Local Government Energy Audit:
Energy Audit Report

Fire Headquarters & Museum

244-320 Perry Street

Trenton, New Jersey 08618-3926

City of Trenton

December 31, 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.

Table of Contents

Table of Figures

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Fire Headquarters & Museum.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

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

1.1 Facility Summary

The Fire Headquarters & Museum is an approximately 62,000 square foot facility comprised of various space types within a single building. The building is three floors and includes area types such as firetruck bays, offices, dormitories, museum, locker room, break room, kitchen, dining room, and a basement with mechanical space.

Lighting at the Fire Headquarters & Museum consists of T8 and some T12 linear fluorescent fixtures, CFLs, and some LED fixtures. Heating is supplied by three gas fired rooftop unit heaters and two non-condensing boilers. The majority of the building's cooling is provided by two constant speed water-cooled screw chillers. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 13 measures and recommends 12 measures which together represent an opportunity for Fire Headquarters & Museum to reduce annual energy costs by roughly $68,174 and annual greenhouse gas emissions by 530,473 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 5.1 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1, Figure 2, and Figure 3 respectively. Together these measures represent an opportunity to reduce the Fire Headquarters & Museum's annual energy use by 23%.

Figure 1 – Previous 12 Month Utility Costs

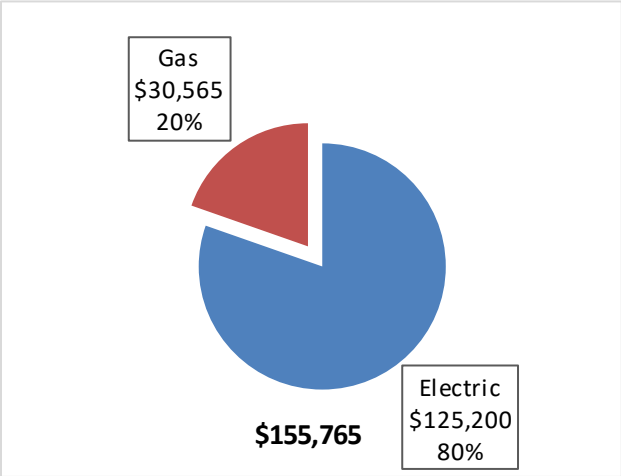


Figure 2 – Potential Post-Implementation Costs (High Priority Measures)

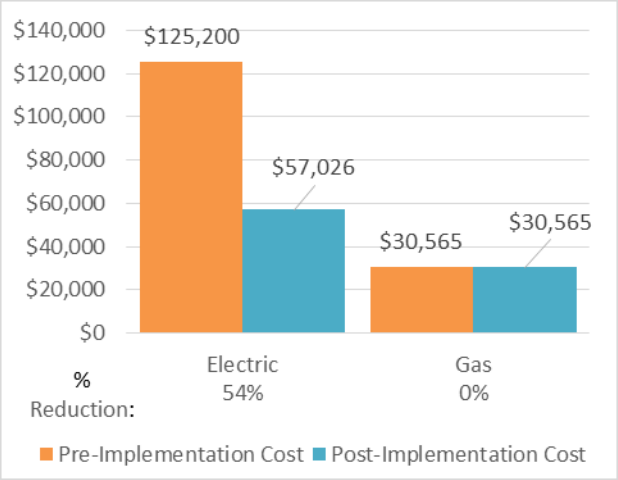
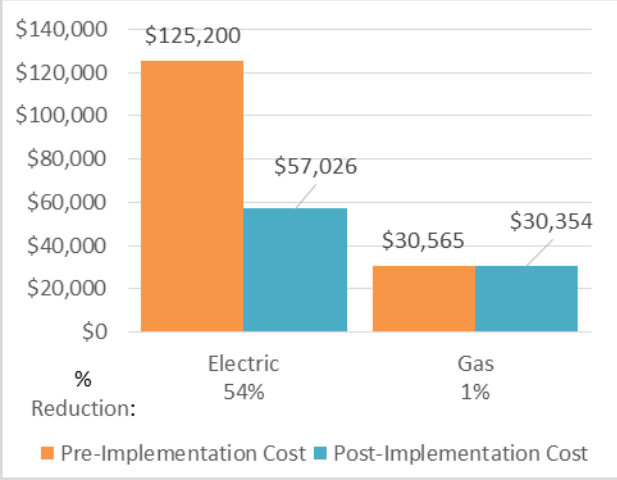


Figure 3 – Potential Post-Implementation Costs (All Evaluated Measures)



A detailed description of the Fire Headquarters & Museum's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 4. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 4 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	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			**279,102**	**27.2**	**0.0**	**$36,119.78**	**$98,784.45**	**$19,745.00**	**$79,039.45**	**2.2**	**281,054**
ECM 1	Install LED Fixtures	Yes	226,845	18.5	0.0	$29,357.02	$75,142.47	$13,850.00	$61,292.47	2.1	228,432
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,450	0.2	0.0	$187.71	$458.84	$70.00	$388.84	2.1	1,461
ECM 3	Retrofit Fixtures with LED Lamps	Yes	50,806	8.5	0.0	$6,575.04	$23,183.14	$5,825.00	$17,358.14	2.6	51,161
Lighting Control Measures			**20,364**	**2.4**	**0.0**	**$2,635.45**	**$15,850.00**	**$1,710.00**	**$14,140.00**	**5.4**	**20,507**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	18,051	2.2	0.0	$2,336.12	$14,980.00	$1,710.00	$13,270.00	5.7	18,178
ECM 5	Install High/Low Lighitng Controls	Yes	2,313	0.1	0.0	$299.33	$870.00	$0.00	$870.00	2.9	2,329
Motor Upgrades			**6,211**	**1.2**	**0.0**	**$803.77**	**$34,595.33**	**$0.00**	**$34,595.33**	**43.0**	**6,254**
ECM 6	Premium Efficiency Motors	Yes	6,211	1.2	0.0	$803.77	$34,595.33	$0.00	$34,595.33	43.0	6,254
Variable Frequency Drive (VFD) Measures			**158,064**	**38.4**	**0.0**	**$20,455.73**	**$111,000.14**	**$14,960.00**	**$96,040.14**	**4.7**	**159,169**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	102,713	30.8	0.0	$13,292.50	$62,805.14	$8,960.00	$53,845.14	4.1	103,431
ECM 8	Install VFDs on Chilled Water Pumps	Yes	13,434	4.8	0.0	$1,738.50	$12,668.60	$2,400.00	$10,268.60	5.9	13,528
ECM 9	Install VFDs on Hot Water Pumps	Yes	21,896	2.8	0.0	$2,833.69	$18,582.30	$0.00	$18,582.30	6.6	22,049
ECM 10	Install VFDs on Cooling Tower Fans	Yes	20,021	0.0	0.0	$2,591.03	$16,944.10	$3,600.00	$13,344.10	5.2	20,161
Electric Chiller Replacement			**61,436**	**22.1**	**0.0**	**$7,950.70**	**$127,935.57**	**$6,880.00**	**$121,055.57**	**15.2**	**61,866**
ECM 11	Install High Efficiency Chillers	Yes	61,436	22.1	0.0	$7,950.70	$127,935.57	$6,880.00	$121,055.57	15.2	61,866
Domestic Water Heating Upgrade			**0**	**0.0**	**31.0**	**$210.59**	**$30,066.00**	**$1,050.00**	**$29,016.00**	**137.8**	**3,632**
	Install High Efficiency Gas Water Heater	No	0	0.0	31.0	$210.59	$30,066.00	$1,050.00	$29,016.00	137.8	3,632
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$208.59**	**$230.00**	**$50.00**	**$180.00**	**0.9**	**1,623**
ECM 12	Vending Machine Control	Yes	1,612	0.0	0.0	$208.59	$230.00	$50.00	$180.00	0.9	1,623
TOTALS FOR HIGH PRIORITY MEASURES			**526,789**	**91.3**	**0.0**	**$68,174.01**	**$388,395.49**	**$43,345.00**	**$345,050.49**	**5.1**	**530,473**
TOTALS FOR ALL EVALUATED MEASURES			**526,789**	**91.3**	**31.0**	**$68,384.60**	**$418,461.49**	**$44,395.00**	**$374,066.49**	**5.5**	**534,105**

* - 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 not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium®). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Chiller measures generally involve replacing older inefficient hydronic chillers with modern energy efficient systems. New chillers can provide equivalent cooling compared to older chillers at a reduced energy cost. These measures save energy by reducing chiller energy usage, due to improved electrical and heat transfer efficiency.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlet when not in use.

Energy Efficient Practices

TRC also identified five low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Fire Headquarters & Museum include:

- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Fire Headquarters & Museum. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 5 – Photovoltaic Potential

Potential	High	
System Potential	156	kW DC STC
Electric Generation	185,854	kWh/yr
Displaced Cost	$16,170	/yr
Installed Cost	$405,600	

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

1.3 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
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)

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 4 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 than 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.

For larger facilities with limited capital availability 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 project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power 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. By enabling grid operators to call upon commercial facilities to reduce their 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 facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 6 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Hoggarth Stephen	Principal Engineer	hstephen@trentonnj.org	(609) 989-3615
TRC Energy Services			
Vish Nimbalkar	Auditor	VNaikNimbalkar@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On May 01, 2017, TRC performed an energy audit at the Fire Headquarters & Museum located in Trenton, New Jersey. TRC's team met with Hoggarth Stephen to review the facility operations and help focus our investigation on specific energy-using systems.

The Fire Headquarters & Museum is an approximately 62,000 square foot facility comprised of various space types within a single building. The building is three floors and includes area types such as firetruck bays, offices, dormitories, museum, locker room, break room, kitchen, dining room, and a basement with mechanical space.

Lighting at the Fire Headquarters & Museum consists of T8 and some T12 linear fluorescent fixtures, CFLs, and some LED fixtures. Heating is supplied by three gas fired rooftop unit heaters and two non-condensing boilers. The majority of the building's cooling is provided by two constant speed water-cooled screw chillers. A thorough description of the facility and our observations are located in Section 2.

The building was renovated from 1998 to 2003.

2.3 Building Occupancy

The museum portion of the building is open Monday through Friday and portions of the fire department are occupied 24 hours a day, seven days a week. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately 10 museum staff members 9:00 AM to 5:00 PM, with six EMTs on and off throughout the day, 18 full time (24/7) staff, and museum visitors.

Figure 7 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Fire Dept	Weekday	24hrs/day
Fire Dept	Weekend	24hrs/day
Museum	Weekday	8AM - 4PM
Museum	Weekend	Closed

2.4 Building Envelope

The building is constructed of concrete block, and structural steel with a brick façade with flat roof sections covered with black membrane. The windows in the newer section are double pane and in good condition, showing little sign of excessive infiltration. The exterior doors are constructed of aluminum and appear in good condition. Rollup doors are a major source in infiltration when they are left open.

Image 1 – Building Exterior

2.5 On-Site Generation

Fire Headquarters & Museum does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting at the facility is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some older T12 fixtures and compact fluorescent lamps (CFL). With the exception of the truck bays and museum area, most of the fixtures are 2-lamp or 3-lamp, 4-foot long troffers with diffusers.

Lighting control in most spaces is provided by manual wall switches. Occupancy sensors were observed in two of the men's restrooms.

The building's exterior lighting is a mix of high-pressure sodium, metal halide, linear fluorescent, compact fluorescent, and LED fixtures that are controlled by photocells.

Image 2 – Typical High-Bay Metal Halide

Image 3 – Exterior LED fixture

Hot Water Heating System

The hot water system consists of two Weil McLain non-condensing 1,084 MBH output boilers. The boilers have a nominal combustion efficiency of 80%. There are four 3 hp and two 5 hp hot water pumps that distribute heated water to the air handlers to provide space heating.

The boilers appear to be in good condition and well maintained.

Image 4 – Boilers

Image 5 – Hot Water Pumps

Chilled Water Air Conditioning System (CHW)

There are seven constant volume air handling units (AHU1 -7), located in the basement mechanical rooms, that serve the majority of the building.

AHUs 1 & 2 each have a 3 hp supply fan and 1 hp return fan. AHUs 3 & 4 each have a 7.5 hp supply fan and a 2 hp return fan. AHUs 5, 6, & 7 each have 15 hp supply fans and 5 hp return fans. The basement has a single 10 hp exhaust fan.

Chilled water is provided to the AHUs by the two Trane constant speed 80-ton water-cooled screw chillers. The chillers are served by a single two-cell Evapco cooling tower.

Image 6 – Cooling tower

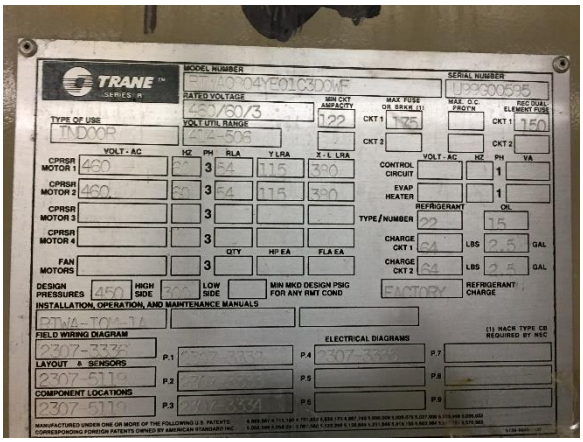


Image 7 – Chiller nameplate

Direct Expansion Air Conditioning System (DX)

A ¾ ton Sanyo cooling only split system is used to condition the server room. The fan and evaporator are located in the server room and the compressor and condensing unit are located on rooftop. The unit utilizes a scroll compressor and a direct-expansion (DX) coil.

Image 8 – DX split system

Image 9 – DX split system nameplate

Domestic Hot Water Heating System

The facility domestic hot water heating system consists of two A.O. Smith gas fired 300-gallon storage tank water heaters with an input rating of 300 MBH each and a nominal efficiency of 83%.

Image 10 – Water heaters

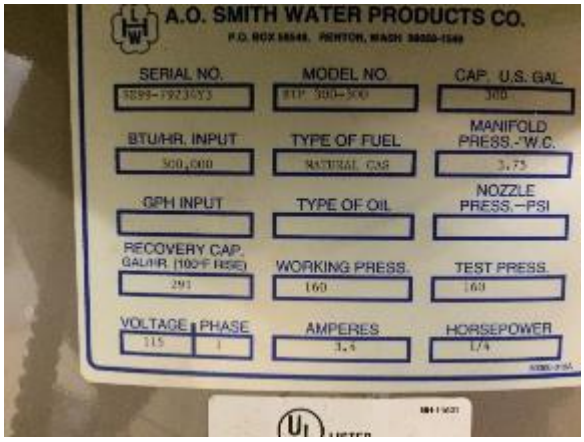


Image 11 – Water heater nameplate

Food Service & Laundry Equipment

The fire department kitchen consists of the following commercial equipment: two upright refrigerators, one upright freezer, undercounter high temp dishwasher, and a 6-burner gas fired range with griddle and two ovens. The site also has a commercial size washing machine and clothes dryer.

Image 12 – Commercial refrigerator

Image 13 – Commercial gas range

Building Plug Load

There are roughly 18 computer work stations throughout the facility and a single server room serving the facility. The server room has cooling provided by a dedicated split system. The majority of the sites remaining plug load consists of typical office and break room equipment.

2.7 Water-Using Systems

There are 10 restrooms and a locker room at this facility.

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 3.4 for additional information.

3.1 Total Cost of Energy

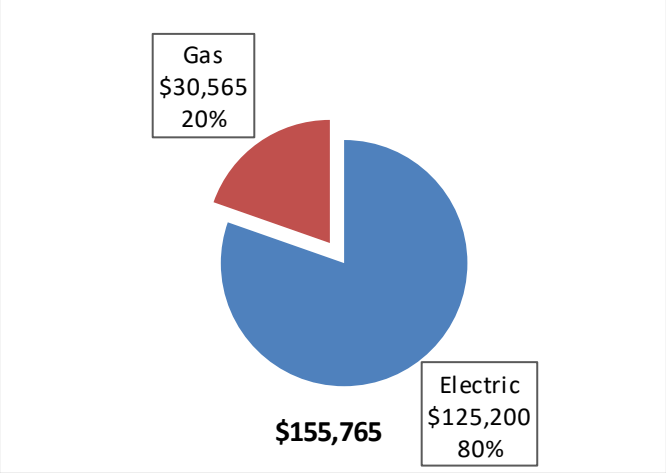
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 8 - Utility Summary

Utility Summary for Fire Headquarters & Museum		
Fuel	**Usage**	**Cost**
Electricity	967,436 kWh	$125,200
Natural Gas	45,022 Therms	$30,565
Total		**$155,765**

The current annual energy cost for this facility is $155,765 as shown in the chart below.

Figure 9 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.129/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. For the most part, the electrical demand for this site tracks well with a mechanically cooled and gas heated facility. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 10 - Electric Usage & Demand

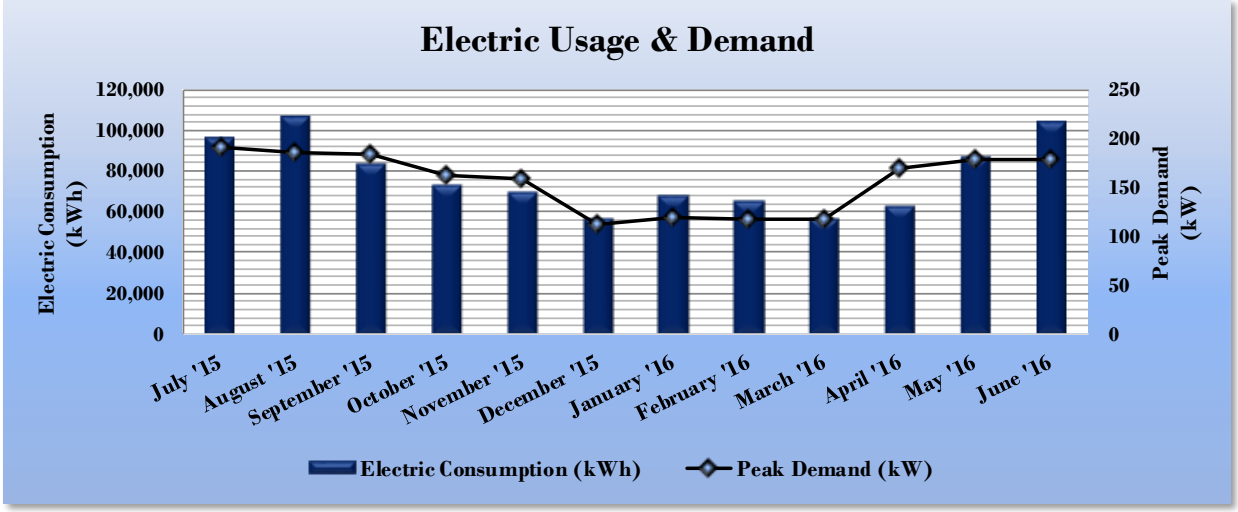


Figure 11 - Electric Usage & Demand

Electric Billing Data for Fire Headquarters & Museum					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
8/7/15	28	96,631	192		$14,147
9/8/15	31	107,418	186		$14,608
10/7/15	28	84,117	184		$10,256
11/5/15	28	73,580	162		$9,432
12/8/15	32	69,954	158		$9,047
1/8/16	30	57,136	112		$6,985
2/8/16	30	68,159	120		$8,092
3/9/16	29	65,941	117		$7,842
4/8/16	29	57,586	117		$6,951
5/9/16	30	63,122	169		$7,735
6/8/16	29	87,683	179		$11,915
7/8/16	29	104,303	179		$14,074
Totals	**353**	**935,630**	**191.8**	**$0**	**$121,084**
Annual	**365**	**967,436**	**191.8**	**$0**	**$125,200**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.679/therm, which is the estimated blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 12 - Natural Gas Usage

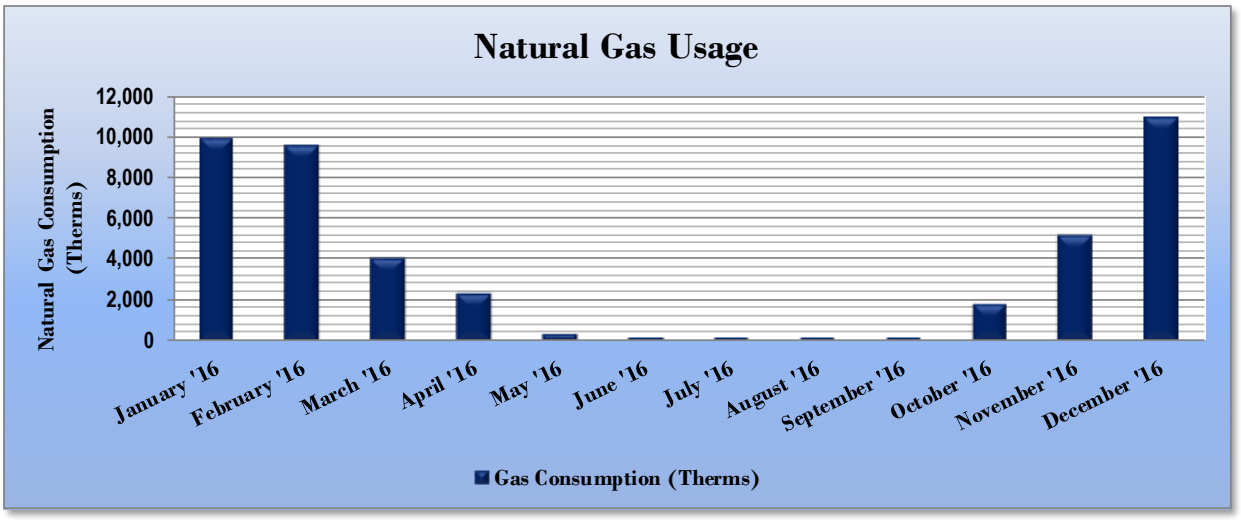


Figure 13 - Natural Gas Usage

Gas Billing Data for Fire Headquarters & Museum			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/8/16	31	9,971	$6,403
3/9/16	30	9,607	$6,093
4/8/16	30	4,102	$1,879
5/9/16	31	2,315	$1,108
6/8/16	30	350	$260
7/8/16	30	225	$205
8/8/16	31	233	$209
9/7/16	30	236	$210
10/6/16	29	227	$206
11/4/16	29	1,861	$2,406
12/7/16	33	5,195	$4,244
1/9/17	33	10,947	$7,509
Totals	**367**	**45,269**	**$30,732**
Annual	**365**	**45,022**	**$30,565**

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 14 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Fire Headquarters & Museum	National Median Building Type: Fire/Police Station
Source Energy Use Intensity (kBtu/ft^2)	243.4	154.4
Site Energy Use Intensity (kBtu/ft^2)	125.9	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 15 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Fire Headquarters & Museum	National Median Building Type: Fire/Police Station
Source Energy Use Intensity (kBtu/ft^2)	152.3	154.4
Site Energy Use Intensity (kBtu/ft^2)	96.8	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. Insufficient utility data was available and this facility type is not eligible to receive an ENERGY STAR® score.

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

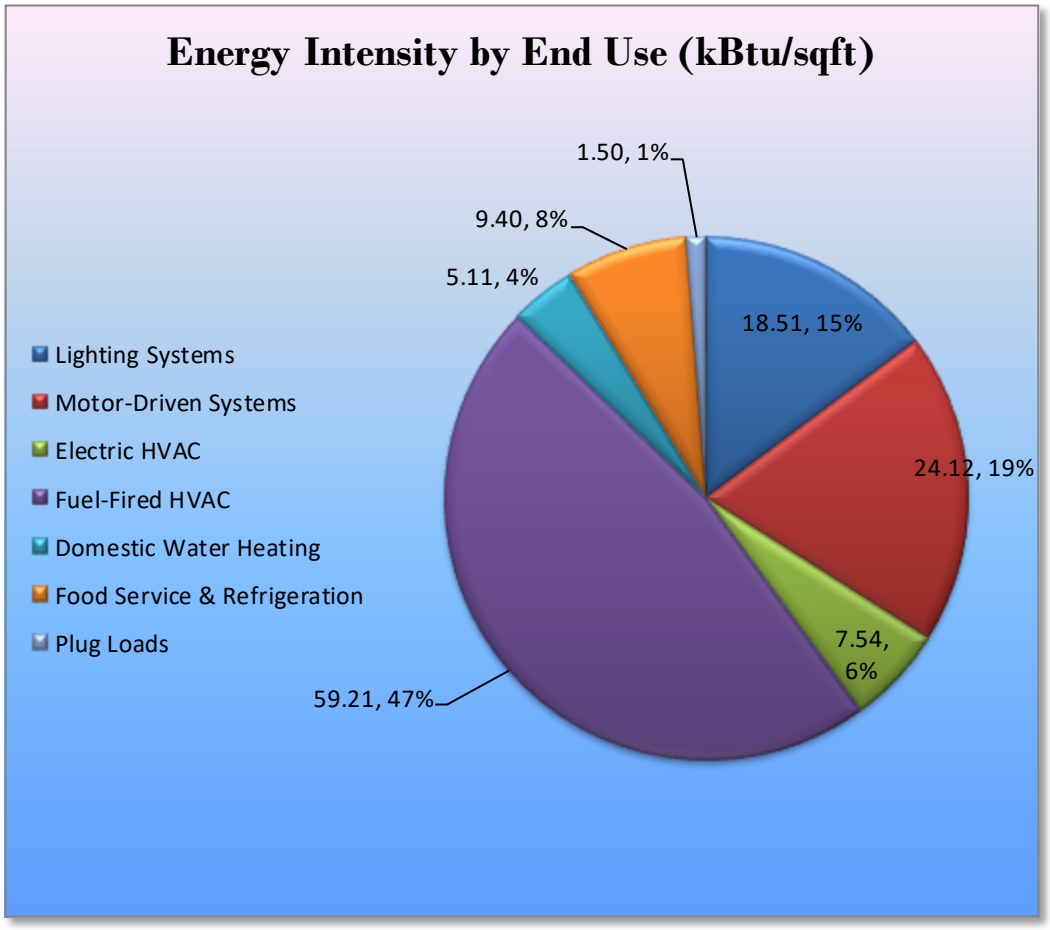
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: https://www.energystar.gov/buildings/training.

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 to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 16 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Fire Headquarters & Museum regarding financial incentives for which they may qualify to implement the recommended measures. 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 usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described 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 17 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	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			**279,102**	**27.2**	**0.0**	**$36,119.78**	**$98,784.45**	**$19,745.00**	**$79,039.45**	**2.2**	**281,054**
ECM 1	Install LED Fixtures	Yes	226,845	18.5	0.0	$29,357.02	$75,142.47	$13,850.00	$61,292.47	2.1	228,432
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,450	0.2	0.0	$187.71	$458.84	$70.00	$388.84	2.1	1,461
ECM 3	Retrofit Fixtures with LED Lamps	Yes	50,806	8.5	0.0	$6,575.04	$23,183.14	$5,825.00	$17,358.14	2.6	51,161
Lighting Control Measures			**20,364**	**2.4**	**0.0**	**$2,635.45**	**$15,850.00**	**$1,710.00**	**$14,140.00**	**5.4**	**20,507**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	18,051	2.2	0.0	$2,336.12	$14,980.00	$1,710.00	$13,270.00	5.7	18,178
ECM 5	Install High/Low Lighitng Controls	Yes	2,313	0.1	0.0	$299.33	$870.00	$0.00	$870.00	2.9	2,329
Motor Upgrades			**6,211**	**1.2**	**0.0**	**$803.77**	**$34,595.33**	**$0.00**	**$34,595.33**	**43.0**	**6,254**
ECM 6	Premium Efficiency Motors	Yes	6,211	1.2	0.0	$803.77	$34,595.33	$0.00	$34,595.33	43.0	6,254
Variable Frequency Drive (VFD) Measures			**158,064**	**38.4**	**0.0**	**$20,455.73**	**$111,000.14**	**$14,960.00**	**$96,040.14**	**4.7**	**159,169**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	102,713	30.8	0.0	$13,292.50	$62,805.14	$8,960.00	$53,845.14	4.1	103,431
ECM 8	Install VFDs on Chilled Water Pumps	Yes	13,434	4.8	0.0	$1,738.50	$12,668.60	$2,400.00	$10,268.60	5.9	13,528
ECM 9	Install VFDs on Hot Water Pumps	Yes	21,896	2.8	0.0	$2,833.69	$18,582.30	$0.00	$18,582.30	6.6	22,049
ECM 10	Install VFDs on Cooling Tower Fans	Yes	20,021	0.0	0.0	$2,591.03	$16,944.10	$3,600.00	$13,344.10	5.2	20,161
Electric Chiller Replacement			**61,436**	**22.1**	**0.0**	**$7,950.70**	**$127,935.57**	**$6,880.00**	**$121,055.57**	**15.2**	**61,866**
ECM 11	Install High Efficiency Chillers	Yes	61,436	22.1	0.0	$7,950.70	$127,935.57	$6,880.00	$121,055.57	15.2	61,866
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$208.59**	**$230.00**	**$50.00**	**$180.00**	**0.9**	**1,623**
ECM 12	Vending Machine Control	Yes	1,612	0.0	0.0	$208.59	$230.00	$50.00	$180.00	0.9	1,623
TOTALS FOR HIGH PRIORITY MEASURES			**526,789**	**91.3**	**0.0**	**$68,174.01**	**$388,395.49**	**$43,345.00**	**$345,050.49**	**5.1**	**530,473**

* - 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

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 18 below.

Figure 18 – 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		**279,102**	**27.2**	**0.0**	**$36,119.78**	**$98,784.45**	**$19,745.00**	**$79,039.45**	**2.2**	**281,054**
ECM 1	Install LED Fixtures	226,845	18.5	0.0	$29,357.02	$75,142.47	$13,850.00	$61,292.47	2.1	228,432
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,450	0.2	0.0	$187.71	$458.84	$70.00	$388.84	2.1	1,461
ECM 3	Retrofit Fixtures with LED Lamps	50,806	8.5	0.0	$6,575.04	$23,183.14	$5,825.00	$17,358.14	2.6	51,161

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

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	197,739	15.5	0.0	$25,590.20	$58,891.04	$11,400.00	$47,491.04	1.9	199,121
Exterior	29,107	3.0	0.0	$3,766.83	$16,251.43	$2,450.00	$13,801.43	3.7	29,310

Measure Description

We recommend replacing existing fixtures containing HID lamps with new high performance LED light fixtures in the truck bays and at exterior locations. This measure saves energy by installing LEDs 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 HID sources.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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	1,450	0.2	0.0	$187.71	$458.84	$70.00	$388.84	2.1	1,461
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	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 primarily pertains to existing T12 lighting, which operates using ballasts that are not compatible with LED tube operation. 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 tube.

ECM 3: 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	50,762	8.5	0.0	$6,569.29	$23,158.93	$5,825.00	$17,333.93	2.6	51,117
Exterior	44	0.0	0.0	$5.75	$24.21	$0.00	$24.21	4.2	45

Measure Description

We recommend retrofitting many existing fluorescent fixtures with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies, including compact fluorescent. 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 tube.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 19 below.

Figure 19 – 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		**20,364**	**2.4**	**0.0**	**$2,635.45**	**$15,850.00**	**$1,710.00**	**$14,140.00**	**5.4**	**20,507**
ECM 4	Install Occupancy Sensor Lighting Controls	18,051	2.2	0.0	$2,336.12	$14,980.00	$1,710.00	$13,270.00	5.7	18,178
ECM 5	Install High/Low Lighitng Controls	2,313	0.1	0.0	$299.33	$870.00	$0.00	$870.00	2.9	2,329

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

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)
18,051	2.2	0.0	$2,336.12	$14,980.00	$1,710.00	$13,270.00	5.7	18,178

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in offices, rest rooms, break rooms, open truck bays, and other common spaces. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results 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. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 5: Install High/Low 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)
2,313	0.1	0.0	$299.33	$870.00	$0.00	$870.00	2.9	2,329

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells, interior corridors, parking lots, and parking garages.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches.

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 20 below.

Figure 20 - Summary of Motor 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)
Motor Upgrades		**6,211**	**1.2**	**0.0**	**$803.77**	**$34,595.33**	**$0.00**	**$34,595.33**	**43.0**	**6,254**
ECM 6	Premium Efficiency Motors	6,211	1.2	0.0	$803.77	$34,595.33	$0.00	$34,595.33	43.0	6,254

ECM 6: Premium Efficiency Motors

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)
6,211	1.2	0.0	$803.77	$34,595.33	$0.00	$34,595.33	43.0	6,254

Measure Description

While this measure has a long simple payback period, it is necessary to replace the existing motors with inverter duty rated motors to accommodate ECM 8, therefore we recommend replacing the standard efficiency motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 21 below.

Figure 21 – 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		**158,064**	**38.4**	**0.0**	**$20,455.73**	**$111,000.14**	**$14,960.00**	**$96,040.14**	**4.7**	**159,169**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	102,713	30.8	0.0	$13,292.50	$62,805.14	$8,960.00	$53,845.14	4.1	103,431
ECM 8	Install VFDs on Chilled Water Pumps	13,434	4.8	0.0	$1,738.50	$12,668.60	$2,400.00	$10,268.60	5.9	13,528
ECM 9	Install VFDs on Hot Water Pumps	21,896	2.8	0.0	$2,833.69	$18,582.30	$0.00	$18,582.30	6.6	22,049
ECM 10	Install VFDs on Cooling Tower Fans	20,021	0.0	0.0	$2,591.03	$16,944.10	$3,600.00	$13,344.10	5.2	20,161

ECM 7: Install VFDs on Constant Volume (CV) HVAC

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)
102,713	30.8	0.0	$13,292.50	$62,805.14	$8,960.00	$53,845.14	4.1	103,431

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

VAV systems should not be controlled such that the supply air temperature is raised at the expense of the fan power. A common mistake is to reset the supply air temperature to achieve chiller energy savings, which can lead to additional air flow requirements. Supply air temperature should be kept low, e.g. 55°F, until the minimum fan speed (typically about 50%) is met. At this point, it is efficient to raise the supply air temperature as the load decreases, but not such that additional air flow and thus fan energy is required.

ECM 8: Install VFDs on Chilled 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)
13,434	4.8	0.0	$1,738.50	$12,668.60	$2,400.00	$10,268.60	5.9	13,528

Measure Description

We recommend installing variable frequency drives (VFD) to control chilled water pumps. This measure requires that chilled water coils be served by 2-way valves and that a differential pressure sensor be installed in the chilled water loop. As the chilled water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as chilled water valves close. The magnitude of energy savings is based on the estimated amount of time that the system operates at reduced loads.

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will have to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

ECM 9: 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)
21,896	2.8	0.0	$2,833.69	$18,582.30	$0.00	$18,582.30	6.6	22,049

Measure Description

We recommend installing variable frequency drives (VFD) to control the heating hot water pumps. 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 results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

ECM 10: Install VFDs on Cooling Tower Fans

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)
20,021	0.0	0.0	$2,591.03	$16,944.10	$3,600.00	$13,344.10	5.2	20,161

Measure Description

We recommend installing a variable frequency drive (VFD) to control the cooling tower fan motor. The VFD will allow the cooling tower fan to operate at the minimum speed necessary to maintain the temperature of the condenser water returning to the chiller. Energy savings results from reducing fan speed (and power) when there is a reduced load on the chiller and outside air wet bulb temperatures are depressed. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.5 Electric Chiller Replacement

Our recommendations for electric chiller replacements are summarized in Figure 22 below.

Figure 22 - Summary of Electric Chiller Replacement 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 Chiller Replacement		**61,436**	**22.1**	**0.0**	**$7,950.70**	**$127,935.57**	**$6,880.00**	**$121,055.57**	**15.2**	**61,866**
ECM 11	Install High Efficiency Chillers	61,436	22.1	0.0	$7,950.70	$127,935.57	$6,880.00	$121,055.57	15.2	61,866

ECM 11: Install High Efficiency Chillers

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)
61,436	22.1	0.0	$7,950.70	$127,935.57	$6,880.00	$121,055.57	15.2	61,866

Measure Description

We recommend replacing two constant speed older inefficient electric 80-ton water-cooled screw chillers with new high efficiency chillers. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile. Positive displacement chillers are usually under 600 tons of cooling capacity and centrifugal chillers generally start at 150 tons of cooling capacity. Constant speed chillers should be used to meet cooling loads with little or no variation while variable speed chillers are more efficient for variable cooling load profiles. Water cooled chillers are more efficient than air cooled chillers but require cooling towers and additional pumps to circulate the cooling water. In any given size range variable speed chillers tend to have better partial load efficiency, but worse full load efficiency, than constant speed chillers.

The savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings associated with this measure is based on the cooling capacity of the new chiller, the improvement in efficiency compared with the base case equipment, the cooling load profile, and the estimated annual operating hours of the chiller before and after the upgrade. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

4.1.6 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment control measures are summarized in Figure 23 below.

Figure 23 - Summary of Plug Load Equipment 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)
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$208.59**	**$230.00**	**$50.00**	**$180.00**	**0.9**	**1,623**
ECM 12	Vending Machine Control	1,612	0.0	0.0	$208.59	$230.00	$50.00	$180.00	0.9	1,623

ECM 12: Vending Machine 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)
1,612	0.0	0.0	$208.59	$230.00	$50.00	$180.00	0.9	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

4.2 ECM Evaluated But Not Recommended

The measure below have been evaluated by the auditor but is not recommended for implementation at the facility. Reasons for exclusion can be found the measure description section.

Figure 24 – Summary of Measure Evaluated, But Not Recommended

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**	**31.0**	**$210.59**	**$30,066.00**	**$1,050.00**	**$29,016.00**	**137.8**	**3,632**
Install High Efficiency Gas Water Heater	0	0.0	31.0	$210.59	$30,066.00	$1,050.00	$29,016.00	137.8	3,632
TOTALS	**0**	**0.0**	**31.0**	**$210.59**	**$30,066.00**	**$1,050.00**	**$29,016.00**	**137.8**	**3,632**

* - 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).

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	31.0	$210.59	$30,066.00	$1,050.00	$29,016.00	137.8	3,632

Measure Description

This measure would replace the existing tank water heater with a high efficiency tank water heater. Improvements in combustion efficiency and reductions in heat losses have improved the overall efficiency of storage water heaters. Energy savings results from using less gas to heat water, due to higher unit efficiency, and fewer run hours to maintain the tank water temperature.

Reasons for not Recommending

This measure was not recommended based on energy savings alone because the simple payback period exceeds the expected life of the replacement equipment.

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 many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M 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.

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.

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.

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.

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 gallons per minute (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 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) 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.

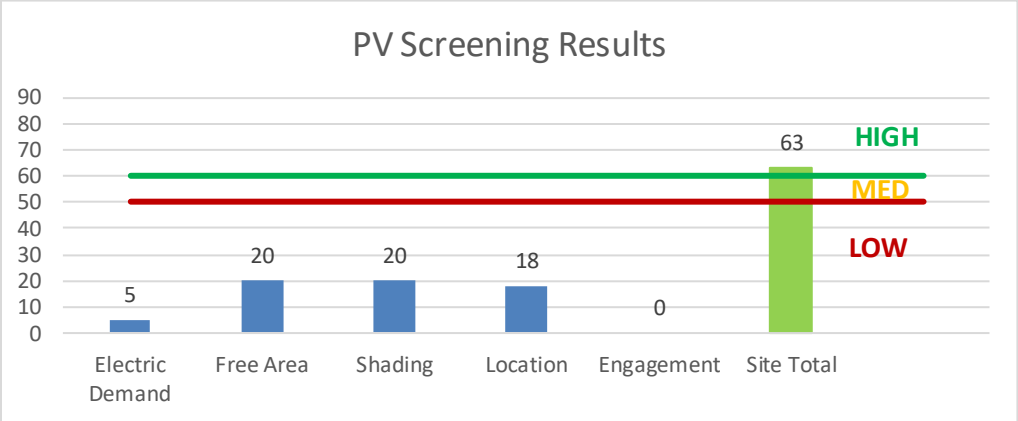
6.1 Photovoltaic

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 **high** potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the main building lot may be feasible. If the Fire Headquarters & Museum is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 25 - Photovoltaic Screening



Potential	High	
System Potential	156	kW DC STC
Electric Generation	185,854	kWh/yr
Displaced Cost	$16,170	/yr
Installed Cost	$405,600	

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (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 developed new solar projects 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

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

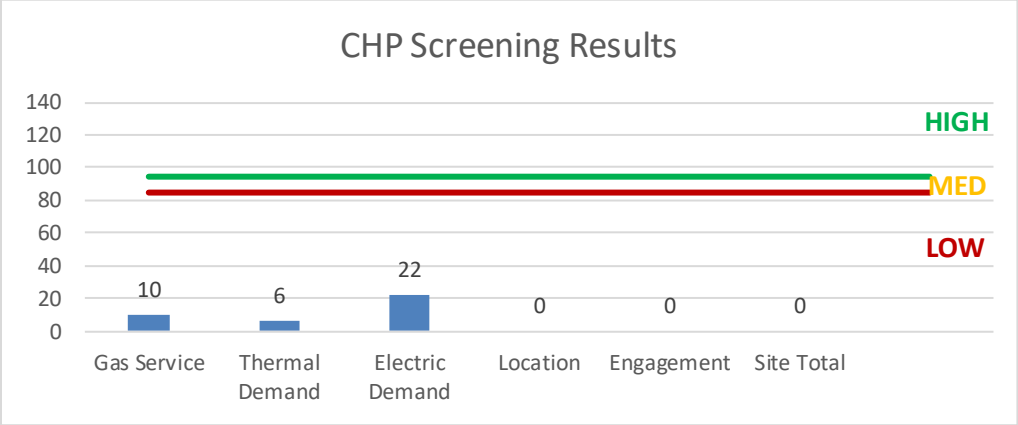
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste 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 boilers are the most significant factors contributing to the 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 New Jersey 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 26 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response 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.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities 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 receive payments whether or not their facility is called upon to curtail their electric usage.

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 programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric 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 curtailment event. DR program participants may need to install smart meters or 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. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

In our opinion, the facility is not a good candidate for DR.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, 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 a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 27 for a list of the eligible programs identified for each recommended ECM.

Figure 27 - 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 Fluorescent Fixtures with LED Lamps and Drivers	X		X			
ECM 3	Retrofit Fixtures with LED Lamps	X		X			
ECM 4	Install Occupancy Sensor Lighting Controls	X		X			
ECM 5	Install High/Low Lighitng Controls			X			
ECM 6	Premium Efficiency Motors			X			
ECM 7	Install VFDs on Constant Volume (CV) HVAC	X		X			
ECM 8	Install VFDs on Chilled Water Pumps	X		X			
ECM 9	Install VFDs on Hot Water Pumps			X			
ECM 10	Install VFDs on Cooling Tower Fans	X		X			
ECM 11	Install High Efficiency Chillers	X		X			
ECM 12	Vending Machine Control	X		X			

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, 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. It 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. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: 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

The SmartStart prescriptive incentive program 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 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). 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 assigned to 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 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) 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 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
Exit Signs	33	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	33	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office Rm 352	4	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Wall Switch	127	2,300	Relamp & Reballast	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,610	0.21	1,004	0.0	$129.90	$506.07	$80.00	3.28
Tech Office Rm 354	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,300	0.06	286	0.0	$37.00	$195.09	$60.00	3.65
3rd Flr Corridor	16	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	4,380	Relamp	No	16	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	4,380	0.23	2,178	0.0	$281.83	$780.36	$240.00	1.92
Restroom	2	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	4,380	Relamp	No	2	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	4,380	0.01	69	0.0	$8.97	$48.42	$10.00	4.28
Restroom	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	None	No	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Janitor Closet	1	Compact Fluorescent: 1 - 13W CFL Recessed Can	Wall Switch	13	1,000	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	1,000	0.00	8	0.0	$1.02	$24.21	$0.00	23.65
Storage Rm 357	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,000	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,000	0.11	224	0.0	$28.96	$219.09	$60.00	5.49
Office Rm 358	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,300	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,610	0.13	650	0.0	$84.15	$335.09	$80.00	3.03
Office Rm 359	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,610	0.09	434	0.0	$56.10	$416.06	$75.00	6.08
Office FMBA	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.05	977	0.0	$126.48	$109.55	$30.00	0.63
Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,380	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,066	0.05	433	0.0	$55.98	$343.03	$20.00	5.77
Credit Union	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,610	0.09	434	0.0	$56.10	$416.06	$75.00	6.08
Front & Rear Doors	6	Metal Halide: (1) 100W Lamp	Daylight Dimming	128	4,368	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	20	4,368	0.34	3,198	0.0	$413.92	$5,795.79	$600.00	12.55
Front & Rear Doors	1	Compact Fluorescent: 1 - 18W Recessed Can	Daylight Dimming	18	4,368	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 9W	Daylight Dimming	9	4,368	0.00	44	0.0	$5.75	$24.21	$0.00	4.21
Front & Rear Doors	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	12	4,368	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	12	4,368	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Entrances Truck Bays	20	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	100	4,368	None	No	20	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	100	4,368	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parking Lot	11	High-Pressure Sodium: (1) 400W Lamp	Daylight Dimming	465	4,368	Fixture Replacement	Yes	11	LED - Fixtures: High-Bay	Occupancy Sensor	54	3,058	2.50	23,194	0.0	$3,001.70	$8,743.70	$1,685.00	2.35
Truck Bay Entrance	2	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	6,000	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	30	6,000	0.28	3,593	0.0	$465.04	$1,931.93	$200.00	3.72
Rear Entrance	6	Compact Fluorescent: 1 - 13W CFL Recessed Can	Wall Switch	13	2,300	Relamp	Yes	6	LED Screw-In Lamps: LED Screw-in 6W	Occupancy Sensor	6	1,610	0.03	137	0.0	$17.76	$415.26	$0.00	23.38
Front Entrance	3	Compact Fluorescent: 1 - 13W CFL Recessed Can	Wall Switch	13	2,300	Relamp	No	3	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	2,300	0.01	55	0.0	$7.06	$72.63	$0.00	10.28
Museum Atrium	6	Compact Fluorescent: 1 - 23W CFL Wall Sconce	Wall Switch	23	2,300	Relamp	Yes	6	LED Screw-In Lamps: LED Screw-in 10W	Occupancy Sensor	10	1,610	0.05	250	0.0	$32.29	$415.26	$35.00	11.78
Museum Atrium	5	Compact Fluorescent: 2 - 23W CFL Recessed Can	Wall Switch	46	2,300	Relamp	Yes	5	LED Screw-In Lamps: LED Screw-in 10W	Occupancy Sensor	10	1,610	0.10	507	0.0	$65.59	$512.10	$35.00	7.27
Museum Atrium	1	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	2,300	None	No	1	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	2,300	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Museum Atrium	1	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	2,300	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	2,300	0.00	18	0.0	$2.35	$24.21	$5.00	8.16

	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
Museum	11	Compact Fluorescent: 2 - 23W CFL Recessed Can	Wall Switch	46	2,300	Relamp	Yes	11	LED Screw-In Lamps: LED Screw-in 10W	Occupancy Sensor	10	1,610	0.23	1,115	0.0	$144.29	$802.62	$35.00	5.32
Museum	28	LED - Fixtures: 18W Pendant Light	Wall Switch	18	2,300	None	No	28	LED - Fixtures: 18W Pendant Light	Wall Switch	18	2,300	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Museum	26	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	2,300	Relamp	Yes	26	LED Screw-In Lamps: LED Screw-in 6W	Occupancy Sensor	6	1,610	0.12	595	0.0	$76.96	$1,169.46	$200.00	12.60
Museum	12	Linear Fluorescent - T5: 1' T5 in Display Case	Wall Switch	8	2,300	Relamp	No	12	LED - Linear Tubes: (1) - 1' lamp	Wall Switch	4	2,300	0.03	125	0.0	$16.14	$180.00	$0.00	11.15
Museum Corridor	5	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	8,736	Relamp	Yes	5	LED - Linear Tubes: (3) 2' Lamps	High/Low Control	26	6,115	0.09	1,735	0.0	$224.53	$443.86	$75.00	1.64
Restroom	3	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	4,380	Relamp	No	3	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	4,380	0.01	104	0.0	$13.45	$72.63	$15.00	4.28
Restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	4,380	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	4,380	0.03	272	0.0	$35.23	$97.55	$30.00	1.92
Stairwell 107	3	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	8,760	None	No	3	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairwell 107	8	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	8,760	Relamp	No	8	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	8,760	0.03	554	0.0	$71.74	$193.68	$40.00	2.14
Training Rm 103	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,610	0.31	1,517	0.0	$196.36	$781.21	$175.00	3.09
2nd Flr Corridor	15	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	8,736	Relamp	Yes	15	LED - Linear Tubes: (3) 2' Lamps	High/Low Control	26	6,115	0.28	5,205	0.0	$673.58	$931.59	$225.00	1.05
Battalion Chief Office Rm 205	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,300	0.06	286	0.0	$37.00	$195.09	$60.00	3.65
Battalion Chief Office Rm 208	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,300	0.06	286	0.0	$37.00	$195.09	$60.00	3.65
Battalion Rm 203	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,300	0.06	286	0.0	$37.00	$195.09	$60.00	3.65
Office Rm 206	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,300	0.06	286	0.0	$37.00	$195.09	$60.00	3.65
Office Rm 202	4	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,300	0.06	286	0.0	$37.00	$195.09	$60.00	3.65
Electrical Closet	1	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	1,000	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	1,000	0.00	8	0.0	$1.02	$24.21	$5.00	18.77
Electrical Closet	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	1,000	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	1,000	0.03	62	0.0	$8.04	$97.55	$30.00	8.40
Clerks Office	9	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	Yes	9	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,610	0.17	822	0.0	$106.40	$708.95	$170.00	5.07
Director's Office 257	6	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	Yes	6	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,610	0.11	548	0.0	$70.94	$562.64	$125.00	6.17
Director's RR	3	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	4,380	Relamp	No	3	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	4,380	0.01	104	0.0	$13.45	$72.63	$15.00	4.28
Restroom	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	None	No	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Restroom	3	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	4,380	Relamp	No	3	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	4,380	0.01	104	0.0	$13.45	$72.63	$15.00	4.28
Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,380	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,066	0.13	1,238	0.0	$160.26	$335.09	$80.00	1.59
Janitor Closet	1	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	1,000	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	1,000	0.00	8	0.0	$1.02	$24.21	$5.00	18.77

	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
Offices 255 & 261	12	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	Yes	12	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,610	0.22	1,096	0.0	$141.87	$855.27	$215.00	4.51
Stairwell	3	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	8,760	Relamp	No	3	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	8,760	0.01	208	0.0	$26.90	$72.63	$15.00	2.14
Stariwell	5	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	8,760	None	Yes	5	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	6,132	0.00	89	0.0	$11.53	$270.00	$0.00	23.42
Basement Mech Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,300	0.11	515	0.0	$66.60	$219.09	$60.00	2.39
Basement Mech Rm 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,300	0.04	172	0.0	$22.20	$73.03	$20.00	2.39
Basement Hallway	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	0.04	652	0.0	$84.32	$73.03	$20.00	0.63
Basement Hallway	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	8,736	Relamp	Yes	4	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	6,115	0.04	833	0.0	$107.82	$400.06	$40.00	3.34
Elevator 1	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	0.02	326	0.0	$42.16	$36.52	$10.00	0.63
2nd Flr Mech Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.11	224	0.0	$28.96	$219.09	$60.00	5.49
Archives	6	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	1,000	Relamp	Yes	6	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	700	0.11	238	0.0	$30.84	$562.64	$125.00	14.19
Archives	1	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	1,000	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	1,000	0.00	8	0.0	$1.02	$24.21	$5.00	18.77
Elevator 2	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	8,736	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.03	582	0.0	$75.37	$68.77	$10.00	0.78
2nd Basement	27	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	Yes	27	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	700	0.60	1,272	0.0	$164.65	$1,525.91	$340.00	7.20
Boiler Rm	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.25	522	0.0	$67.56	$511.21	$140.00	5.49
Electric Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.04	75	0.0	$9.65	$73.03	$20.00	5.49
Fire Pump Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.07	1,303	0.0	$168.63	$146.06	$40.00	0.63
Fire Pump Rm	2	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	8,736	Relamp	No	2	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	8,736	0.01	138	0.0	$17.89	$48.42	$10.00	2.15
Fire Pump Rm	1	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	8,736	None	No	1	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	8,736	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Machine Shop	56	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	No	56	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,300	0.98	4,803	0.0	$621.57	$2,044.84	$560.00	2.39
Storage	85	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	Yes	85	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	700	1.88	4,005	0.0	$518.34	$4,723.78	$1,060.00	7.07
Equip Rm 130A	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.13	2,470	0.0	$319.64	$489.09	$95.00	1.23
Back Corridor	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	6,115	0.16	2,882	0.0	$372.91	$455.61	$70.00	1.03
Back Corridor	3	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	8,736	Relamp	No	3	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	8,736	0.01	207	0.0	$26.83	$72.63	$15.00	2.15
Break Rm	6	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	Yes	6	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,610	0.11	548	0.0	$70.94	$562.64	$125.00	6.17
Locker Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	490	0.0	$63.41	$109.55	$30.00	1.25

	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
Men's Rm	3	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	4,380	None	No	3	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
ADA Men's Rm	3	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	4,380	None	No	3	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Computer Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,300	0.04	172	0.0	$22.20	$73.03	$20.00	2.39
Maintenance Rm 133	3	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	No	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,300	0.04	214	0.0	$27.75	$146.32	$45.00	3.65
Truck Bay	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,368	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,058	0.27	2,470	0.0	$319.64	$708.18	$155.00	1.73
Truck Bay	25	Metal Halide: (1) 400W Lamp	Wall Switch	458	6,000	Fixture Replacement	Yes	25	LED - Fixtures: High-Bay	Occupancy Sensor	54	4,200	5.58	71,224	0.0	$9,217.38	$19,812.05	$3,820.00	1.73
Computer Rm	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	2,300	None	No	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	2,300	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Air Pack Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,300	0.04	172	0.0	$22.20	$73.03	$20.00	2.39
Air Pack Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,300	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,300	0.02	91	0.0	$11.77	$36.52	$10.00	2.25
Rm 125	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,300	0.04	172	0.0	$22.20	$73.03	$20.00	2.39
Rm 125	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,300	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,300	0.02	91	0.0	$11.77	$36.52	$10.00	2.25
Rm 124	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,300	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,610	0.05	227	0.0	$29.40	$343.03	$20.00	10.99
Truck Bay 2	25	Mercury Vapor: (1) 400W Lamp	Wall Switch	455	6,000	Fixture Replacement	Yes	25	LED - Fixtures: High-Bay	Occupancy Sensor	54	4,200	5.54	70,715	0.0	$9,151.58	$19,812.05	$3,820.00	1.75
Truck Bay 2	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	None	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Truck Bay 2	6	Metal Halide: (1) 150W Lamp	Wall Switch	190	6,000	Fixture Replacement	Yes	6	LED - Fixtures: High-Bay	Occupancy Sensor	20	4,200	0.56	7,160	0.0	$926.56	$4,869.29	$935.00	4.25
Watch Desk	6	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	8,760	Relamp	Yes	6	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	6,132	0.11	2,088	0.0	$270.17	$562.64	$125.00	1.62
Elevator Area	2	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	2,300	Relamp	No	2	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	2,300	0.01	36	0.0	$4.71	$48.42	$10.00	8.16
Storage Rm	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Fitness Rm	9	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	4,380	Relamp	Yes	9	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	3,066	0.17	1,566	0.0	$202.63	$708.95	$170.00	2.66
Restroom	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	None	No	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Truck Bay 3	20	Mercury Vapor: (1) 400W Lamp	Wall Switch	455	6,000	Fixture Replacement	Yes	20	LED - Fixtures: High-Bay	Occupancy Sensor	54	4,200	4.43	56,572	0.0	$7,321.26	$15,937.64	$3,070.00	1.76
Truck Bay 3	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Truck Bay 3	8	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,368	None	Yes	8	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	3,058	0.01	71	0.0	$9.20	$220.00	$35.00	20.11
Jacket Rm	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	None	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.08	1,546	0.0	$200.06	$270.00	$35.00	1.17
Plaque Rm	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,300	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,610	0.03	136	0.0	$17.56	$270.00	$0.00	15.38

	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
Office	8	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	Yes	8	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,610	0.15	731	0.0	$94.58	$660.18	$155.00	5.34
Laundry	1	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	2,300	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	2,300	0.00	18	0.0	$2.35	$24.21	$5.00	8.16
Dining Area	20	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	2,300	Relamp	Yes	20	LED Screw-In Lamps: LED Screw-in 6W	Occupancy Sensor	6	1,610	0.09	457	0.0	$59.20	$1,024.20	$170.00	14.43
Kitchen	6	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	2,200	Relamp	Yes	6	LED Screw-In Lamps: LED Screw-in 6W	Occupancy Sensor	6	1,540	0.03	131	0.0	$16.99	$415.26	$30.00	22.68
Kitchen	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,200	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,200	0.01	40	0.0	$5.15	$32.52	$10.00	4.37
Storage	4	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	1,000	None	No	4	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	1,000	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Fire Pole	2	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	8,760	Relamp	No	2	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	8,760	0.01	139	0.0	$17.93	$48.42	$10.00	2.14
Flight Deck	8	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	2,300	Relamp	Yes	8	LED Screw-In Lamps: LED Screw-in 6W	Occupancy Sensor	6	1,610	0.04	183	0.0	$23.68	$463.68	$40.00	17.89
Mop Closet	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Dormitory 1	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,300	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,610	0.13	650	0.0	$84.15	$335.09	$80.00	3.03
Dormitory 1	7	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	Yes	7	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,610	0.13	639	0.0	$82.76	$611.41	$140.00	5.70
Dormitory Corridor	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	None	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.04	773	0.0	$100.03	$270.00	$35.00	2.35
Dormitory Corridor	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	8,736	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	8,736	0.01	271	0.0	$35.13	$48.77	$15.00	0.96
Dormitory Restroom	9	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	None	Yes	9	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	3,066	0.01	80	0.0	$10.38	$270.00	$0.00	26.02
Restrooms	20	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	None	Yes	20	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	3,066	0.02	178	0.0	$23.06	$540.00	$70.00	20.38
Restrooms	20	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	4,380	Relamp	Yes	20	LED Screw-In Lamps: LED Screw-in 6W	Occupancy Sensor	6	3,066	0.09	871	0.0	$112.73	$1,024.20	$170.00	7.58
Stariwell	4	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	8,760	None	No	4	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairwell	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairwell	1	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	8,760	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	8,760	0.00	69	0.0	$8.97	$24.21	$5.00	2.14
Dormitory 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,300	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,610	0.13	650	0.0	$84.15	$335.09	$80.00	3.03
Dormitory 2	10	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	2,300	None	Yes	10	LED Screw-In Lamps: 1 - Torpedo LED	Occupancy Sensor	6	1,610	0.01	47	0.0	$6.05	$270.00	$35.00	38.82
Dormitory 2	12	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,300	Relamp	Yes	12	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,610	0.22	1,096	0.0	$141.87	$855.27	$35.00	5.78
Captains Dormitory	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,300	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,300	0.03	129	0.0	$16.65	$54.77	$15.00	2.39
Captains Dormitory	13	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	2,300	Relamp	Yes	13	LED Screw-In Lamps: LED Screw-in 6W	Occupancy Sensor	6	1,610	0.06	297	0.0	$38.48	$584.73	$65.00	13.51
Dorm Rm 226	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,300	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,300	0.03	129	0.0	$16.65	$54.77	$15.00	2.39

	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
Dorm Rm 226	1	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	2,300	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	2,300	0.00	18	0.0	$2.35	$24.21	$5.00	8.16
Dorm Restroom	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	None	No	2	LED Screw-In Lamps: 1 - Torpedo LED	Wall Switch	6	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Dorm Restroom	3	Compact Fluorescent: 1 - Screw-in Torpedo CFL	Wall Switch	13	4,380	Relamp	No	3	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	4,380	0.01	104	0.0	$13.45	$72.63	$15.00	4.28
Dorm Rm 227	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,300	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,300	0.03	129	0.0	$16.65	$54.77	$15.00	2.39
Dorm Rm 227	1	Compact Fluorescent: 1 - 13W CFL	Wall Switch	13	2,300	Relamp	No	1	LED Screw-In Lamps: LED Screw-in 6W	Wall Switch	6	2,300	0.00	18	0.0	$2.35	$24.21	$5.00	8.16

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
AHU-1 2nd flr mech room, AHU-2 Basement	AHU-1&2	2	Supply Fan	3.0	86.5%	No	2,745	Yes	89.5%	Yes	2	1.74	5,212	0.0	$674.51	$7,624.98	$480.00	10.59
AHU-1 2nd flr mech room, AHU-2 Basement	AHU-1&2	2	Return Fan	1.0	82.5%	No	2,745	Yes	85.5%	Yes	2	0.61	1,824	0.0	$236.06	$6,565.59	$160.00	27.14
Basement	AHU-3&4	2	Supply Fan	7.5	88.5%	No	3,391	Yes	91.0%	Yes	2	4.25	15,650	0.0	$2,025.34	$9,476.48	$1,200.00	4.09
Basement	AHU-3&4	2	Return Fan	2.0	84.0%	No	2,745	Yes	86.5%	Yes	2	1.19	3,564	0.0	$461.20	$6,522.05	$320.00	13.45
Basement	AHU-5&6	2	Supply Fan	15.0	91.0%	No	3,391	Yes	93.0%	Yes	2	8.26	30,282	0.0	$3,918.87	$14,082.34	$2,400.00	2.98
Basement	AHU-5&6	2	Return Fan	5.0	87.5%	No	2,745	Yes	89.5%	Yes	2	2.86	8,504	0.0	$1,100.54	$8,152.44	$800.00	6.68
Basement	AHU-7	1	Supply Fan	15.0	91.0%	No	3,391	Yes	93.0%	Yes	1	4.13	15,141	0.0	$1,959.43	$7,041.17	$1,200.00	2.98
Basement	AHU-7	1	Return Fan	5.0	87.5%	No	2,745	Yes	89.5%	Yes	1	1.43	4,252	0.0	$550.27	$4,076.22	$400.00	6.68
Basement	Space heating	1	Heating Hot Water Pump	3.0	86.5%	No	2,745	Yes	89.5%	Yes	1	0.41	3,147	0.0	$407.21	$3,884.01	$0.00	9.54
Basement	Space heating	1	Heating Hot Water Pump	3.0	86.5%	No	2,745	Yes	89.5%	Yes	1	0.41	3,147	0.0	$407.21	$3,884.01	$0.00	9.54
Basement	Space heating	1	Heating Hot Water Pump	3.0	86.5%	No	2,745	Yes	89.5%	Yes	1	0.41	3,147	0.0	$407.21	$3,884.01	$0.00	9.54
Basement	Space heating	1	Heating Hot Water Pump	3.0	86.5%	No	2,745	Yes	89.5%	Yes	1	0.41	3,147	0.0	$407.21	$3,884.01	$0.00	9.54
Basement	Space heating	1	Heating Hot Water Pump	5.0	87.5%	No	2,745	Yes	89.5%	Yes	1	0.66	5,153	0.0	$666.86	$4,076.22	$0.00	6.11
Basement	Space heating	1	Heating Hot Water Pump	5.0	87.5%	No	2,745	Yes	89.5%	Yes	1	0.66	5,153	0.0	$666.86	$4,076.22	$0.00	6.11
Basement	Boiler	1	Boiler Feed Water Pump	0.5	78.2%	No	2,745	No	78.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	DHW	3	Water Supply Pump	2.0	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	DCW	2	Water Supply Pump	2.0	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	Fire pump	1	Water Supply Pump	20.0	90.2%	No	10	No	90.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	Dust control	1	Exhaust Fan	10.0	89.5%	No	3,391	Yes	91.7%	Yes	1	2.80	10,285	0.0	$1,331.08	$5,151.50	$800.00	3.27
Basement	Air compressor	1	Air Compressor	15.0	91.0%	No	4,957	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		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
Whole Building	Fan coils	20	Supply Fan	0.5	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Make-up air	3	Supply Fan	5.0	87.5%	No	2,745	Yes	89.5%	Yes	3	4.30	12,756	0.0	$1,650.82	$12,228.66	$1,200.00	6.68
Basement	Space cooling	1	Chilled Water Pump	20.0	91.0%	No	962	Yes	93.0%	Yes	1	2.54	6,946	0.0	$898.90	$8,582.03	$1,200.00	8.21
Basement	Cooling tower	1	Condenser Water Pump	10.0	89.5%	No	962	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Cooling tower	1	Condenser Water Pump	20.0	90.2%	No	962	No	90.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Cooling tower	1	Cooling Tower Fan	30.0	93.6%	No	962	Yes	93.6%	Yes	1	0.00	10,011	0.0	$1,295.52	$11,910.75	$1,800.00	7.80
Basement	Space cooling	1	Chilled Water Pump	20.0	91.0%	No	962	Yes	93.0%	Yes	1	2.54	6,946	0.0	$898.90	$8,582.03	$1,200.00	8.21
Basement	Cooling tower	1	Condenser Water Pump	10.0	89.5%	No	962	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Cooling tower	1	Condenser Water Pump	20.0	90.2%	No	962	No	90.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Cooling tower	1	Cooling Tower Fan	30.0	93.6%	No	962	Yes	93.6%	Yes	1	0.00	10,011	0.0	$1,295.52	$11,910.75	$1,800.00	7.80

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
Rooftop	Server room	1	Split-System AC	0.75		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	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
Basement	Chilled water	1	Water-Cooled Screw Chiller	80.00	Yes	1	Water-Cooled Scroll Chiller	Variable	80.00	0.75	0.48	11.04	30,718	0.0	$3,975.35	$63,967.78	$3,440.00	15.23
Basement	Chilled water	1	Water-Cooled Screw Chiller	80.00	Yes	1	Water-Cooled Scroll Chiller	Variable	80.00	0.75	0.48	11.04	30,718	0.0	$3,975.35	$63,967.78	$3,440.00	15.23

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
Rooftop	Make-up air	3	Warm Air Unit Heater	550.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	Space heating	1	Non-Condensing Hot Water Boiler	1,084.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	Space heating	1	Non-Condensing Hot Water Boiler	1,084.00	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
Basement	DHW	2	Storage Tank Water Heater (> 50 Gal)	Yes	2	Storage Tank Water Heater (> 50 Gal)	Natural Gas	92.00%	Et	0.00	0	31.0	$210.59	$30,066.00	$1,050.00	137.78

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
Kitchen	2	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Yes	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 Griddle (5 Feet Width)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Break room	1	Gas Griddle (3 Feet Width)	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?
Break room	1	Refrigerator/Freezer	600.0	Yes
Break room	1	LED (50')	100.0	Yes
Break room	1	Coffee machine	900.0	No
Break room	1	Microwave	1,000.0	Yes
Break room	1	CRT (20')	120.0	Yes
Laundry room	1	Washer	900.0	Yes
Laundry room	1	Dryer	1,600.0	Yes
Kitchen	2	Ice maker	100.0	Yes
Kitchen	1	Dishwasher	1,500.0	Yes
Kitchen	1	Microwave	1,000.0	Yes
Fitness room	3	LED (24')	80.0	Yes
Fitness room	1	Treadmill	2,400.0	Yes
Dorm	6	LED (24')	80.0	Yes
Offices	18	Desktop	110.0	Yes
Offices	2	Copier	1,400.0	Yes
Offices	4	Printer	460.0	Yes
Fitness room	1	CRT (27')	120.0	Yes
Training room	1	LED (50')	100.0	Yes
Office	1	LED (40")	85.0	Yes
Dorm area	2	Coffee machine	900.0	No
Dorm area	1	Refrigerator/Freezer	600.0	Yes
Dorm area	1	Microwave	1,000.0	Yes
Dorm area	1	Dishwasher	1,500.0	Yes
Dorm area	1	Ice maker	100.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	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
Dining room	1	Refrigerated	Yes	0.00	1,612	0.0	$208.59	$230.00	$50.00	0.86

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]

Trenton Firehouse

Primary Property Type: Fire Station
Gross Floor Area (ft²): 65,228
Built: 1927

For Year Ending: February 28, 2017
Date Generated: October 09, 2018

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
Trenton Firehouse 320 Perry St Trenton, New Jersey 08618	City of Trenton 319 East State Street Trenton, NJ 08618 (____)____-_____	Hoggarth Stephen 319 East State Street Trenton, NJ 08618 6099893615 hstephen@trentonnj.org

Property ID: 5948221

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
103.2 kBtu/ft²

Source EUI
195.9 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	3,471,987 (52%)
Electric - Grid (kBtu)	3,262,464 (48%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	65.8
National Median Source EUI (kBtu/ft²)	124.9
% Diff from National Median Source EUI	57%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	515

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)