Local Government Energy Audit:
Energy Audit Report

Firehouse

City of Jersey City

595 Palisade Ave.

Jersey City, NJ 07307

February 19, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate saving are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Firehouse 595 Palisade Ave. The goal of a LGEA is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and put you in a position to implement the ECMs. The LGEA also sets you on the path to receive financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing the ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey local government in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

1.1 Facility Summary

The Firehouse at 595 Palisade Avenue is a 20,000 square foot, single story building built in the late 2000's. The Firehouse is the Engine 14 Ladder 7 of the Fire Department of Jersey City.

The building consists of offices, firetruck bays, a bunk room, a locker room, a kitchen and gymnasium room. As an emergency service facility, the 595 Palisade Avenue firehouse is open 24 hours a day, seven (7) days a week. The garage has three (3) engine entrance doors on the North and South sides of the building.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated nine (9) projects which represent an opportunity to reduce annual energy costs by $14,916 and annual greenhouse gas emissions by 109,743 lbs CO_2e. The measures would pay for themselves in 4.7 years. The breakdown of existing and potential utility costs is illustrated in Figure 1 and Figure 2, respectively. These projects represent an opportunity to reduce Firehouse 595 Palisade Ave.'s annual energy use by 18.6%.

Figure 1 – Previous 12 Month Utility Costs

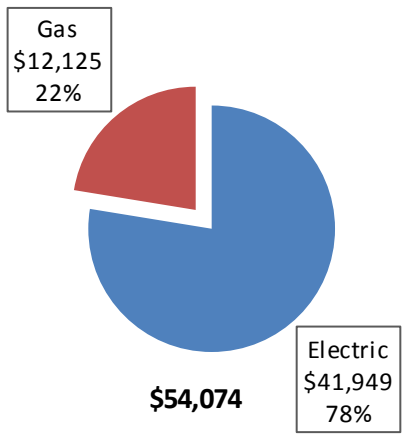
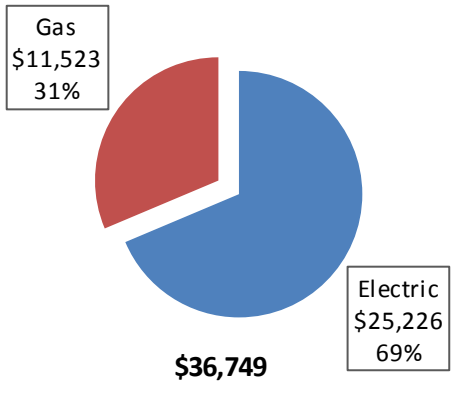


Figure 2 – Potential Post-Implementation Costs



A detailed description of Firehouse 595 Palisade Ave.'s existing energy use can be found in Section 3.

The evaluated measures have been listed and grouped into major categories as shown in Figure 3. Brief descriptions of the categories can be found below and descriptions of the individual opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**72,334**	**6.0**	**0.0**	**$10,174.52**	**$13,583.68**	**$1,225.00**	**$12,358.68**	**1.21**	**72,840**
ECM 1	Install LED Fixtures	27,720	2.3	0.0	$3,899.05	$5,479.65	$45.00	$5,434.65	1.39	27,913
ECM 2	Retrofit Fixtures with LED Lamps	44,377	3.7	0.0	$6,242.05	$7,781.37	$1,180.00	$6,601.37	1.06	44,687
ECM 3	Install LED Exit Signs	238	0.0	0.0	$33.42	$322.67	$0.00	$322.67	9.66	239
Lighting Control Measures		**7,087**	**0.6**	**0.0**	**$996.84**	**$1,276.00**	**$220.00**	**$1,056.00**	**1.06**	**7,136**
ECM 4	Install Occupancy Sensor Lighting Controls	7,087	0.6	0.0	$996.84	$1,276.00	$220.00	$1,056.00	1.06	7,136
Variable Frequency Drive (VFD) Measures		**8,238**	**1.0**	**0.0**	**$1,158.82**	**$3,275.85**	**$0.00**	**$3,275.85**	**2.83**	**8,296**
ECM 5	Install VFDs on Hot Water Pumps	8,238	1.0	0.0	$1,158.82	$3,275.85	$0.00	$3,275.85	2.83	8,296
Electric Unitary HVAC Measures		**3,625**	**1.4**	**0.0**	**$509.89**	**$47,141.38**	**$0.00**	**$47,141.38**	**92.45**	**3,650**
ECM 6	Install High Efficiency Heat Pumps	3,625	1.4	0.0	$509.89	$47,141.38	$0.00	$47,141.38	92.45	3,650
HVAC System Improvements		**10,478**	**2.4**	**0.0**	**$1,473.82**	**$1,100.00**	**$250.00**	**$850.00**	**0.58**	**10,551**
ECM 7	Install Dual Enthalpy Outside Economizer Control	10,478	2.4	0.0	$1,473.82	$1,100.00	$250.00	$850.00	0.58	10,551
Domestic Water Heating Upgrade		**0**	**0.0**	**62.1**	**$601.82**	**$4,903.07**	**$152.00**	**$4,751.07**	**7.89**	**7,269**
ECM 8	Install High Efficiency Gas Water Heater	0	0.0	18.9	$182.97	$4,392.04	$152.00	$4,240.04	23.17	2,210
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	43.2	$418.85	$511.03	$0.00	$511.03	1.22	5,059
TOTALS		**101,762**	**11.4**	**62.1**	**$14,915.71**	**$71,279.98**	**$1,847.00**	**$69,432.98**	**4.66**	**109,743**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when conditions allow. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Variable Frequency Drives measures generally involve controlling the speed of a motor to achieve a flow or temperature rather than using a valve, damper, or no means at all. These measures save energy by slowing a motor which is an extremely efficient method of control.

Electric Unitary HVAC measures generally involve replacing old inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide cooling equivalent to older air condition systems, but use less energy. These measures save energy by reducing the power used by the air condition system due to improved electrical efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand when conditions allow. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperatures. These measures save energy by reducing the demand on the systems and the amount of time systems operate.

Domestic Water Heating upgrade measures generally involve replacing old inefficient domestic water heating systems with modern energy efficient systems. New domestic water heating systems can provide equivalent or greater capacity as older systems, but use less energy. These measures save energy by

reducing the fuel used by the domestic water heating systems due to improved efficiency or the removal of standby losses.

Energy Efficient Practices

TRC also identified nine (9) no (or low) cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems. Through these practices equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. Opportunities identified include:

- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

Self-Generation Measures

TRC evaluated the potential for installing self-generation sources for Firehouse 595 Palisade Ave. Based on the configuration of the site and its loads there is a moderate potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	Medium	
System Potential	57	kW DC STC
Electric Generation	67,908	kWh/yr
Displaced Cost	$5,910	/yr
Installed Cost	$148,200	

For details on our evaluation and the self-generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, the equipment changes outlined for each ECM need to be selected and installed through project implementation. One of the first considerations is if there is capital available for project implementation. Another consideration is whether to pursue individual ECMs, a group of ECMs, or a comprehensive approach wherein all ECMs are pursued, potentially in conjunction with other facility projects or improvements.

Rebates, incentives, and financing are available from the NJBPU, NJCEP, as well as some of the state's investor-owned utilities, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any project, please review the appropriate incentive program guidelines

before proceeding. This is important because in most cases you will need to submit an application for the incentives before purchasing materials and beginning installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Direct Install
- Energy Savings Improvement Program (ESIP)

For facilities with capital available for implementation of selected individual measures or phasing implementation of selected measures over multiple years, incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to design the ECM(s), select the equipment and apply for the incentive(s). Program pre-approval is required for some SmartStart incentives, so only after receiving approval may the ECM(s) be installed. The incentive values listed above in Figure 3 represent the SmartStart program and will be explained further in Section 8, as well as the other programs as mentioned below.

This facility also qualifies for the Direct Install program which, through an authorized network of participating contractors, can assist with the implementation of a group of measures versus installing individual measures or phasing implementation. This program is designed to be turnkey and will provide an incentive up to 70% of the cost of the project identified by the designated contractor.

For facilities without capital available to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with external project development, design, and implementation services as well as financing for implementing ECMs. This LGEA report is the first step for participating in ESIP and should help you determine next steps. Refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a program (non-NJCEP) designed to reduce consumer electric load when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability locally. By enabling grid operators to call upon Curtailment Service Providers and energy consumers to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants will receive payments whether or not their facility is called upon to curtail their load. Refer to Section 7 for additional information on this program.

Additional descriptions of all relevant incentive programs are located in Section 8 or: www.njcleanenergy.com/ci.

To ensure projects are implemented such that maximum savings and incentives are achieved, bids and specifications should be reviewed by your procurement personnel and/or consultant(s) to ensure that selected equipment coincides with LGEA recommendations, as well as applicable incentive program guidelines and requirements.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
John Mercer	Assistant Business Administrator	jmercer@jcnj.org	201-547-4417
Designated Representative			
Chief Michael Conforti	Chief Battalion	mconforti@njjcps.org	732-687-2798
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	732-855-2879

2.2 General Site Information

On July 14, 2016, TRC Energy Services performed an energy audit at Firehouse 595 Palisade Ave. located in Jersey City, New Jersey. TRC's auditor met with Chief Michael Conforti to review the facility operations and focus the investigation on specific energy-using systems.

The 595 Palisade Avenue Firehouse is a 20,000 square foot, single story building built in in the late 2000's. The firehouse is the Engine Company 14, Ladder 7 of the Fire Department of Jersey City. The building consists of offices, firetruck bays, a bunk room, a locker room, a kitchen and gymnasium room. The Jersey City Fire Department is interested in exploring a cost effective options that can make the Firehouse and its system more efficient.

2.3 Building Occupancy

The Fire House is an emergency facility operating 24 hours, seven (7) days a week. The typical schedule is presented in the table below.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Fire House Palissade Avenue	Weekday	12:00 AM - 12:00 AM
Fire House Palissade Avenue	Weekend	12:00 AM - 12:00 AM

2.4 Building Envelope

The foundation consists of a conventional reinforced concrete foundation. Exterior walls are finished with brick masonry. Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good condition with no signs of uncontrolled moisture, air-leakage and other energy-compromising issues.

The garage has three (3) engine entrance doors on the North and South sides of the building. The building envelope appears to be in good condition with no evidence of damage or air infiltration.

The primary roof is flat and covered with a black rubber and appears to be in good condition. The primary roof is surrounded by sloped metallic roofs with no sign of excessive wear of damage.

The facility has wood-framed, double-paned window units. Windows, shading devices, sills, related flashing and caulking were inspected for signs of moisture, air leakage and other energy comprising issues. Overall, the windows were found to be in good condition with no signs of uncontrolled moisture, air-leakage and other energy-comprising issues.

2.5 On-site Generation

The Firehouse-595 Palisade Avenue has 45 kVA Kohler back-up generator, which burns diesel fuel. It is used in case of emergency power outage. It is located on the flat rooftop.

2.6 Energy-Using Systems

Lighting System

Lighting is predominately by 32-Watt linear fluorescent T8 lamps with electronic ballasts. The kitchen, the front exterior, and the bathrooms are all lit with 2-lamp, 26-Watts 4-pin recessed can compact fluorescent lamps (26 watts each).

The engine bay area is lit with 400-Watt metal halide and 32-Watt fluorescent T8 lamps. Lighting control is provided by manual light switch.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Hot Water System

Heating is provided by a Weil McLain gas-fired boiler with output capacity of 395,000 Btu/hr located in the mechanical room. The boiler appeared to be in good condition, but the controller cover needs to be reattached. The baseboards located throughout the interior spaces are supplied with heating hot water by a 3 hp constant speed pump. The boiler is controlled based on the outside air temperature. The boiler is 14 years old.

The mechanical and electrical rooms have one (1) 5-kW unit heater each while the engine bay area has two 100 kBtu/hr hot water unit heaters.

Air Conditioning (DX)

One (1) 30-ton constant volume Carrier rooftop unit provides cooling and electric heating to the facility. The unit utilizes a scroll compressor and a direct-expansion (DX) coil. The unit is 14 years old and appears in fair condition. The packaged unit is controlled by programmable thermostat.

A 1-ton Carrier window air conditioner serves the electrical room.

Building Energy Management System

The facility has no BMS running currently. The building energy management system stopped working for a year due to a dispute with the contractor who installed and maintained the BMS. The server is still in place. However, we could not determine during our site visit the type of BMS that was installed. The BMS should be restored for a better HVAC system control.

Domestic Hot Water

The domestic hot water system consists of one (1) A. O. Smith gas-fired, non-condensing hot water heater with an input rating of 76 kBtu/hr and an estimated efficiency of 76%. The water heater has a 75-gallon storage tank and is located in the mechanical room.

The water heater is leaking from the top pipe connection. The vessel is hot and the outside temperature reading was 91°F.

The water heater should be replaced with new energy efficient unit with better insulation.

Food Service

The Firehouse has a small non-commercial kitchen that is used to prepare breakfast and lunch for the firefighters. The ovens, range tops, and griddle are all gas fired. The kitchen is clean and the equipment was in good condition.

Refrigeration

The facility has two (2) different cold storage areas. The kitchen has one (1) Traulsen two-section stand-up refrigerator that is used to store fresh food. The refrigerator has stainless steel exterior and aluminum interior.

The garage has one Manitowoc air cooled ice machine and one stand-up refrigerator. The ice machine has a capacity of 430 lbs/day, an energy usage of 5.8 kWh/100 lbs and a water usage per ice of 19.9 gallon/100 lbs.

Overall the refrigeration equipment is in good condition.

Plug load & Vending Machines

There are four (4) desktop computers with LCD monitor in the facility. There is no server in the facility.

The facility has seven (7) flat screen wall mounted TVs located in different spaces.

There is a small laundry room which consists of two (2) electric washing machines and two gas-fired dryers. The machines are frequently used by the firefighters.

2.7 Water-Using Systems

There are two restrooms at this facility which faucets are rated for 2.0 gallons per minute (gpm) or higher, the toilets are rated at 2.5 gallons per flush (gpf)and the urinals are rated at 2 (gpf). The Firehouse also has a women's and men's locker room. All of the showerheads of the locker room are rated at 2.0 gpm. The kitchen has one faucet that is rated for 2.5 gpm.

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost/ft^2 and energy use/ft^2. These energy use indices are indicative of the relative energy effectiveness of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy use for other facilities identified as: Emergency Services. Specific local climate conditions, daily occupancy hours of the facility, seasonal fluctuations in occupancy, daily operating hours of energy use systems, and the behavior of the occupants with regard to operating systems that impact energy use such as turning off appliances and leaving windows open. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

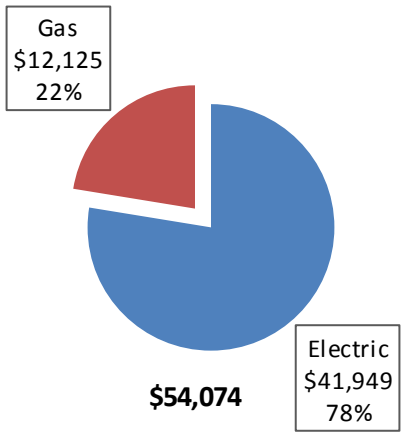
The following energy consumption and cost data is based on the last 12 month period of utility usage data that was provided for each utility. The annual consumption and cost was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Firehouse 595 Palisade Ave.		
Fuel	**Usage**	**Cost**
Electricity	279,660 kWh	$41,949
Natural Gas	12,508 Therms	$12,125
Total		**$54,074**

The current utility cost for this site is $54,074 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost (combined for commodity, transmission and distribution) for the past 12 months is $0.141/kWh, which is the blended rate used throughout the analyses in this report. The monthly electricity consumption and peak demand is represented graphically in the chart below.

Figure 9 -Electric Usage & Demand

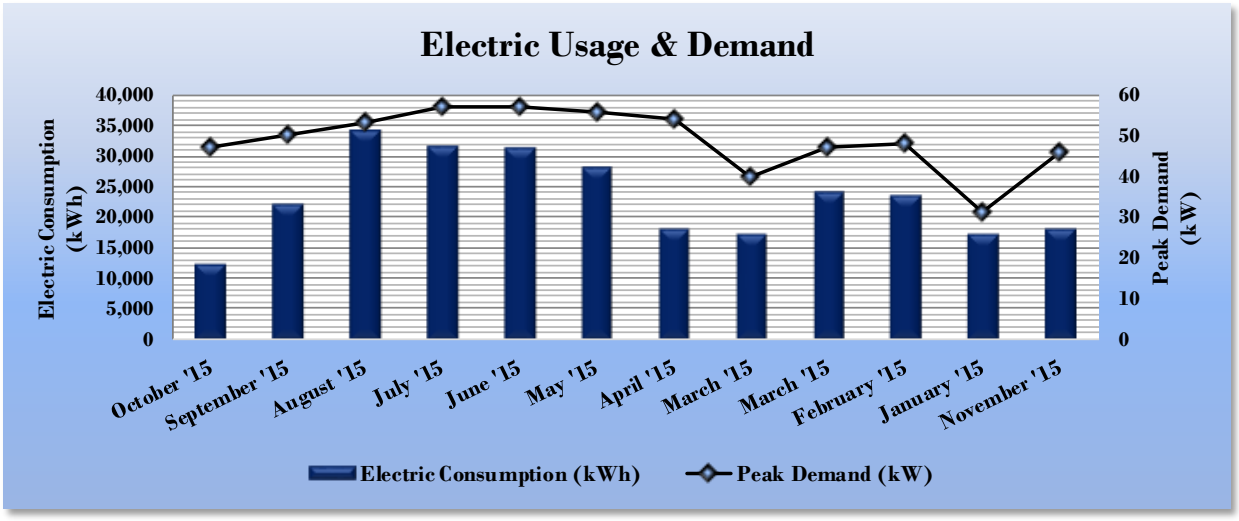


Figure 10 - Electric Usage & Demand

Electric Billing Data for Firehouse 595 Palisade Ave.					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
11/11/15	30	12,510	47	$205	$1,877
10/13/15	29	22,230	50	$219	$3,335
9/14/15	32	34,350	53	$231	$5,153
8/13/15	29	31,680	57	$247	$4,752
7/15/15	30	31,470	57	$247	$4,721
6/15/15	32	28,350	56	$242	$4,253
5/14/15	29	18,120	54	$236	$2,718
4/15/15	30	17,370	40	$175	$2,606
3/16/15	30	24,210	47	$271	$3,632
2/17/15	30	23,610	48	$207	$3,542
1/16/15	32	17,460	31	$133	$2,619
12/15/15	32	18,300	46	$199	$2,745
Totals	**365**	**279,660**	**57**	**$2,612**	**$41,949**
Annual	**365**	**279,660**	**57**	**$2,612**	**$41,949**

3.3 Natural Gas Usage

Natural Gas is provided by PSE&G. The average gas cost for the past 12 months is $0.969/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is represented graphically in the chart below.

Figure 11 - Natural Gas Usage

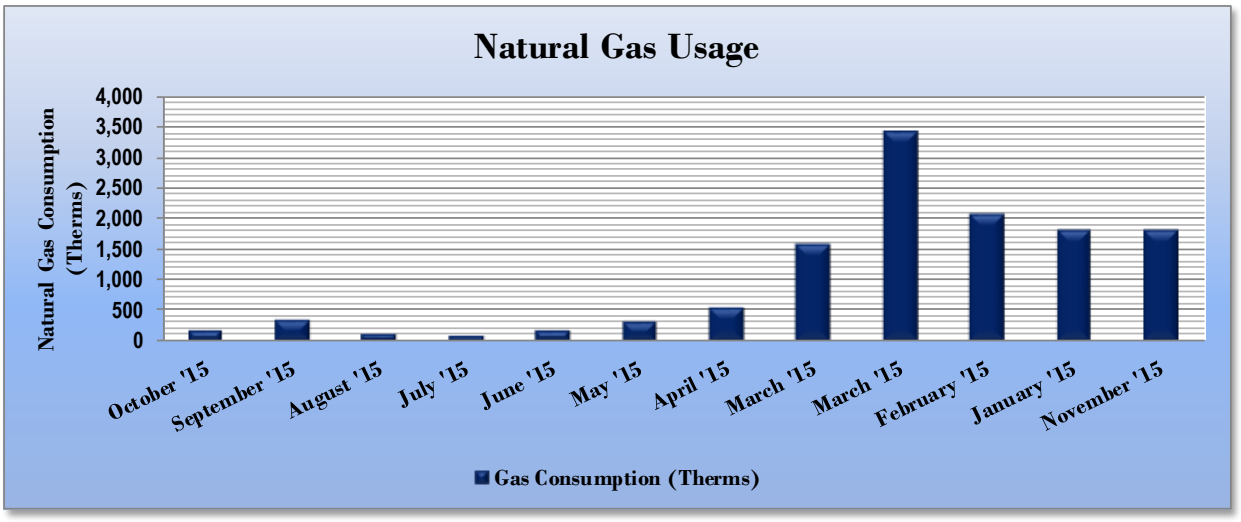


Figure 12 - Natural Gas Usage

Gas Billing Data for Firehouse 595 Palisade Ave.			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
11/11/15	29	186	$150
10/13/15	29	357	$276
9/14/15	32	110	$97
8/13/15	29	94	$85
7/15/15	30	167	$141
6/15/15	32	311	$253
5/14/15	29	547	$431
4/15/15	30	1,582	$1,276
3/16/15	31	3,420	$3,052
2/17/15	30	2,093	$2,697
1/16/15	32	1,809	$1,856
12/15/15	32	1,832	$1,811
Totals	**365**	**12,508**	**$12,125**
Annual	**365**	**12,508**	**$12,125**

3.4 Benchmarking

This facility was benchmarked through Portfolio Manager, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and compares its performance against a yearly baseline, national medians, or similar buildings in your portfolio. Metrics used in this comparison are the energy use intensity (EUI) and ENERGY STAR® Score.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more energy than similar buildings on a square foot basis or if that building performs better than the median. EUI is presented in both site energy and source energy. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy is the raw fuel consumed to generate the energy consumed at the site, factoring in energy production and distribution losses.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Firehouse 595 Palisade Ave.	National Median Building Type: Emergency Services
Source Energy Use Intensity (kBtu/ft^2)	215.5	154.4
Site Energy Use Intensity (kBtu/ft^2)	110.2	88.3

By implementing all recommended measures covered in this reporting, the Project's estimated post-implementation EUI improves as shown in the table below:

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Firehouse 595 Palisade Ave.	National Median Building Type: Emergency Services
Source Energy Use Intensity (kBtu/ft^2)	157.7	154.4
Site Energy Use Intensity (kBtu/ft^2)	89.8	88.3

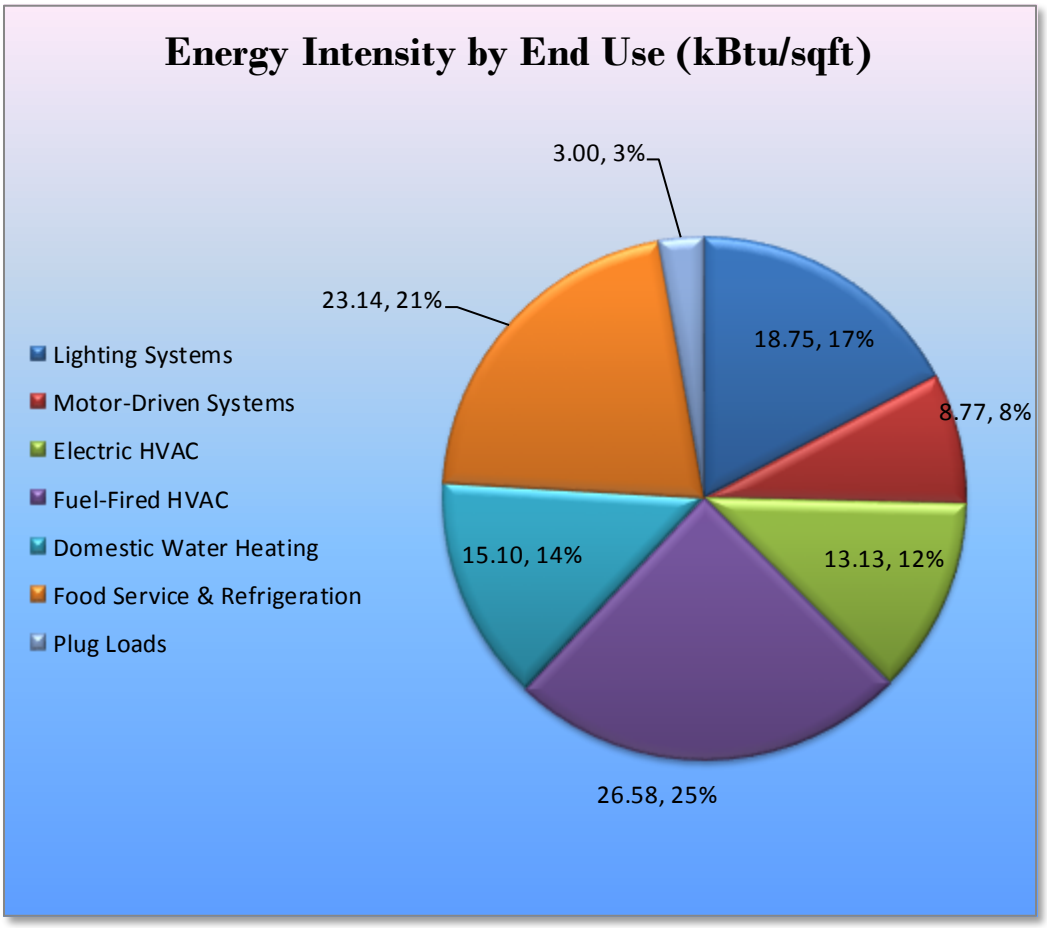
Many buildings can also receive a 1 – 100 ENERGY STAR® score. This score compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide — and may be eligible for ENERGY STAR® certification. This building type does not currently qualify to receive a score.

The Portfolio Manager, Statement of Energy Performance can be found in Appendix B: ENERGY STAR® Statement of Energy Performance.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building and determine their proportional contribution to overall building energy usage. This visual representation of energy end uses highlights systems that may benefit most from energy efficiency projects.

Figure 15 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy projects, help prioritize specific measures for implementation, and set Firehouse 595 Palisade Ave. on the path to receive financial incentives. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is considered sufficient to make decisions and to prioritize energy projects. Savings are based on the New Jersey Board of Public Utilities New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016. Further analysis or investigation may be required to calculate more accurate savings to support any custom SmartStart, Pay for Performance, or Large Energy Users incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJ prescriptive SmartStart program. Depending on your implementation strategy, the project may be eligible for more lucrative incentives through other programs as identified in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**72,334**	**6.0**	**0.0**	**$10,174.52**	**$13,583.68**	**$1,225.00**	**$12,358.68**	**1.21**	**72,840**
ECM 1	Install LED Fixtures	27,720	2.3	0.0	$3,899.05	$5,479.65	$45.00	$5,434.65	1.39	27,913
ECM 2	Retrofit Fixtures with LED Lamps	44,377	3.7	0.0	$6,242.05	$7,781.37	$1,180.00	$6,601.37	1.06	44,687
ECM 3	Install LED Exit Signs	238	0.0	0.0	$33.42	$322.67	$0.00	$322.67	9.66	239
Lighting Control Measures		**7,087**	**0.6**	**0.0**	**$996.84**	**$1,276.00**	**$220.00**	**$1,056.00**	**1.06**	**7,136**
ECM 4	Install Occupancy Sensor Lighting Controls	7,087	0.6	0.0	$996.84	$1,276.00	$220.00	$1,056.00	1.06	7,136
Variable Frequency Drive (VFD) Measures		**8,238**	**1.0**	**0.0**	**$1,158.82**	**$3,275.85**	**$0.00**	**$3,275.85**	**2.83**	**8,296**
ECM 5	Install VFDs on Hot Water Pumps	8,238	1.0	0.0	$1,158.82	$3,275.85	$0.00	$3,275.85	2.83	8,296
Electric Unitary HVAC Measures		**3,625**	**1.4**	**0.0**	**$509.89**	**$47,141.38**	**$0.00**	**$47,141.38**	**92.45**	**3,650**
ECM 6	Install High Efficiency Heat Pumps	3,625	1.4	0.0	$509.89	$47,141.38	$0.00	$47,141.38	92.45	3,650
HVAC System Improvements		**10,478**	**2.4**	**0.0**	**$1,473.82**	**$1,100.00**	**$250.00**	**$850.00**	**0.58**	**10,551**
ECM 7	Install Dual Enthalpy Outside Economizer Control	10,478	2.4	0.0	$1,473.82	$1,100.00	$250.00	$850.00	0.58	10,551
Domestic Water Heating Upgrade		**0**	**0.0**	**62.1**	**$601.82**	**$4,903.07**	**$152.00**	**$4,751.07**	**7.89**	**7,269**
ECM 8	Install High Efficiency Gas Water Heater	0	0.0	18.9	$182.97	$4,392.04	$152.00	$4,240.04	23.17	2,210
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	43.2	$418.85	$511.03	$0.00	$511.03	1.22	5,059
TOTALS		**101,762**	**11.4**	**62.1**	**$14,915.71**	**$71,279.98**	**$1,847.00**	**$69,432.98**	**4.66**	**109,743**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Lighting Upgrades include several "submeasures" as outlined in Figure 17 below.

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**72,334**	**6.0**	**0.0**	**$10,174.52**	**$13,583.68**	**$1,225.00**	**$12,358.68**	**1.21**	**72,840**
ECM 1	Install LED Fixtures	27,720	2.3	0.0	$3,899.05	$5,479.65	$45.00	$5,434.65	1.39	27,913
ECM 2	Retrofit Fixtures with LED Lamps	44,377	3.7	0.0	$6,242.05	$7,781.37	$1,180.00	$6,601.37	1.06	44,687
ECM 3	Install LED Exit Signs	238	0.0	0.0	$33.42	$322.67	$0.00	$322.67	9.66	239

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	27,720	2.3	0.0	$3,899.05	$5,479.65	$45.00	$5,434.65	1.39	27,913
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing the 400 W metal halide fixtures located in the engine room with new high performance LED light fixtures. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

During planning and design for the installation of new fixtures, we recommend a holistic approach that considers both the technology of the lighting sources and how they are controlled.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	43,672	3.6	0.0	$6,142.95	$7,145.15	$1,110.00	$6,035.15	0.98	43,978
Exterior	705	0.1	0.0	$99.10	$636.22	$70.00	$566.22	5.71	709

Measure Description

This measure evaluates replacing linear fluorescent T8 lamps with LED tube lamps and replacing halogen incandescent and compact fluorescent screw-in/plug-in based lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed although there is a fluorescent fixture ballast in place. Other tube lamps require that fluorescent fixture ballasts be removed or replaced with LED drivers. Screw-in/plug-in LED lamps can be used as a direct replacement for most other screw-in/plug-in lamps. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are more than twice that of a fluorescent source and more than ten (10) times incandescent sources. LED lamps that use the existing fluorescent fixture ballast will be constrained by the remaining hours of the ballast. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

During retrofit planning and design, we recommend a holistic approach that considers both the technology of the lighting sources and how they are controlled.

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	238	0.0	0.0	$33.42	$322.67	$0.00	$322.67	9.66	239
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing incandescent lighting in exit signs with LEDs. LED sources require virtually no maintenance and LED exit signs have a life expectancy of at least 20 years. Many manufacturers can provide retrofit kits that meet fire and safety code requirements. Retrofit kits are less expensive and simpler to install than replacement signs, however, new fixtures would have a longer useful life and are therefore recommended.

A reduction in maintenance costs will be realized with the proposed retrofit because lamps will not have to be replaced as frequently.

4.1.2 Lighting Control Measures

Lighting control measures include several "submeasures" as outlined in Figure 18 below.

Figure 18 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**7,087**	**0.6**	**0.0**	**$996.84**	**$1,276.00**	**$220.00**	**$1,056.00**	**1.06**	**7,136**
ECM 4	Install Occupancy Sensor Lighting Controls	7,087	0.6	0.0	$996.84	$1,276.00	$220.00	$1,056.00	1.06	7,136

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
7,087	0.6	0.0	$996.84	$1,276.00	$220.00	$1,056.00	1.06	7,136

Measure Description

This measure evaluates installing occupancy sensors to control light fixtures that are currently manually controlled in restrooms, locker rooms, and private offices. Sensors detect occupancy using ultrasonic and/or infrared wave technologies. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Occupants will also be able to manually turn off fixtures. Energy savings result from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. Ceiling-mounted or remote-mounted sensors require the use of low voltage switching relays or a wireless signal to the switch. In general, use wall switch replacement sensors for single occupant offices and other small rooms. Install ceiling-mounted or remote mounted sensors in locations without local switching, in situations where the existing wall switches are not in the line-of-sight of the main work area, and in large spaces. We recommend a holistic design approach that considers both the technology of the lighting sources and how they are controlled.

Maintenance savings are anticipated due to reduced lamp operation, however, additional maintenance costs may be incurred because the occupancy sensors may require periodic adjustment; it is anticipated that the net effect on maintenance costs will be negligible.

4.1.3 Variable Frequency Drive Measures

Variable frequency drive (VFD) measures include several "submeasures" as outlined in Figure 19 below.

Figure 19 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**8,238**	**1.0**	**0.0**	**$1,158.82**	**$3,275.85**	**$0.00**	**$3,275.85**	**2.83**	**8,296**
ECM 5	Install VFDs on Hot Water Pumps	8,238	1.0	0.0	$1,158.82	$3,275.85	$0.00	$3,275.85	2.83	8,296

ECM 5: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
8,238	1.0	0.0	$1,158.82	$3,275.85	$0.00	$3,275.85	2.83	8,296

Measure Description

This measure evaluates installing a variable frequency drive (VFD) to control the 3 hp hot water pump. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the amount of time at reduced loads.

4.1.4 Electric Unitary HVAC Measures

Unitary HVAC measures include several "submeasures" as outlined in Figure 20 below.

Figure 20 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**3,625**	**1.4**	**0.0**	**$509.89**	**$47,141.38**	**$0.00**	**$47,141.38**	**92.45**	**3,650**
ECM 6	Install High Efficiency Heat Pumps	3,625	1.4	0.0	$509.89	$47,141.38	$0.00	$47,141.38	92.45	3,650

ECM 6: Install High Efficiency Heat Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
3,625	1.4	0.0	$509.89	$47,141.38	$0.00	$47,141.38	92.45	3,650

Measure Description

This measure evaluates replacing the Carrier packaged heat pumps with high efficiency packaged heat pumps. There have been significant improvements in both compressor and fan motor efficiencies in the past several years. Therefore, electricity savings can be achieved by replacing old units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system and a higher HPSF rating indicates more efficient heating mode. The magnitude of energy savings for this measure depends

on the relative efficiency of the old and new unit, the cooling and heating loads, and the annual operating hours.

4.1.5 HVAC System Improvements

HVAC system improvement measures include several "submeasures" as outlined in Figure 21 below.

Figure 21 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**10,478**	**2.4**	**0.0**	**$1,473.82**	**$1,100.00**	**$250.00**	**$850.00**	**0.58**	**10,551**
ECM 7	Install Dual Enthalpy Outside Economizer Control	10,478	2.4	0.0	$1,473.82	$1,100.00	$250.00	$850.00	0.58	10,551

ECM 7: Install Dual Enthalpy Outside Economizer Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
10,478	2.4	0.0	$1,473.82	$1,100.00	$250.00	$850.00	0.58	10,551

Measure Description

Dual enthalpy economizers are used to control a ventilation system's outside air intake in order to reduce a facility's total cooling load. A dual enthalpy economizer monitors the air temperature and humidity of both the outside and return air. The control supplies the lowest energy (temperature and humidity) air to the air handling system. When outside air conditions allow, outside air can be used for cooling in place of the air handling system's compressor. This reduces the demand on the cooling system, lowering its usage hours, saving energy. Savings result from using outside air instead of mechanical cooling whenever possible.

4.1.6 Domestic Water Heating Upgrade

Domestic water heating measures include several "submeasures" as outlined in Figure 22 below.

Figure 22 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**62.1**	**$601.82**	**$4,903.07**	**$152.00**	**$4,751.07**	**7.89**	**7,269**
ECM 8	Install High Efficiency Gas Water Heater	0	0.0	18.9	$182.97	$4,392.04	$152.00	$4,240.04	23.17	2,210
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	43.2	$418.85	$511.03	$0.00	$511.03	1.22	5,059

ECM 8: Install High Efficiency Gas Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	18.9	$182.97	$4,392.04	$152.00	$4,240.04	23.17	2,210

Measure Description

This measure evaluates the savings from replacing the current domestic water heater with a high efficiency water heater. The current water is leaking. Improvements in combustion efficiency and reductions in heat loss have improved the overall efficiency of water heaters. Savings result from less gas used during combustion and less time operating during standby to maintain the water tank temperature.

ECM 9: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	43.2	$418.85	$511.03	$0.00	$511.03	1.22	5,059

Measure Description

This measure evaluates the savings from installing low flow domestic water devices to reduce overall water flow in general and hot water flow in particular. Low flow showerheads and faucet aerators reduce the water flow, relative to standard showerheads and aerators, from the fixture. Pre-rinse spray valves—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow valves will reduce water use.

All of the low flow devices reduce the overall water flow from the fixture which generally reduces the amount of hot water used resulting in energy and water savings.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of low or no-cost efficiency strategies. By employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

Installing low flow faucets or faucet aerators, low flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low flow toilets and low flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.6 for any low-flow ECM recommendations.

6 SELF-GENERATION MEASURES

Self-generation measures include both renewable (e.g., solar, wind) and non-renewable (e.g., microturbines) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

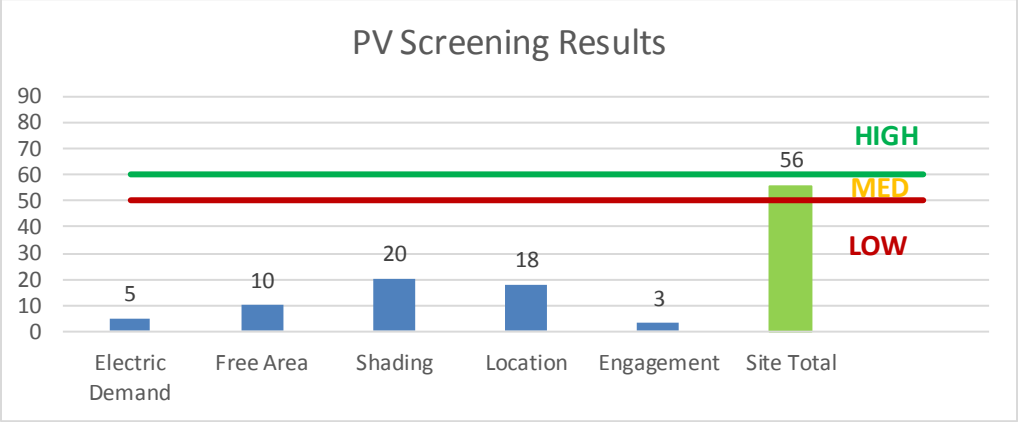
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a medium potential for installing a PV array.

In order to be cost-effective, a solar PV array generally needs a minimum of 4,000 sq ft of flat or south-facing rooftop, or other unshaded space, on which to place the PV panels. In our opinion, the facility does appear meet these minimum criteria for cost-effective PV installation.

Figure 23 - Photovoltaic Screening



Potential	Medium	
System Potential	57	kW DC STC
Electric Generation	67,908	kWh/yr
Displaced Cost	$5,910	/yr
Installed Cost	$148,200	

Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

In non-industrial settings, combined heat and power (CHP) is the on-site generation of electricity and recovery of heat which is put to beneficial use. Common prime movers in CHP applications include reciprocating engines, microturbines, fuel cells, and (at large facilities) gas turbines. Electricity is typically interconnected to the sites local distribution system. Heat is recovered from the exhaust stream and the ancillary cooling system and interconnected to the existing hot water (or steam) distribution system.

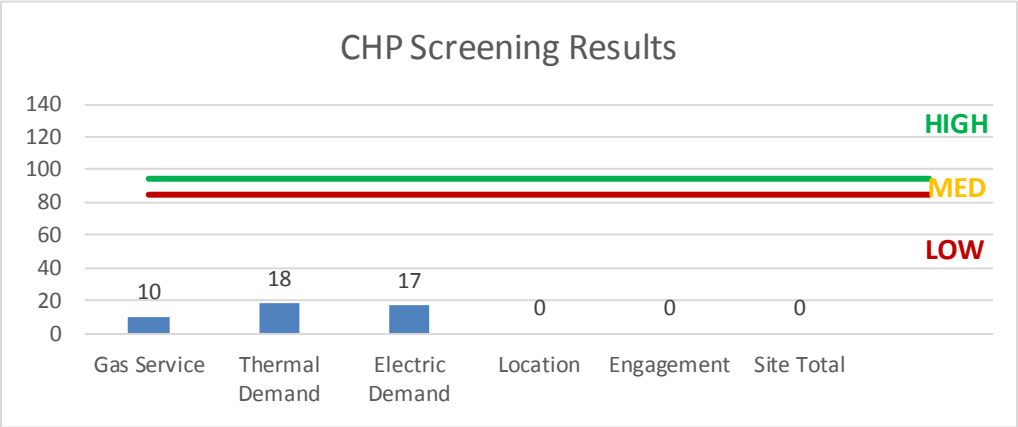
CHP systems are typically used to produce a portion of the electricity needed by a facility, with the balance of electric needs satisfied by purchase from the grid. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Low or infrequent thermal load, and lack of space near the existing thermal generation are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in NJ specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

Figure 24 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce consumer electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. DR service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability locally.

By enabling grid operators to call upon Curtailment Service Providers and energy consumers to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants will receive payments whether or not their facility is called upon to curtail their load.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR program often find it to be a valuable source of revenue for their facility(ies) because the payments can significantly offset annual utility costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats so that air conditioning units run less frequently or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR event cycle. DR program participants often have to install smart meters and may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and others, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's 1999 Electricity Restructuring Law which requires all customers of investor-owned electric and gas utilities to pay this charge on their monthly energy bills. As a contributor to the fund you were able to participate in the LGEA program and are also eligible to utilize the equipment incentive programs. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 25 for a list of the eligible programs identified for each recommended ECM.

Figure 25 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	X		X			
ECM 2	Retrofit Fixtures with LED Lamps	X		X			
ECM 3	Install LED Exit Signs			X			
ECM 4	Install Occupancy Sensor Lighting Controls	X		X			
ECM 5	Install VFDs on Hot Water Pumps			X			
ECM 6	Install High Efficiency Heat Pumps			X			
ECM 7	Install Dual Enthalpy Outside Economizer Control	X		X			
ECM 8	Install High Efficiency Gas Water Heater	X		X			
ECM 9	Install Low-Flow Domestic Hot Water Devices			X			

SmartStart is generally well suited for implementation of individual or small sets of measures, with the flexibility to install projects at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities to bundle measures and simplify participation, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities and requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption; applicants can use in-house staff or preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent comparison of available incentives.

Brief descriptions of all relevant alternative financing and incentive programs are located in the sections below. You may also check the following website for further information, including most current program availability, requirements, and incentive levels: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program is comprised of new construction and retrofit components that offer incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives for various energy efficiency equipment based on national/market trends, new technologies or changes in efficiency baselines.

Prescriptive Equipment Incentives Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

All customer sizes and types may be served by this program. This program provides an effective mechanism for securing incentives for individual projects that may be completed at once or over several years.

Incentives

The prescriptive path provides fixed incentives for specific energy efficiency measures whereas the custom measure path provides incentives for unique or specialized technologies that are not addressed through prescriptive offerings.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at the lesser of 50% of the total installed incremental project cost, or a buy down to a one year payback. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

8.2 Direct Install

Overview

Direct Install is a turnkey program available to existing small to mid-sized facilities with a peak electric demand that did not exceed 200 kW in the preceding 12 months. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and install those measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor assigned to the county where your facility is located; a complete list is provided on the DI website identified below. The contractor will be paid the program incentive directly which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps mentioned above, and the remaining 30% of the cost is your responsibility to the contractor.

Since Direct Install offers a free assessment, LGEA applicants that do not meet the audit program eligibility requirements, but do meet the DI requirements, may be moved directly into this program.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI.

8.3 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec .

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize the incentive programs to help further reduce costs when compiling the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Front Exterior Lighting	5	CFL Screw-In Lamps: Recessed can 2x26W	Daylight Dimming	52	4,368	Relamp	No	5	LED Screw-In Lamps: 4-PIN 2x13W LED Bulb	Daylight Dimming	26	4,368	0.11	642	0.0	$90.26	$440.51	$50.00	4.33
Kitchen	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,115	0.61	7,410	0.0	$1,042.25	$1,018.40	$200.00	0.79
Kitchen	6	CFL Screw-In Lamps: Recessed can 2x26W	Wall Switch	52	8,736	Relamp	No	6	LED Screw-In Lamps: 4-PIN 2x13W LED Bulb	Wall Switch	26	8,736	0.13	1,540	0.0	$216.61	$528.61	$60.00	2.16
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	8,736	0.04	489	0.0	$68.73	$75.20	$15.00	0.88
Corridor	1	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	79	0.0	$11.14	$107.56	$0.00	9.66
Corridor	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.14	1,647	0.0	$231.61	$466.00	$80.00	1.67
Corridor	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	8,736	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	8,736	0.01	173	0.0	$24.30	$35.90	$5.00	1.27
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,736	0.02	286	0.0	$40.27	$63.20	$0.00	1.57
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	8,736	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	8,736	0.01	173	0.0	$24.30	$35.90	$5.00	1.27
Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,115	0.61	7,410	0.0	$1,042.25	$1,018.40	$200.00	0.79
Office of Special Operation	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,115	0.20	2,470	0.0	$347.42	$416.80	$80.00	0.97
Office Chief Special Oper	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,115	0.10	1,235	0.0	$173.71	$266.40	$50.00	1.25
Gym Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,115	0.31	3,705	0.0	$521.12	$567.20	$110.00	0.88
Men's Bathroom & Locker Room	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.25	3,072	0.0	$432.12	$621.60	$20.00	1.39
Men's Bathroom & Locker Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	8,736	0.24	2,932	0.0	$412.40	$451.20	$90.00	0.88
Women's Bathroom & Locker Room	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.09	1,152	0.0	$162.04	$305.60	$20.00	1.76
Women's Bathroom & Locker Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	8,736	0.04	489	0.0	$68.73	$75.20	$15.00	0.88
Women's Bathroom & Locker Room	1	CFL Screw-In Lamps: Recessed can 2x26W	Wall Switch	52	8,736	Relamp	No	1	LED Screw-In Lamps: 4-PIN 2x13W LED Bulb	Wall Switch	26	8,736	0.02	257	0.0	$36.10	$88.10	$10.00	2.16
Bunk Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,115	0.36	4,322	0.0	$607.98	$642.40	$125.00	0.85
Storage1	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	8,736	0.04	489	0.0	$68.73	$75.20	$15.00	0.88
Electrical Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.03	326	0.0	$45.82	$58.50	$10.00	1.06
Capitaine Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,115	0.28	3,372	0.0	$474.26	$191.20	$35.00	0.33
Capitaine Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.05	652	0.0	$91.64	$117.00	$20.00	1.06
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	8,736	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	8,736	0.01	173	0.0	$24.30	$35.90	$5.00	1.27
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,736	0.02	286	0.0	$40.27	$63.20	$0.00	1.57

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Bathroom	1	CFL Screw-In Lamps: Recessed 2X26W	Wall Switch	52	8,736	Relamp	No	1	LED Screw-In Lamps: 4-PIN 2x13W LED Bulb	Wall Switch	26	8,736	0.02	257	0.0	$36.10	$88.10	$10.00	2.16
Mechanical Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	8,736	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.18	2,211	0.0	$311.04	$380.53	$20.00	1.16
Laundry Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	8,736	0.04	489	0.0	$68.73	$75.20	$15.00	0.88
Garage Bya	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,736	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	8,736	0.04	489	0.0	$68.73	$75.20	$15.00	0.88
Garage Bya	9	Metal Halide: (1) 400W Lamp	Wall Switch	458	8,736	Fixture Replacement	No	9	LED - Fixtures: Downlight Pendant	Wall Switch	146	8,736	2.28	27,720	0.0	$3,899.05	$5,479.65	$45.00	1.39
Garage Bya	2	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	158	0.0	$22.28	$215.11	$0.00	9.66
Garage Bya	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.27	3,258	0.0	$458.22	$585.00	$100.00	1.06
Roof Top	2	Halogen Incandescent 64W	Daylight Dimming	65	4,380	Relamp	No	2	LED Screw-In Lamps: LED Screw in	Daylight Dimming	59	4,380	0.01	63	0.0	$8.84	$195.71	$20.00	19.87

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical room	Fire House	2	Heating Hot Water Pump	3.0	86.5%	No	2,745	No	86.5%	Yes	1	1.04	8,238	0.0	$1,158.82	$3,275.85	$0.00	2.83
Roof Top	Fire House	1	Exhaust Fan	0.3	70.0%	No	2,745	No	70.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Fire House	1	Exhaust Fan	0.5	70.0%	No	2,745	No	70.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Garage	Garage	3	Other	0.5	68.0%	No	2,745	No	68.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Fire House	1	Supply Fan	15.0	84.3%	No	3,391	No	84.3%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electrical Room	Electrical Room	1	Supply Fan	0.3	78.0%	No	2,745	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Mechanical Room	1	Supply Fan	0.3	78.0%	No	2,745	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Garage Bay	Garage Bay	1	Supply Fan	0.3	78.0%	No	2,745	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Electrical Room	Electrical Room	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Fire House	1	Packaged Air-Source HP	30.00	51.00	Yes	1	Packaged Air-Source HP	30.00	51.00	9.50	3.20	Yes	3.77	14,103	0.0	$1,983.71	$48,241.38	$250.00	24.19
Mechanical Room	Mechanical Room	1	Electric Resistance Heat		17.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electrical Room	Electrical Room	1	Electric Resistance Heat		17.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Fire House	1	Non-Condensing Hot Water Boiler	395.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechnical Room	Fire House	1	Storage Tank Water Heater (> 50 Gal)	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	80.00%	Et	0.00	0	18.9	$182.97	$4,392.04	$152.00	23.17

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	3.4	$33.07	$14.34	$0.00	0.43
Bathroom	3	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	17.1	$165.33	$21.51	$0.00	0.13
Locker Room	4	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	22.7	$220.45	$28.68	$0.00	0.13
Locker Room	5	Showerhead	2.00	2.00	0.00	0	0.0	$0.00	$446.50	$0.00	0.00

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Garage	1	Ice Making Head (<450 lbs/day), Batch	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Novelty Cooler Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	Install Automatic Shutoff Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Garage	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	Yes	No	0.00	0	0.0	$0.00	$16,598.81	$750.00	0.00
Kitchen	1	Gas Convection Oven (Half Size)	Yes	No	0.00	0	0.0	$0.00	$7,118.81	$500.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Kitchen	1	Flat Screen TV	128.0	Yes
Kitchen	1	Microwave	1,000.0	No
Kitchen	1	Toaster	800.0	Yes
Kitchen	1	Coffe Maker	700.0	Yes
Kitchen	1	Coffe Maker	700.0	Yes
Resting Room	1	Flat Screen TV	128.0	Yes
Corridor	1	Flat Screen TV	128.0	Yes
Corridor	1	Desktop	191.0	Yes
Corridor	1	Office Printer	1,440.0	Yes
Office-Special-Operation	1	Office Printer	1,440.0	Yes
Chief-Special-Operaton	1	Office Printer	1,440.0	Yes
Men's Bathroom	2	Hand dryer	450.0	Yes
Women's Bthroom	2	Hand dryer	450.0	Yes
Punl Room	1	Flat Screen TV	128.0	Yes
Capitaine Office	1	Office Printer	1,440.0	Yes
Capitaine Office	2	Desktop	191.0	Yes
Capitaine Office	1	Flat Screen TV	128.0	Yes
Capitaine Office	1	Flat Screen TV	128.0	Yes
Chief Special Operaton	1	Desktop	191.0	Yes
Laundry Room	1	Washing Machine	1,500.0	Yes
Laundry Room	1	Washing Machine	1,500.0	Yes
Laundry Room	1	Washing Machine	1,500.0	Yes
Laundry Room	2	Washing Machine	1,500.0	Yes

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Firehouse - 595 Palisade Avenue

Primary Property Type: Fire Station
Gross Floor Area (ft²): 20,000
Built: 2002

For Year Ending: October 31, 2015
Date Generated: October 21, 2016

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Firehouse - 595 Palisade Avenue 599 Palisade Ave Jersey City, New Jersey 07307	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5082932

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
112.9 kBtu/ft²

Source EUI
216.6 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	938,259 (42%)
Natural Gas (kBtu)	1,319,982 (58%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	80.5
National Median Source EUI (kBtu/ft²)	154.4
% Diff from National Median Source EUI	40%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	196

Signature & Stamp of Verifying Professional

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

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)