Local Government Energy Audit Report

Department of Public Works – Road Services

January 20, 2022

Prepared for:

Township of Morris

6 Jane Way

Morris Township, NJ 07960

Prepared by:

TRC

317 George Street

New Brunswick, NJ 08901

Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities and help prioritize specific measures for implementation. 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 reviewed the energy conservation measures and estimates of energy savings 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 material and labor costs primarily on RS Means cost manuals as well as on our experience at similar facilities. This approach is based on standard cost estimating manuals and is vendor neutral. Cost estimates include material and labor pricing associated with one for one equipment replacements. Cost estimates do not include demolition or removal of hazardous waste. The actual implementation costs for energy savings projects are anticipated to be significantly higher based on the specific conditions at your site(s). We strongly recommend that you work with your design engineer or contractor to develop actual project costs for your specific scope of work for the installation of high efficiency equipment. We encourage you to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on selected products and installers. TRC and NJBPU do not guarantee cost estimates and shall in no event be held liable should actual installed costs vary from these material and labor estimates.

Incentive values provided in this report are estimated based of previously run state efficiency programs. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available utility 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.

Table of Contents

ENERGY EFFICIENCY INCENTIVE & REBATE TRANSITION

For the purposes of your LGEA, estimated incentives and rebates are included as placeholders for planning purposes. New Jersey utilities are rolling out their own energy efficiency programs, which your project may be eligible for depending on individual measures, quantities, and size of the building.

In 2018, Governor Murphy signed into law the landmark legislation known as the Clean Energy Act. The law called for a significant overhaul of New Jersey's clean energy systems by building sustainable infrastructure in order to fight climate change and reduce carbon emissions, which will in turn create well-paying local jobs, grow the state's economy, and improve public health while ensuring a cleaner environment for current and future residents.

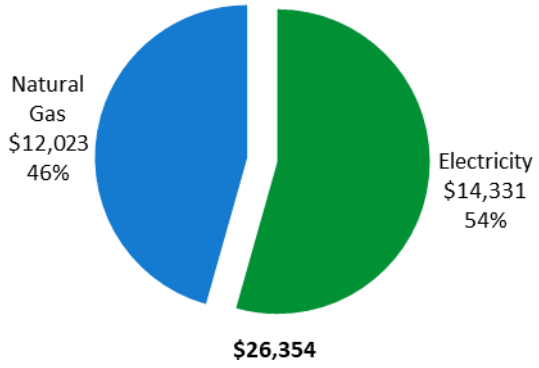
These next generation energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and incentives directly to customers like you. NJCEP will still offer programs for new construction, renewable energy, the Energy Savings Improvement Program (ESIP), and large energy users.

New utility programs are under development. Keep up to date with developments by visiting the NJCEP website.

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Department of Public Works – Road Services. 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 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: $26,354 Electricity: 125,400 kWh Natural Gas: 13,149 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.

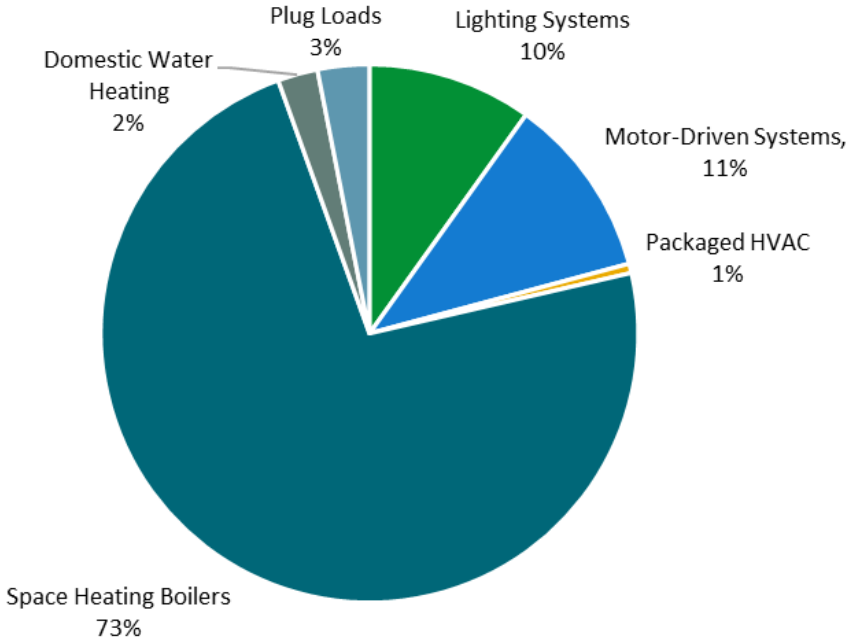


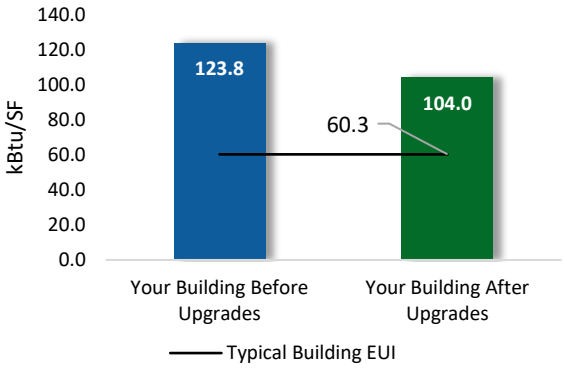
Figure 1 - Energy Use by System

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.

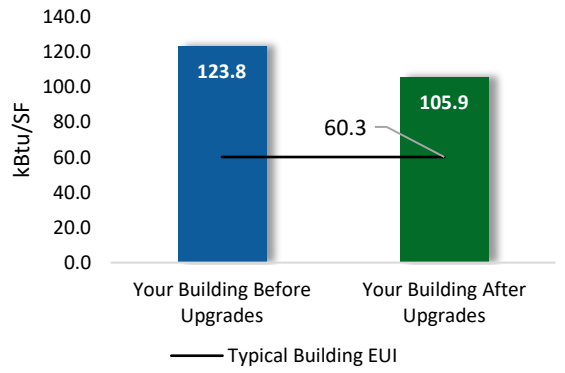
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$75,314
Potential Rebates & Incentives[1]	$4,610
Annual Cost Savings	$6,863
Annual Energy Savings	Electricity: 51,947 kWh Natural Gas: 1,013 Therms
Greenhouse Gas Emission Savings	32 Tons
Simple Payback	10.3 Years
Site Energy Savings (all utilities)	16%



Scenario 2: Cost Effective Package[2]

Installation Cost	$41,075
Potential Rebates & Incentives	$4,085
Annual Cost Savings	$5,970
Annual Energy Savings	Electricity: 44,128 kWh Natural Gas: 1,013 Therms
Greenhouse Gas Emission Savings	28 Tons
Simple Payback	6.2 Years
Site Energy Savings (all utilities)	14%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

[1] Incentives are based on previously run state rebate programs. Contact your utility provider for current program incentives that 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**27,291**	**5.2**	**-3**	**$3,088**	**$12,073**	**$2,169**	**$9,904**	**3.2**	**27,093**
ECM 1	Install LED Fixtures	Yes	16,807	2.4	-1	$1,908	$7,856	$1,200	$6,656	3.5	16,764
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,569	0.6	0	$176	$761	$125	$636	3.6	1,538
ECM 3	Retrofit Fixtures with LED Lamps	Yes	8,593	2.1	-2	$968	$3,312	$844	$2,468	2.5	8,474
ECM 4	Install LED Exit Signs	Yes	322	0.0	0	$36	$145	$0	$145	4.0	315
Lighting Control Measures			**3,093**	**1.2**	**-1**	**$347**	**$2,784**	**$480**	**$2,304**	**6.6**	**3,033**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	3,093	1.2	-1	$347	$2,784	$480	$2,304	6.6	3,033
Motor Upgrades			**83**	**0.0**	**0**	**$9**	**$1,019**	**$0**	**$1,019**	**107.9**	**83**
ECM 6	Premium Efficiency Motors	No	83	0.0	0	$9	$1,019	$0	$1,019	107.9	83
Variable Frequency Drive (VFD) Measures			**18,998**	**4.5**	**0**	**$2,171**	**$43,640**	**$925**	**$42,715**	**19.7**	**19,131**
ECM 7	Install VFDs on Constant Volume (CV) Fans	No	3,107	0.8	0	$355	$17,629	$325	$17,304	48.7	3,128
ECM 8	Install VFDs on Heating Water Pumps	No	4,102	0.5	0	$469	$11,519	$200	$11,319	24.1	4,131
ECM 9	Install VFDs on Process Blowers	Yes	11,789	3.2	0	$1,347	$14,492	$400	$14,092	10.5	11,872
Unitary HVAC Measures			**528**	**0.7**	**0**	**$60**	**$4,073**	**$0**	**$4,073**	**67.5**	**532**
ECM 10	Install High Efficiency Air Conditioning Units	No	528	0.7	0	$60	$4,073	$0	$4,073	67.5	532
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**73**	**$666**	**$10,589**	**$826**	**$9,763**	**14.7**	**8,534**
ECM 11	Install High Efficiency Hot Water Boilers	Yes	0	0.0	73	$666	$10,589	$826	$9,763	14.7	8,534
HVAC System Improvements			**0**	**0.0**	**27**	**$245**	**$475**	**$120**	**$355**	**1.4**	**3,142**
ECM 12	Install Pipe Insulation	Yes	0	0.0	27	$245	$475	$120	$355	1.4	3,142
Domestic Water Heating Upgrade			**0**	**0.0**	**6**	**$52**	**$200**	**$40**	**$160**	**3.1**	**661**
ECM 13	Install Low-Flow DHW Devices	Yes	0	0.0	6	$52	$200	$40	$160	3.1	661
Food Service & Refrigeration Measures			**1,954**	**0.2**	**0**	**$223**	**$460**	**$50**	**$410**	**1.8**	**1,968**
ECM 14	Vending Machine Control	Yes	1,954	0.2	0	$223	$460	$50	$410	1.8	1,968
TOTALS (COST EFFECTIVE MEASURES)			**44,128**	**9.8**	**101**	**$5,970**	**$41,075**	**$4,085**	**$36,990**	**6.2**	**56,302**
TOTALS (ALL MEASURES)			**51,947**	**11.8**	**101**	**$6,863**	**$75,314**	**$4,610**	**$70,704**	**10.3**	**64,176**

* - All incentives presented in this table are included as placeholders and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

** - 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

Utility run energy efficiency programs and 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.

For details on these programs please visit New Jersey's Clean Energy Program website or contact your utility provider.

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 and Power (CHP)

The CHP program provides incentives for combined heat and power (i.e., 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.

Successor Solar Incentive Program (SuSI)

New Jersey is committed to supporting solar energy. Solar projects help the state reach the renewable goals outlined in the state's Energy Master Plan. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available, but certified solar projects are able to earn one SREC II (Solar Renewable Energy Certificates II) for each megawatt-hour of solar electricity produced from a qualifying solar facility.

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.

Large Energy User Program (LEUP)

LEUP designed to promote self-investment in energy efficiency and combined heat and power or fuel cell projects. It incentivizes owners/users of buildings to upgrade or install energy conserving measures in existing buildings to help offset the capital costs associated with the project. The efficiency upgrades are customized to meet the requirements of the customers' existing facilities, while advancing the State's energy efficiency, conservation, and greenhouse gas reduction goals.

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Department of Public Works – Road Services. 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.

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 June 29, 2021, TRC performed an energy audit at Department of Public Works – Road Services located in Morris Township, New Jersey. TRC met with Thomas J. Eschmann to review the facility operations and help focus our investigation on specific energy-using systems.

The Department of Public Works – Road Services is a three building, 14,080 square foot complex built in 1970, comprised of a multistory main building housing offices and maintenance garages, equipment shed, and salt dome. Spaces include offices, corridors, stairwells, restrooms, garages, and mechanical spaces.

2.2 Building Occupancy

The facility is occupied year-round and is occupied during the week and Saturday by about 40 staff.

Building Name	Weekday/Weekend	Operating Schedule
Department of Public Works – Road Services	Weekday	5:30 am to 3:30 pm
	Weekend	Sat. 6:00 am to 2:00 pm

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

The main building office area has metal siding while the maintenance garage section exterior is painted concrete block. The structure overall is in good condition. Most of the windows in the office section are vinyl framed with double paned clear glass. The maintenance garage windows are older with a mix of single-pane metal and vinyl framed glass. The main building windows were caulked when originally installed in 1988. The main building windows are in good condition, but the maintenance garage windows may need replacing. The two-story portion of the main building has a steel pitched roof while the maintenance garage area has a flat rolled roof. Both roofs are in good condition. None of the roofs are insulated, however, the main building ceiling is insulated at the second floor. The salt dome has an asphalt shingled roof and is in fair condition while the equipment shed has a steel pitched roof.

The main building garage has eight, 14-foot fiberglass paneled doors. Four were replaced in 2020; the remaining four are slated to be replaced this year. The main entrance/exit are steel doors in good condition. The maintenance garages have metal foam filled 12-foot doors and are in fair to good condition. Some of the weather stripping is missing in the maintenance garages.

Mechanic Garage

Street Side of Main Building

Exterior Door

Exterior Window

2.4 Lighting Systems

The primary interior lighting system uses a mix of LED fixtures and 32-Watt linear fluorescent T8 lamps. There are also several 40-Watt T12 fixtures. Additionally, there are a few incandescent and LED general purpose lamps. Metal halide fixtures illuminate portions of the equipment shed.

Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts. Fixture types include 1-lamp or 4-lamp, 4-foot-long recessed fixtures and 2-foot fixtures with U-bend tube lamps. Most fixtures are in good condition. Some exit signs are LED, however, there are a few incandescent units. Interior lighting levels were generally sufficient. Lighting fixtures in the facility are controlled by wall switches.

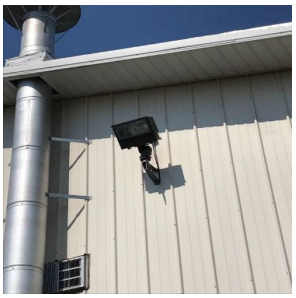
Non-LED Exit Sign

Fluorescent T8 U-Bend Fixture

Fluorescent T8 Fixture

Incandescent A-19 Bulb

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



Metal Halide Flood Light

LED Flood Light

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

Reception, a few offices, and the break room are cooled by window air conditioning (AC) units. These vary in capacity between 0.7 tons and 1.5 tons. The units are in fair condition but appear older and are likely operating beyond their useful life. They range in efficiency between 9 EER and 10 EER. They are not ENERGY STAR® labeled.

Window AC Unit

Unitary Heating Equipment

The mechanical shops are heated by suspended hot water unit heaters served by the boiler. These units each have an estimated heating capacity of 100 MBh. The units are in good condition. Equipment is controlled by a manual dial thermostat.

Suspended Unit Heater

2.6 Heating Hot Water Systems

One, 472 MBh hot water boiler serves the building heating load with a nominal efficiency of 80%. Installed in 1988, it appears to be in fair condition. The hydronic distribution system is a heating-only system. The boiler serves four unit heaters (described above) with four constant speed 0.8 hp heating hot water pumps. There is approximately 50 feet of 1-inch supply and/or return pipe with no insulation.

Hydronic Boiler

2.7 Domestic Hot Water

Hot water is produced by a 40-gallon, 35 MBh gas-fired storage water heater with a 60% efficiency rating. The domestic hot water pipes are not insulated.

Storage Water Heater

2.8 Plug Load & Vending Machines

The location is doing a great job managing their electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are 13 computer workstations throughout the facility. Plug loads throughout the building include general café and office equipment.

There are several residential-style refrigerators throughout the building and vary in condition and efficiency. There is a refrigerated beverage vending machine and a non-refrigerated vending machine. Vending machines are not equipped with occupancy-based controls.

Microwave

Non-Refrigerated Vending Machine

Small Printer

Mini Refrigerator

2.9 Water-Using Systems

There are two restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher. There is a restroom with showers and showerheads are rated at 2.5 gpm.

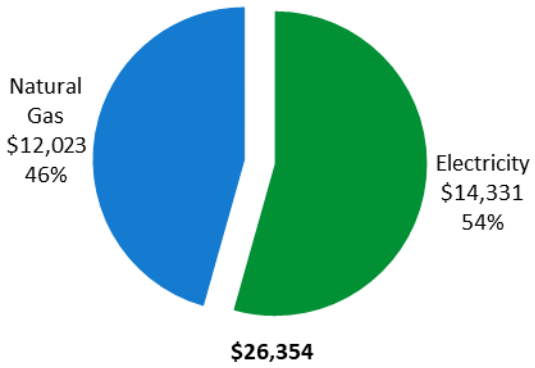
Kitchen Faucet

Restroom Faucet

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	125,400 kWh	$14,331
Natural Gas	13,149 Therms	$12,023
Total		**$26,354**



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.

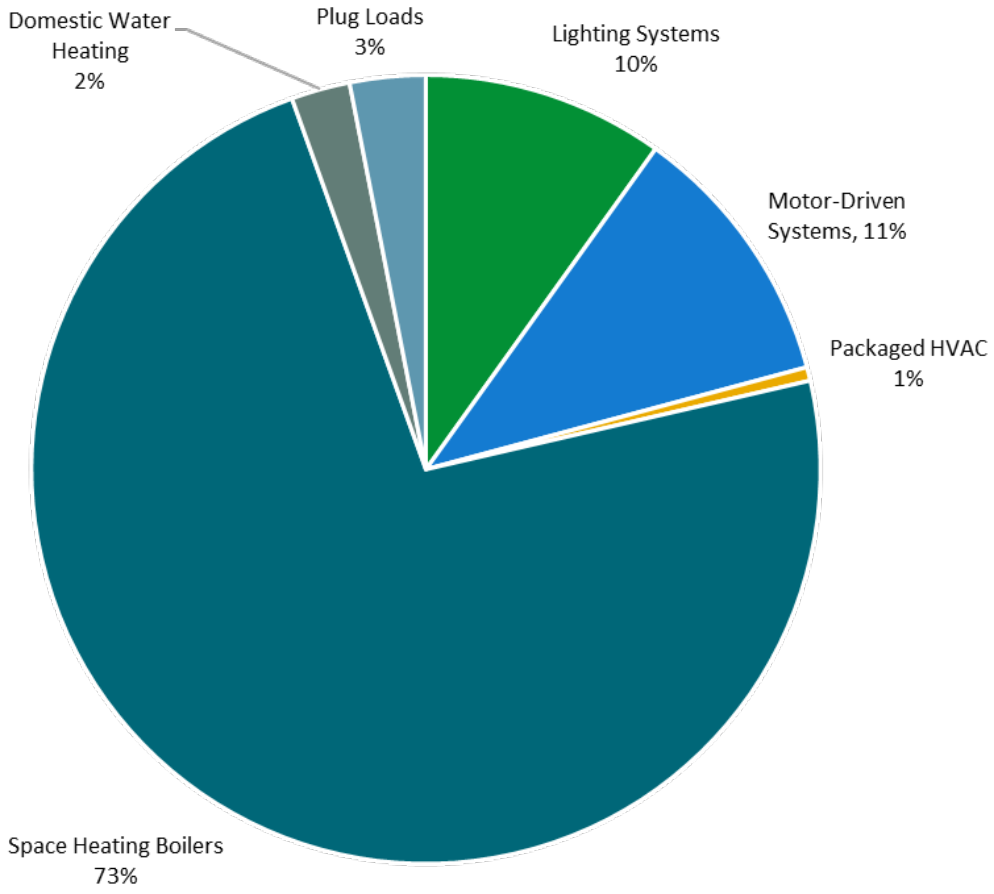
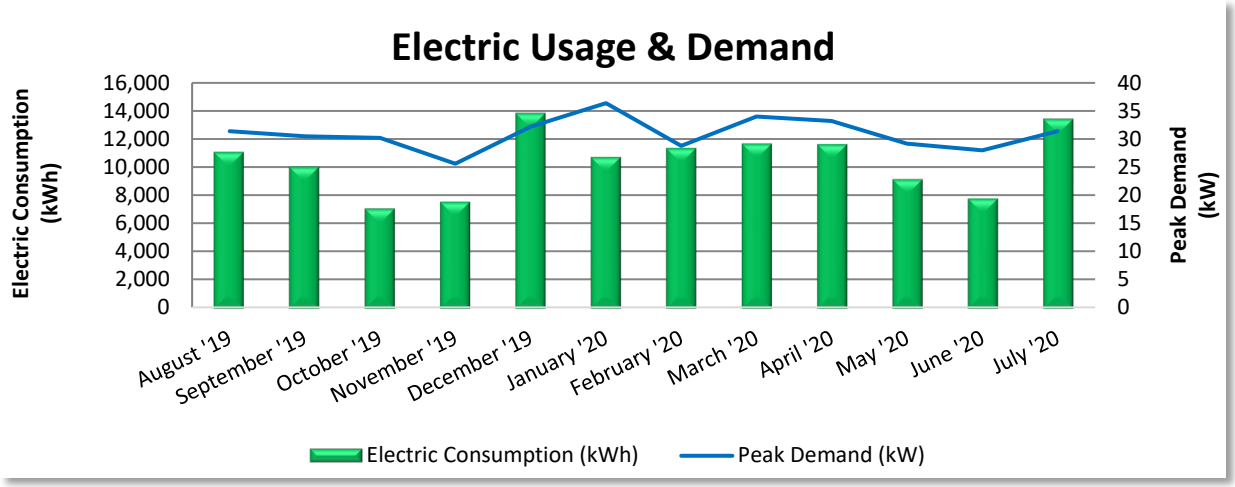


Figure 4 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary 3 Phase.



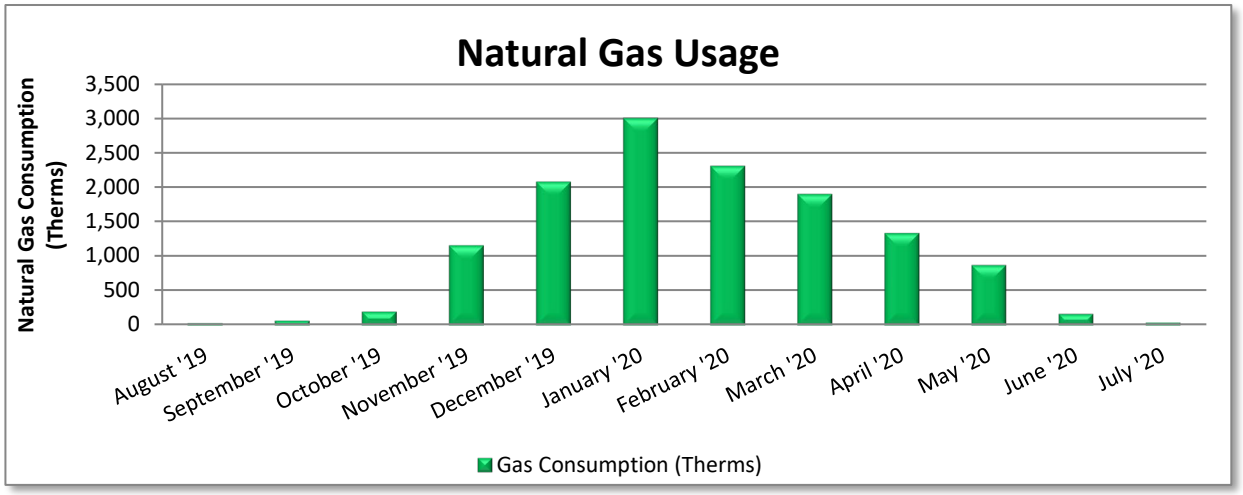
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
8/16/19	29	11,080	31	$142	$1,283
9/17/19	32	10,040	31	$136	$1,176
10/17/19	30	7,080	30	$125	$873
11/15/19	29	7,560	26	$96	$992
12/18/19	33	13,840	32	$137	$1,520
1/17/20	30	10,720	36	$163	$1,228
2/17/20	31	11,360	29	$116	$1,238
3/18/20	30	11,680	34	$148	$1,302
4/17/20	30	11,640	33	$143	$1,294
5/18/20	31	9,160	29	$118	$1,037
6/18/20	31	7,800	28	$119	$917
7/17/20	29	13,440	31	$142	$1,470
Totals	**365**	**125,400**	**36**	**$1,585**	**$14,331**
Annual	**365**	**125,400**	**36**	**$1,585**	**$14,331**

Notes:

- Peak demand of 36 kW occurred in January 2020.
- Average demand over the past 12 months was 31 kW.
- The average electric cost over the past 12 months was $0.114/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 natural gas under rate class Large Volume Gas (LVG.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
8/19/19	28	33	$155
9/19/19	31	68	$173
10/17/19	28	199	$263
11/15/19	29	1,157	$1,272
12/18/19	33	2,076	$2,283
1/21/20	34	2,994	$2,430
2/19/20	29	2,302	$1,902
3/20/20	30	1,899	$1,599
4/21/20	32	1,333	$912
5/19/20	28	873	$643
6/18/20	30	169	$226
7/21/20	33	44	$165
Totals	**365**	**13,149**	**$12,023**
Annual	**365**	**13,149**	**$12,023**

Notes:

- The average gas cost for the past 12 months is $0.914/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 country, 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.

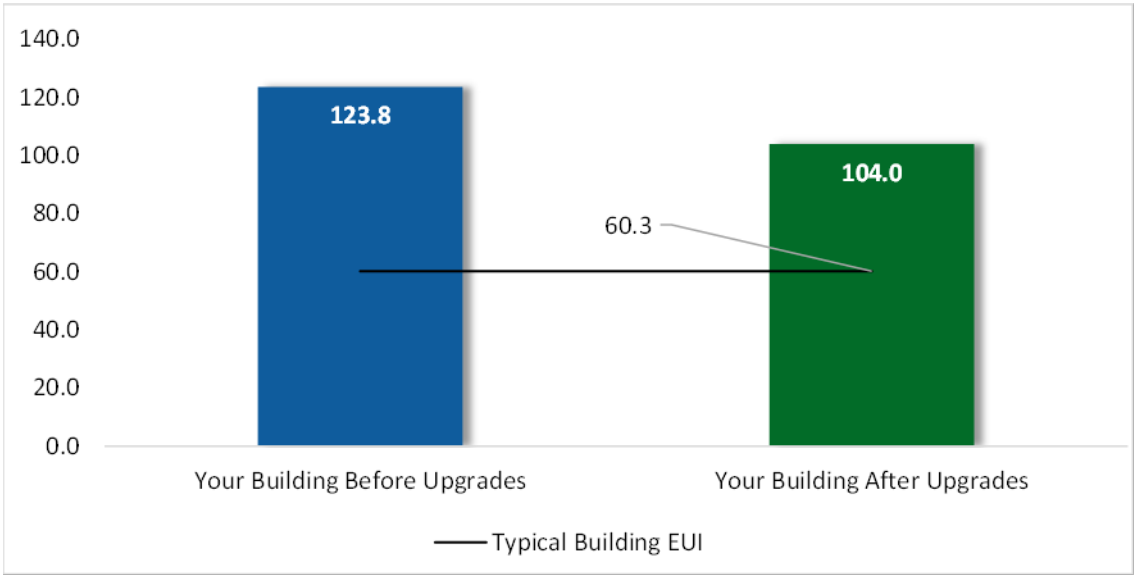


Figure 5 - Energy Use Intensity Comparison[3]

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 a 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.

[3] Based on all evaluated ECMs

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[4].

[4] 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 and provide information about the cost effectiveness of those improvements. Most energy conservation measures have received preliminary analysis of feasibility, which identifies expected ranges of savings. 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's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. 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 previously run state rebate programs. New utility programs are expected to start rolling out in the spring and summer of 2021. Keep up to date with developments by visiting the NJCEP website. Some measures and proposed upgrades may be eligible for higher incentives than those shown below.

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	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**27,291**	**5.2**	**-3**	**$3,088**	**$12,073**	**$2,169**	**$9,904**	**3.2**	**27,093**
ECM 1	Install LED Fixtures	Yes	16,807	2.4	-1	$1,908	$7,856	$1,200	$6,656	3.5	16,764
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,569	0.6	0	$176	$761	$125	$636	3.6	1,538
ECM 3	Retrofit Fixtures with LED Lamps	Yes	8,593	2.1	-2	$968	$3,312	$844	$2,468	2.5	8,474
ECM 4	Install LED Exit Signs	Yes	322	0.0	0	$36	$145	$0	$145	4.0	315
Lighting Control Measures			**3,093**	**1.2**	**-1**	**$347**	**$2,784**	**$480**	**$2,304**	**6.6**	**3,033**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	3,093	1.2	-1	$347	$2,784	$480	$2,304	6.6	3,033
Motor Upgrades			**83**	**0.0**	**0**	**$9**	**$1,019**	**$0**	**$1,019**	**107.9**	**83**
ECM 6	Premium Efficiency Motors	No	83	0.0	0	$9	$1,019	$0	$1,019	107.9	83
Variable Frequency Drive (VFD) Measures			**18,998**	**4.5**	**0**	**$2,171**	**$43,640**	**$925**	**$42,715**	**19.7**	**19,131**
ECM 7	Install VFDs on Constant Volume (CV) Fans	No	3,107	0.8	0	$355	$17,629	$325	$17,304	48.7	3,128
ECM 8	Install VFDs on Heating Water Pumps	No	4,102	0.5	0	$469	$11,519	$200	$11,319	24.1	4,131
ECM 9	Install VFDs on Process Blowers	Yes	11,789	3.2	0	$1,347	$14,492	$400	$14,092	10.5	11,872
Unitary HVAC Measures			**528**	**0.7**	**0**	**$60**	**$4,073**	**$0**	**$4,073**	**67.5**	**532**
ECM 10	Install High Efficiency Air Conditioning Units	No	528	0.7	0	$60	$4,073	$0	$4,073	67.5	532
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**73**	**$666**	**$10,589**	**$826**	**$9,763**	**14.7**	**8,534**
ECM 11	Install High Efficiency Hot Water Boilers	Yes	0	0.0	73	$666	$10,589	$826	$9,763	14.7	8,534
HVAC System Improvements			**0**	**0.0**	**27**	**$245**	**$475**	**$120**	**$355**	**1.4**	**3,142**
ECM 12	Install Pipe Insulation	Yes	0	0.0	27	$245	$475	$120	$355	1.4	3,142
Domestic Water Heating Upgrade			**0**	**0.0**	**6**	**$52**	**$200**	**$40**	**$160**	**3.1**	**661**
ECM 13	Install Low-Flow DHW Devices	Yes	0	0.0	6	$52	$200	$40	$160	3.1	661
Food Service & Refrigeration Measures			**1,954**	**0.2**	**0**	**$223**	**$460**	**$50**	**$410**	**1.8**	**1,968**
ECM 14	Vending Machine Control	Yes	1,954	0.2	0	$223	$460	$50	$410	1.8	1,968
TOTALS			**51,947**	**11.8**	**101**	**$6,863**	**$75,314**	**$4,610**	**$70,704**	**10.3**	**64,176**

* - All incentives presented in this table are included as placeholders and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**27,291**	**5.2**	**-3**	**$3,088**	**$12,073**	**$2,169**	**$9,904**	**3.2**	**27,093**
ECM 1	Install LED Fixtures	16,807	2.4	-1	$1,908	$7,856	$1,200	$6,656	3.5	16,764
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,569	0.6	0	$176	$761	$125	$636	3.6	1,538
ECM 3	Retrofit Fixtures with LED Lamps	8,593	2.1	-2	$968	$3,312	$844	$2,468	2.5	8,474
ECM 4	Install LED Exit Signs	322	0.0	0	$36	$145	$0	$145	4.0	315
Lighting Control Measures		**3,093**	**1.2**	**-1**	**$347**	**$2,784**	**$480**	**$2,304**	**6.6**	**3,033**
ECM 5	Install Occupancy Sensor Lighting Controls	3,093	1.2	-1	$347	$2,784	$480	$2,304	6.6	3,033
Variable Frequency Drive (VFD) Measures		**11,789**	**3.2**	**0**	**$1,347**	**$14,492**	**$400**	**$14,092**	**10.5**	**11,872**
ECM 9	Install VFDs on Process Blowers	11,789	3.2	0	$1,347	$14,492	$400	$14,092	10.5	11,872
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**73**	**$666**	**$10,589**	**$826**	**$9,763**	**14.7**	**8,534**
ECM 11	Install High Efficiency Hot Water Boilers	0	0.0	73	$666	$10,589	$826	$9,763	14.7	8,534
HVAC System Improvements		**0**	**0.0**	**27**	**$245**	**$475**	**$120**	**$355**	**1.4**	**3,142**
ECM 12	Install Pipe Insulation	0	0.0	27	$245	$475	$120	$355	1.4	3,142
Domestic Water Heating Upgrade		**0**	**0.0**	**6**	**$52**	**$200**	**$40**	**$160**	**3.1**	**661**
ECM 13	Install Low-Flow DHW Devices	0	0.0	6	$52	$200	$40	$160	3.1	661
Food Service & Refrigeration Measures		**1,954**	**0.2**	**0**	**$223**	**$460**	**$50**	**$410**	**1.8**	**1,968**
ECM 14	Vending Machine Control	1,954	0.2	0	$223	$460	$50	$410	1.8	1,968
TOTALS		**44,128**	**9.8**	**101**	**$5,970**	**$41,075**	**$4,085**	**$36,990**	**6.2**	**56,302**

* - All incentives presented in this table are included as placeholders and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 7 – 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**27,291**	**5.2**	**-3**	**$3,088**	**$12,073**	**$2,169**	**$9,904**	**3.2**	**27,093**
ECM 1	Install LED Fixtures	16,807	2.4	-1	$1,908	$7,856	$1,200	$6,656	3.5	16,764
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,569	0.6	0	$176	$761	$125	$636	3.6	1,538
ECM 3	Retrofit Fixtures with LED Lamps	8,593	2.1	-2	$968	$3,312	$844	$2,468	2.5	8,474
ECM 4	Install LED Exit Signs	322	0.0	0	$36	$145	$0	$145	4.0	315

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: salt dome, equipment shed, and main building 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: mechanical garage and superintendent office in main building.

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent or 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: boiler room, employee locker room, restrooms, reception, sign shop, stairwells, offices, corridors, break room, and exterior.

ECM 4: Install LED Exit Signs

Replace incandescent 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**3,093**	**1.2**	**-1**	**$347**	**$2,784**	**$480**	**$2,304**	**6.6**	**3,033**
ECM 5	Install Occupancy Sensor Lighting Controls	3,093	1.2	-1	$347	$2,784	$480	$2,304	6.6	3,033

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 that 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: offices, employee locker room, restrooms, salt dome, and storage rooms.

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**83**	**0.0**	**0**	**$9**	**$1,019**	**$0**	**$1,019**	**107.9**	**83**
ECM 6	Premium Efficiency Motors	83	0.0	0	$9	$1,019	$0	$1,019	107.9	83

ECM 6: Premium Efficiency Motors

We evaluated installing standard efficiency motors with IHP 2014 efficiency motors. This evaluation assumes that existing motors will be replaced with motors of equivalent size and type. In some cases, additional savings may be possible by downsizing motors to better meet the motor's current load requirements.

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Exterior 1	exterior exhaust fan	2	Exhaust Fan	0.3	

Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours. The base case motor energy consumption is estimated using the efficiencies found on nameplates or estimated based on the age of the motor and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the current *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*.

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**18,998**	**4.5**	**0**	**$2,171**	**$43,640**	**$925**	**$42,715**	**19.7**	**19,131**
ECM 7	Install VFDs on Constant Volume (CV) Fans	3,107	0.8	0	$355	$17,629	$325	$17,304	48.7	3,128
ECM 8	Install VFDs on Heating Water Pumps	4,102	0.5	0	$469	$11,519	$200	$11,319	24.1	4,131
ECM 9	Install VFDs on Process Blowers	11,789	3.2	0	$1,347	$14,492	$400	$14,092	10.5	11,872

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new inverter duty rated motor to conservatively account for the cost of an inverter duty rated motor.

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

We evaluated VFDs to control constant volume fan motor speeds. This converts 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 signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature.

Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

ECM 8: Install VFDs on Heating Water Pumps

We evaluated VFDs to control heating water pumps. Two-way valves must serve the hot water coils and the hot water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the hot water distribution they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases and the VFD modulates the pump speed to maintain a differential pressure setpoint.

Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Affected pumps: boiler's heating hot water pump

ECM 9: Install VFDs on Process Blowers

Install VFDs to control process blowers(s). In most cases sensors will be required in order to trigger adjustments to blower speed. The blower speed will have to be controlled to maintain any minimum fixed head requirement for the system. Be sure your process blower control strategy incorporates the proper sensor inputs in order to have a fully functional control system.

Energy savings result from reducing the process blower speed (and power) when conditions allow for reduced air flow.

Affected motors: sanitation garage process blowers

4.5 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**528**	**0.7**	**0**	**$60**	**$4,073**	**$0**	**$4,073**	**67.5**	**532**
ECM 10	Install High Efficiency Air Conditioning Units	528	0.7	0	$60	$4,073	$0	$4,073	67.5	532

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units at this facility are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the window AC units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 10: Install High Efficiency Air Conditioning Units

Evaluate standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling and heating load and the estimated annual operating hours.

Affected units: all window AC units

4.6 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**73**	**$666**	**$10,589**	**$826**	**$9,763**	**14.7**	**8,534**
ECM 11	Install High Efficiency Hot Water Boilers	0	0.0	73	$666	$10,589	$826	$9,763	14.7	8,534

ECM 11: Install High Efficiency Hot Water Boilers

Replace the older inefficient hot water boiler with a new high efficiency hot water boiler. 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 the boiler 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.

4.7 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**27**	**$245**	**$475**	**$120**	**$355**	**1.4**	**3,142**
ECM 12	Install Pipe Insulation	0	0.0	27	$245	$475	$120	$355	1.4	3,142

ECM 12: Install Pipe Insulation

Install insulation on heating water and domestic hot water system piping. Distribution system losses are dependent on system fluid temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: hot water piping and domestic hot water piping.

4.8 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**6**	**$52**	**$200**	**$40**	**$160**	**3.1**	**661**
ECM 13	Install Low-Flow DHW Devices	0	0.0	6	$52	$200	$40	$160	3.1	661

ECM 13: 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
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 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.

4.9 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,954**	**0.2**	**0**	**$223**	**$460**	**$50**	**$410**	**1.8**	**1,968**
ECM 14	Vending Machine Control	1,954	0.2	0	$223	$460	$50	$410	1.8	1,968

ECM 14: Vending Machine Control

Vending machines operate continuously, even during unoccupied hours. Install occupancy sensor controls to reduce energy use. These controls power down vending machines when the vending machine area has been vacant for some time, and they power up the machines at necessary regular intervals or when the surrounding area is occupied. Energy savings are dependent on the vending machine and activity level in the area surrounding the machines.

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.

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save between 5% to 20% of the energy usage in your building without substantial capital investment. A successful plan includes your records of energy usage trends and costs, building equipment lists, current maintenance practices, planned capital upgrades, and incorporates your ideas for improved building operation. Your plan will address goals for energy-efficient operation, provide detail on how to reach the goals, and will outline procedures for measuring and reporting whether goals have been achieved.

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[5]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Weatherization

Caulk or weather strip leaky doors and windows to reduce drafts and loss of heated or cooled air. Sealing cracks and openings can reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. Materials used may include caulk, polyurethane foam, and other weather-stripping materials. There is an energy savings opportunity by reducing the uncontrolled air exchange between the outside and inside of the building. Blower door assisted comprehensive building air sealing will reduce the amount of air exchange which will in turn reduce the load on the buildings heating and cooling equipment and thus providing energy savings and increased occupant comfort.

Doors and Windows

Close exterior doors and windows in heated and cooled areas. Leaving doors and windows open leads to a loss of heat during the winter and chilled air during the summer. Reducing air changes per hour (ACH) can lead to increased occupant comfort as well as heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

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

Window Treatments/Coverings

Use high-reflectivity films or cover windows with shades or shutters to reduce solar heat gain and reduce the load on cooling and heating systems. Older, single pane windows and east or west-facing windows are especially prone to solar heat gain. In addition, use shades or shutters at night during cold weather to reduce heat loss.

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.

Lighting Controls

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly. Adjust exterior lighting time clock controls seasonally as needed to match your lighting requirements.

Fans to Reduce Cooling Load

Install ceiling fans to supplement your cooling system. Thermostat settings can typically be increased by 4°F with no change in overall occupant comfort due to the wind chill effect of moving air.

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.

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 and efficiently. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the boiler tubes to improve heat transfer.

Optimize HVAC Equipment Schedules

Energy Management Systems (EMS) typically provide advanced controls for building HVAC systems, including chillers, boilers, air handling units, rooftop units and exhaust fans. The EMS monitors and reports operational status, schedules equipment 'start' and 'stop' times, locks out equipment operation based on outside air or space temperature, and often optimizes damper and valve operation based on complex algorithms. These EMS features, when in proper adjustment, can improve comfort for building occupants and save substantial energy.

Know your EMS scheduling capabilities. Regularly monitor HVAC equipment operating schedules and match them to building operating hours in order to eliminate unnecessary equipment operation and save energy. Monitoring should be performed often at sites with frequently changing usage patterns – daily in some cases. We recommend using the 'Optimal Start' feature of the EMS, if available, to optimize the building warmup sequence. Most EMS scheduling programs provide for "Holiday" schedules which can be used during reduced use or shutdown periods. Finally, many systems are equipped with a one-time override function which can be used to provide additional space conditioning due to a one-time, special event. When available this override feature should be used rather than changing the base operating schedule.

Water Heater Maintenance

The lower the supply water temperature that is used for hand washing sinks, the less energy is needed to heat the water. Reducing the temperature results in energy savings and the change is often unnoticeable to users. Be sure to review the domestic water temperature requirements for sterilizers and dishwashers as you investigate reducing the supply water temperature.

Also, 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.

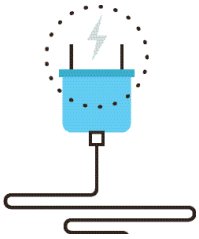
Compressed Air System Maintenance

Compressed air systems require periodic maintenance to operate at peak efficiency. A maintenance plan for compressed air systems should include:

- Inspection, cleaning, and replacement of inlet filter cartridges
- Cleaning of drain traps
- Daily inspection of lubricant levels to reduce unwanted friction
- Inspection of belt condition and tension
- Check for leaks and adjust loose connections
- Overall system cleaning

Contact a qualified technician for help with setting up periodic maintenance schedule.

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[6]. Your local utility may offer incentives or rebates for this equipment.

[6] For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

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[7] or download a copy of EPA's "WaterSense® at Work: Best Management Practices for Commercial and Institutional Facilities"[8] 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.

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

[8] 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 sufficient and 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.

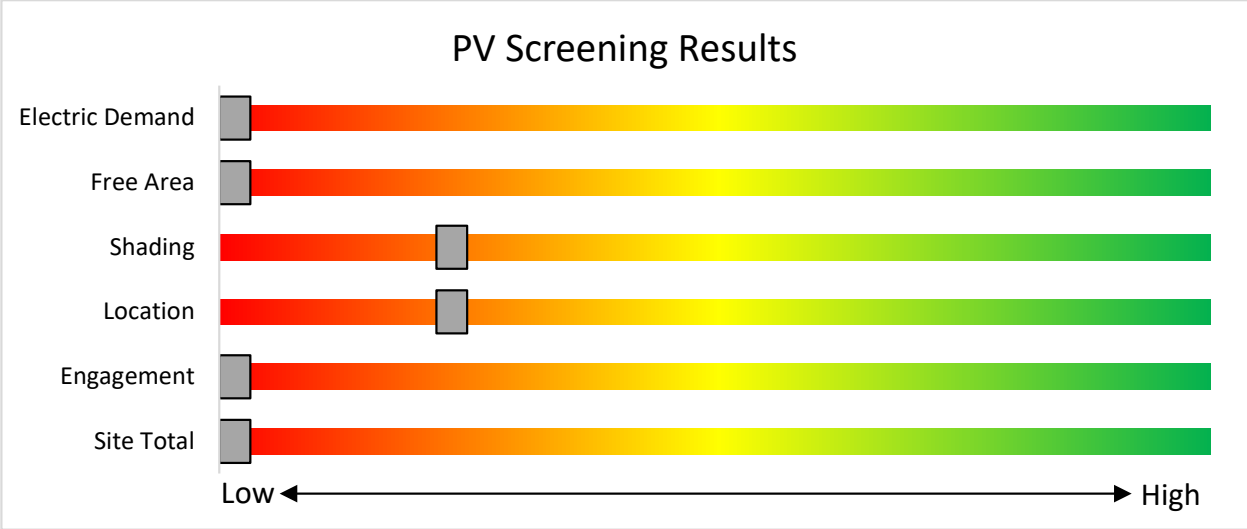


Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects. Solar projects may qualify to earn SREC- IIs (Solar Renewable Energy Certificates-II), however, the project owners *must* register their solar projects prior to the start of construction to establish the project's eligibility.

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:

Successor Solar Incentive Program (SuSI): https://www.njcleanenergy.com/renewable-energy/programs/susi-program

- **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.

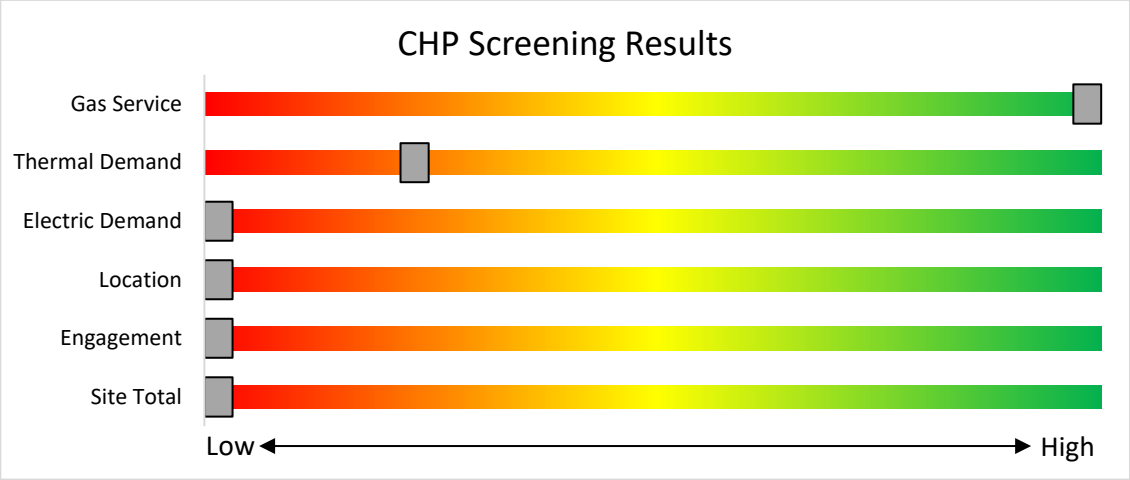


Figure 9 - Combined Heat and Power Screening

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? New Jersey's Clean Energy Programs can help.

7.1 Utility Energy Efficiency Programs

New utility programs are expected to start rolling out in the spring and summer of 2021. Keep up to date with developments by visiting the NJCEP website.

8 New Jersey's Clean Energy Programs

New Jersey's Clean Energy Program will continue to offer some energy efficiency programs.

8.1 Large Energy Users

The Large Energy Users Program (LEUP) is designed to foster self-directed investment in energy projects. This program is offered to New Jersey's largest energy customers that annually contribute at least $200,000 to the NJCEP aggregate of all buildings/sites. This equates to roughly $5 million in energy costs in the prior fiscal year.

Incentives

Incentives are based on the specifications below. The maximum incentive per entity is the lesser of:

- $4 million
- 75% of the total project(s) cost
- 90% of total NJCEP fund contribution in previous year
- $0.33 per projected kWh saved; $3.75 per projected Therm saved annually

How to Participate

To participate in LEUP, you will first need submit an enrollment application. This program requires all qualified and approved applicants to submit an energy plan that outlines the proposed energy efficiency work for review and approval. Applicants may submit a Draft Energy Efficiency Plan (DEEP), or a Final Energy Efficiency Plan (FEEP). Once the FEEP is approved, the proposed work can begin.

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

8.2 Combined Heat and Power

The Combined Heat & Power (CHP) program provides incentives for eligible CHP or waste heat to power (WHP) projects. Eligible CHP or WHP projects must achieve an annual system efficiency of at least 65% (lower heating value, or LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

Incentives

Eligible Technologies	Size (Installed Rated Capacity)[1]	Incentive ($/kW)	% of Total Cost Cap per Project[3]	$ Cap per Project[3]
Powered by non-renewable or renewable fuel source[4]	≤500 kW	$2,000	30-40%[2]	$2 million
Gas Internal Combustion Engine	>500 kW - 1 MW	$1,000		
Gas Combustion Turbine	> 1 MW - 3 MW	$550	30%	$3 million
Microturbine Fuel Cells with Heat Recovery	>3 MW	$350		
Waste Heat to Power*	<1 MW	$1,000	30%	$2 million
	> 1MW	$500		$3 million

*Waste Heat to Power: Powered by non-renewable fuel source, heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine).

Check the NJCEP website for details on program availability, current incentive levels, and requirements.

How to Participate

You work with a qualified developer or consulting firm to complete the CHP application. Once the application is approved the project can be installed. Information about the CHP program can be found at www.njcleanenergy.com/CHP.

8.3 Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects prior to the start of construction to establish the project's eligibility to earn SREC-IIs (Solar Renewable Energy Certificates-II). SuSI consists of two sub-programs. The Administratively Determined Incentive (ADI) Program and the Competitive Solar Incentive (CSI) Program.

Administratively Determined Incentive (ADI) Program

The ADI Program provides administratively set incentives for net metered residential projects, net metered non-residential projects 5 MW or less, and all community solar projects.

After the registration is accepted, construction is complete, and a complete final as-built packet has been submitted, the project is issued a New Jersey certification number, which enables it to generate New Jersey SREC- IIs.

Market Segments	Size MW dc	Incentive Value ($/SREC II)	Public Entities Incentive Value - $20 Adder ($/SRECII)
Net Metered Residential	All types and sizes	$90	N/A
Small Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects smaller than 1 MW	$100	$120
Large Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects 1 MW to 5 MW	$90	$110
Small Net Metered Non-Residential Ground Mount	Projects smaller than 1 MW	$85	$105
Large Net Metered Non-Residential Ground Mount	Projects 1 MW to 5 MW	$80	$100
LMI Community Solar	Up to 5 MW	$90	N/A
Non-LMI Community Solar	Up to 5 MW	$70	N/A
Interim Subsection (t)	All types and sizes	$100	N/A

Eligible projects may generate SREC-IIs for 15 years following the commencement of commercial operations which is defined as permission to operate (PTO) from the Electric Distribution Company. After 15 years, projects may be eligible for a NJ Class I REC.

SREC-IIs will be purchased monthly by the SREC-II Program Administrator who will allocate the SREC-IIs to the Load Serving Entities (BGS Providers and Third-Party Suppliers) annually based on their market share of retail electricity sold during the relevant Energy Year.

The ADI Program online portal is now open to new registrations effective August 28, 2021.

Competitive Solar Incentive Program

The Competitive Solar Incentive (CSI) Program will provide competitively set incentives for grid supply projects and net metered non-residential projects greater than 5MW. The program is currently under development with the goal of holding the first solicitation by early-to-mid 2022. For updates, please continue to check the Solar Proceedings page on the New Jersey's Clean Energy Program website.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan.

If you are considering installing solar photovoltaics on your building, visit the following link for more information: https://njcleanenergy.com/renewable-energy/programs/susi-program.

8.3 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 into 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 description 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.

9 PROJECT DEVELOPMENT

Energy conservation measures (ECMs) have been identified for your site and their energy and economic analyses are provided within this LGEA report. The next steps with project development are to set goals and create a comprehensive project plan. The graphic below provides an overview of the process flow for a typical energy efficiency or renewable energy project. We recommend implementing as many ECMs as possible prior to undertaking a feasibility study for a renewable project. The cyclical nature of this process flow demonstrates the ongoing work required to continually improve building energy efficiency over time. If your building(s) scope of work is relatively simple to implement or small in scope, the measurement and verification (M&V) step may not be required. It should be noted through a typical project cycle, there will be changes in costs based on specific scopes of work, contractor selections, design considerations, construction, etc. The estimated costs provided throughout this LGEA report demonstrate the unburdened turn-key material and labor cost only. There will be contingencies and additional costs at the time of implementation. We recommend comprehensive project planning includes the review of multiple bids for project work, incorporate potential operational & maintenance (O&M) cost savings and maximize your incentive potential.

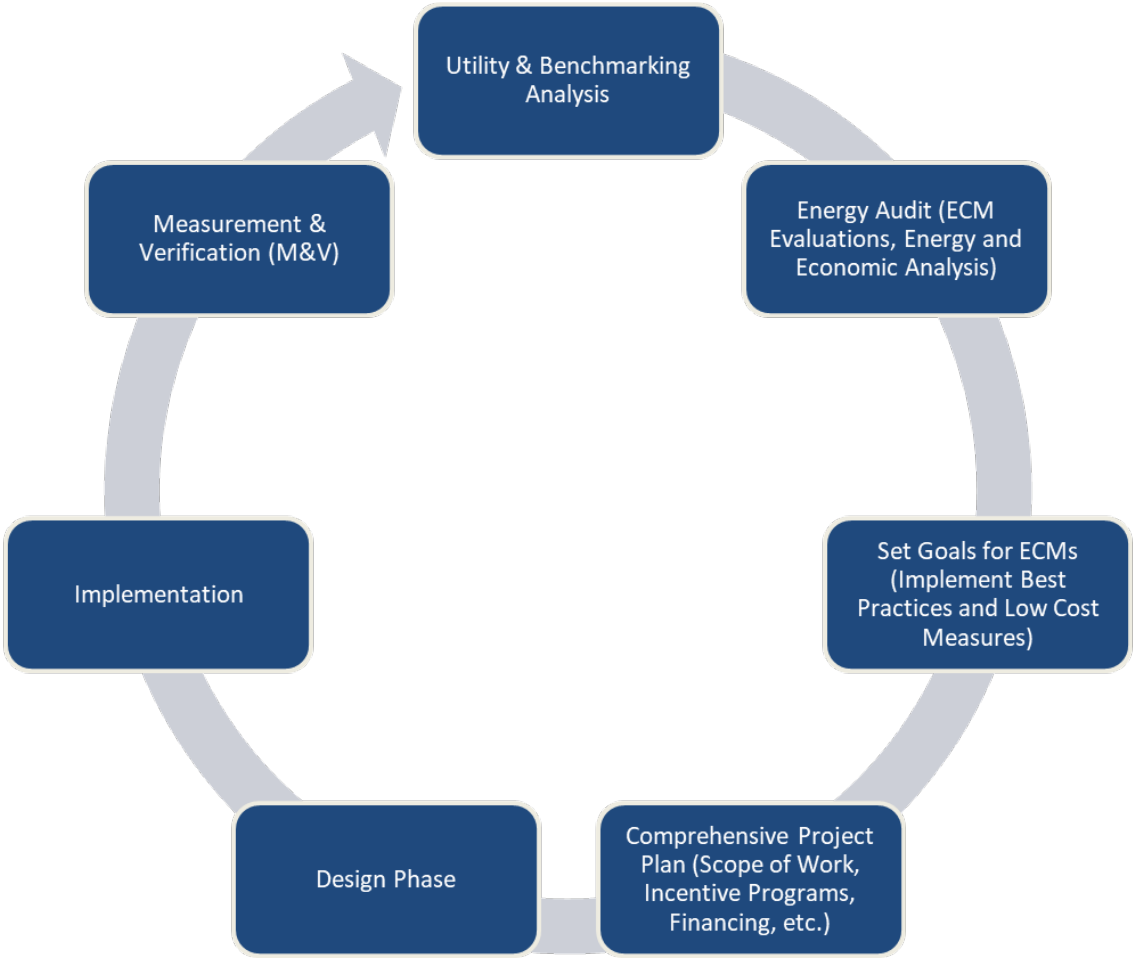


Figure 30 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 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[9].

10.2 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[10].

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

[10] 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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	500	3	Relamp	No	1	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	11	500	0.0	25	0	$3	$17	$1	5.7
Employee Locker room	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,116	3, 5	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,840	0.4	1,864	0	$209	$670	$160	2.4
Exterior 1	7	Halogen Incandescent: (1) 70W PAR36 Screw-In Lamp	Timeclock		70	4,380	3	Relamp	No	7	LED Lamps: (1) 10.5W Plug-In Lamp	Timeclock	11	4,380	0.0	1,824	0	$208	$121	$7	0.5
Exterior 1	1	LED - Fixtures: Flood Fixture	Timeclock		35	4,380		None	No	1	LED - Fixtures: Flood Fixture	Timeclock	35	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior 1	5	Metal Halide: (1) 400W Lamp	Timeclock		458	4,380	1	Fixture Replacement	No	5	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	100	4,380	0.0	7,840	0	$896	$2,594	$500	2.3
Exterior 1	3	Metal Halide: (1) 250W Lamp	Photocell		295	4,380	1	Fixture Replacement	No	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	75	4,380	0.0	2,891	0	$330	$1,336	$300	3.1
Foremen restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,080	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,080	0.0	62	0	$7	$72	$10	9.0
Main Restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,080	3, 5	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,435	0.3	785	0	$88	$597	$140	5.2
Mechanical garage 2	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Mechanical garage 2	64	LED - Fixtures: Ambient - 4' - Indirect Fixture	Wall Switch	S	30	2,100	5	None	Yes	64	LED - Fixtures: Ambient - 4' - Indirect Fixture	Occupancy Sensor	30	1,449	0.5	1,275	0	$143	$1,392	$240	8.1
Mechanical garage 2	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	2,080	2	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,080	0.0	67	0	$7	$51	$5	6.1
Mechanical shop	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Mechanical shop	52	LED - Fixtures: Ambient - 4' - Indirect Fixture	Wall Switch	S	30	2,100		None	No	52	LED - Fixtures: Ambient - 4' - Indirect Fixture	Wall Switch	30	2,100	0.0	0	0	$0	$0	$0	0.0
Reception	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,116	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,116	0.0	73	0	$8	$18	$5	1.6
Reception	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,116	3	Relamp	No	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,116	0.3	1,411	0	$158	$438	$120	2.0
Sand building	3	Metal Halide: (1) 400W Lamp	Timeclock	S	458	2,080	1, 5	Fixture Replacement	Yes	3	LED - Fixtures: High-Bay	Occupancy Sensor	100	1,435	1.0	2,476	-1	$278	$1,588	$170	5.1
Sanitation Garage	28	LED - Fixtures: Ambient - 4' - Indirect Fixture	Wall Switch	S	30	2,100		None	No	28	LED - Fixtures: Ambient - 4' - Indirect Fixture	Wall Switch	30	2,100	0.0	0	0	$0	$0	$0	0.0
Sign Shop	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,080	3	Relamp	No	1	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	11	2,080	0.0	105	0	$12	$17	$1	1.4
Sign Shop	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,080		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,080	0.0	0	0	$0	$0	$0	0.0
Sign Shop	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,080	3	Relamp	No	5	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,080	0.2	594	0	$67	$365	$100	4.0
Stairwell 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,080	3	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,080	0.1	238	0	$27	$146	$40	4.0
Stairwell 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,080	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,080	0.0	119	0	$13	$73	$20	4.0
Storage garage	5	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	2,080	1, 5	Fixture Replacement	Yes	5	LED - Fixtures: High-Bay	Occupancy Sensor	100	1,435	1.7	4,127	-1	$463	$2,686	$290	5.2
Assistant Superintendent office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,080	3, 5	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,435	0.1	314	0	$35	$262	$60	5.7
Assistant Superintendent office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,080	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,080	0.0	62	0	$7	$72	$10	9.0

	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Break room	2	Exit Signs: Incandescent	None		24	8,760	4	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	322	0	$36	$145	$0	4.0
Break room	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,080	3, 5	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,435	0.6	1,413	0	$159	$889	$220	4.2
Foremen room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,080	3	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,080	0.1	238	0	$27	$146	$40	4.0
Main hallway 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,116	3	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,116	0.1	470	0	$53	$146	$40	2.0
Main hallway 2 restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,080	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,080	0.0	62	0	$7	$72	$10	9.0
Superintendent office	6	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	2,080	2, 5	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,435	0.7	1,731	0	$194	$942	$160	4.0

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?	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical shop	exhaust fan	1	Exhaust Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	air compressor	1	Air Compressor	15.0	70.0%	No			W	1,250		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	exterior exhaust fan	2	Exhaust Fan	0.3	65.0%	No			W	2,745	6, 7	Yes	69.5%	Yes	2	0.2	791	0	$90	$5,705	$100	62.0
Sanitation Garage	exhaust fan	2	Exhaust Fan	0.3	65.0%	No			W	2,745	7	No	69.5%	Yes	2	0.2	791	0	$90	$6,350	$100	69.1
Sanitation Garage	exhaust fan	1	Exhaust Fan	1.0	70.0%	No			W	2,745	7	No	77.0%	Yes	1	0.3	1,277	0	$146	$3,417	$75	22.9
Boiler room	Boiler	4	Heating Hot Water Pump	0.8	70.0%	No			W	2,745	8	No	81.1%	Yes	4	0.5	4,102	0	$469	$11,519	$200	24.1
Exterior 1	recycling motor	1	Other	10.0	70.0%	No			W	26		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical garage 2	garage doors	6	Other	0.8	70.0%	No			W	30		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical garage 2	electric purifiers	2	Other	0.8	70.0%	No			W	1,000		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical shop	lift motor	1	Other	2.0	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical shop	garage doors	3	Other	0.8	70.0%	No			W	30		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Sanitation Garage	garage doors	8	Other	0.3	65.0%	No			W	30		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Sanitation Garage	blower	4	Process Blower	2.0	70.0%	No			W	2,745	9	No	86.5%	Yes	4	3.2	11,789	0	$1,347	$14,492	$400	10.5
Employee Locker room	fan	1	Ventilation Fan	0.3	65.0%	No			W	2,745	7	No	69.5%	Yes	1	0.1	330	0	$38	$3,175	$50	82.9
Mechanical garage 2	unit heaters	1	Supply Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical garage 2	unit heaters	2	Supply Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical shop	unit heaters	1	Supply Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged 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)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	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/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanic office	Mechanic office	1	Window AC	1.00		10.00					10	Yes	1	Window AC	1.00		12.00		0.1	80	0	$9	$703	$0	76.9
Reception	Reception	1	Window AC	0.70		9.40					10	Yes	1	Window AC	0.70		12.00		0.1	77	0	$9	$594	$0	67.2
Assistant Superintendent office	Assistant Superintendent office	1	Window AC	0.70		9.40					10	Yes	1	Window AC	0.70		12.00		0.1	77	0	$9	$594	$0	67.2
Break room	Break room	1	Window AC	1.00		10.00					10	Yes	1	Window AC	1.00		12.00		0.1	80	0	$9	$703	$0	76.9
Foremen room	Foremen room	1	Window AC	1.50		10.00					10	Yes	1	Window AC	1.50		12.00		0.2	120	0	$14	$884	$0	64.5
Superintendent office	Superintendent office	1	Window AC	0.70		9.00					10	Yes	1	Window AC	0.70		12.00		0.1	93	0	$11	$594	$0	55.7
Mechanical garage 2	Mechanical garage 2	1	Unit Heater		100.00							No							0.0	0	0	$0	$0	$0	0.0
Mechanical garage 2	Mechanical garage 2	2	Unit Heater		100.00							No							0.0	0	0	$0	$0	$0	0.0
Mechanical shop	Mechanical shop	1	Unit Heater		100.00							No							0.0	0	0	$0	$0	$0	0.0

Space Heating Boiler 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)	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	unit heaters	1	Non-Condensing Hot Water Boiler	472			B	11	Yes	1	Non-Condensing Hot Water Boiler	472	85.00%	Et	0.0	0	73	$666	$10,589	$826	14.7

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Boiler	12	50	1.00	0.0	0	23	$208	$360	$100	1.2
Boiler room	storage hot water tank	12	20	0.50	0.0	0	4	$37	$115	$20	2.6

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Whole building	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	22V40F1	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Break room	13	1	Faucet Aerator (Kitchen)	2.50	1.50	0.0	0	1	$5	$7	$2	1.0
Foremen restroom	13	1	Faucet Aerator (Lavatory)	2.30	0.50	0.0	0	1	$9	$7	$4	0.3
Main hallway 2 restroom	13	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	$9	$7	$4	0.4
Main Restroom	13	2	Showerhead	2.50	1.50	0.0	0	3	$29	$179	$30	5.2

Plug Load Inventory

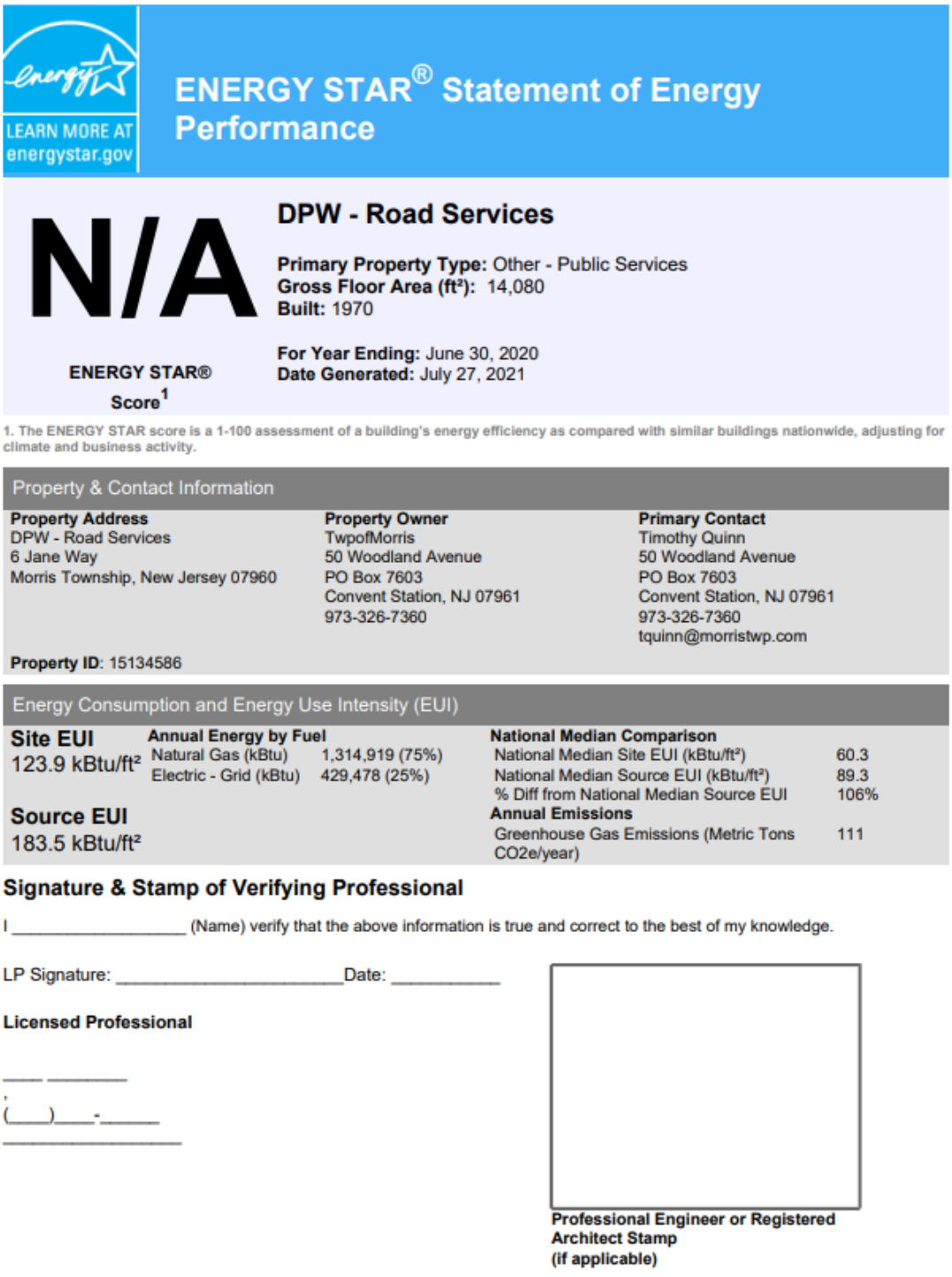
	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Mechanical shop	1	Coffee Machine	1,000	No		
Assistant Superintendent office	1	Coffee Machine	1,000	No		
Superintendent office	1	Coffee Machine	1,000	No		
Mechanic office	2	Desktop	270	No		
Mechanical shop	1	Desktop	270	No		
Reception	2	Desktop	270	No		
Sign Shop	1	Desktop	270	No		
Assistant Superintendent office	2	Desktop	270	No		
Foremen room	3	Desktop	270	No		
Superintendent office	2	Desktop	270	No		
Mechanical shop	1	Fan (Portable)	150	No		
Mechanical shop	1	Microwave	1,000	No		
Break room	1	Microwave	1,000	No		
Superintendent office	1	Microwave	1,000	No		
Sign Shop	1	industrial printer	700	No		
Break room	1	electric stove	3,000	No		
Mechanic office	1	Printer (Medium/Small)	300	No		
Reception	1	Printer (Medium/Small)	300	No		
Assistant Superintendent office	1	Printer (Medium/Small)	300	No		
Foremen room	2	Printer (Medium/Small)	300	No		
Superintendent office	1	Printer (Medium/Small)	300	No		
Reception	1	Printer/Copier (Large)	500	No		
Mechanical shop	1	Refrigerator (Mini)	212	No		
Reception	1	Refrigerator (Mini)	212	No		
Break room	1	Refrigerator (Residential)	250	No		
Mechanic office	1	Scanner/Fax Machine	300	No		
Assistant Superintendent office	1	Scanner/Fax Machine	300	No		
Assistant Superintendent office	1	Scanner/Fax Machine	300	No		
Superintendent office	1	Scanner/Fax Machine	300	No		
Break room	2	Television	212	No		

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Break room	1	Non-Refrigerated	14	Yes	0.0	343	0	$39	$230	$0	5.9
Break room	1	Refrigerated	14	Yes	0.2	1,612	0	$184	$230	$50	1.0

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]

DPW - Road Services

Primary Property Type: Other - Public Services
Gross Floor Area (ft²): 14,080
Built: 1970

For Year Ending: June 30, 2020
Date Generated: July 27, 2021

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
DPW - Road Services 6 Jane Way Morris Township, New Jersey 07960	TwpofMorris 50 Woodland Avenue PO Box 7603 Convent Station, NJ 07961 973-326-7360	Timothy Quinn 50 Woodland Avenue PO Box 7603 Convent Station, NJ 07961 973-326-7360 tquinn@morristwp.com

Property ID: 15134586

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
123.9 kBtu/ft²

Source EUI
183.5 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	1,314,919 (75%)
Electric - Grid (kBtu)	429,478 (25%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	60.3
National Median Source EUI (kBtu/ft²)	89.3
% Diff from National Median Source EUI	106%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	111

Signature & Stamp of Verifying Professional

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

LP Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer or Registered Architect 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's 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.
TREC	*Transition Incentive Renewable Energy Certificate:* a factorized renewable energy certificate 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.