Local Government Energy Audit:
Energy Audit Report

Firehouse

City of Jersey City

2 Bergen Avenue

Jersey City, NJ 07305

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 savings 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 (TRC) 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 the Firehouse located at 2 Bergen Avenue in Jersey City, New Jersey.

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 the Firehouse in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

1.1 Facility Summary

The Firehouse is a two-story 10,000 square foot facility comprised of office spaces, dormitories for the firefighters and an apparatus floor (garage where fire engines are parked). The building also contains a commercial kitchen and mechanical rooms.

The lighting at the Firehouse consists of aging and inefficient T12 and T8 fluorescent lighting fixtures and recessed CFL lamps for most part. We also observed some aging HVAC equipment that is in need of replacement. A thorough description of the facility and our observations are located in Section 2.

Energy Conservation Measures

TRC recommends four (4) energy conservation measures which together represent an opportunity for the Firehouse to reduce annual energy costs by $1,903 and annual greenhouse gas emissions by 42,516 lbs CO_2e. We estimate that the measures would likely pay for themselves in energy savings in about 5.1 years. The breakdown of existing and potential utility costs is illustrated in Figure 1 and Figure 2, respectively. These measures represent an opportunity to reduce the Firehouse's annual energy use by 13.3%.

Figure 1 – Previous 12 Month Utility Costs

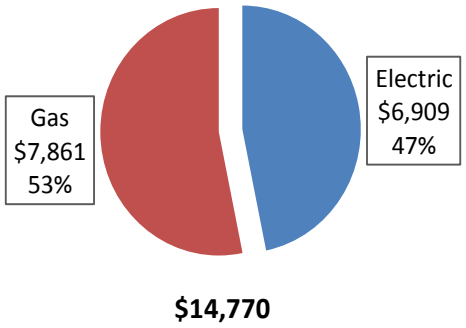
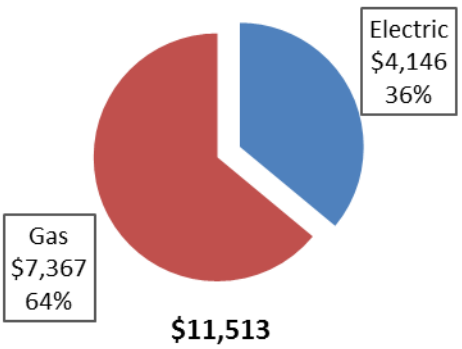


Figure 2 – Potential Post-Implementation Costs



A detailed description of the existing energy usage for the Firehouse 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 ECMs can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Natural Gas Savings (MMBtu)	Annual N/A Savings (MMBtu)	Annual N/A Savings (MMBtu)	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			**33,803**	**4.0**	**0.0**	**0.0**	**0.0**	**0.0**	**$1,325.08**	**$9,126.16**	**$720.00**	**$8,406.16**	**6.34**	**34,039**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	21,958	1.8	0.0	0.0	0.0	0.0	$860.75	$3,608.19	$0.00	$3,608.19	4.19	22,111
ECM 2	Retrofit Fixtures with LED Lamps	Yes	10,137	2.1	0.0	0.0	0.0	0.0	$397.37	$4,765.09	$720.00	$4,045.09	10.18	10,208
ECM 3	Install LED Exit Signs	Yes	1,708	0.1	0.0	0.0	0.0	0.0	$66.96	$752.89	$0.00	$752.89	11.24	1,720
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	2,160	0.3	0.0	0.0	0.0	0.0	$84.67	$928.00	$160.00	$768.00	9.07	2,175
Domestic Water Heating Upgrade			**0**	**0.0**	**53.8**	**0.0**	**0.0**	**53.8**	**$493.73**	**$489.52**	**$0.00**	**$489.52**	**0.99**	**6,302**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	53.8	0.0	0.0	53.8	$493.73	$489.52	$0.00	$489.52	0.99	6,302
TOTALS			**35,963**	**4.3**	**53.8**	**0.0**	**0.0**	**53.8**	**$1,903.49**	**$10,543.68**	**$880.00**	**$9,663.68**	**5.08**	**42,516**

* - 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 measure 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.

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.

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. Measures in this category must also include installation of certain “low-flow” devices that are designed to reduce excessive water usage. By cutting overall water usage the amount of energy needed to heat domestic hot water is also reduced.

Energy Efficient Practices

TRC also identified six (6) low cost (or no 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 at the Firehouse include:

- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- 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 the Firehouse. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

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

1.2 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

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

For facilities wanting to pursue only selected individual measures (or planning to phase 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 do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

Additional descriptions of relevant incentive programs can be found in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
John Mercer	Assistant Business Administrator	jmercer@jcnj.org	201-547-4417
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On July 15, 2016, TRC performed an energy audit at the Firehouse located at 2 Bergen Avenue in Jersey City, New Jersey. TRC's team met with Chief Battalion Michael Conforti to review the facility operations and focus the investigation on specific energy-using systems.

The Firehouse is a 10,000 square foot facility comprised of office spaces, dormitories for the firefighters and an apparatus floor (garage where fire engines are parked). The building has two (2) floors with a commercial kitchen and mechanical rooms. The building is centrally heated and cooled. The building was constructed in 1900.

2.3 Building Occupancy

The apparatus floor and the dormitories, including the kitchen are functional and occupied round the year. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Firehouse - #2, Bergen Avenue	Weekday	7AM - 7AM
Firehouse - #2, Bergen Avenue	Weekend	7AM - 7AM

2.4 Building Envelope

The exterior of the building is brick masonry and the interior construction is wood and Stucco. It has a flat roof with black membrane. The rooftop is very small and has just about the right space to hold the air handling unit. The apparatus floor has two (2) garage doors for the access of the fire engines. The windows are double pane and show sign of little sign air infiltration.

Building envelope

2.5 On-site Generation

The Firehouse does not have any on-site electric generation capacity.

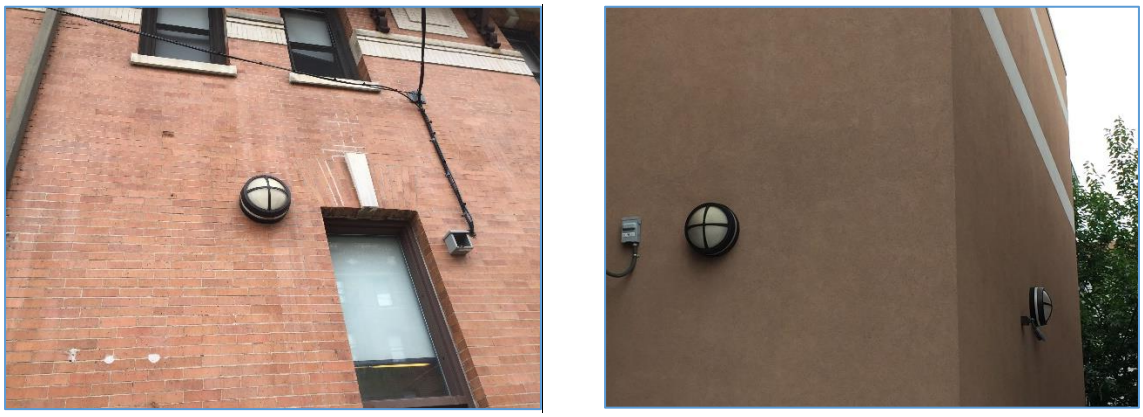
2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided predominately by linear 32 Watt fluorescent T8 lamps with electronic ballasts as well as compact fluorescent lamps (CFL).

Lighting control in most spaces is provided by wall switches. It is recommended that the facility install occupancy sensors in many spaces, particularly in the office spaces and dormitories as they have lights on even at the times they were unoccupied. The occupancy sensors can be either wall or ceiling mounted depending on the space layout.

The building has minimal exterior lighting and consists of wall mount CFL screw-in lamp fixtures.



Exterior lighting at the firehouse

Hot Water / Steam System

The Firehouse engine bays have four (4) separate warm air unit heaters from Sterling. These have an output capacity of 166 MBh, thermal efficiency of 82% and about 12 years old. The unit is in decent working condition. However, as this area has a high ceiling and heat losses through the garage doors, the heating may occasionally be inadequate. When this unit needs to be replaced, we recommend the installation of low intensity infrared (IR) tube heater. These are more efficient because they do not heat the volume of air in large areas such as truck bays, but just the people and the object surfaces. They can also be concentrated to smaller areas instead of being installed in a common area at great heights.

Air Conditioning (DX)

One (1) 12.5-ton McQuay Package AC unit with a furnace is located on the building rooftop. This is used to cool and heat the building centrally. The system is nine (9) years old with an Energy Efficiency Ratio (EER) rating of 9.7. The furnace on the unit has an output capacity of 204 MBh and a thermal efficiency of 81% for heating purposes. The building also has one small window air conditioning unit, which is about 12 years old and has an EER of 10.8. Air conditioning units generally have a rated useful lifetime of about 15 years. When these AC units are at the end of their useful life, we recommend replacing them with higher efficiency ENERGY STAR® rated units.

Rooftop air handling unit

.

Domestic Hot Water

The domestic hot water system for the facility consists of one AO Smith as fired hot water heater with an input rating of 75 MBh with a nominal efficiency of 80%. The water heater has a storage capacity of 98 gallons.

Domestic hot water heater

Food Service & Laundry Equipment

The facility has a full commercial kitchen that is used to cook breakfast lunch and dinner for the fire fighters on a regular basis. The kitchen has a six(6) burner, two (2) full over and a 2-foot griddle unit with a hood. All units are gas fired. Other equipment in the kitchen include a fridge, microwave oven, coffee machines, and kettle.

Plug load & Vending Machines

The plug load in the office spaces consist primarily of work stations with five (5) computers, three (3) printers, and four (4) televisions. There is no centralized PC power management software installed.

2.7 Water-Using Systems

There are two (2) restrooms at this facility and all of the faucets are rated for 2.5 gallons per minute (gpm), the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf. There are two (2) restrooms with shower heads that the firefighters use. It is recommended that the fixtures are replaced with low flow rate fixtures. Another simple measure would be attaching aerators to the faucets which typically limits water flow through the faucets there by reducing the water use.

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 per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 0 for additional information.

3.1 Total Cost of Energy

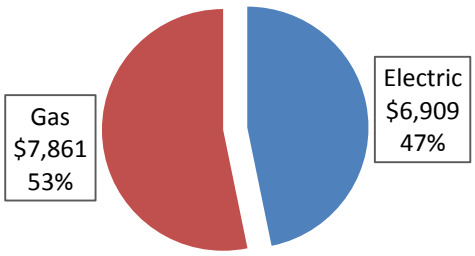
The following energy consumption and cost data is based on the last 12 month period of utility usage data that was provided for each utility. The annual consumption and cost was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Firehouse 2 Bergen Ave.		
Fuel	**Usage**	**Cost**
Electricity	138,431 kWh	$6,909
Natural Gas	8,568 Therms	$7,861
Total		**$14,770**

The current utility cost for this site is $14,770 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



$14,770

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 $0.039/kWh, which is the blended rate used throughout the analyses in this report. The third party supply is provided by Constellation Energy. The monthly electricity consumption and peak demand is represented graphically in the chart below.

Figure 8 - Electric Usage & Demand

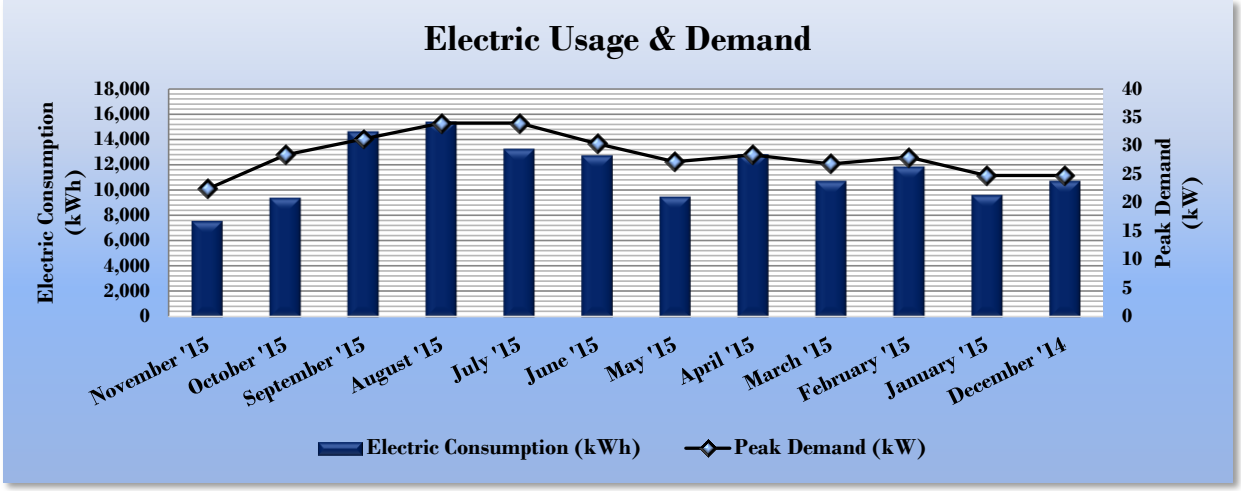


Figure 9 - Electric Usage & Demand

Electric Billing Data for Firehouse 2 Bergen Ave.					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
11/18/15	29	7,560	22	$98	$288
10/20/15	29	9,400	28	$124	$363
9/21/15	32	14,600	31	$136	$864
8/20/15	29	15,360	34	$148	$938
7/22/15	30	13,240	34	$148	$903
6/22/15	32	12,720	30	$132	$844
5/21/15	28	9,480	27	$118	$411
4/23/15	29	12,800	28	$123	$516
3/25/15	33	10,720	27	$116	$446
2/20/15	29	11,840	28	$121	$485
1/22/15	31	9,618	25	$108	$393
12/22/14	33	10,713	25	$108	$438
Totals	**364**	**138,051**	**34**	**$1,479**	**$6,890**
Annual	**365**	**138,431**	**34**	**$1,483**	**$6,909**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.917/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 10 - Natural Gas Usage

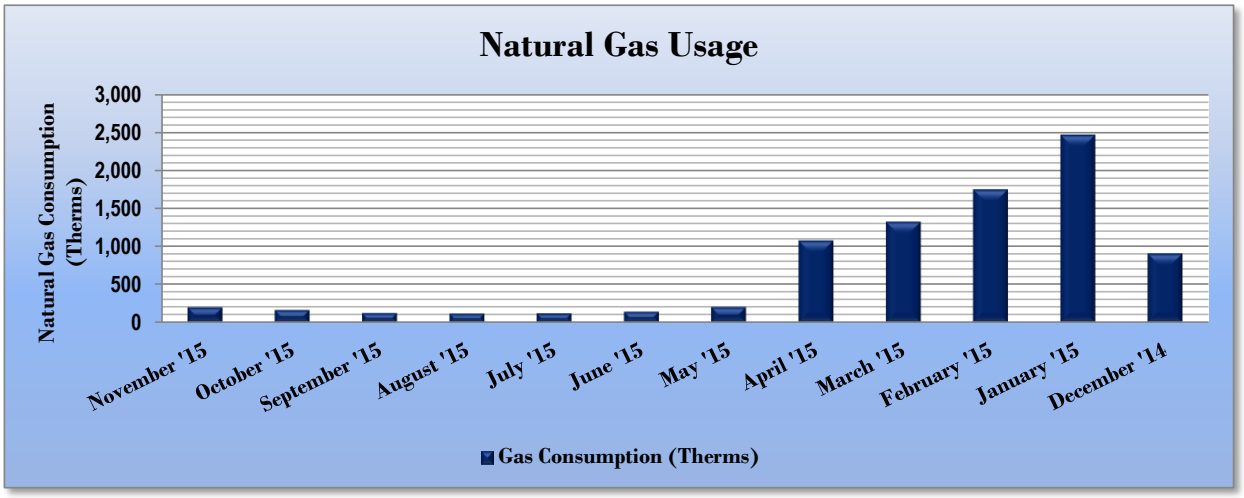


Figure 11 - Natural Gas Usage

Gas Billing Data for Firehouse 2 Bergen Ave.			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
11/18/15	29	196	$161
10/20/15	29	160	$132
9/21/15	32	120	$105
8/20/15	29	113	$100
7/22/15	30	119	$104
6/22/15	32	138	$118
5/21/15	28	200	$164
4/23/15	29	1,073	$846
3/25/15	33	1,321	$1,165
2/20/15	29	1,744	$1,588
1/22/15	31	2,459	$2,431
12/22/14	33	902	$925
Totals	**364**	**8,545**	**$7,839**
Annual	**365**	**8,568**	**$7,861**

3.4 Benchmarking

This facility was benchmarked using 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 then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

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 or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of 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 includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Firehouse 2 Bergen Ave.	National Median Building Type: Fire/Police Station
Source Energy Use Intensity (kBtu/ft^2)	238.3	154.4
Site Energy Use Intensity (kBtu/ft^2)	132.9	88.3

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

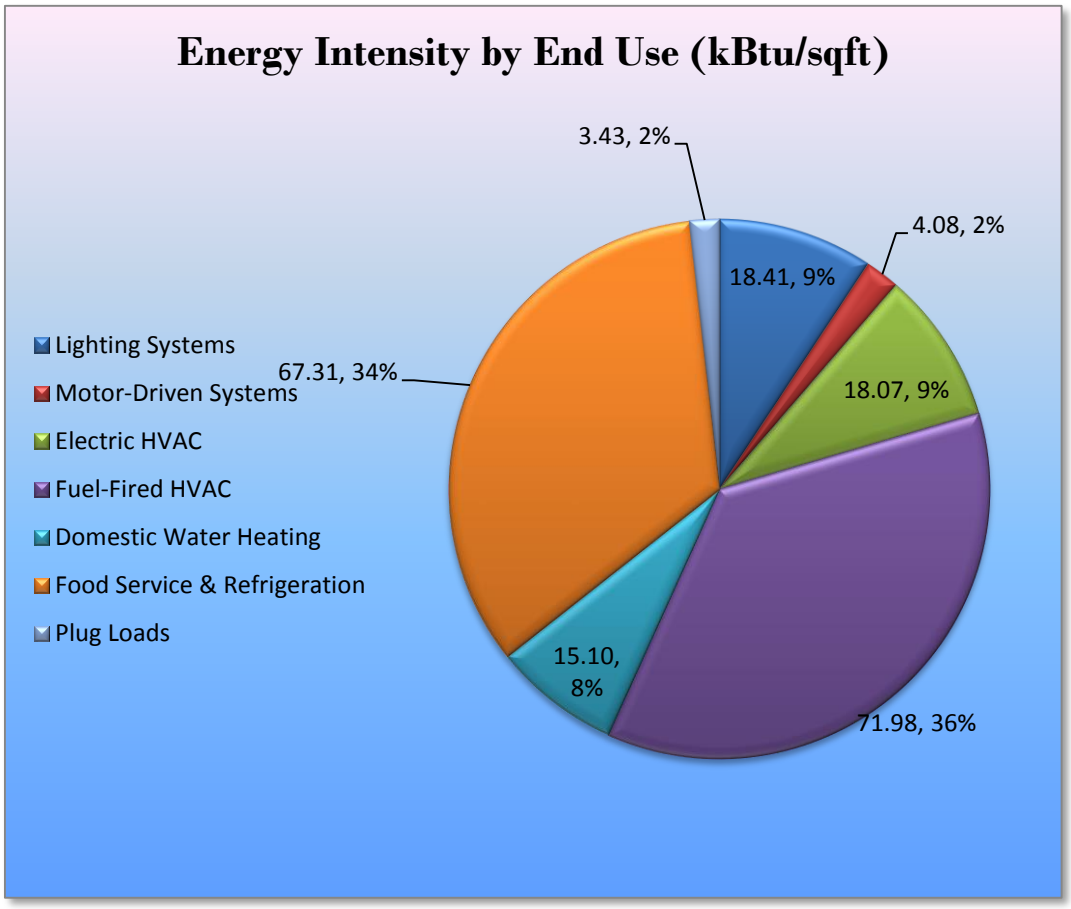
Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Firehouse 2 Bergen Ave.	National Median Building Type: Fire/Police Station
Source Energy Use Intensity (kBtu/ft^2)	194.1	154.4
Site Energy Use Intensity (kBtu/ft^2)	115.3	88.3

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It 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. Your building is not is one of the building categories that are eligible to receive a score. This building type is currently not eligible for an ENERGY STAR® score. However, a Portfolio Manager "Statement of Energy Performance" was developed for this site and 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 14 - 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 the Firehouse 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 15 – 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		**33,803**	**4.0**	**0.0**	**$1,325.08**	**$9,126.16**	**$720.00**	**$8,406.16**	**6.34**	**34,039**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	21,958	1.8	0.0	$860.75	$3,608.19	$0.00	$3,608.19	4.19	22,111
ECM 2	Retrofit Fixtures with LED Lamps	10,137	2.1	0.0	$397.37	$4,765.09	$720.00	$4,045.09	10.18	10,208
ECM 3	Install LED Exit Signs	1,708	0.1	0.0	$66.96	$752.89	$0.00	$752.89	11.24	1,720
Lighting Control Measures		**2,160**	**0.3**	**0.0**	**$84.67**	**$928.00**	**$160.00**	**$768.00**	**9.07**	**2,175**
ECM 4	Install Occupancy Sensor Lighting Controls	2,160	0.3	0.0	$84.67	$928.00	$160.00	$768.00	9.07	2,175
Domestic Water Heating Upgrade		**0**	**0.0**	**53.8**	**$493.73**	**$489.52**	**$0.00**	**$489.52**	**0.99**	**6,302**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	53.8	$493.73	$489.52	$0.00	$489.52	0.99	6,302
TOTALS		**35,963**	**4.3**	**53.8**	**$1,903.49**	**$10,543.68**	**$880.00**	**$9,663.68**	**5.08**	**42,516**

* - 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

Recommended Lighting Upgrades are summarized Figure 16 below.

Figure 16 – 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		**33,803**	**4.0**	**0.0**	**$1,325.08**	**$9,126.16**	**$720.00**	**$8,406.16**	**6.34**	**34,039**
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ECM 3	Install LED Exit Signs	1,708	0.1	0.0	$66.96	$752.89	$0.00	$752.89	11.24	1,720

ECM 1: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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	21,958	1.8	0.0	$860.75	$3,608.19	$0.00	$3,608.19	4.19	22,111
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

We recommend retrofitting existing fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than ten (10) times longer than many incandescent lamps.

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	9,560	1.9	0.0	$374.76	$4,603.83	$690.00	$3,913.83	10.44	9,627
Exterior	577	0.2	0.0	$22.60	$161.26	$30.00	$131.26	5.81	581

Measure Description

We recommend replacing incandescent screw-in or plug-in based lamps with LED lamps. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than ten (10) times longer than many incandescent lamps.

ECM 3: Install LED Exit Signs

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	1,708	0.1	0.0	$66.96	$752.89	$0.00	$752.89	11.24	1,720
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

We recommend replacing all incandescent or compact fluorescent EXIT signs with LED EXIT signs. LED EXIT signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Recommended Lighting Control Measures are summarized in Figure 17 below.

Figure 17 – 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		**2,160**	**0.3**	**0.0**	**$84.67**	**$928.00**	**$160.00**	**$768.00**	**9.07**	**2,175**
ECM 4	Install Occupancy Sensor Lighting Controls	2,160	0.3	0.0	$84.67	$928.00	$160.00	$768.00	9.07	2,175

ECM 4: Install Occupancy Sensor Lighting Controls

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)
2,160	0.3	0.0	$84.67	$928.00	$160.00	$768.00	9.07	2,175

Measure Description

We recommend installing occupancy sensors to control light fixtures that are currently manually controlled in restrooms, dormitories and private offices. Sensors detect occupancy using ultrasonic and/or infrared 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.

4.1.3 Domestic Hot Water Heating System Upgrades

Recommended upgrades to the domestic hot water heating system are summarized in Figure 18 below.

Figure 18 - 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**	**53.8**	**$493.73**	**$489.52**	**$0.00**	**$489.52**	**0.99**	**6,302**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	53.8	$493.73	$489.52	$0.00	$489.52	0.99	6,302

ECM 5: Install Low-Flow DHW Devices

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	53.8	$493.73	$489.52	$0.00	$489.52	0.99	6,302

Measure Description

We recommend 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

Low-flow devices reduce the overall water usage from the fixture which generally reduces the amount of fuel needed to heat hot water, 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.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

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.

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.

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).

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.

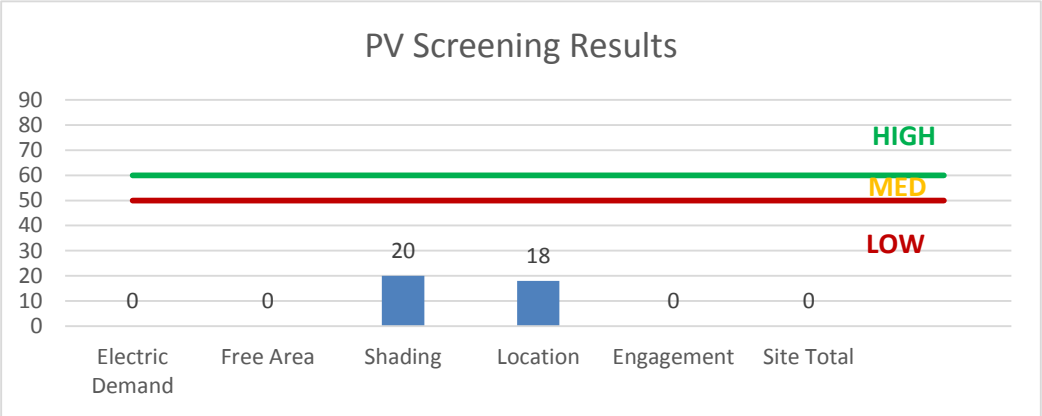
6.1 Photovoltaic

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 low potential for cost-effective installation of a solar PV array.

If the Firehouse is interested in pursuing the installation of PV, we recommend a full feasibility study be conducted.

Figure 19 - Photovoltaic Screening



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.

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

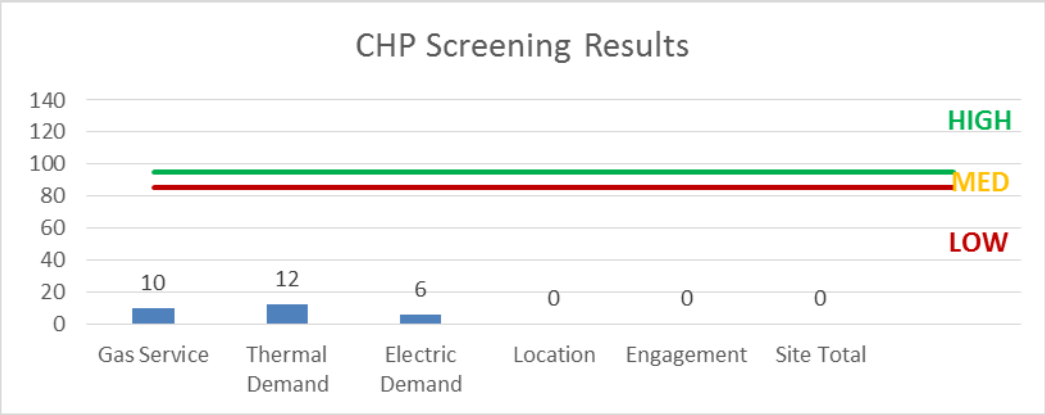
6.2 Combined Heat and Power

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 cost-effective installation of a CHP system.

Figure 20 – CHP 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 or facilities 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.

The Firehouse does not appear to have sufficient electric load to be able to participate in a DR program.

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 Electricity Restructuring Law (1999) 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 21 for a list of the eligible programs identified for each recommended ECM.

Figure 21 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	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 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 or: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently 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

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

SmartStart prescriptive provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

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 medium-sized facilities with a peak electric demand that does not exceed 200 kW for a recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected 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 who the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program 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 and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

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

8.3 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 NJCEP incentive programs to help further reduce costs when developing 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
Apparatus floor	36	Linear Fluorescent - T12: 4' T12 (40W) - 2L	None	88	8,736	Fixture Replacement	No	36	LED - Linear Tubes: (2) 4' Lamps	None	29	8,736	1.73	20,967	0.0	$821.93	$3,003.48	$0.00	3.65
Apparatus floor	1	Exit Signs: Incandescent	None	45	8,760	LED Retrofit	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	386	0.0	$15.13	$107.56	$0.00	7.11
Storage closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	78	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	78	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairs	3	Linear Fluorescent - T12: 4' T12 (40W) - 1L	None	46	8,736	Fixture Replacement	No	3	LED - Linear Tubes: (1) 4' Lamp	None	15	8,736	0.08	933	0.0	$36.57	$187.56	$0.00	5.13
Stairs	1	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	386	0.0	$15.13	$107.56	$0.00	7.11
Kitchen	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	93	3,640	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	None	44	3,640	0.36	1,832	0.0	$71.83	$676.80	$135.00	7.54
Kitchen	2	Exit Signs: Incandescent	None	45	8,760	LED Retrofit	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.06	772	0.0	$30.27	$215.11	$0.00	7.11
Stairwell	5	Linear Fluorescent - T12: 4' T12 (40W) - 2L	None	88	8,736	Fixture Replacement	No	5	LED - Linear Tubes: (2) 4' Lamps	None	29	8,736	0.24	2,912	0.0	$114.16	$417.15	$0.00	3.65
Basement	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	182	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	None	29	182	0.19	48	0.0	$1.86	$409.50	$70.00	182.30
Basement	1	Exit Signs: Incandescent	None	45	8,760	LED Retrofit	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	386	0.0	$15.13	$107.56	$0.00	7.11
2nd floor - storage closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	78	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	78	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
2nd Floor hallway	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	None	62	8,736	Relamp	Yes	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.28	3,456	0.0	$135.48	$800.80	$40.00	5.62
2nd Floor hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	LED Retrofit	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$215.11	$0.00	0.00
2nd floor - Storage Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	78	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	78	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
2nd Floor - Room 2	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	None	62	3,640	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,548	0.19	960	0.0	$37.63	$495.20	$20.00	12.63
2nd Floor - Room 2	1	CFL Screw-In Lamps: Recessed fixtures	None	26	8,736	Relamp	No	1	LED Screw-In Lamps: Recessed fixtures	None	12	8,736	0.01	138	0.0	$5.42	$53.75	$10.00	8.08
2nd Floor Living room	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	93	3,640	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,548	0.41	2,058	0.0	$80.68	$717.60	$140.00	7.16
2nd Floor - Women's Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	None	62	12	None	No	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	None	62	12	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
2nd Floor - Women's Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	12	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	12	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
2nd Floor - Women's Room	1	CFL Screw-In Lamps: Recessed fixtures	None	26	12	None	No	1	CFL Screw-In Lamps: Recessed fixtures	None	26	12	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
2nd Floor - Men's Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	1,820	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,274	0.14	343	0.0	$13.45	$350.00	$60.00	21.57
2nd Floor - Men's Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	1,820	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	None	15	1,820	0.03	72	0.0	$2.82	$71.80	$10.00	21.90
2nd Floor - Men's Room	3	CFL Screw-In Lamps: Recessed fixtures	None	60	1,820	Relamp	No	3	LED Screw-In Lamps: Recessed fixtures	None	12	1,820	0.12	296	0.0	$11.61	$483.78	$90.00	33.92
2nd floor office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	93	7,280	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,096	0.31	3,087	0.0	$121.03	$567.20	$110.00	3.78
Bathroom inside the office	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	1,820	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	1,820	0.01	36	0.0	$1.41	$35.90	$5.00	21.90

Lighting Inventory & Recommendations (continued)

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 inside the office	1	CFL Screw-In Lamps: Recessed fixtures	None	60	1,820	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	1,820	0.04	94	0.0	$3.67	$35.90	$0.00	9.79
2nd Floor TV room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	93	1,820	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,274	0.20	515	0.0	$20.17	$416.80	$80.00	16.70
Gym	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	93	1,092	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	764	0.20	309	0.0	$12.10	$416.80	$80.00	27.83
Exterior Light	3	CFL Screw-In Lamps: Wall mount fixtures	None	100	2,184	Relamp	No	3	LED Screw-In Lamps: Surface Mount fixture	None	12	2,184	0.21	652	0.0	$25.54	$161.26	$30.00	5.14

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
Apparatus Floor	Hoist Door	2	Other	0.5	78.2%	No	52	No	78.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Apparatus Floor	Apparatus Floor	1	Exhaust Fan	0.8	81.1%	No	4,000	No	81.1%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Apparatus Floor	Apparatus Floor	1	Exhaust Fan	1.3	78.2%	No	4,000	No	78.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	Fire engines	1	Air Compressor	2.0	88.5%	No	4,957	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions										Proposed	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)	*Cooling Mode Efficiency (SEER/EER)*	*Heating Mode Efficiency (COP)*	*Manufacturer*	*Model Number*	*Equipment Age (Years)*	*Annual Cooling EFLH*	Install High Efficiency System?	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Rooftop	Firehouse conditioned spaces	1	Packaged AC	12.50	204.00	9.70	3.22	McQuay	MPS012AGCM25E	9	3,800	No	$0.00	$0.00	0.00
Office	Apparatus Floor	1	Window AC	0.50		10.80		Friedrich	SS12N10	12	2,068	No	$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
Apparatus Area Ceiling	Apparatus floor of the firehouse	4	Warm Air Unit Heater	166.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop unit	First floor offices	1	Furnace	204.00	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
Firehouse basement	Fire house water fixtures	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Fire house bathroom	5	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	42.6	$391.16	$35.85	$0.00	0.09
Shower head	5	Showerhead	2.50	2.00	0.00	0	9.5	$86.93	$446.50	$0.00	5.14
Fire house pantry	1	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	1.7	$15.65	$7.17	$0.00	0.46

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
Pantry	2	Gas Convection Oven (Full Size)	No	No	0.00	0	0.0	$0.00	$18,580.09	$1,000.00	0.00
Pantry	2	Gas Griddle (≤2 Feet Width)	No	No	0.00	0	0.0	$0.00	$2,723.63	$250.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel 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	Payback w/ Incentives in Years
Pantry	1	Under Counter (High Temp)	Natural Gas	N/A	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Apparatus floor	2	Fridge - medium	8.6	No
Pantry	2	TV	72.0	No
Pantry	2	computers	75.0	No
Pantry	1	Printer - Smalll	20.0	No
Pantry	1	Double door - fridge	600.0	No
Pantry	1	Water dispenser	12.5	No
Pantry	1	Coffee maker	800.0	No
Pantry	1	Coffee maker	400.0	No
Pantry	1	Pop-up Toaster	850.0	No
Pantry	1	Microwave	1,000.0	No
Room 2 - 2nd floor	1	Ceiling fan	100.0	No
Room 2 - 2nd floor	1	Computer	75.0	No
Room 2 - 2nd floor	1	Printer - Smalll	20.0	No
Room 2 - 2nd floor	1	Television	72.0	No
Room 2 - 2nd floor	1	Paper Shredder	360.0	No
2nd floor- office	1	Ceiling fan	100.0	No
2nd floor- office	2	Computers	75.0	No
2nd floor- office	1	Printer - Smalll	20.0	No
2nd floor- office	1	Television	72.0	No
Gym - 2nd floor	1	Television	72.0	No

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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N/A

ENERGY STAR® Score[1]

Firehouse - 2 Bergen Avenue

Primary Property Type: Fire Station
Gross Floor Area (ft²): 10,000
Built: 1900

For Year Ending: October 31, 2015
Date Generated: October 24, 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 - 2 Bergen Avenue 2 Bergen Ave Jersey City, New Jersey 07305	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5082929

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
145 kBtu/ft²

Source EUI
267.9 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	897,173 (62%)
Electric - Grid (kBtu)	553,072 (38%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	83.6
National Median Source EUI (kBtu/ft²)	154.4
% Diff from National Median Source EUI	74%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	122

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)