Local Government Energy Audit Report

Public Works Garage and Princeton Hook & Ladder

November 15, 2019

Prepared for:

Municipality of Princeton
27 North Harrison Street
Princeton, NJ 08540

Prepared by:

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Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information about financial incentives that may be available. Most energy conservation measures have received preliminary analysis of feasibility that identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to establish a basis for further discussion and to help prioritize energy measures.

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual 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. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

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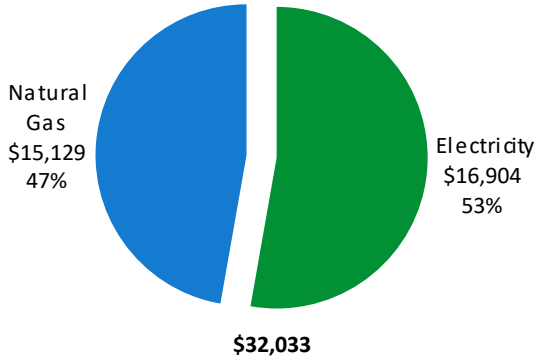
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for the Public Works Garage and Princeton Hook and Ladder. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC Energy Services (TRC) conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $32,033 Electricity: 146,106 kWh Natural Gas: 16,297 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

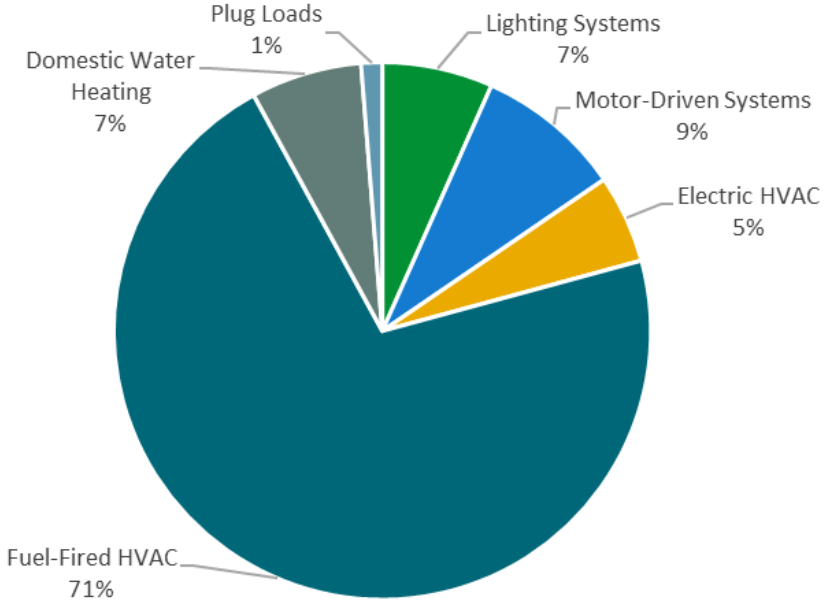


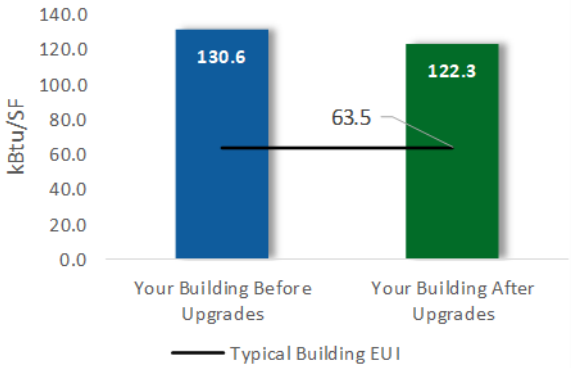
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

This energy audit considered a range of potential energy improvements in your building. Costs and savings will vary between improvements. Presented below are two potential scopes of work for your consideration.

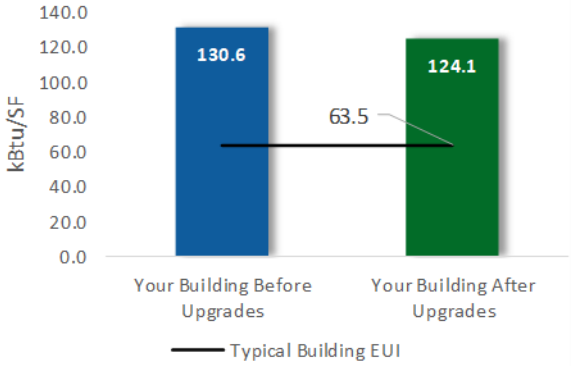
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$31,134
Potential Rebates & Incentives[1]	$2.238
Annual Cost Savings	$3,357
Annual Energy Savings	Electricity: 29,838 kWh Natural Gas: 329 Therms
Greenhouse Gas Emission Savings	17 Tons
Simple Payback	7.7 Years
Site Energy Savings (all utilities)	6%



Scenario 2: Cost Effective Package[2]

Installation Cost	$10,094
Potential Rebates & Incentives	$1,138
Annual Cost Savings	$3,382
Annual Energy Savings	Electricity: 28,526 kWh Natural Gas: 88 Therms
Greenhouse Gas Emission Savings	15 Tons
Simple Payback	2.6 Years
Site Energy Savings (all utilities)	5%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

[1] Incentives are based on current SmartStart Prescriptive incentives. Other Program incentives may apply.

[2] A cost-effective measure is defined as one where the simple payback does not exceed two-thirds of the expected proposed equipment useful life. Simple payback is based on the net measure cost after potential incentives.

#	Energy Conservation Measure	*Cost Effective?*	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			**21,848**	**3.3**	**-4**	**$2,488**	**$9,247**	**$1,088**	**$8,159**	**3.3**	**21,500**
ECM 1	Install LED Fixtures	No	1,076	0.2	0	$125	$2,898	$300	$2,598	20.9	1,084
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	16,634	2.0	-4	$1,892	$4,968	$556	$4,412	2.3	16,335
ECM 3	Retrofit Fixtures with LED Lamps	Yes	3,902	1.2	-1	$445	$1,019	$232	$787	1.8	3,848
ECM 4	Install LED Exit Signs	No	237	0.0	0	$27	$362	$0	$362	13.5	232
Lighting Control Measures			**5,488**	**1.0**	**-1**	**$624**	**$4,050**	**$350**	**$3,700**	**5.9**	**5,390**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	5,488	1.0	-1	$624	$4,050	$350	$3,700	5.9	5,390
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**24**	**$224**	**$17,779**	**$800**	**$16,979**	**76.0**	**2,820**
ECM 6	Install High Efficiency Hot Water Boilers	No	0	0.0	24	$224	$17,779	$800	$16,979	76.0	2,820
Domestic Water Heating Upgrade			**2,502**	**0.0**	**14**	**$422**	**$57**	**$0**	**$57**	**0.1**	**4,186**
ECM 7	Install Low-Flow DHW Devices	Yes	2,502	0.0	14	$422	$57	$0	$57	0.1	4,186
TOTALS (COST EFFECTIVE MEASURES)			**28,526**	**4.2**	**9**	**$3,382**	**$10,094**	**$1,138**	**$8,956**	**2.6**	**29,760**
TOTALS (ALL MEASURES)			**29,838**	**4.4**	**33**	**$3,757**	**$31,134**	**$2,238**	**$28,896**	**7.7**	**33,895**

* - All incentives presented in this table are based on NJ SmartStart 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).

Figure 2 – Evaluated Energy Improvements

For more detail on each evaluated energy improvement and a break out of cost-effective improvements, see **Section 4: Energy Conservation Measures**.

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decisions to make, such as:

- How will the project be funded and/or financed?
- Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- Are there other facility improvements that should happen at the same time?

Pick Your Installation Approach

New Jersey's Clean Energy Programs give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives before purchasing materials or starting installation.

The potential ECMs identified for this building likely qualify for multiple incentive and funding programs. Based on current program rules and requirements, your measures are likely to qualify for the following programs:

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
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 LED Exit Signs		X	
ECM 5	Install Occupancy Sensor Lighting Controls	X	X	
ECM 6	Install High Efficiency Hot Water Boilers	X	X	
ECM 7	Install Low-Flow Domestic Hot Water Devices		X	

Figure 3 – Funding Options

New Jersey's Clean Energy Programs At-A-Glance

	SmartStart Flexibility to install at your own pace	**Direct Install** Turnkey installation	**Pay for Performance** Whole building upgrades
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Average peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified partner to develop your energy reduction plan and set your energy savings targets.

Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.

Individual Measures with SmartStart

For facilities wishing 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, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation.

Turnkey Installation with Direct Install

The Direct Install program provides 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. Direct Install contractors will assess and verify individual measure eligibility and, in most cases, they perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Whole Building Approach with Pay for Performance

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also use this program. Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings.

More Options from Around the State

Financing and Planning Support with the Energy Savings Improvement Program (ESIP)

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the 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. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

Resiliency with Return on Investment through Combined Heat & Power (CHP)

The CHP program provides incentives for combined heat and power (aka cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces 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. By enabling commercial facilities to reduce electric demand 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 demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Public Works Garage and Princeton Hook and Ladder. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

2.1 Site Overview

On July 17, 2019, TRC performed an energy audit at Public Works Garage and Princeton Hook and Ladder located in Princeton, New Jersey. TRC met with Brian Maher to review the facility operations and help focus our investigation on specific energy-using systems.

Public Works Garage is a 2-story, 9,000 square foot building and Princeton Hook and Ladder is a 2-story, 7,300 square foot building, both built in 1957. Spaces include: conference rooms, meeting rooms, garage bay, engine room, compressor room, kitchen, break areas, bunk room, offices, stairwells, restrooms, storage rooms, locker room, shop space, and mechanical spaces.

2.2 Building Occupancy

The facility is occupied year-round for both buildings. Typical weekday occupancy is 7 staff.

There are no weekend activities for the public works garage.

Building Name	Weekday/Weekend	Operating Schedule
Princeton Hook and Ladder	Weekday	24 hours
	Weekend	24 hours
Public Works Garage	Weekday	7:00 AM to 3:30 PM
	Weekend	Closed

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block and brick masonry. The roof over the Public Works Garage is flat and covered with black membrane, which it is in good condition. The Hook and Ladder building has a pitched roof with asphalt shingles.

The walls are made of concrete masonry units (CMUs) with painted CMU interior finish.

Most of the windows are single pane and have wood frames. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have metal and wood frames and are in fair condition with undamaged door seals.

Hook & Ladder & PWG Buildings

Roofs: Hook & Ladder, PWG

Window & Exterior Doors

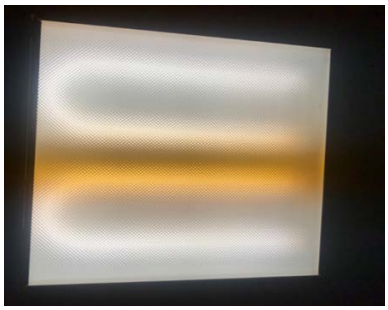
2.4 Lighting Systems

The primary interior lighting system in the Hook and Ladder building uses 34-Watt U-bend and 75W linear fluorescent T12 lamps. The primary interior lighting system in the Public Works Garage uses 32-Watt linear fluorescent T8 lamps. There are also some compact fluorescent lamps (CFL), incandescent, and LED general purpose lamps in both buildings. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

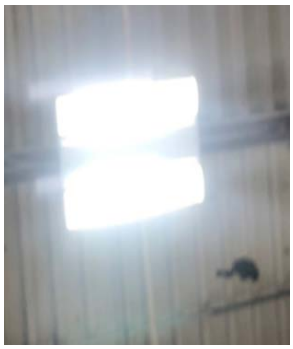
Fixture types include 2-lamp, 4- or 8-foot long recessed or surface mounted fixtures and 2-foot fixtures with U-bend tube lamps. Most exit signs are CFL however there are a few LED units present.

Most fixtures are in fair condition. Interior lighting levels were generally sufficient. The majority of lighting fixtures are controlled manually and the remainder by occupancy sensors.

Exterior fixtures include wall packs with high intensity discharge (HID) or LED lamps. Exterior light fixtures are controlled by a time clock or photocell, depending on the fixture.



75-Watt & 34-Watt U-Bend T12 Fixtures – Hook & Ladder



Linear T8 Fixtures & Occupancy Sensor – PWG

HID, CFL, & LED Fixtures

2.5 Air Handling Systems

Packaged and Split-System Units

The facility is served by multiple packaged and split-system roof top units, including two large Daikin rooftop units equipped with a gas-fired furnace section for the Public Works Garage. They were being installed at the time of the audit. The units serving the Hook and Ladder are all in good condition. Packaged and split system units are controlled with programmable thermostats. Refer to the table below for the size and efficiency of the units.

Unit	Area Served	Size	Efficiency
Ductless Mini-Split AC	Princeton Hook & Ladder	2.83 tons	10.90 SEER
Ductless Mini-Split HP	Princeton Hook & Ladder	1.50 tons/18 kBtuh	12.50 EER/4.11 COP
Ductless Mini-Split HP	Princeton Hook & Ladder	2.50 tons/30 kBtuh	9.50 EER/3.14 COP
Packaged AC with gas heat	Public Works Garage	18.00 tons/360 kBtuh	11.00 EER/80% AFUE
Ductless Mini-Split HP	Public Works Garage	4.00 tons/54 kBtuh	10.15 EER/3.72 COP
Indirect Furnace unit	Public Works Garage	120 kBtuh	80% AFUE

Large Daikin Unit Under Installation & Indirect Gas-Fired Furnace Unit

Split System ACs & Programmable Thermostat

2.6 Heating Hot Water Systems

Two 243 MBh Utica hot water boilers serve the Hook and Ladder building heating load. The burners are non-modulating with a nominal efficiency of 81.2%. The boilers are configured in a lead-lag control scheme. Both boilers may be required under high load conditions. They are in poor condition and have been evaluated for replacement.

The boilers serve a primary only distribution system with three constant speed 1/6 hp heating hot water pumps operating in lead/lag fashion. Space heating temperature is controlled with local thermostats.

Utica Hot Water Boilers & Hot Water Pumps

2.7 Domestic Hot Water

Hot water in the Hook and Ladder building is produced with a 80 gallon 76 MBh gas-fired storage water heater with a 80% efficiency. Hot water in the Public Works Garage is produced with a 40 gallon 4.5 kW electric storage water heater. The two water heaters are in good condition.

Gas-Fired & Electric Water Heaters

2.8 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 1% percent of total building energy use. This is lower than a typical building.

You seem to already be doing a great job managing your electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately four computer work stations throughout the facility. Plug loads throughout the building include general café and office equipment. There are typical loads such as microwaves, printers, copiers and fans.

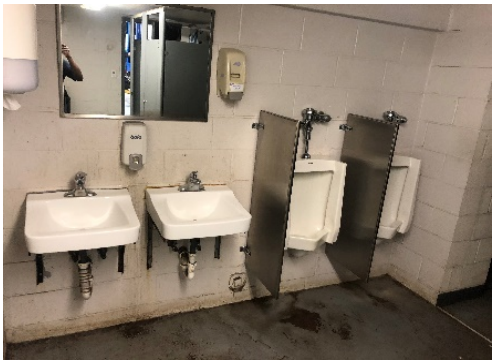
There are several residential style refrigerators throughout the building that are used to store food and beverages. These vary in condition and efficiency.



Refrigerator, Copier, & TV

2.9 Water-Using Systems

There are restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher.



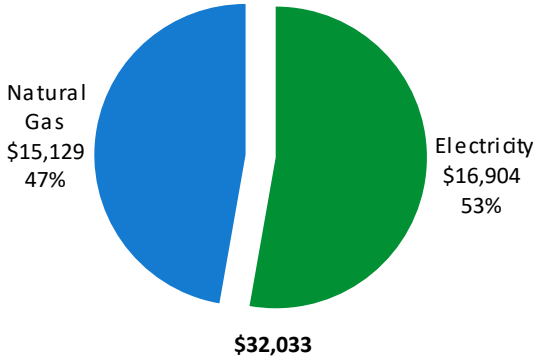
Lavatory sinks and urinals

Lavatory sink

3 ENERGY USE AND COSTS

Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	146,106 kWh	$16,904
Natural Gas	16,297 Therms	$15,129
Total		**$32,033**



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

The energy auditor collects information regarding equipment operating hours, capacity, efficiency and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated energy use is then compared to the historical energy use and the initial inputs are revised, as necessary, to balance the calculated energy use to the historical energy use.

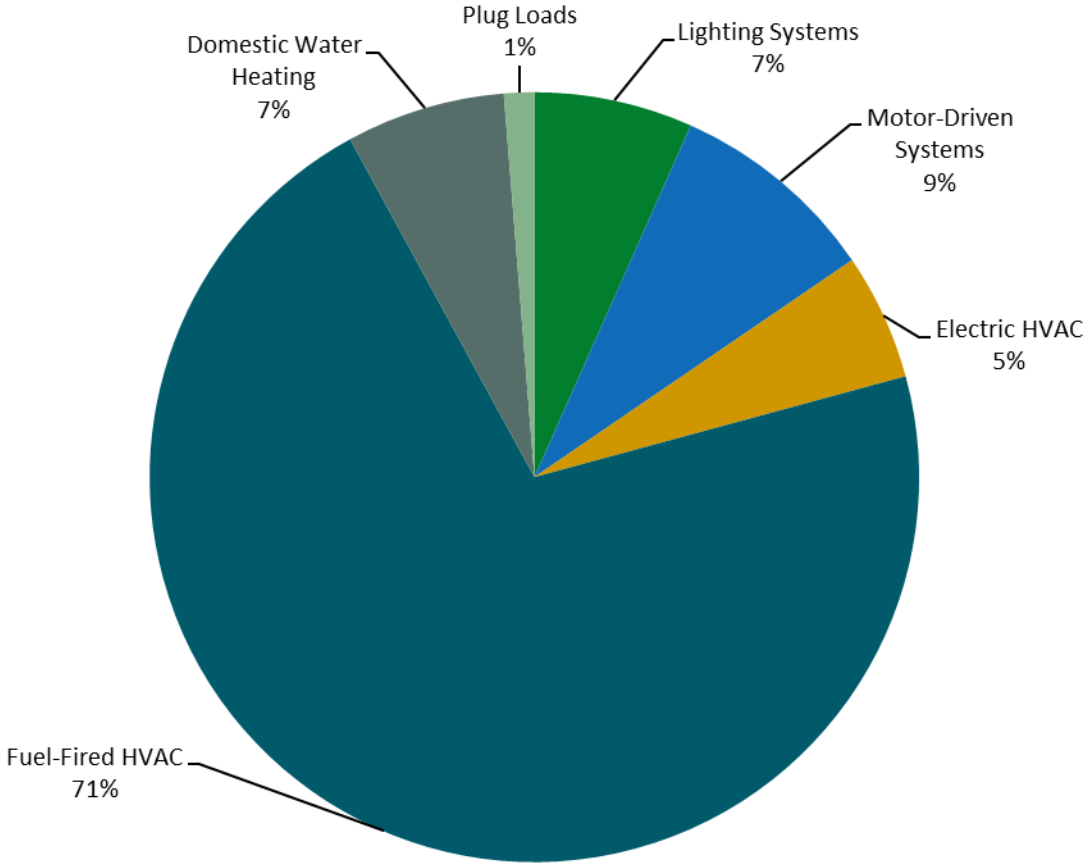
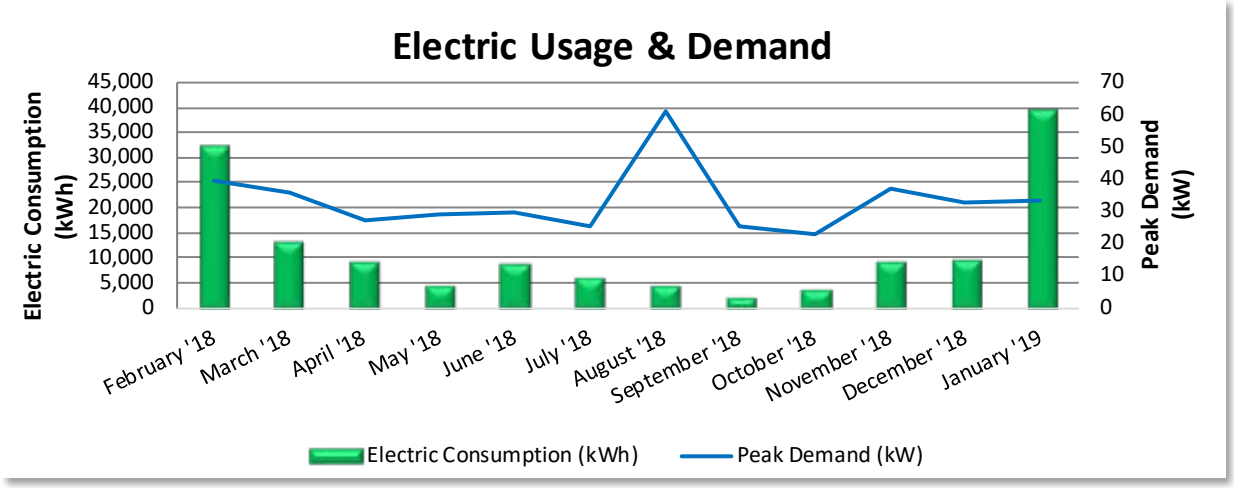


Figure 5 - Energy Balance

3.1 Electricity

PSE&G delivers and produces electricity under rate class General Light and Power (GLP).



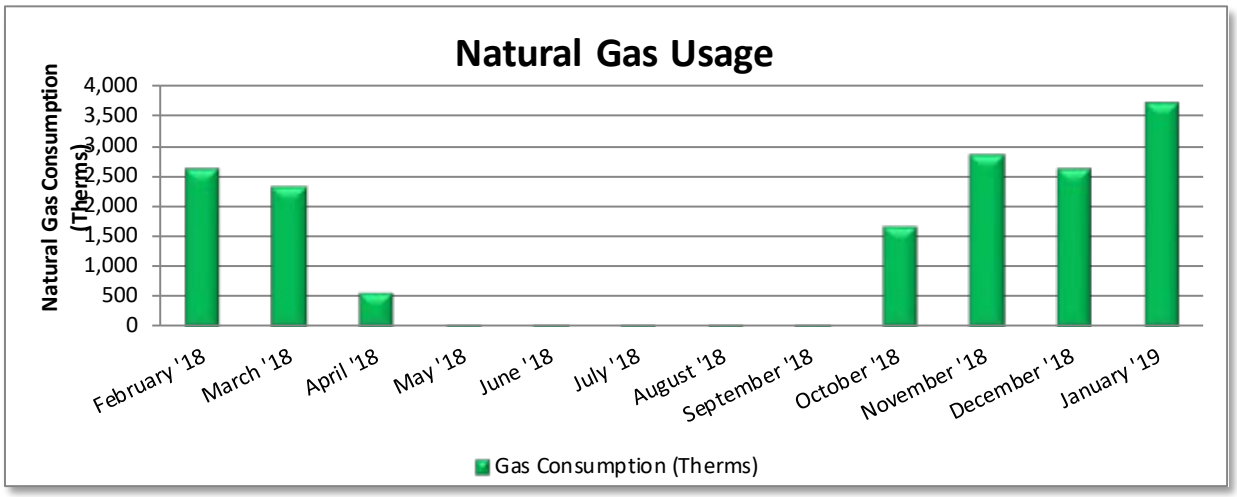
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
3/15/18	30	32,427	40	$170	$2,822
4/16/18	32	13,473	36	$149	$1,398
5/15/18	29	9,414	27	$110	$1,119
6/14/18	30	4,698	29	$117	$1,033
7/16/18	32	9,036	30	$120	$1,323
8/14/18	29	6,381	25	$102	$1,064
9/13/18	30	4,815	61	$124	$1,011
10/12/18	29	2,439	25	$102	$592
11/12/18	31	4,113	23	$88	$675
12/13/18	31	9,639	37	$136	$1,127
1/15/19	33	9,936	33	$120	$1,214
2/13/19	29	39,735	33	$122	$3,526
Totals	**365**	**146,106**	**61**	**$1,460**	**$16,904**
Annual	**365**	**146,106**	**61**	**$1,460**	**$16,904**

Notes:

- Peak demand of 61 kW occurred in August '18.
- The average electric cost over the past 12 months was $0.116/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers and supplies natural gas under rate class General Service Gas (GSG).



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
3/15/18	30	2,619	$2,362
4/16/18	32	2,311	$1,553
5/15/18	29	540	$452
6/14/18	30	19	$125
7/16/18	32	4	$114
8/14/18	29	10	$119
9/13/18	30	6	$116
10/12/18	29	24	$128
11/12/18	31	1,654	$1,590
12/13/18	31	2,825	$2,674
1/15/19	33	2,599	$2,612
2/13/19	29	3,684	$3,285
Totals	**365**	**16,297**	**$15,129**
Annual	**365**	**16,297**	**$15,129**

Notes:

- The average gas cost for the past 12 months is $0.928/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *Portfolio Manager®* software. Benchmarking compares your building's energy use to that of similar buildings across the county, while neutralizing variations due to location, occupancy and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR® benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

Benchmarking Score	N/A

Due to its unique characteristics, this building type is not able to receive a benchmarking score. This report contains suggestions about how to improve building performance and reduce energy costs.

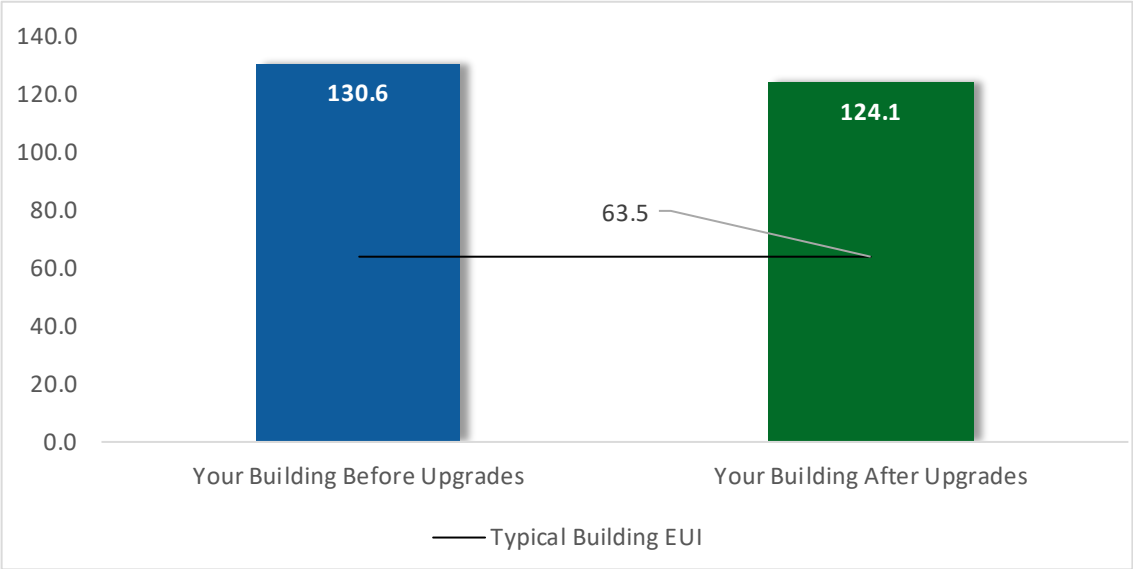


Figure 6 - Energy Use Intensity Comparison

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. A number of factors can cause as building to vary from the "typical" energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

Tracking Your Energy Performance

Keeping track of your energy use on a monthly basis is one of the best ways to keep energy costs in check. Update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance.

We have created a Portfolio Manager® account for your facility and we have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.

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.

For more information on ENERGY STAR® and Portfolio Manager®, visit their website[3].

[3] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify and evaluate potential energy efficiency improvements, provide information about the cost effectiveness of those improvements, and recognize potential financial incentives from NJBPU. Most energy conservation measures have received preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey Clean Energy Program Protocols to Measure Resource Savings*, which is 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.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives are based on the current NJCEP prescriptive SmartStart program. A higher level of investigation may be necessary to support any SmartStart Custom, Pay for Performance, or Direct Install incentive applications. Some measures and proposed upgrades may be eligible for higher incentives than those shown below through other NJCEP programs described in a following section of this report.

For a detailed list of the locations and recommended energy conservation measures for all inventoried equipment, see **Appendix A: Equipment Inventory & Recommendations.**

#	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		**21,848**	**3.3**	**-4**	**$2,488**	**$9,247**	**$1,088**	**$8,159**	**3.3**	**21,500**
ECM 1	Install LED Fixtures	1,076	0.2	0	$125	$2,898	$300	$2,598	20.9	1,084
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	16,634	2.0	-4	$1,892	$4,968	$556	$4,412	2.3	16,335
ECM 3	Retrofit Fixtures with LED Lamps	3,902	1.2	-1	$445	$1,019	$232	$787	1.8	3,848
ECM 4	Install LED Exit Signs	237	0.0	0	$27	$362	$0	$362	13.5	232
Lighting Control Measures		**5,488**	**1.0**	**-1**	**$624**	**$4,050**	**$350**	**$3,700**	**5.9**	**5,390**
ECM 5	Install Occupancy Sensor Lighting Controls	5,488	1.0	-1	$624	$4,050	$350	$3,700	5.9	5,390
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**24**	**$224**	**$17,779**	**$800**	**$16,979**	**76.0**	**2,820**
ECM 6	Install High Efficiency Hot Water Boilers	0	0.0	24	$224	$17,779	$800	$16,979	76.0	2,820
Domestic Water Heating Upgrade		**2,502**	**0.0**	**14**	**$422**	**$57**	**$0**	**$57**	**0.1**	**4,186**
ECM 7	Install Low-Flow DHW Devices	2,502	0.0	14	$422	$57	$0	$57	0.1	4,186
TOTALS		**29,838**	**4.4**	**33**	**$3,757**	**$31,134**	**$2,238**	**$28,896**	**7.7**	**33,895**

* - All incentives presented in this table are based on NJ SmartStart 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).

Figure 7 – All Evaluated 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		**20,535**	**3.2**	**-4**	**$2,337**	**$5,987**	**$788**	**$5,199**	**2.2**	**20,184**
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	16,634	2.0	-4	$1,892	$4,968	$556	$4,412	2.3	16,335
ECM 3	Retrofit Fixtures with LED Lamps	3,902	1.2	-1	$445	$1,019	$232	$787	1.8	3,848
Lighting Control Measures		**5,488**	**1.0**	**-1**	**$624**	**$4,050**	**$350**	**$3,700**	**5.9**	**5,390**
ECM 5	Install Occupancy Sensor Lighting Controls	5,488	1.0	-1	$624	$4,050	$350	$3,700	5.9	5,390
Domestic Water Heating Upgrade		**2,502**	**0.0**	**14**	**$422**	**$57**	**$0**	**$57**	**0.1**	**4,186**
ECM 6	Install Low-Flow DHW Devices	2,502	0.0	14	$422	$57	$0	$57	0.1	4,186
TOTALS		**28,526**	**4.2**	**9**	**$3,382**	**$10,094**	**$1,138**	**$8,956**	**2.6**	**29,760**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance

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

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	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		**21,848**	**3.3**	**-4**	**$2,488**	**$9,247**	**$1,088**	**$8,159**	**3.3**	**21,500**
ECM 1	Install LED Fixtures	1,076	0.2	0	$125	$2,898	$300	$2,598	20.9	1,084
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	16,634	2.0	-4	$1,892	$4,968	$556	$4,412	2.3	16,335
ECM 3	Retrofit Fixtures with LED Lamps	3,902	1.2	-1	$445	$1,019	$232	$787	1.8	3,848
ECM 4	Install LED Exit Signs	237	0.0	0	$27	$362	$0	$362	13.5	232

When considering lighting upgrades, we suggest using a comprehensive design approach that simultaneously upgrades lighting fixtures and controls to maximize energy savings and improve occupant lighting. Comprehensive design will also consider appropriate lighting levels for different space types to make sure that the right amount of light is delivered where needed. If conversion to LED light sources are proposed, we suggest converting all of a specific lighting type (e.g. linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Install LED Fixtures

Replace existing fixtures containing HID lamps with new LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixture(s).

Maintenance savings may also be achieved since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

Affected building areas: the Hook and Ladder exterior fixtures.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures by removing the fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology which use less power than other lighting technologies but provides equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and therefore do not need to be replaced as often.

Affected building areas: Princeton Hook and Ladder kitchen, conference/meeting rooms, engine room, restrooms, and bunk room with fluorescent fixtures with T12 tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies.

This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected building areas: all Public Work Garage areas with fluorescent fixtures with T8 tubes; Hook and Ladder front entrance with CFLs, exterior fixtures and mechanical room with halogen lamps, and stairwell and storage room with incandescent lamps.

ECM 4: Install LED Exit Signs

Replace compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output. Maintenance savings and improved reliability may also be achieved, as the longer-lasting LED lamps will not need to be replaced as often as the existing lamps.

4.2 Lighting Controls

#	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		**5,488**	**1.0**	**-1**	**$624**	**$4,050**	**$350**	**$3,700**	**5.9**	**5,390**
ECM 5	Install Occupancy Sensor Lighting Controls	5,488	1.0	-1	$624	$4,050	$350	$3,700	5.9	5,390

Lighting controls reduce energy use by turning off or lowering, lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 5: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

Affected building areas: the Hook and Ladder engine room, bar, meeting room, conference room, kitchen, and storage room; Public Works Garage bay, compressor room, restroom, break room, and shop.

4.3 Gas-Fired Heating

#	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)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**24**	**$224**	**$17,779**	**$800**	**$16,979**	**76.0**	**2,820**
ECM 6	Install High Efficiency Hot Water Boilers	0	0.0	24	$224	$17,779	$800	$16,979	76.0	2,820

ECM 6: Install High Efficiency Hot Water Boilers

Replace older inefficient hot water boilers with high efficiency hot water boilers. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

For the purposes of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load at this facility. In many cases installing multiple modular boilers rather than one or two large boilers will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boilers has a long payback and may not be justifiable based simply on energy considerations. However, the boilers have reached the end of their normal useful life. Typically, the marginal cost of purchasing high efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boilers.

4.4 Domestic Water Heating

#	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		**2,502**	**0.0**	**14**	**$422**	**$57**	**$0**	**$57**	**0.1**	**4,186**
ECM 7	Install Low-Flow DHW Devices	2,502	0.0	14	$422	$57	$0	$57	0.1	4,186

ECM 7: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The following low flow devices are recommended to reduce hot water usage:

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing.

Additional cost savings may result from reduced water usage.

5 ENERGY EFFICIENT BEST PRACTICES

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs. You may already be doing some of these things— see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before - you can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions.[4] Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Lighting Maintenance

Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.

In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

AC System Evaporator/Condenser Coil Cleaning

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan, and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

[4] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the water side or fire side of the boiler.

Water Heater Maintenance

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- Corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot, or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional.
- For electric water heaters, look for signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank.
- For water heaters more than three years old, have a technician inspect the sacrificial anode annually.

Water Conservation

Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

For more information regarding water conservation go to the EPA's WaterSense website[5] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[6] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. 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.

If the facility has detached buildings with a master water meter for the entire campus, check for unnatural wet areas in the lawn or water seeping in the foundation at water pipe penetrations through the foundation. Periodically check overnight meter readings when the facility is unoccupied, and there is no other scheduled water usage.

Manage irrigation systems to use water more effectively outside the building. Adjust spray patterns so that water lands on intended lawns and plantings and not on pavement and walls. Consider installing an evapotranspiration irrigation controller that will prevent over-watering.

Procurement Strategies

Purchasing efficient products reduces energy costs without compromising quality. Consider modifying your procurement policies and language to require ENERGY STAR® or WaterSense™ products where available.

[5] https://www.epa.gov/watersense

[6] https://www.epa.gov/watersense/watersense-work-0

6 On-site Generation

You don't have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the facility's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, which results in improved electric grid reliability through better use of transmission and distribution systems.

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze 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.

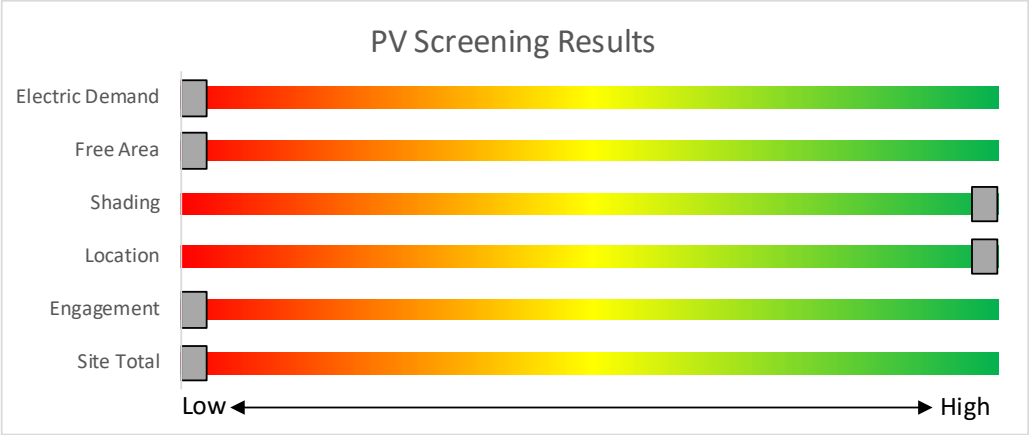
6.1 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has **no potential** for installing a PV array.

This facility does not appear to meet the minimum criteria for a cost-effective solar PV installation. To be cost-effective, a solar PV array needs certain minimum criteria, such as sustained electric demand and sufficient flat or south-facing rooftop or other unshaded space on which to place the PV panels.

The graphic below displays the results of the PV potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.



Potential	None	
System Potential	35	kW DC STC
Electric Generation	41,698	kWh/yr
Displaced Cost	$4,820	/yr
Installed Cost	$91,000	

Figure 9 - Photovoltaic Screening

Solar Renewable Energy Credit (SREC) Registration Program

Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program before starting construction. Once your PV system is up and running, you periodically earn credits, which can then be sold on the open market for up to 15 years.

If you are considering installing solar photovoltaics on your building, visit www.njcleanenergy.com/srec for more information about the SREC Registration Program.

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

- **Basic Info on Solar PV in NJ**: www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: 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) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

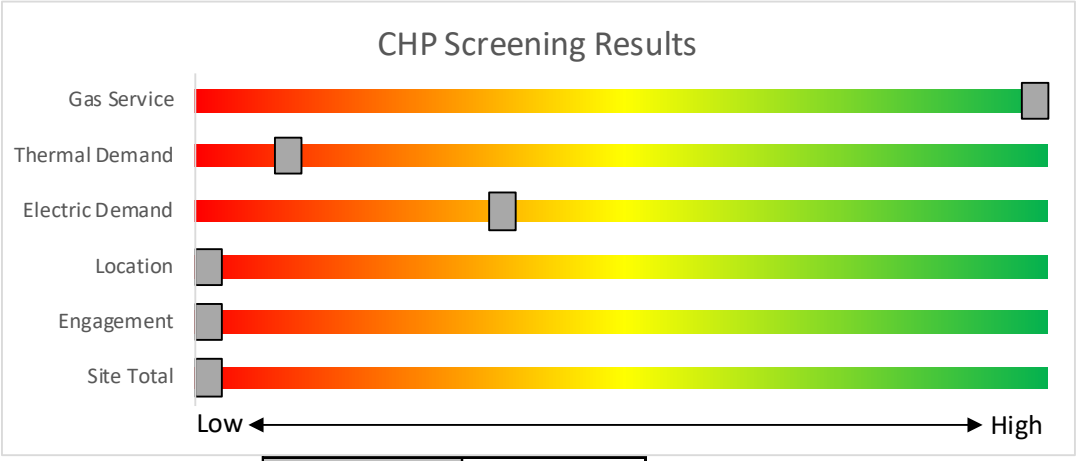
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling.

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need 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 **no potential** for installing a cost-effective CHP system.

Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. The lack of gas service, low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

The graphic below displays the results of the CHP potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.



Potential	None	
System Type	None	
System Potential	0	kW
Electric Generation	2,146	kWh/yr
Thermal Generation	52,148	MBtu/yr
Displaced Cost	-$171	/yr
Installed Cost	$4,000	

Figure 10 - Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 Project Funding and Incentives

Ready to improve your building's performance? NJ Clean Energy Programs can help. Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available NJ Clean Energy Programs.

	SmartStart *Flexibility to install at your own pace*	**Direct Install** *Turnkey installation*	**Pay for Performance** *Whole building upgrades*
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Average peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.
Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.			

7.1 SmartStart

SmartStart offers incentives for installing prescriptive and custom energy efficiency measures at your facility. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades. This program serves most common equipment types and sizes.

SmartStart routinely 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

Incentives

The SmartStart Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type.

SmartStart Custom provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives. Custom incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings. Incentives are 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

Submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. You can work with your preferred contractor or use internal staff to install measures.

Visit www.njcleanenergy.com/SSB for a detailed program description, instructions for applying, and applications.

7.2 Direct Install

Direct Install is a turnkey program available to existing small to medium-sized facilities with an average peak electric demand that does not exceed 200 kW over the recent 12-month period. You 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. Each entity is limited to incentives up to $250,000 per fiscal year.

How to Participate

To participate in Direct Install, 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.

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

7.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. 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. Annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

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 described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

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 used 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. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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 already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website[7].

8.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate monthly. 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 typically depends on whether a customer prefers 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 does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website[8].

[7] www.state.nj.us/bpu/commercial/shopping.html.

[8] 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	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Princeton Hook & Ladder - Wall Pack	1	Halogen Incandescent: One Lamp Screw-in	Timeclock		150	4,380	3	Relamp	No	1	LED Lamps: One Lamp Screw-in	Timeclock	23	4,380	0.1	556	0	$64	$22	$1	0.3
Princeton Hook & Ladder - Wall Pack	1	Metal Halide: (1) 70W Lamp	Timeclock		95	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	29	4,380	0.0	291	0	$34	$966	$100	25.7
Princeton Hook & Ladder - Wall Pack	2	Metal Halide: (1) 100W Lamp	Timeclock		128	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	38	4,380	0.1	785	0	$91	$1,932	$200	19.1
Princeton Hook & Ladder - Front entrance	3	Compact Fluorescent: One Lamp Screw-in	Photocell		32	4,380	3	Relamp	No	3	LED Lamps: One Lamp Screw-in	Photocell	23	4,380	0.0	118	0	$14	$52	$3	3.6
Princeton Hook & Ladder - Engine Bldg A room	11	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	s	158	7,000	2, 5	Relamp & Reballast	Yes	11	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	4,830	1.1	9,008	-2	$1,024	$1,686	$255	1.4
Princeton Hook & Ladder - Restroom	1	LED Lamps: One Lamp Screw-in	Wall Switch	s	10	7,000		None	No	1	LED Lamps: One Lamp Screw-in	Wall Switch	10	7,000	0.0	0	0	$0	$0	$0	0.0
Princeton Hook & Ladder - Conference Room	9	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	s	72	7,000	2, 5	Relamp & Reballast	Yes	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,830	0.4	3,350	-1	$381	$1,212	$125	2.9
Princeton Hook & Ladder - Conference Room	2	Exit Signs: Fluorescent	None		11	8,760	4	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	95	0	$11	$145	$0	13.5
Princeton Hook & Ladder - Kitchen	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	s	72	7,000	2, 5	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,830	0.1	744	0	$85	$479	$20	5.4
Princeton Hook & Ladder - Storage Room	3	Incandescent: One Lamp Screw-in	Wall Switch	s	65	730	3, 5	Relamp	Yes	3	LED Lamps: One Lamp Screw-in	Occupancy Sensor	10	504	0.2	138	0	$16	$322	$3	20.3
Princeton Hook & Ladder - Bar	2	Linear Fluorescent - T12: 2' T12 (20W) - 1L	Wall Switch	s	25	7,000	2, 5	Relamp & Reballast	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	4,830	0.0	289	0	$33	$367	$6	11.0
Princeton Hook & Ladder - Womens Restroom	1	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	s	72	7,000	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	7,000	0.0	295	0	$34	$105	$10	2.8
Princeton Hook & Ladder - Mens Restroom	1	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	s	72	7,000	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	7,000	0.0	295	0	$34	$105	$10	2.8
Princeton Hook & Ladder - Stairwell	2	Exit Signs: Fluorescent	None		11	8,760	4	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	95	0	$11	$145	$0	13.5
Princeton Hook & Ladder - Stairwell	4	Incandescent: One Lamp Screw-in	Wall Switch	s	65	7,000	3	Relamp	No	4	LED Lamps: One Lamp Screw-in	Wall Switch	10	7,000	0.2	1,671	0	$190	$69	$4	0.3
Princeton Hook & Ladder - Bunk Room	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	s	72	1,095	2	Relamp & Reballast	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,095	0.1	92	0	$10	$209	$20	18.1
Princeton Hook & Ladder - 2nd Floor	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	s	72	7,000	2, 5	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,830	0.1	744	0	$85	$479	$20	5.4
Princeton Hook & Ladder - 2nd Flr Meeting Room	16	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	s	72	7,000	2, 5	Relamp & Reballast	Yes	16	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,830	0.7	5,955	-1	$677	$1,945	$195	2.6
Princeton Hook & Ladder - 2nd Flr Meeting Room	1	Exit Signs: Fluorescent	None		11	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	47	0	$5	$72	$0	13.5
Princeton Hook & Ladder - Restroom	1	LED Lamps: One Lamp Screw-in	Wall Switch	s	10	7,000		None	No	1	LED Lamps: One Lamp Screw-in	Wall Switch	10	7,000	0.0	0	0	$0	$0	$0	0.0
Princeton Hook & Ladder - Mechanical Room	1	LED - Fixtures: Ambient - 8' - Direct Fixture	Wall Switch	s	97	730		None	No	1	LED - Fixtures: Ambient - 8' - Direct Fixture	Wall Switch	97	730	0.0	0	0	$0	$0	$0	0.0
Princeton Hook & Ladder - Mechanical Room	1	Halogen Incandescent: One Lamp Screw-in	Wall Switch	s	90	730	3	Relamp	No	1	LED Lamps: One Lamp Screw-in	Wall Switch	13	730	0.1	61	0	$7	$21	$1	2.9
Public Works Garage - Wall Pack	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock		55	4,380		None	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	55	4,380	0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Garage Bay	20	LED - Linear Tubes: (2) 4' T5HO (25W) Lamps	Wall Switch	s	51	2,100	5	None	Yes	20	LED - Linear Tubes: (2) 4' T5HO (25W) Lamps	Occupancy Sensor	51	1,449	0.3	717	0	$82	$540	$70	5.8
Public Works Garage - Garage Bay	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Public Works Garage - Garage Bay	25	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	s	17	2,100	5	None	Yes	25	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,449	0.1	299	0	$34	$540	$70	13.8
Public Works Garage - Storage Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	s	62	500	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	18	0	$2	$37	$10	13.1
Public Works Garage - Compressor Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	s	62	2,100	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,449	0.1	381	0	$43	$416	$75	7.9
Public Works Garage - Parts Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	s	62	1,470	3	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,470	0.2	314	0	$36	$219	$60	4.5
Public Works Garage - Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	s	62	2,100	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,449	0.1	190	0	$22	$343	$20	14.9
Public Works Garage - Locker Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	s	62	1,470	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,470	0.1	210	0	$24	$146	$40	4.5
Public Works Garage - Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	s	62	2,100	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,100	0.0	75	0	$9	$37	$10	3.1
Public Works Garage - 2nd Floor Office	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	s	29	1,470		None	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,470	0.0	0	0	$0	$0	$0	0.0
Public Works Garage - 2nd Floor Office 2	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	s	29	1,470		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,470	0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Break Room	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	s	29	2,100	5	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,449	0.0	122	0	$14	$270	$35	16.9
Public Works Garage - Break Room	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Public Works Garage - 2nd Floor Shop	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	s	62	2,100	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,449	0.1	381	0	$43	$416	$75	7.9

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?	Remaining Useful Life	Annual Operating Hours	ECM #	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
Princeton Hook & Ladder - Mechanical Room	Heating Hot Water	3	Heating Hot Water Pump	0.2	60.0%	No	w	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Roof	Daikin DPS018 unit	2	Supply Fan	15.0	93.0%	Yes	n	2,400		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Roof	Daikin DPS018 unit	2	Return Fan	8.0	91.0%	Yes	n	2,400		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Roof	Greenheck Indirect Furnace unit RTU-1	1	Supply Fan	0.8	81.0%	No	w	2,400		No	81.0%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Roof	Garage exhaust	1	Exhaust Fan	3.0	86.5%	No	w	2,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Garage	Vehicle Lift	3	Other	2.0	86.5%	No	w	200		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Garage	Vehicle Lift	2	Other	3.5	89.5%	No	w	200		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Garage	Air Compressor	1	Air Compressor	5.0	85.5%	No	w	200		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Garage	Air Compressor	1	Air Compressor	5.0	85.5%	No	w	0		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Roof	Greenheck Fans	5	Exhaust Fan	0.3	69.5%	No	w	2,000		No	69.5%	No		0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Garage	Roll up Doors	2	Other	0.5	78.2%	No	w	200		No	78.2%	No		0.0	0	0	$0	$0	$0	0.0

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 (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	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
Princeton Hook & Ladder - Ground Floor	Conference Room	2	Ductless Mini-Split AC	2.83		w		No							0.0	0	0	$0	$0	$0	0.0
Princeton Hook & Ladder - Roof	2nd Floor	1	Ductless Mini-Split HP	1.50	18.00	w		No							0.0	0	0	$0	$0	$0	0.0
Princeton Hook & Ladder - Roof	2nd Floor	1	Ductless Mini-Split HP	2.50	30.00	w		No							0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Roof	Public Works HVAC	2	Packaged AC	18.00		n		No							0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Ground Floor	Offices	1	Ductless Mini-Split HP	4.00	54.00	w		No							0.0	0	0	$0	$0	$0	0.0

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)	Remaining Useful Life	ECM #	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
Princeton Hook & Ladder - Mechanical Room	Heating Hot Water	2	Non-Condensing Hot Water Boiler	243.00	w		No						0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Roof	Daikin DPS018 furnace	2	Furnace	360.00	n		No						0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Roof	Greenheck Indirect Furnace unit	1	Furnace	120.00	w		No						0.0	0	0	$0	$0	$0	0.0

DHW Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Remaining Useful Life	ECM #	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
Princeton Hook & Ladder - Mechanical Room	DHW	1	Storage Tank Water Heater (> 50 Gal)	w		No						0.0	0	0	$0	$0	$0	0.0
Public Works Garage - Garage	DHW	1	Storage Tank Water Heater (≤ 50 Gal)	w		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Princeton Hook & Ladder - Multiple Locations	6	5	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	14	$132	$36	$0	0.3
Public Works Garage - Multiple Locations	6	3	Faucet Aerator (Lavatory)	2.20	0.50	0.0	2,502	0	$290	$22	$0	0.1

Plug Load Inventory

Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Princeton Hook & Ladder - Break Area	1	Water Cooler	500.0	
Princeton Hook & Ladder - Break Area	1	TV	120.0	
Princeton Hook & Ladder - Break Area	1	Computers	75.0	
Princeton Hook & Ladder - Break Area	1	Electric Stove	2,400.0	
Princeton Hook & Ladder - Break Area	1	Microwave	1,000.0	
Princeton Hook & Ladder - Break Area	2	Coffee Machine	400.0	
Princeton Hook & Ladder - Break Area	1	Refrigerator	600.0	
Public Works Garage - Offices	4	Computers	75.0	
Public Works Garage - Lockers	1	Dehumidifier	1,500.0	
Public Works Garage - Offices	1	Printer	20.0	
Public Works Garage - Break Area	1	Microwave	1,000.0	
Public Works Garage - Break Area	1	Coffee Machine	400.0	
Public Works Garage - Break Area	1	Toaster	850.0	
Public Works Garage - Break Area	1	Water Cooler	500.0	
Public Works Garage - Break Area	1	Refrigerator	600.0	
Public Works Garage - Break Area	1	TV	120.0	
Public Works Garage - Garage	6	Floor Fans	125.0	

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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.

LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

27 North Harrison Street

Primary Property Type: Non-Refrigerated Warehouse
Gross Floor Area (ft²): 16,300
Built: 1957

For Year Ending: January 31, 2019
Date Generated: August 02, 2019

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
27 North Harrison Street 27 North Harrison Street Princeton, New Jersey 08540	Municipality of Princeton One Monument Drive Princeton, NJ 08540 (____)____-_____	Robert Hough One Monument Drive Princeton, NJ 08540 6096882566 rhough@princetonnj.gov

Property ID: 6858120

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
147.7 kBtu/ft²

Source EUI
203.4 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	450,199 (19%)
Natural Gas (kBtu)	1,957,635 (81%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	38.4
National Median Source EUI (kBtu/ft²)	52.9
% Diff from National Median Source EUI	285%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	150

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)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate fiscal savings associated with measures. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR®	ENERGY STAR is the government-backed symbol for energy efficiency. The ENERGY STAR program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas:* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp.
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
MH	*Metal halide*: a type of HID lamp.
MBh	*Thousand Btu per hour*
MBtu	*One thousand British thermal units*
MMBtu	*One million British thermal units*
MV	*Mercury Vapor:* a type of HID lamp.
NJBPU	*New Jersey Board of Public Utilities*
NJCEP	*New Jersey Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR® Portfolio Manager®.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense™	The symbol for water efficiency. The WaterSense™ program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.