2 Add condensing hot water boiler

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
10,842	0	0	598	650	(0.1)	0	16.7	16.7

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

This measure is recommended.

5.3 ECM-3 Install pipe insulation

It was noted during the site visit that none of the hot water piping in the boiler room was insulated. It is recommended to install piping insulation on all of the hot water piping in this room as well as any other piping found to be un-insulated. Natural gas savings will result from reduced heat transfer and reduced heating loads of the water heater and boiler systems.

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

ECM-3 Install pipe insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
4,188	0	0	671	730	1.6	0	5.7	5.7

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

This measure is recommended.

5.4.1 ECM-L1 Lighting Replacement / Upgrades

The school has a mixture of T-12 and T-8 fluorescent lighting fixtures. The All Purpose room has twenty eight (28) 400 watt metal halide lights and the stage has six (6) 400 watt metal halide lights. Some spaces like the boiler room, restrooms, janitor's closets and storage rooms are provided with incandescent lights. Exterior lights are a mixture of incandescent and compact fluorescent lights. All the lights in this building are controlled by manual switches except exterior lights which are controlled by timer.

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 Replacement / Upgrades

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
10,472	1.9	5,094	0	914	0.3	2,225	11.5	9.0

* LED retrofits must go through the "custom" measures incentive option under New Jersey SmartStart Program. There are no "prescriptive" incentives for LED retrofits. Projects must achieve a minimum of 75,000 kWh annual savings to qualify for "custom" incentives. See section 6.0 for other incentive opportunities

This measure is not recommended in lieu of ECM L3.

5.4.2 ECM-L2 Install Lighting Controls (Occupancy Sensors)

The majority of the interior lights are controlled by wall mounted switches. 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 recommends installing occupancy sensors for the current lighting system. Using a process similar to that utilized in Section ECM-L1, the energy savings for this measure was calculated by applying the known fixture wattages in the space to the estimated existing and proposed times of operation for each fixture.

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

ECM-L2 Install Lighting 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
641	0	1,795	620	260	5.1	50	2.5	2.3

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

This measure is not recommended in lieu of ECM L3.

5.4.3 ECM-L3 Lighting Replacements with Controls (Occupancy Sensors)

This measure is a combination of ECM-L1 and ECM-L2; recommending replace/upgrade the current lighting fixtures to more efficient ones and installing occupancy sensors on the new lights. Interactive effects of the higher efficiency lights and occupancy sensors lead the energy and cost savings for this measure to not be cumulative or equivalent to the sum of replacing the lighting fixtures alone and installing occupancy sensors without the lighting upgrade. The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-L3 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
11,113	1.9	5,973	0	1,042	0.4	2,275	10.7	8.5

* LED retrofits must go through the “custom” measures incentive option under New Jersey SmartStart Program. There are no “prescriptive” incentives for LED retrofits. Projects must achieve a minimum of 75,000 kWh annual savings to qualify for “custom” incentives. See section 6.0 for other incentive opportunities

This measure is recommended.

5.5 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:

- Replace door seals and sweeps.
- Purchase Energy Star labeled appliances when replacement is needed.
- Upgrade the plumbing fixtures to low flow plumbing fixtures and aerators when needed

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 city 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.

6.1.1 New Jersey Smart Start Program

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

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

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

6.1.2 Direct Install Program

The Direct Install Program applies to smaller facilities that have a peak electrical demand of 200 kW or less in any of the previous 12 months. Buildings must be located in New Jersey and served by one of the state's public, regulated electric utility companies.

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

The Direct Install program has specific HVAC equipment and lighting requirements and is generally applicable only to smaller package HVAC units, small boilers and lighting retrofits.

The program pays a maximum amount of $75,000 per building, and up to $250,000 per customer per year. Installations must be completed by an approved Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website. Contractors will coordinate with the applicant to arrange installation of

recommended measures identified in a previous energy assessment, such as this energy audit. The incentive is reimbursed to the Owner upon successful replacement and payment of the equipment.

This facility qualifies for the direct install program since the peak electric demand in the evaluated 12 month period was below 200 KW.

6.1.3 New Jersey Pay For Performance Program (P4P)

This building may be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives are available from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed to offset the cost of energy conservation projects for facilities that pay the Societal Benefits Charge (SBC) and whose demand (kW) in any of the preceding 12 months exceeds 100 kW. This demand minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations and *is not applicable to public schools*. Facilities that meet this criterion must also achieve a minimum performance target of 15% energy reduction by using the EPA Portfolio Manager benchmarking tool before and after implementation of the measure(s). Additionally, the overall return on investment (ROI) must exceed 10%. If the participant is a municipal electric company customer, and a customer of a regulated gas New Jersey Utility, only gas measures will be eligible under the Program. Available incentives are as follows:

Incentive #1: Energy Reduction Plan – This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP). The ERP must include a detailed energy audit of the desired ECMs, energy savings calculations (using building modeling software) and inputting of all utility bills into the EPA Portfolio Manager website.

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

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

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

<u>Electric</u>

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

<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.

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 Area (Ft^2)	Potential PV Array Size (kW)
2,577	20

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 $200/SREC for 2015 and this number was utilized in the cash flow for this report.

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

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

Photovoltaic (PV) Solar Power Generation – 20 kW System

Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable SREC	Payback (without SREC)	Payback (with SREC)	Recommended
	Electricity		Natural Gas					
$	kW	kWh	Therms	$	$	Years	Years	Y/N
$80,000	20	24,726	0	$3,585	$5,811	22.3	8.5	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 Borough 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.

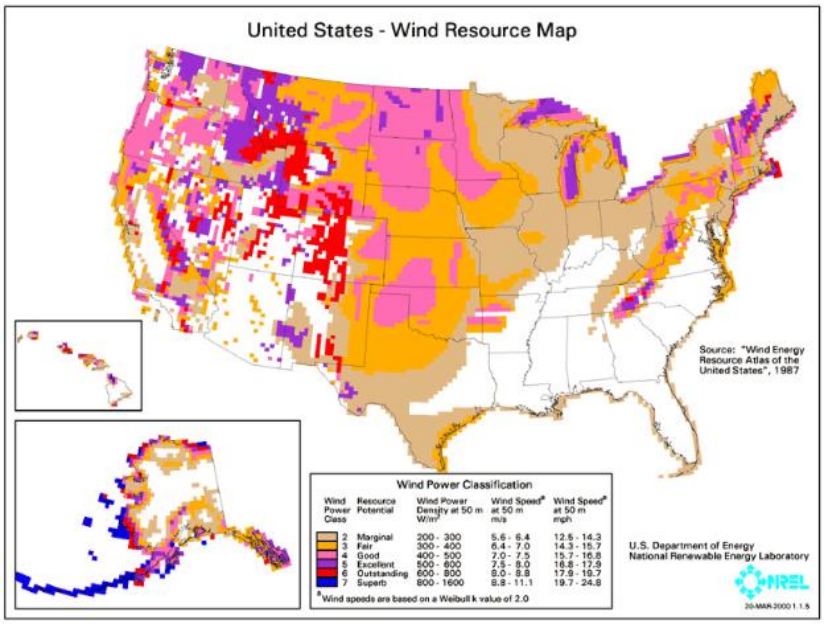
Several options exist for using active solar thermal systems for space heating. The most common method is called a passive solar hot water system involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system described above which requires pumping). 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. The building has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter; however thermal usage during the summer months does not exist. Thermal energy produced by the CHP plant in

the warmer months will be wasted. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building. CHP is not recommended due to the building's limited summer thermal demand.

This measure is not recommended due to the absence of large enough year-round thermal loads which are needed for efficiency CHP operation.

7.4 Demand Response Curtailment

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

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

A pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. From January 2014 through December 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
7.7	6.0	6.7	N	N

*the demand is estimated from one month bill

This measure is not recommended due to the low demand usage.

8.0 CONCLUSIONS & RECOMMENDATIONS

The following section summarizes the LGEA energy audit conducted by CHA for the Borough of Glen Rock's DPW Garage.

The following projects should be considered for implementation:

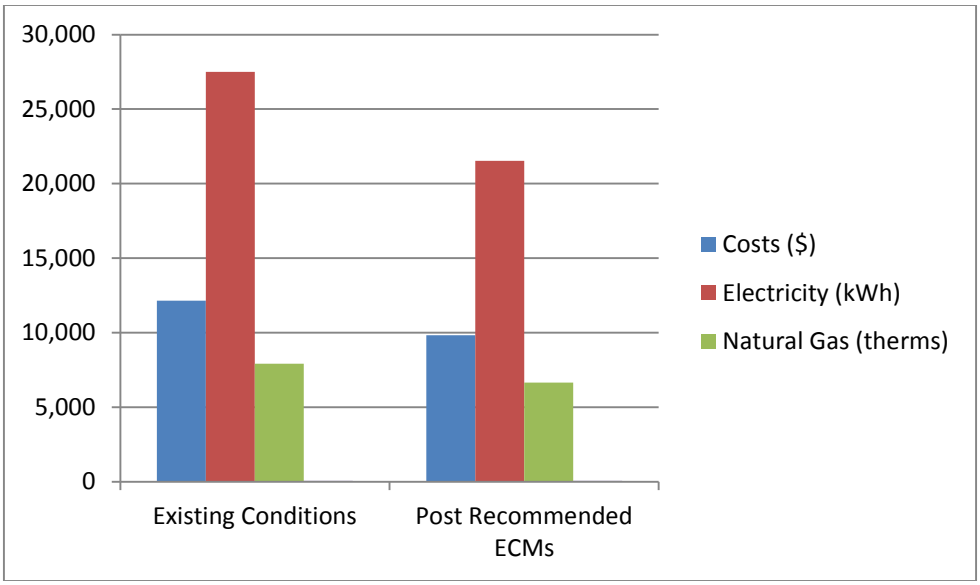
- Replace roll up doors
- Install pipe insulation
- Lighting Replacements with Controls (Occupancy Sensors)

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)
5,973	1,270	2,422	10.8

If the Borough of Glen Rock implements the recommended ECMs, energy savings would be as follows:

	Existing Conditions	Post Recommended ECMs	Percent Savings
Costs ($)	12,152	9,731	20%
Electricity (kWh)	27,504	21,531	22%
Natural Gas (therms)	7,908	6,638	16%
Greenhouse Gas Reduction (MT CO2	54	44	17%
Site EUI (kbtu/SF/Yr)	203.3	169.4	



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

APPENDIX A

Utility Usage Analysis and Alternate Utility Suppliers

Local Government Energy Audit
Borough of Glen Rock
DPW Garage - 473 Doremus Ave, Glen Rock, NJ

121.0
107.4
98.1

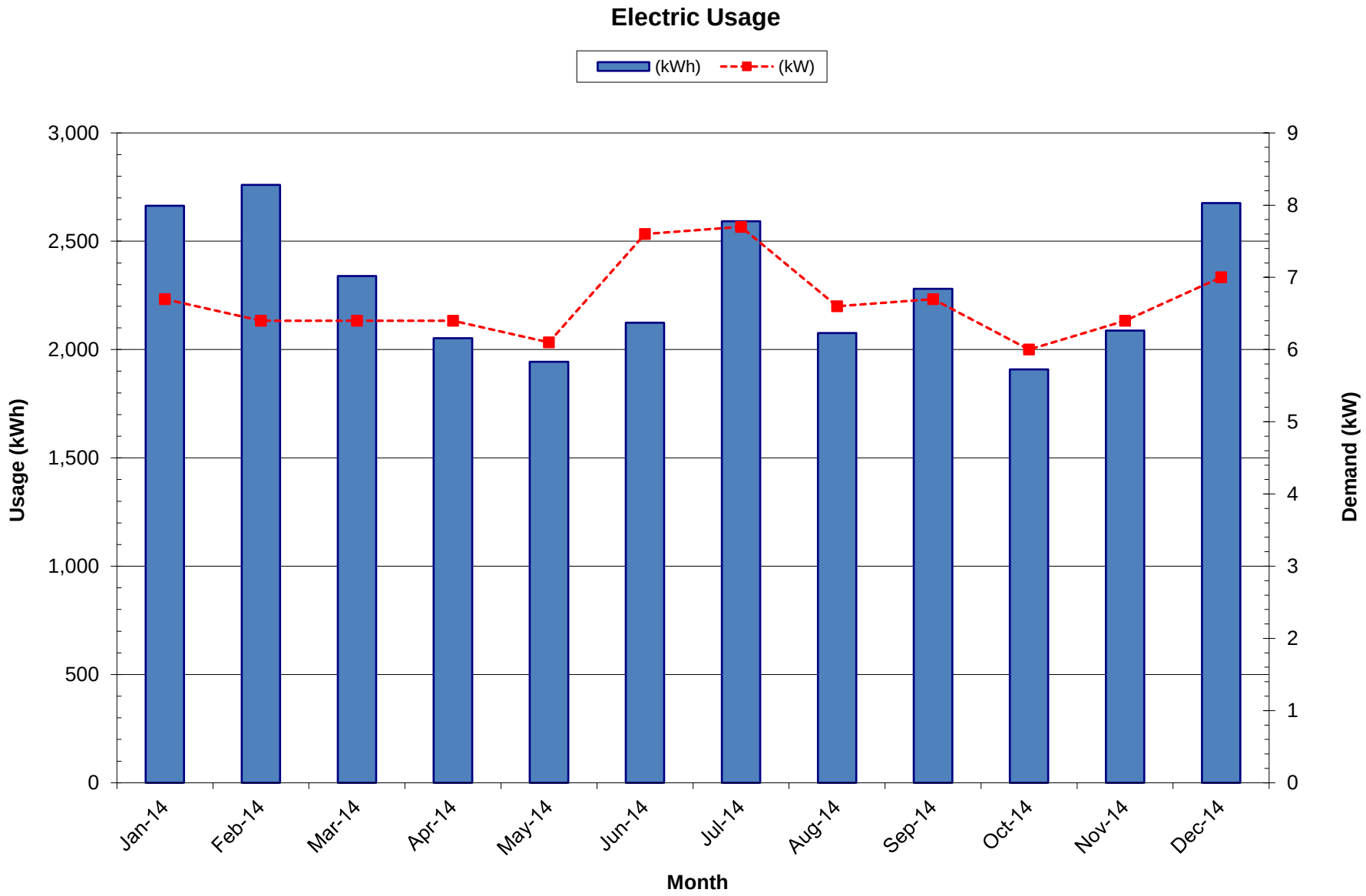
Electric Service

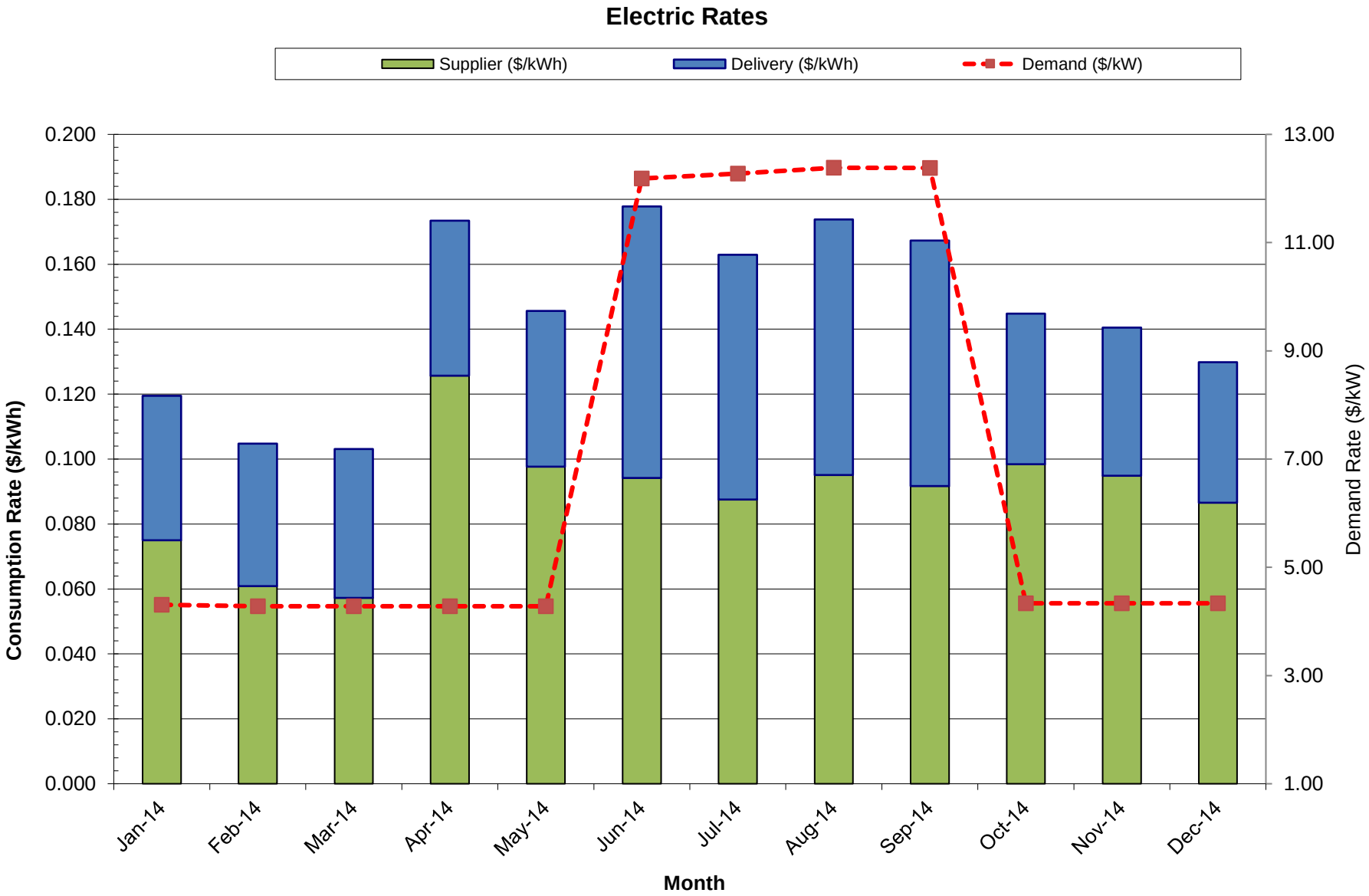
For Service at: **DPW Garage - 473 Doremus Ave, Glen Rock, NJ**
Account No.: **66 968 943 06**
Meter No.: **656002459**

Delivery: **PSE&G**
Supply: **South Jersey Energy Company**

	Consumption		Demand		Provider Charges			Unit Costs				
Month	(kWh)	($)	(kW)	($)	Delivery ($)	Supplier ($)	Total ($)	Demand ($/kW)	Consumption ($/kWh)	Delivery ($/kWh)	Supplier ($/kWh)	Blended Rate ($/kWh)
January-14	2,664	$28.82	6.70	28.88	118.38	199.85	370.89	4.310	0.011	0.044	0.075	0.139
February-14	2,760	$29.86	6.4	27.4	121.0	168.0	289.06	4.281	0.011	0.044	0.061	0.105
March-14	2,340	$25.30	6.4	27.4	107.4	133.9	241.30	4.281	0.011	0.046	0.057	0.103
April-14	2,052	$22.16	6.4	27.4	98.1	257.9	355.94	4.281	0.011	0.048	0.126	0.173
May-14	1,944	$21.00	6.1	26.11	93.29	189.78	283.07	4.280	0.011	0.048	0.098	0.146
June-14	2,124	$36.22	7.6	92.62	177.63	200.08	377.71	12.187	0.017	0.084	0.094	0.178
July-14	2,592	$43.80	7.7	94.53	195.38	226.85	422.23	12.277	0.017	0.075	0.088	0.163
August-14	2,076	$35.26	6.6	81.73	163.52	197.33	360.85	12.383	0.017	0.079	0.095	0.174
September-14	2,280	$38.73	6.7	83.0	172.4	209.0	381.38	12.382	0.017	0.076	0.092	0.167
October-14	1,908	$19.81	6.0	26.0	88.6	187.7	276.27	4.337	0.010	0.046	0.098	0.145
November-14	2,088	$21.68	6.4	27.8	95.3	198.0	293.33	4.336	0.010	0.046	0.095	0.140
December-14	2,676	$27.78	7.0	30.4	115.7	231.7	347.38	4.336	0.010	0.043	0.087	0.130
Total (12 months)	**27,504**	**$350.42**	**7.7**	**573.15**	**$1,546.66**	**$2,400.09**	**$3,999.41**	**$7.164**	**$0.013**	**$0.056**	**$0.087**	**$0.145**
Notes	1A	1B	2A	2B	3	4	5	6	7	8	9	9

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


Electric Usage
(kWh)
(kW)
3,000
2,500
2,000
1,500
1,000
500
0
Usage (kWh)
9
8
7
6
5
4
3
2
1
0
Demand (kW)
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Month

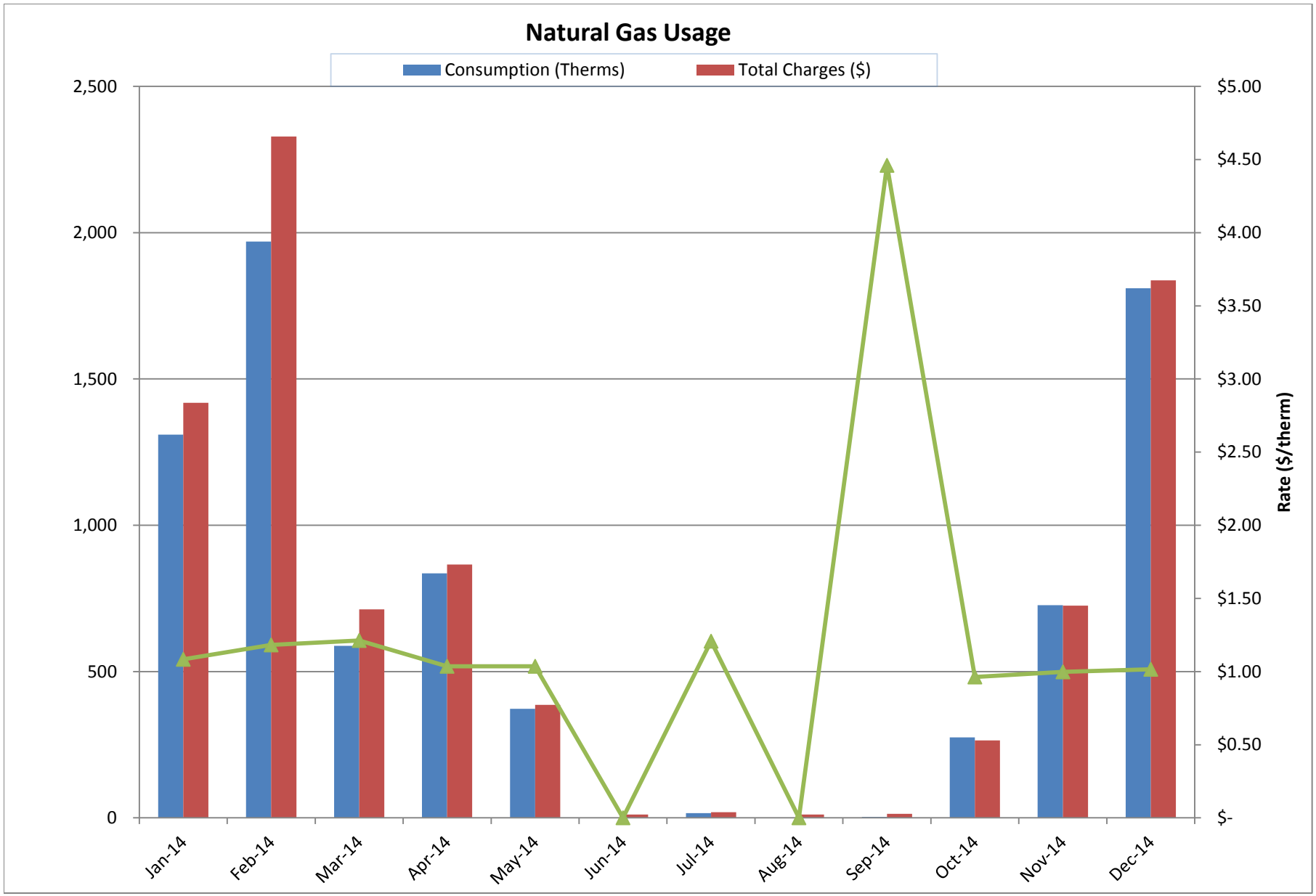

Electric Rates
Supplier ($/kWh)
Delivery ($/kWh)
Demand ($/kW)
Consumption Rate ($/kWh)
Demand Rate ($/kW)
0.200
0.180
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
13.00
11.00
9.00
7.00
5.00
3.00
1.00
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Month

Local Government Energy Audit
Borough of Glen Rock
DPW Garage - 473 Doremus Ave, Glen Rock, NJ

Natural Gas Service

For Service at: DPW Garage - 473 Doremus Ave, Glen Rock, NJ
Account No.: 67 268 631 01
Meter No: 2124193
Delivery: PSE&G
Supply: PSE&G

Month	Consumption (Therms)	Delivery Charge ($)	Supply Charge ($)	Total Charges ($)	Delivery Rate ($/Therm)	Supply Rate ($/Therm)	Total Rate ($/Therm)
January-14	1,310	585.94	832.92	$1,418.86	0.447	0.636	1.083
February-14	1,970	857.74	1,471.20	$2,328.94	0.435	0.747	1.182
March-14	588	258.50	454.28	$712.78	0.440	0.773	1.212
April-14	836	271.90	593.58	$865.48	0.325	0.710	1.035
May-14	372.6	127.32	258.86	$386.18	0.342	0.695	1.036
June-14	0	11.00	0.00	$11.00	#DIV/0!	#DIV/0!	#DIV/0!
July-14	16	11.00	8.32	$19.32	0.688	0.520	1.208
August-14	0	11.17	0.00	$11.17	#DIV/0!	#DIV/0!	#DIV/0!
September-14	3.2	12.14	1.93	$14.07	3.849	0.612	4.461
October-14	275.0	95.25	169.73	$264.98	0.346	0.617	0.964
November-14	726.9	277.52	447.97	$725.49	0.382	0.616	0.998
December-14	1,809.9	674.40	1,162.30	$1,836.70	0.373	0.642	1.015
Total (All)	**7,907.5**	**$ 3,193.88**	**$ 5,401.09**	**$ 8,594.97**	**0.404**	**0.683**	**1.087**
Total (last 12-months)	**7,907.5**	**$ 3,193.88**	**$ 5,401.09**	**$ 8,594.97**	**0.404**	**0.683**	**1.087**
		37.2%	62.8%	100.0%			


Natural Gas Usage
Consumption (Therms)
Total Charges ($)
2,500
2,000
1,500
1,000
500
0
$5.00
$4.50
$4.00
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$-
Rate ($/therm)
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-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 # 30655
DPW Garage
473 Doremus Avenue, Glen Rock, NJ 07452

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
Hot Water Boilers	3	Triangle Tube	Prestige Solo 250	N/A	Gas fired condensing hot water boiler	245 MBH Input / 223 MBH Output	91%	Utility Room	Garage Spaces	2013	23		2015	2	25
Boiler Water Circulation Pumps	3	Grundfos	UPS 26-99 FC	52722512 P1	Cenntrifugal Water Pump	N/A	N/A	Utility Room	Garage Spaces	2013	8		2015	2	10
Hot Water Circulation Pumps	2	N/A	N/A	N/A	Centrfugal Water Pump	In-Line Pump, 1725 RPM, with 3/4 HP motor	N/A	Utility Room	Garage Spaces	2013	8		2015	2	10
Unit Heaters	6	Nesbitt	N/A	N/A	Unit Heaters with hot water heatingcoils	N/A	N/A	Garage	Garage Spaces	1980	-15		2015	35	20
Gas Radiant Heaters	2	Superior	UB-120	N/A	Gas Radiant Heaters	120 MBH Capacity	N/A	Garage	Garage Spaces	2013	13		2015	2	15
Air Cleaners	3	Airmation	N/A	N/A	Air Cleaners	N/A	N/A	Garage	Garage Spaces	2000	10		2015	15	25

APPENDIX C

ECM Calculation and Cost Estimate Summary Table

Glen Rock
CHA Project Number: 30655

Rate of Discount (used for NPV) 3.0%

Utility Costs		Yearly Usage	Existing MT C0	Metric Ton Carbon Dioxide Equivalent	Building Area	Annual Utility Cost		
						Electric	Natural Gas	Fuel Oil
$ 0.145	$/kWh blended			0.000420205	4,352			
$ 0.145	$/kWh supply	27,504	11.56	0.000420205		$ 3,557	$ 8,595	
$ 7.70	$/kW	7.1		0				
$ 1.09	$/Therm	7,908	42.19	0.00533471				
	$/kgals			0				
	$/Gal							

DPW Garage

Recommend? Y or N		Item	Savings kW	kWh	therms	No. 2 Oil gal	Water kgal	$	Cost	Simple Payback	Life Expectancy	Equivalent CO2 (Metric tons)	NJ Smart Start Incentives	Direct Install Eligible (Y/N)	Payback w/ Incentives	Simple Projected Lifetime Savings kW	kWh	therms	kgal/yr	$	ROI	NPV	IRR
N	ECM-1	Replace windows	0.0	0	157	0	0	171	$ 8,696	51.0	30	0.8	$ -	N	51.0	0.0	0	4,709	0	$ 5,118	(0.4)	($5,352)	-3.1%
Y	ECM-2	Replace roll up doors	0.0	0	598	0	0	650	$ 10,842	16.7	15	3.2	$ -	N	16.7	0.0	0	8,977	0	$ 9,757	(0.1)	($3,076)	-1.3%
Y	ECM-3	Install pipe insulation	0.0	0	671	0	0	730	$ 4,188	5.7	15	3.6	$ -	N	5.7	0.0	0	10,068	0	$ 10,943	1.6	$4,521	15.4%
N	ECM-L1	Lighting Replacements / Upgrades	1.9	5,094	0	0	0	914	$ 10,472	11.5	15.0	2.1	$ 2,225	N	9.0	28.5	76,410	0	0	$ 13,713	0.3	$2,667	7.2%
N	ECM-L2	Install Lighting Controls (Add Occupancy Sensors)	0.0	1,795	0	0	0	260	$ 641	2.5	15.0	0.8	$ 50	N	2.3	0.0	26,925	0	0	$ 3,904	5.1	$2,516	43.8%
Y	ECM-L3	Lighting Replacements with Controls (Occupancy Sensors)	1.9	5,973	0	0	0	1,042	$ 11,113	10.7	15.0	2.5	$ 2,275	N	8.5	28.5	89,595	0	0	$ 15,625	0.4	$3,597	8.1%
		Total (Not Including ECMs or L1, L2)	**1.9**	**5,973**	**1,270**	**0**	**0**	**$ 2,422**	**$ 26,143**	**10.8**	**15.0**	**9**	**$ 2,275**		**9.9**	**29**	**89,595**	**19,046**	**-**	**$ 36,325**	**0.4**	**$5,042**	**5.8%**
		Recommended Measures (highlighted green above)	**1.9**	**5,973**	**1,270**	**0**	**0**	**$ 2,422**	**$ 26,143**	**10.8**	**15.0**	**9**	**$ 2,275**	**0**	**9.9**	**29**	**89,595**	**19,046**	-	**$ 36,325**	**0.4**	**$5,042**	**5.8%**
		% of Existing	**27%**	**0.2171684**	**0.1605613**	**#DIV/0!**	**#DIV/0!**																

		City:	Newark, NJ				
		Occupied Hours/Week	45	45	45	45	45
			Building Operating Hours	Auditorium Occupied Hours	Gymnasium Occupied Hours	Library Occupied Hours	Classrooms Occupied Hours
Temp	Enthalpy h (Btu/lb)	Bin Hours					
102.5							
97.5	35.4	6	2	2	2	2	2
92.5	37.4	31	8	8	8	8	8
87.5	35.0	131	35	35	35	35	35
82.5	33.0	500	134	134	134	134	134
77.5	31.5	620	166	166	166	166	166
72.5	29.9	664	178	178	178	178	178
67.5	27.2	854	229	229	229	229	229
62.5	24.0	927	248	248	248	248	248
57.5	20.3	600	161	161	161	161	161
52.5	18.2	730	196	196	196	196	196
47.5	16.0	491	132	132	132	132	132
42.5	14.5	656	176	176	176	176	176
37.5	12.5	1,023	274	274	274	274	274
32.5	10.5	734	197	197	197	197	197
27.5	8.7	334	89	89	89	89	89
22.5	7.0	252	68	68	68	68	68
17.5	5.4	125	33	33	33	33	33
12.5	3.7	47	13	13	13	13	13
7.5	2.1	34	9	9	9	9	9
2.5	1.3	1	0	0	0	0	0
-2.5							
-7.5							

Multipliers	
Material:	1.027
Labor:	1.246
Equipment:	1.124

Heating System Efficiency	91%	
Cooling Eff (kW/ton)	1.2	

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

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

Glen Rock
CHA Project Number: 30655
DPW Garage

ECM-1: Window Replacement/Upgrade

Description This ECM evaluates replacing the old existing windows with new better insulated windows.

	Occupied Cooling Hours per Week	45	Hours
	Occupied Heating Hours per Week	45	Hours
Given	Heating Energy Cost	$1.09	$/Therm
	Cooling Energy Cost	$0.145	$/Kwh
	Occupied Cooling Setpoint Temperature	80.0	Degrees F
	Occupied Cooling Avg Space Air Enthalpy	27.5	btu/# air
	Occupied Heating Setpoint Temperature	72.0	Degrees F Occupied
	Unoccupied Heating Setpoint Temperature	65.0	Degrees F Unoccupied
	Window Area	96	sq.ft.
	Window Perimeter	80	ft
	Proposed U factor	0.45	Btu/(h*sqft*degf)
	Proposed Air Infiltration	0.05	cfm/ft
	Cooling Conversion	12,000	Btu/ton
	Heating Btu Conversion	1,000,000	Btu/MMBtu
Assumptions	Existing U factor	1.13	Btu/(h*sqft*degf)
	Existing Air Infiltration	0.50	cfm/ft
	Heating System Efficiency	91%	
	Cooling System Efficiency	0	kW/Ton

Formula
Cooling Energy Conduction = (Existing U x Area x (OA Temp - RA Temp) x Op Hours)
Heating Energy Conduction = (Existing U x Area x (RA Temp - OA Temp) x Op Hours)
Cooling Energy Infiltration = (4.5 x Leakage x Perimeter x (OA Enthalpy - RA Enthalpy) x Op Hours)
Heating Energy Infiltration = 1.08 x Leakage x Perimeter x (RA temp - OA temp) x Op Hours)
Load = (Conduction) + (Infiltration)
Cooling Energy = (Cooling Load) / (12,000 Btu/Ton) x (kw/Ton)
Heating Energy = (Heating Load) / (1,000,000 Btu/MMBtu) / (Boiler Efficiency)
Energy Cost = (Energy) x (Cost/Unit)

Existing	Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
	Cooling	35.41	97.5	6	1.6	0.0	0.0	3,051	0	0	2,287	0	0
	Cooling	37.40	92.5	31	8.3	0.0	0.0	11,260	0	0	14,800	0	0
	Cooling	34.98	87.5	131	35.1	0.0	0.0	28,549	0	0	47,274	0	0
	Cooling	33.05	82.5	500	133.9	0.0	0.0	36,321	0	0	133,724	0	0
	Heating	31.55	77.5	620	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	29.91	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	27.19	67.5	854	0.0	228.8	0.0	0	111,667	0	0	44,469	0
	Heating	23.99	62.5	927	0.0	248.3	678.7	0	255,892	184,062	0	101,904	73,299
	Heating	20.25	57.5	600	0.0	160.7	439.3	0	252,797	357,403	0	100,671	142,329
	Heating	18.21	52.5	730	0.0	195.5	534.5	0	413,628	724,734	0	164,719	288,611
	Heating	15.99	47.5	491	0.0	131.5	359.5	0	349,543	682,441	0	139,199	271,769
	Heating	14.51	42.5	656	0.0	175.7	480.3	0	562,314	1,172,281	0	223,930	466,838
	Heating	12.51	37.5	1,023	0.0	274.0	749.0	0	1,025,528	2,234,364	0	408,396	889,791
	Heating	10.50	32.5	734	0.0	196.6	537.4	0	842,454	1,894,632	0	335,490	754,500
	Heating	8.67	27.5	334	0.0	89.5	244.5	0	431,876	994,771	0	171,986	396,148
	Heating	6.97	22.5	252	0.0	67.5	184.5	0	362,459	850,619	0	144,342	338,742
	Heating	5.44	17.5	125	0.0	33.5	91.5	0	197,952	471,573	0	78,830	187,795
	Heating	3.73	12.5	47	0.0	12.6	34.4	0	81,258	195,976	0	32,360	78,044
	Heating	2.08	7.5	34	0.0	9.1	24.9	0	63,722	155,272	0	25,376	61,834
	Heating	1.31	2.5	1	0.0	0.3	0.7	0	2,019	4,964	0	804	1,977
	Subtotal =			**8,760**	**179**	**1,824**	**4,359**	**79,181**	**4,953,110**	**9,923,092 btu**	**198,085**	**1,972,477**	**3,951,674**

	Conduction		Infiltration		
Cooling Lo	(79181) +	(	198085) =		**277,266 btu**
	Cooling Load				
Cooling En	(277266)/	(	12000) *	(0.00) =	**0 kWh**
	Cooling Energy		Cooling Cost		
Cooling En	(0.00) x	(	$0.145) =		**$ -**
	Conduction		Infiltration		
Heating Lo	(14876201) +	(	5924151) =		**20,800,352 btu**
	Heating Load		Heat Content		
Heating En	(20800352)/	(	91%)/	(100000) =	**229 Therms**
	Heating Energy		Heating Cost		
Heating En	(228.58) x	(	$1.087) =		**$ 248**

Proposed	Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
	Cooling	35.40723	97.5	6	1.6	0.0	0.0	1,215	0	0	229	0	0
	Cooling	37.40	92.5	31	8.3	0.0	0.0	4,484	0	0	1,480	0	0
	Cooling	34.98	87.5	131	35.1	0.0	0.0	11,369	0	0	4,727	0	0
	Cooling	33.05	82.5	500	133.9	0.0	0.0	14,464	0	0	13,372	0	0
	Heating	31.55	77.5	620	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	29.91	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	27.19	67.5	854	0.0	228.8	0.0	0	44,469	0	0	4,447	0
	Heating	23.99	62.5	927	0.0	248.3	678.7	0	101,904	73,299	0	10,190	7,330
	Heating	20.25	57.5	600	0.0	160.7	439.3	0	100,671	142,329	0	10,067	14,233
	Heating	18.21	52.5	730	0.0	195.5	534.5	0	164,719	288,611	0	16,472	28,861
	Heating	15.99	47.5	491	0.0	131.5	359.5	0	139,199	271,769	0	13,920	27,177
	Heating	14.51	42.5	656	0.0	175.7	480.3	0	223,930	466,838	0	22,393	46,684
	Heating	12.51	37.5	1,023	0.0	274.0	749.0	0	408,396	889,791	0	40,840	88,979
	Heating	10.50	32.5	734	0.0	196.6	537.4	0	335,490	754,500	0	33,549	75,450
	Heating	8.67	27.5	334	0.0	89.5	244.5	0	171,986	396,148	0	17,199	39,615
	Heating	6.97	22.5	252	0.0	67.5	184.5	0	144,342	338,742	0	14,434	33,874
	Heating	5.44	17.5	125	0.0	33.5	91.5	0	78,830	187,795	0	7,883	18,779
	Heating	3.73	12.5	47	0.0	12.6	34.4	0	32,360	78,044	0	3,236	7,804
	Heating	2.08	7.5	34	0.0	9.1	24.9	0	25,376	61,834	0	2,538	6,183
	Heating	1.31	2.5	1	0.0	0.3	0.7	0	804	1,977	0	80	198
	Subtotal =			**8,760**	**179**	**1,824**	**4,359**	**31,532**	**1,972,477**	**3,951,674 btu**	**19,809**	**197,248**	**395,167**

	Conduction		Infiltration		
Cooling Lo	(31532) +	(	19809) =		**51,341 btu**
	Cooling Load				
Cooling En	(51341)/	(	12000) *	(0.00) =	**0 kWh**
	Cooling Energy		Cooling Cost		
Cooling En	(0.00) x	(	$0.145) =		**$ -**
	Conduction		Infiltration		
Heating Lo	(5924151) +	(	592415) =		**6,516,566 btu**
	Heating Load		Heat Content		
Heating En	(6516566)/	(	91%) /	(100000) =	**72 Therms**
	Heating Energy		Heating Cost		
Heating En	(71.61) x	(	$1.087) =		**$ 78**

Summary

EXISTING COOLING ENERGY	**0.00**	**kWh**	**$ -**
EXISTING HEATING ENERGY	**228.58**	**Therms**	**$ 248.43**
EXISTING ENERGY COST			**$ 248.43**

PROPOSED COOLING ENERGY	**0.00**	**kWh**	**$ -**
PROPOSED HEATING ENERGY	**71.61**	**Therms**	**$ 77.83**
PROPOSED ENERGY COST			**$ 77.83**

COOLING ENERGY SAVINGS	**0.00**	**kWh**	**$ -**
HEATING ENERGY SAVINGS	**156.96**	**Therms**	**$ 170.60**
ENERGY COST SAVINGS			**$ 170.60**

Glen Rock

CHA Project Number: 30655

DPW Garage

ECM-1: Window Replacement/Upgrade - 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.		
									$ -	
New Windows	96	SF	$ 35	$ 25	$ -	$ 3,451	$ 2,990	$ -	$ 6,441	

Note: Cost Estimates are for energy calculations only, do not use for procurement

$ 6,441	Subtotal
$ 2,254	35% Contingency
$ 8,696	**Total**

Glen Rock
CHA Project Number: 30655
DPW Garage

ECM-2: Overhead Door Replacement/Upgrade

Description This ECM evaluates replacing the minimally insulated overhead doors with new insulated overhead doors.

Description This ECM evaluates the thermal energy savings associated with replacing three un-insulated overhead doors with three new insulated overhead doors.

	Occupied Cooling Hours per Week	45	Hours
	Occupied Heating Hours per Week	45	Hours
Given	Heating Energy Cost	$1.09	$/Therm
	Cooling Energy Cost	$0.145	$/Kwh
	Occupied Cooling Setpoint Temperature	70.0	Degrees F
	Occupied Cooling Avg Space Air Enthalpy	27.5	btu/# air
	Occupied Heating Setpoint Temperature	72.0	Degrees F
	Unoccupied Heating Setpoint Temperature	65.0	Degrees F
	Door Area	720	sq.ft.
	Door Perimeter	192	ft
	Proposed U factor	0.08	Btu/(h*sqft*degf)
	Proposed Air Infiltration	0.05	cfm/ft
	Cooling Conversion	12,000	Btu/ton
	Heating Btu Conversion	1,000,000	Btu/MMBtu
Assumptions	Existing U factor	0.50	Btu/(h*sqft*degf)
	Existing Air Infiltration	0.50	cfm/ft
	Heating System Efficiency	91%	
	Cooling System Efficiency	0	kW/Ton

Formula
Cooling Energy Conduction = (Existing U x Area x (OA Temp - RA Temp) x Op Hours)
Heating Energy Conduction = (Existing U x Area x (RA Temp - OA Temp) x Op Hours)
Cooling Energy Infiltration = (4.5 x Leakage x Perimeter x (OA Enthalpy - RA Enthalpy) x Op Hours)
Heating Energy Infiltration = 1.08 x Leakage x Perimeter x (RA temp - OA temp) x Op Hours)
Load = (Conduction) + (Infiltration)
Cooling Energy = (Cooling Load) / (12,000 Btu/Ton) x (kw/Ton)
Heating Energy = (Heating Load) / (1,000,000 Btu/MMBtu) / (Boiler Efficiency)
Energy Cost = (Energy) x (Cost/Unit)

Existing

Operation	OA Enthalpy	OA Temp	Total Hours	Heating Occupied Hours	Heating Unoccupied Hours	Heating Occupied Conduction	Heating Unoccupied Conduction	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	35.41	97.5	6	0.0	0.0	0	0	0	0
Cooling	37.40	92.5	31	0.0	0.0	0	0	0	0
Cooling	34.98	87.5	131	0.0	0.0	0	0	0	0
Cooling	33.05	82.5	500	0.0	0.0	0	0	0	0
Cooling	31.55	77.5	620	0.0	0.0	0	0	0	0
Cooling	29.91	72.5	664	0.0	0.0	0	0	0	0
Heating	27.19	67.5	854	228.8	0.0	370,575	0	106,726	0
Heating	23.99	62.5	927	248.3	678.7	849,198	610,827	244,569	175,918
Heating	20.25	57.5	600	160.7	439.3	838,929	1,186,071	241,611	341,589
Heating	18.21	52.5	730	195.5	534.5	1,372,661	2,405,089	395,326	692,666
Heating	15.99	47.5	491	131.5	359.5	1,159,988	2,264,738	334,076	652,244
Heating	14.51	42.5	656	175.7	480.3	1,866,086	3,890,314	537,433	1,120,411
Heating	12.51	37.5	1,023	274.0	749.0	3,403,302	7,414,923	980,151	2,135,498
Heating	10.50	32.5	734	196.6	537.4	2,795,754	6,287,496	805,177	1,810,799
Heating	8.67	27.5	334	89.5	244.5	1,433,218	3,301,232	412,767	950,755
Heating	6.97	22.5	252	67.5	184.5	1,202,850	2,822,850	346,421	812,981
Heating	5.44	17.5	125	33.5	91.5	656,920	1,564,955	189,193	450,707
Heating	3.73	12.5	47	12.6	34.4	269,663	650,363	77,663	187,304
Heating	2.08	7.5	34	9.1	24.9	211,468	515,282	60,903	148,401
Heating	1.31	2.5	1	0.3	0.7	6,702	16,473	1,930	4,744
Subtotal =			**8,760**	**1,824**	**4,359**	**16,437,311**	**32,930,614**	**btu**	**4,733,945**	**9,484,017**

	Conduction	Infiltration		
Heating Lo (	49367925) + (	14217962) =		**63,585,887 btu**
	Heating Load	Heat Content		
Heating En (	63585887)/(	91%)/(	100000	**699 Therms**
	Heating Energy	Heating Cost		
Heating En (	698.75) x (	$1.087) =		**$ 759**

Operation	OA Enthalpy	OA Temp	Total Hours	Heating Occupied Hours	Heating Unoccupied Hours	Heating Occupied Conduction	Heating Unoccupied Conduction	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	35.40723	97.5	6	0.0	0.0	0	0	0	0
Cooling	37.40	92.5	31	0.0	0.0	0	0	0	0
Cooling	34.98	87.5	131	0.0	0.0	0	0	0	0
Cooling	33.05	82.5	500	0.0	0.0	0	0	0	0
Cooling	31.55	77.5	620	0.0	0.0	0	0	0	0
Cooling	29.91	72.5	664	0.0	0.0	0	0	0	0
Heating	27.19	67.5	854	228.8	0.0	57,810	0	10,673	0
Heating	23.99	62.5	927	248.3	678.7	132,475	95,289	24,457	17,592
Heating	20.25	57.5	600	160.7	439.3	130,873	185,027	24,161	34,159
Heating	18.21	52.5	730	195.5	534.5	214,135	375,194	39,533	69,267
Heating	15.99	47.5	491	131.5	359.5	180,958	353,299	33,408	65,224
Heating	14.51	42.5	656	175.7	480.3	291,109	606,889	53,743	112,041
Heating	12.51	37.5	1,023	274.0	749.0	530,915	1,156,728	98,015	213,550
Heating	10.50	32.5	734	196.6	537.4	436,138	980,849	80,518	181,080
Heating	8.67	27.5	334	89.5	244.5	223,582	514,992	41,277	95,075
Heating	6.97	22.5	252	67.5	184.5	187,645	440,365	34,642	81,298
Heating	5.44	17.5	125	33.5	91.5	102,479	244,133	18,919	45,071
Heating	3.73	12.5	47	12.6	34.4	42,067	101,457	7,766	18,730
Heating	2.08	7.5	34	9.1	24.9	32,989	80,384	6,090	14,840
Heating	1.31	2.5	1	0.3	0.7	1,045	2,570	193	474
Subtotal =			**8,760**	**1,824**	**4,359**	**2,564,220**	**5,137,176**	**btu**	**473,395**	**948,402**

	Conduction	Infiltration		
Heating Lo (	7701396) + (	1421796) =		**9,123,193 btu**
	Heating Load	Heat Content		
Heating En (	9123193)/(	91%) / (	100000	**100 Therms**
	Heating Energy	Heating Cost		
Heating En (	100.25) x (	$1.087) =		**$ 109**

Summary

EXISTING HEATING ENERGY	**698.75**	**Therms**	**$ 759.45**
PROPOSED HEATING ENERGY	**100.25**	**Therms**	**$ 108.96**
HEATING ENERGY SAVINGS	**598.49**	**Therms**	**$ 650.48**

Glen Rock

CHA Project Number: 30655

DPW Garage

ECM-2: Overhead Door Replacement/Upgrade - 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.		
									$ -	
New OH Doors	3	EA	$ 2,000	$ 500	$ -	$ 6,162	$ 1,869	$ -	$ 8,031	Internet price

Note: Cost Estimates are for energy calculations only, do not use for procurement

$ 8,031	Subtotal
$ 2,811	35% Contingency
$ 10,842	**Total**

Glen Rock
CHA Project Number: 30655
DPW Garage

ECM-3: Install Piping Insulation (Bare Pipe)

Description This ECM evaluates insulating heating system piping which is not currently insulated to reduce heat loss from piping and heat gain to the spaces.

Given

		Pipe #1	Pipe #2	Pipe #3	Pipe #4	
Fuel Energy Cost	=				$ 1.09	$/Therm (Nat'l Gas)
Operation (Hours/Week)	=				40	Hours/Week
Operation (Heating Weeks/Year)	=				52	Weeks/Year
Operation (Hours/Year)	=				2080	Hours/Year
Heating Media	=				Water	
Piping Material	=				Mild Steel	
Ambient Temperature	=				72	°F
Pipe Diameter	=	2	1 1/2	4	2	inches
Pipe Length	=	100.00 feet	360.00 feet	0.00 feet	0.00 feet	

Assumption

		Pipe #1	Pipe #2	Pipe #3	Pipe #4	
Min. Pipe Insulation Recommended	=	1.50 inches	1.00 inches	1.50 inches	1.50	inches
Circulating Temperature	=				150	°F
Heating Efficiency	=				91%	
Pipe Insulation Conductivity	=				0.29	Btu*in./(h*ft2*F)

Formula

Piping Correction Factor = (Current Transmission Coefficient / Reference Transmission Coefficient)
Temperature Correction Factor = (Circulating Temperature - Ambient Temperature) / (Circulating Temperature - Reference Temperature)
Hourly Heat Loss per pipe size and length = (Heat loss per foot [from chart]) x (Piping Correction Factor) x (Temperature Correction Factor) x (Pipe Length)
Seasonal Heat Loss = (Hourly Heat Loss Total) x (Operating hours) / (Heating Efficiency) / (1,000 btu/Mbtu)

Energy Loss = (Seasonal Heat Loss) / (Conversion Factor [MBtu/Unit])
Energy Loss Cost = (Energy Loss) x (cost/unit)

Calculation

Existing

Piping Correction Factor = (Current Transmission Coefficient 2.00 / Reference Transmission Coefficient 2.00) = **1.00**

Temperature Correction Factor = (Circulating Temp. 150 - Ambient Temp. 72) / (Circulating Temp. 150 - Reference Temp. 80) = **1.11**

	Heat Loss per foot	Piping CF	Temperature CF	Pipe Length		
Heat Loss Pipe #1 (Hourly)	84.92	1.00	1.11	100.00	9,462	Btuh
Heat Loss Pipe #2 (Hourly)	67.23	1.00	1.11	360.00	26,969	Btuh
Heat Loss Pipe #3 (Hourly)	151.61	1.00	1.11	0.00	-	Btuh
Heat Loss Pipe #4 (Hourly)	84.92	1.00	1.11	0.00	-	Btuh
					36,431	**Btuh**

Seasonal Heat Loss = (Hourly Heat Loss 36,431) x (operating Hours 2,080) / (Heating Efficiency 91%) / (Factor 1,000) = **83,270 Mbtu**

Existing Energy Loss = (Seasonal Heat Loss 83,270) / (Btu/unit 100) = **833 Therm**

Existing Energy Loss Cost = (Unit 833) x (Cost per Unit $ 1.09) = **$ 905**

New

	Heat Loss per foot	Piping CF	Temperature CF	Pipe Length		
Heat Loss Pipe #1 (Hourly)	13.00	1.00	1.11	100.00	1,449	Btuh
Heat Loss Pipe #2 (Hourly)	14.00	1.00	1.11	360.00	5,616	Btuh
Heat Loss Pipe #3 (Hourly)	19.00	1.00	1.11	0.00	-	Btuh
Heat Loss Pipe #4 (Hourly)	13.00	1.00	1.11	0.00	-	Btuh
					7,065	**Btuh**

Seasonal Heat Loss = (Hourly Heat Loss 7,065) x (operating Hours 2,080) / (Heating Efficiency 91%) / (Factor 1,000) = **16,148 Mbtu**

New Energy Loss = (Seasonal Heat Loss 16,148) / (Btu/unit 100) = **161 Therm**

New Energy Loss Cost = (Unit 161) x (Cost per Unit $ 1.09) = **$ 176**

Result

Existing Heat Loss		**833**	**Therm**	**$**	**905**
New Heat Loss		**161**	**Therm**	**$**	**176**
Savings	**100%**	**671**	**Therm**	**$**	**730** 80.6%

Conversion Factors

$/MCF (Nat'l Gas)	1	1,030,000	btu/MCF	MCF	Mbh/MCF	1,030	MMbh/MCF	####
$/CCF (Nat'l Gas)	2	103,000	btu/CCF	CCF	Mbh/CCF	103	MMbh/CCF	####
$/CF (Nat'l Gas)	3	1,030	btu/CF	CF	Mbh/CF	1.030	MMbh/CF	####
$/Therm (Nat'l Gas)	4	100,000	btu/Therm	Therm	Mbh/Therm	100	MMbh/Therm	####
$/gal (LP Gas)	5	91,500	btu/gallon	gallons	Mbh/gallon	91.5	MMbh/gallon	####
$/gal (Fuel Oil #2)	6	139,000	btu/gallon	gallons	Mbh/gallon	139	MMbh/gallon	####
$/lb Steam	7	975	btu/lb Steam	lb Steam	Mbh/lb Steam	0.975	MMbh/lb Steam	####
$/1000 lbs Steam	8	975,000	btu/1000 lbs Stear	1000 lbs Steam	Mbh/1000 lbs Steam	975	MMbh/1000 lbs S	####

This chart is not used but is left for future reference

Pipe Diameter	Initial Bare	Final (1) R=2	Final (2) ASHRAE standard	ASHRAE standard 40-80	Final (2) ASHRAE stnd x pipe length	Initial Bare x pipe length	
(I.d.)	BTU/hr/ft/°F	BTU/hr/ft/°F	BTU/hr/ft/°F	Relative thickness in inches	Btu/hr/°F		
1/2	0.27	0.18	0.15	0.75	30.0	54.0	44%
3/4	0.61	0.27	0.21	0.75	42.0	122.0	66%
1	0.77	0.30	0.23	0.75	46.0	154.0	70%
1 1/2	1.06	0.34	0.20	1.00	40.0	212.0	81%
2	1.30	0.36	0.21	1.00	42.0	260.0	84%
3	1.86	0.39	0.22	1.00	44.0	372.0	88%
4	2.30	0.41	0.22	1.00	44.0	460.0	90%
6	3.35	0.44	0.23	1.00	46.0	670.0	93%

Select one pipe length from below: 200
25 ft
50 ft
100 ft
150 ft
200 ft

Glen Rock
CHA Project Number: 30655
DPW Garage

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2012
Building must have a minimum average electric demand of 100 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
Values used in this calculation are for ALL identified measures except for alternate ECMs, regardless of payback or IR
P4P estimated incentives represent a best case scenario, and will likely be lower depending on which measures are included. The savings displayed here are not guaranteed to qualify for P4P incentives if IRR or payback requirements are not met.

Total Building Area (Square Feet)	4,352
Is this audit funded by NJ BPU (Y/N)	Yes

Board of Public Utilites (BPU)

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

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$3,557	$8,595
Existing Usage (from utility)	27,504	7,908
Proposed Savings	5,973	1,270
Existing Total MMBtus	885	
Proposed Savings MMBtus	147	
% Energy Reduction	**16.7%**	
Proposed Annual Savings	$2,422	

	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	$0.10	$0.98
Incentive #3	$0.09	$0.90	$0.005	$0.05	$0.11	$1.25	$0.10	$0.98

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$5,000
Incentive #2	$587	$1,248	$1,835
Incentive #3	$587	$1,248	$1,835
Total All Incentives	**$1,174**	**$2,496**	**$8,670**

Total Project Cost	$26,143

		Allowable Incentive
% Incentives #1 of Utility Cost*	41.1%	$5,000
% Incentives #2 of Project Cost**	7.0%	$1,835
% Incentives #3 of Project Cost**	7.0%	$1,835
Total Eligible Incentives***	**$8,670**	
Project Cost w/ Incentives	$17,473	

Project Payback (years)	
w/o Incentives	w/ Incentives
10.8	7.2

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

** Maximum allowable amount of Incentive #2 is 25% of total project cost.
Maximum allowable amount of Incentive #3 is 25% of total project cost.

*** Maximum allowable amount of Incentive #1 is $50,000 if not funded by NJ BPU, and $25,000 if it is.
Maximum allowable amount of Incentive #2 & #3 is $1 million per gas account and $1 million per electric account; maximum 2 million per project

Glen Rock
CHA Project Number: 30655
DPW Garage

ECM-3: Install Piping Insulation (Bare Pipe) - 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.		
Fiberglass Pipe insulation	460	LF	$ 4.14	$2.00		$ 1,956	$ 1,146	$ -	$ 3,102	RS Means 2012
						$ -	$ -	$ -	$ -	

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

$ 3,102	Subtotal
$ 1,086	35% Contingency
$ 4,188	**Total**

Energy Audit of DPW Garage
CHA Project No. 30655
Existing Lighting & Audit Input

Cost of Electricity: **$0.123** **$/kWh**
$3.03 **$/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
196LED	Garage	Offices	16	W 32 C F 4 (ELE)	F44ILL	112	1.79	SW	2080	3,727	OCC	
191	Garage	Offices	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.25	SW	2080	512	OCC	
196LED	Garage	Offices	4	W 32 C F 4 (ELE)	F44ILL	112	0.45	SW	2080	932	OCC	
35LED	Office	Offices	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.27	SW	2080	562	OCC	
7LED	Utilty Room	Storage Areas	2	2T 32 R F 2 (u)	FU2LL	60	0.12	SW	2080	250	OCC	
143LED	Exterior Lights	Outdoor Lighting	6	HPS 100 POLE	HPS100/1	138	0.83	SW	4368	3,617	PHC	
	Total		**33**				**3.70**			**9,599**		

Energy Audit of DPW Garage
CHA Project No. 30655
ECM-L1 Lighting Replacements

		EXISTING CONDITIONS								RETROFIT CONDITIONS							COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
196LED	Garage	16	W 32 C F 4 (ELE)	F44ILL	112	1.8	SW	2080	3,727	16	T 50 R LED	RTLED50	50	0.8	SW	2,080	1,664	2,063	1.0	$ 289.86	$ 3,780.00	$800	13.0	10.3
191	Garage	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	SW	2080	512	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	SW	2,080	512	-	0.0	$ -	$ -	$0		#DIV/0!
196LED	Garage	4	W 32 C F 4 (ELE)	F44ILL	112	0.4	SW	2080	932	4	T 50 R LED	RTLED50	50	0.2	SW	2,080	416	516	0.2	$ 72.47	$ 945.00	$200	13.0	10.3
35LED	Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2080	562	3	T 59 R LED	RTLED38	38	0.1	SW	2,080	237	324	0.2	$ 45.58	$ 708.75	$75	15.5	13.9
7LED	Utilty Room	2	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	2080	250	2	2T 25 R LED	2RTLED	25	0.1	SW	2,080	104	146	0.1	$ 20.45	$ 405.00	$100	19.8	14.9
143LED	Exterior Lights	6	HPS 100 POLE	HPS100/1	138	0.8	SW	4368	3,617	6	ALED52	ALED52	60	0.4	SW	4,368	1,572	2,044	0.5	$ 268.46	$ 4,633.20	$1,050	17.3	13.3
	Total	**33**				**3.7**			**9,599**	**33**			**346**	**1.8**			**4,505**	**5,094**	**1.9**	**$697**	**$10,472**	**$2,225**		
																		Demand Savings		**1.9**	**$70**			
																		kWh Savings		**5,094**	**$627**			
																		Total savings			**$697**		**15.0**	**11.8**

Energy Audit of DPW Garage
CHA Project No. 30655
ECM-L2 Install Occupancy Sensors

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Smart Start Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	Lighting Fixture Code	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
196LED	Garage	16	W 32 C F 4 (ELE)	F44ILL	112	1.8	SW	2080	3,727.4	16	W 32 C F 4 (ELE)	F44ILL	112	1.8	OCC	1456	2,609.2	1,118.2	0.0	$137.54	$128.25	$10.00	0.9	0.9
191	Garage	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	SW	2080	511.7	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	OCC	1456	358.2	153.5	0.0	$18.88	$128.25	$10.00	6.8	6.3
196LED	Garage	4	W 32 C F 4 (ELE)	F44ILL	112	0.4	SW	2080	931.8	4	W 32 C F 4 (ELE)	F44ILL	112	0.4	OCC	1456	652.3	279.6	0.0	$34.38	$128.25	$10.00	3.7	3.4
35LED	Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2080	561.6	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	OCC	1456	393.1	168.5	0.0	$20.72	$128.25	$10.00	6.2	5.7
7LED	Utilty Room	2	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	2080	249.6	2	2T 32 R F 2 (u)	FU2LL	60	0.1	OCC	1456	174.7	74.9	0.0	$9.21	$128.25	$10.00	13.9	12.8
143LED	Exterior Lights	6	HPS 100 POLE	HPS100/1	138	0.8	SW	4368	3,616.7	6	HPS 100 POLE	HPS100/1	138	0.8	PHC	4368	3,616.7	0.0	0.0	$0.00	$0.00	$0.00		#DIV/0!
															0	#N/A	#VALUE!	#VALUE!	#N/A	#VALUE!			#VALUE!	#VALUE!
	Total	**33**				**3.7**			**9598.8**	**33.0**				**3.7**			**7804.2**	**1794.6**	**0.0**	**220.7**	**641.3**	**50.0**		
																	Demand Savings			**0.0**	**$0**			
																	kWh Savings			**1,795**	**$221**			
																	Total Savings				**$221**		**2.9**	**2.7**

Energy Audit of DPW Garage
CHA Project No. 30655
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) * (kWh Saved)	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
196LED	Garage	16	W 32 C F 4 (ELE)	F44ILL	112	1.8	SW	2080	3,727	16	T 50 R LED	RTLED50	50	0.8	OCC	1,456	1,165	2,563	1.0	$ 351.26	$ 3,908.25	$ 810	11.1	8.8
191	Garage	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	SW	2080	512	2	S 60 C F 2 (ELE) 8'	F82EE	123	0.2	OCC	1,456	358	154	0.0	$ 18.88	$ 128.25	$ 10	6.8	6.3
196LED	Garage	4	W 32 C F 4 (ELE)	F44ILL	112	0.4	SW	2080	932	4	T 50 R LED	RTLED50	50	0.2	OCC	1,456	291	641	0.2	$ 87.82	$ 1,073.25	$ 210	12.2	9.8
35LED	Office	3	T 32 R F 3 (ELE)	F43ILL/2	90	0.3	SW	2080	562	3	T 59 R LED	RTLED38	38	0.1	OCC	1,456	396	396	0.2	$ 54.33	$ 837.00	$ 85	15.4	13.8
7LED	Utilty Room	2	2T 32 R F 2 (u)	FU2LL	60	0.1	SW	2080	250	2	2T 25 R LED	2RTLED	25	0.1	OCC	1,456	73	177	0.1	$ 24.29	$ 533.25	$ 110	22.0	17.4
143LED	Exterior Lights	6	HPS 100 POLE	HPS100/1	138	0.8	SW	4368	3,617	6	ALED52	ALED52	60	0.4	PHC	4,368	1,572	2,044	0.5	$ 268.46	$ 4,633.20	$ 1,050	17.3	13.3
															0	#N/A								#VALUE!
S	**Total**	**33**				**3.7**			**9,599**	**33**				**1.8**			**3,625**		**1.9**	**805**	**11,113**	**$2,275**		
S																	**Demand Savings**			**1.9**	**$70**			
S																	**kWh Savings**			**5,973**	**$735**			
S																	**Total Savings**				**$805**		**13.8**	**11.0**

APPENDIX D

Photovoltaic Analysis

Borough of Glen Rock
DPW Garage

Cost of Electricity	$0.145	/kWh
Electricity Usage	27,504	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
$80,000	**20.0**	**24,726**	**0**	**$3,585**	**0**	**$3,585**	**$0**	**$5,811**	**22.3**	**8.5**

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $235 /1000kwh

Area Output*
588 m2
6,324 ft2

Perimeter Output*
100 m
329 ft

Available Roof Space for PV:
(Area Output - 10 ft x Perimeter) x 85%
2,577 ft2

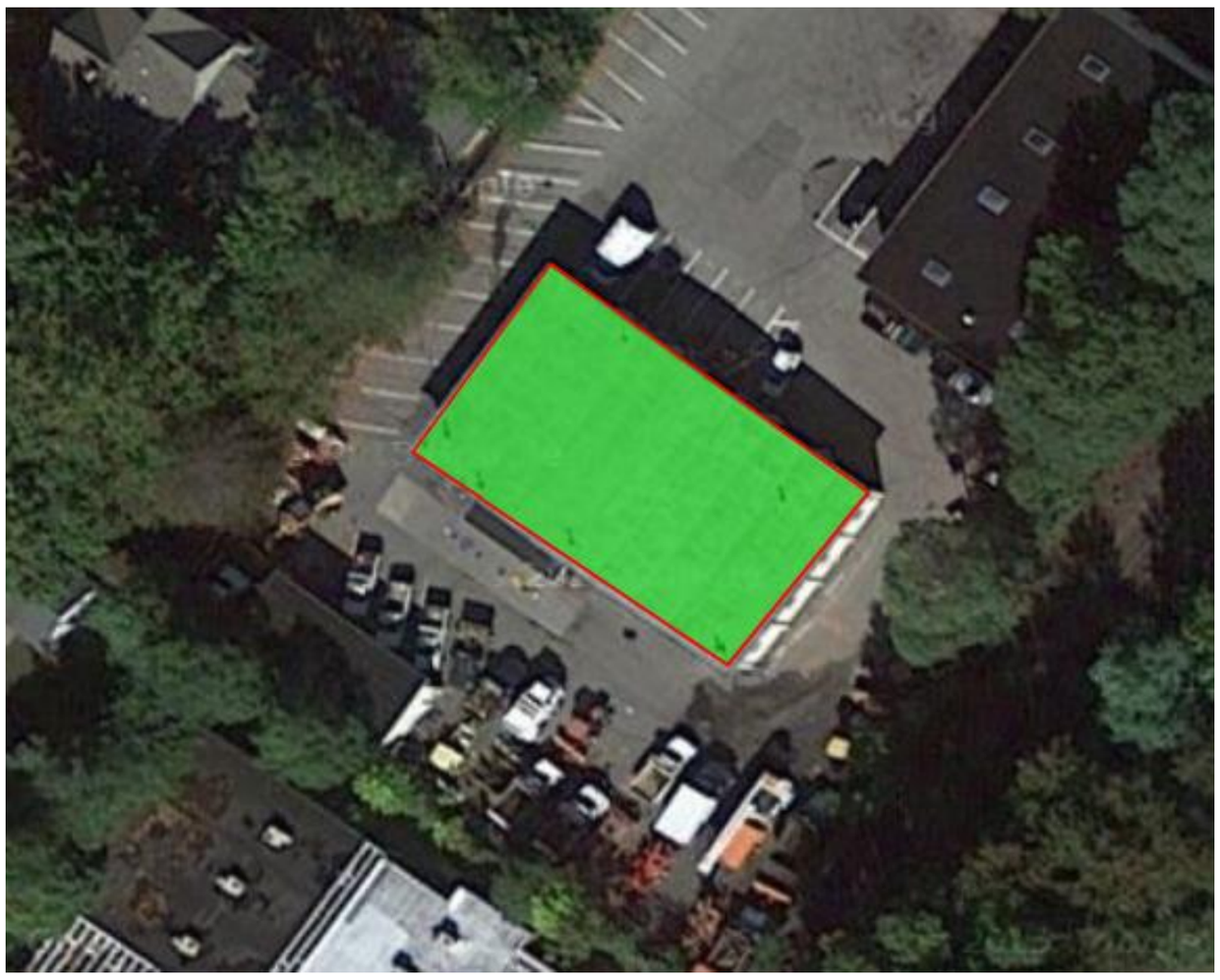
Approximate System Size: Is the roof flat? (Yes/No) NO

11.5 watt/ft2
29,630 DC watts
20 kW Enter into PV Watts

PV Watts Inputs***

Array Tilt Angle	20	Enter into PV Watts (always 20 if flat, if pitched - enter estimated roof angle)
Array Azimuth	180	Enter into PV Watts (default)
Zip Code	07452	Enter into PV Watts
DC/AC Derate Factor	0.83	Enter info PV Watts

PV Watts Output
24,726 annual kWh calculated in PV Watts program



% Offset Calc

Usage	27,504	(from utilities)
PV Generation	24,726	(generated using PV Watts)
% offset	90%	

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

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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

RESULTS

24,725 kWh per Year *

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	2.91	1,532	222
February	3.51	1,642	238
March	4.21	2,152	312
April	4.19	2,039	296
May	5.95	2,916	423
June	6.27	2,901	421
July	5.24	2,508	364
August	4.75	2,276	330
September	5.09	2,361	342
October	3.55	1,768	256
November	2.73	1,343	195
December	2.49	1,288	187
Annual	4.24	24,726	$ 3,586

User Comments

Glen Rock DPW Garage Facility - Roof Mounted PV System

Location and Station Identification

Requested Location	473 doremus avenue glen rock nj	
Weather Data Source	(TMY3) CALDWELL/ESSEX CO., NJ	9.8 mi
Latitude	40.88° N	
Longitude	74.28° W	

PV System Specifications *(Commercial)*

DC System Size	20 kW
Module Type	Premium
Array Type	Fixed (open rack)
Array Tilt	20°
Array Azimuth	180°
System Losses	14%
Inverter Efficiency	96%
DC to AC Size Ratio	1.1

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.15 $/kWh
Initial Cost	4.00 $/Wdc

APPENDIX E

Photos

APPENDIX F – PHOTOS

1. Boilers

2. Pumps

3. Air Cleaners

APPENDIX F

EPA Benchmarking Report

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

DPW Garage

Primary Property Function: Other
Gross Floor Area (ft²): 4,352
Built: 1929

For Year Ending: December 31, 2014
Date Generated: October 29, 2015

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
DPW Garage
473 Doremus Avenue
Glen Rock, New Jersey 07452

Property Owner
Borough of Glen Rock
1 Harding Plaza
Glen Rock, NJ 07452
(201) 670-3956

Primary Contact
Lenora Benjamin
1 Harding Plaza
Glen Rock, NJ 07452
(201) 670-3956
srivera@chacompanies.com

Property ID: 4614806

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
203.2 kBtu/ft²

Source EUI
258.4 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	93,775 (11%)
Natural Gas (kBtu)	790,760 (89%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	96.8
National Median Source EUI (kBtu/ft²)	123.1
% Diff from National Median Source EUI	110%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	55

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

Lenora Benjamin
1 Harding Plaza
Glen Rock, NJ 07452
(201) 670-3956
srivera@chacompanies.com

Professional Engineer Stamp (if applicable)