Local Government Energy Audit Report

Raritan Yard

October 12, 2023

Prepared for:
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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 on 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

1 **Executive Summary** **1**

1.1 **Planning Your Project** 4

Pick Your Installation Approach 4
Options from Your Utility Company 4
Prescriptive and Custom Rebates 4
Direct Install 4
Engineered Solutions 4
Options from New Jersey's Clean Energy Program 5

2 **Existing Conditions** **6**

2.1 Site Overview 6
2.2 Building Occupancy 7
2.3 Building Envelope 7
2.4 Lighting Systems 12
2.5 Air Handling Systems 13

Unitary Electric HVAC Equipment 13
Unitary Heating Equipment 14
Air Handling Unit (AHU) 15

2.6 Steam Heating Systems 15
2.7 Domestic Hot Water 16
2.8 Plug Load and Vending Machines 16
2.9 Water-Using Systems 17
2.10 Process Equipment 18

3 **Energy Use and Costs** **20**

3.1 Electricity 22
3.2 Natural Gas 23
3.3 Benchmarking 24

Tracking Your Energy Performance 25

4 **Energy Conservation Measures** **26**

4.1 Lighting 29

ECM 1: Install LED Fixtures 29
ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers 29
ECM 3: Retrofit Fixtures with LED Lamps 30

4.2 Lighting Controls 30

ECM 4: Install Occupancy Sensor Lighting Controls 30

4.3 Variable Frequency Drives (VFD) 31

ECM 5: Install VFDs on Constant Volume (CV) Fans 31

4.4 Unitary HVAC 31

ECM 6: Install High Efficiency Heat Pumps 31

4.5 Domestic Water Heating 32

ECM 7: Install Low-Flow DHW Devices 32

4.6 Food Service & Refrigeration Measures 32

ECM 8: Vending Machine Control 32

4.7 Measures for Future Consideration 33

Air Compressor Optimization 33
Compressed Air Leaks 34
Compressed Air System Controls 34
Variable Speed Drives 34
Compressed Air Receiver (Storage) 35
Railway Snow Melt Systems 35

5 Energy Efficient Best Practices 37

Energy Tracking with ENERGY STAR Portfolio Manager 37
Weatherization 37
Doors and Windows 37
Lighting Maintenance 38
Lighting Controls 38
Motor Controls 38
Motor Maintenance 38
Fans to Reduce Cooling Load 38
Thermostat Schedules and Temperature Resets 38
AC System Evaporator/Condenser Coil Cleaning 39
HVAC Filter Cleaning and Replacement 39
Steam Trap Repair and Replacement 39
Boiler Maintenance 39
Furnace Maintenance 39
Water Heater Maintenance 39
Compressed Air System Maintenance 40
Water Conservation 40
Procurement Strategies 41

6 On-site Generation 42

6.1 Solar Photovoltaic 43
6.2 Combined Heat and Power 45

7 Electric Vehicles (EV) 46

7.1 Electric Vehicle Charging 46

8 Project Funding and Incentives 48

8.1 Utility Energy Efficiency Programs 49

Prescriptive and Custom 49
Direct Install 49
Engineered Solutions 50

8.2 New Jersey's Clean Energy Programs 51

Large Energy Users 51
Combined Heat and Power 52
Successor Solar Incentive Program (SuSI) 53
Energy Savings Improvement Program 54

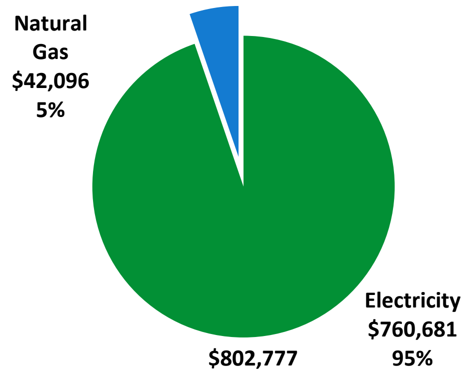
9 Project Development 55
10 Energy Purchasing and Procurement Strategies 56

10.1 Retail Electric Supply Options 56
10.2 Retail Natural Gas Supply Options 56
Appendix A: Equipment Inventory & Recommendations A-1
Appendix B: ENERGY STAR Statement of Energy Performance B-1
Appendix C: Glossary C-1

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Raritan Yard. 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: $802,777 Electricity: 7,031,321 kWh Natural Gas: 53,499 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.

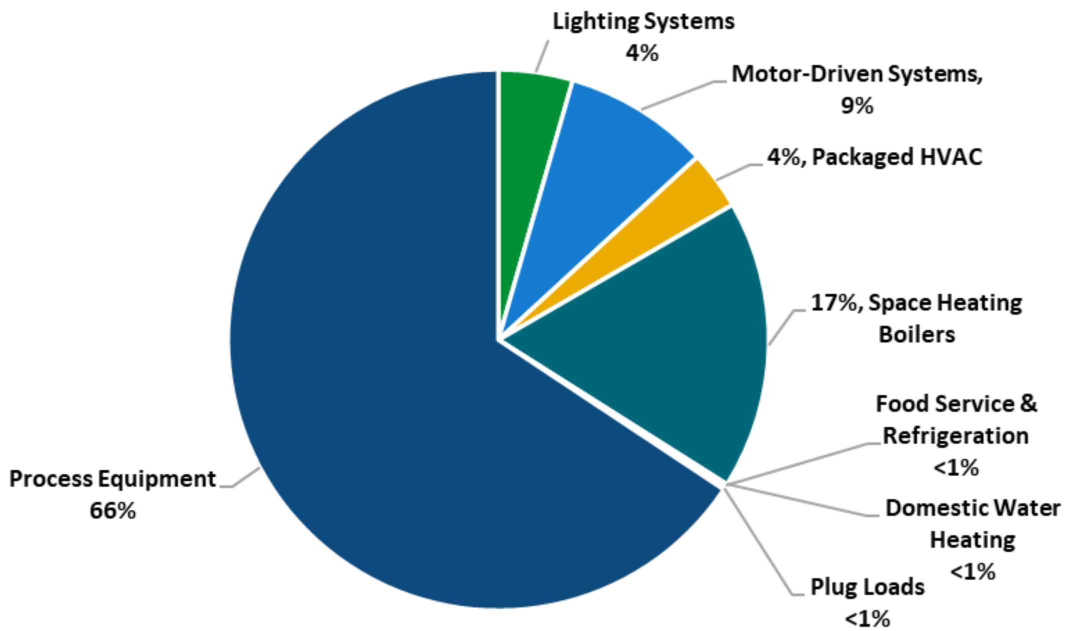


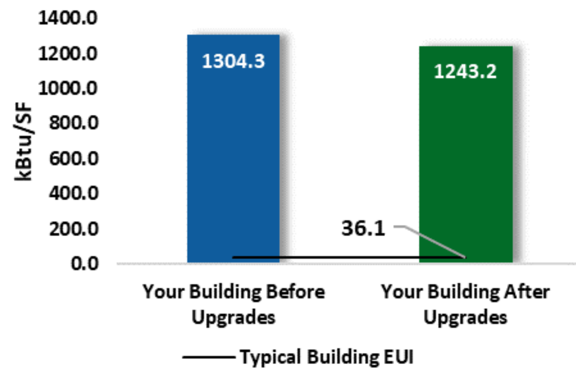
Figure 1 - Energy Use by System

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.

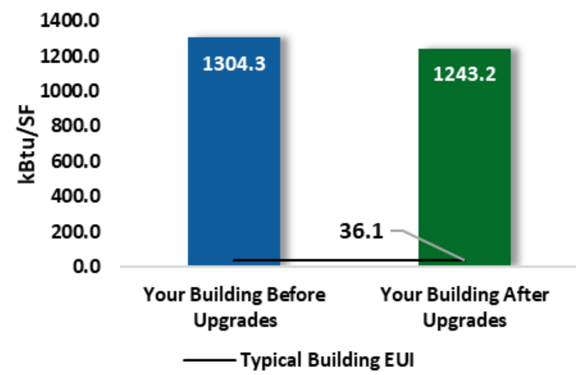
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$123,952
Potential Rebates & Incentives[1]	$14,985
Annual Cost Savings	$44,197
Annual Energy Savings	Electricity: 410,304 kWh Natural Gas: -244 Therms
Greenhouse Gas Emission Savings	205 Tons
Simple Payback	2.5 Years
Site Energy Savings (All Utilities)	5%



Scenario 2: Cost Effective Package[2]

Installation Cost	$123,952
Potential Rebates & Incentives	$14,985
Annual Cost Savings	$44,197
Annual Energy Savings	Electricity: 410,304 kWh Natural Gas: -244 Therms
Greenhouse Gas Emission Savings	205 Tons
Simple Payback	2.5 Years
Site Energy Savings (all utilities)	5%



On-site Generation Potential

Photovoltaic	High
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			**230,652**	**7.1**	**-20**	**$24,799**	**$60,614**	**$9,676**	**$50,938**	**2.1**	**229,971**
ECM 1	Install LED Fixtures	Yes	145,624	3.1	-9	$15,681	$47,816	$7,630	$40,186	2.6	145,549
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	45,559	0.5	-1	$4,919	$6,537	$960	$5,577	1.1	45,737
ECM 3	Retrofit Fixtures with LED Lamps	Yes	39,468	3.5	-9	$4,199	$6,261	$1,086	$5,175	1.2	38,686
Lighting Control Measures			**24,175**	**1.9**	**-6**	**$2,572**	**$5,016**	**$680**	**$4,336**	**1.7**	**23,693**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	24,175	1.9	-6	$2,572	$5,016	$680	$4,336	1.7	23,693
Variable Frequency Drive (VFD) Measures			**67,974**	**12.2**	**0**	**$7,354**	**$44,688**	**$4,500**	**$40,188**	**5.5**	**68,449**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	67,974	12.2	0	$7,354	$44,688	$4,500	$40,188	5.5	68,449
Unitary HVAC Measures			**83,372**	**32.0**	**0**	**$9,020**	**$12,655**	**$0**	**$12,655**	**1.4**	**83,955**
ECM 6	Install High Efficiency Heat Pumps	Yes	83,372	32.0	0	$9,020	$12,655	$0	$12,655	1.4	83,955
Domestic Water Heating Upgrade			**222**	**0.0**	**1**	**$30**	**$57**	**$29**	**$29**	**1.0**	**313**
ECM 7	Install Low-Flow DHW Devices	Yes	222	0.0	1	$30	$57	$29	$29	1.0	313
Food Service & Refrigeration Measures			**3,909**	**0.4**	**0**	**$423**	**$920**	**$100**	**$820**	**1.9**	**3,936**
ECM 8	Vending Machine Control	Yes	3,909	0.4	0	$423	$920	$100	$820	1.9	3,936
TOTALS (COST EFFECTIVE MEASURES)			**410,304**	**53.7**	**-24**	**$44,197**	**$123,952**	**$14,985**	**$108,967**	**2.5**	**410,317**
TOTALS (ALL MEASURES)			**410,304**	**53.7**	**-24**	**$44,197**	**$123,952**	**$14,985**	**$108,967**	**2.5**	**410,317**

* - All incentives presented in this table are included as placeholders for planning purposes 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.

Options from Your Utility Company

Prescriptive and Custom Rebates

For facilities wishing to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the Prescriptive and Custom Rebates program. To participate, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval may be required for some incentives. Contact your utility company for more details prior to project installation.

Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized contractor. This program can provide incentives up to 70% or 80% of the cost of selected measures. A Direct Install contractor will assess and verify individual measure eligibility and perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Engineered Solutions

The Engineered Solutions program provides tailored energy-efficiency assistance and turnkey engineering services to municipalities, universities, schools, hospitals, and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. The program provides all professional services from audit, design, construction administration, to commissioning and measurement and verification for custom whole-building energy-efficiency projects. Engineered Solutions allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs.

For more details on these programs please contact your utility provider.

Options from New Jersey's Clean Energy Program

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 is designed to promote self-investment in energy efficiency. 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.

For more details on these programs please visit [New Jersey's Clean Energy Program website](#) .

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Raritan Yard. 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 February 14, 2023, TRC performed an energy audit at Raritan Yard located in Raritan, New Jersey. TRC met with James Morecraft to review the facility operations and help focus our investigation on specific energy-using systems.

Raritan Yard is comprised of eight separate buildings, with building areas provided in the table below. The facility was constructed in the late 1960's. The buildings share utility meters for gas and electricity. Spaces include offices, conference rooms, lounges, garages, restrooms, locker rooms, storage rooms, electrical and mechanical space.

Lighting for the facility is provided mainly by linear fluorescent T8 fixtures in the compressor building, mechanical department, main building, sub station (B), and communications trailer; high-pressure sodium fixtures in the fuel shed; and plug-in compact fluorescent fixtures in the engine house. One boiler provides heating to the engine house, one gas-fired furnace and one split air conditioning (AC) system provide heating and cooling to the mechanical department, and eight through-the-wall AC units provide heating and cooling to the main building and communications trailer. The facility has one diesel generator to provide emergency backup electricity to the Fuel Shed.

Building Name	Size of Building (Square Feet)
Rail Maintenance Fuel Shed	3,000
Rail Maintenance Compressor Building	2,250
Rail Maintenance Mechanical department	2,000
Rail Maintenance Engine House	10,000
Rail Maintenance Main Building	3,200
Rail Maintenance Sub Station (A)	720
Rail Maintenance Sub Station (B)	600
Rail Maintenance Communications Trailer	725

2.2 Building Occupancy

The facility is fully occupied year-round, with a typical occupancy of about 25 staff.

Building Name	Weekday/Weekend	Operating Schedule
Raritan Yard	Weekday	24/7
	Weekend	24/7

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

The fuel shed building walls are comprised of uninsulated steel siding, while the engine house walls are comprised of insulated steel siding. The compressor building and sub station (B) building walls are concrete block over structural steel with a brick facade, and the mechanical department building walls are concrete block over structural steel with a block facade. The main building and communications trailer consist of several trailers constructed with metal walls.

The fuel shed, mechanical department, and engine house each have a pitched metal roof, and are in fair condition. The compressor building, main building, sub station (B), and communications trailer each have a flat roof with a rubber membrane and are in fair condition.

The mechanical department windows are double glazed while the main building and communications trailer windows are single glazed and have aluminum frames with thermal breaks. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have a mix of metal and wooden frames and are in fair condition with worn door seals. Degraded window and door seals increase drafts and outside air infiltration. The garage areas are equipped with motorized metal doors. Overall, the building envelopes appear in fair condition.

Rail Maintenance Fuel Shed

Rail Maintenance Compressor Building

Rail Maintenance Mechanical department

Rail Maintenance Engine House

Rail Maintenance Main Building

Rail Maintenance Sub Station (A)

Rail Maintenance Sub Station (B)

Rail Maintenance Communications Trailer

2.4 Lighting Systems

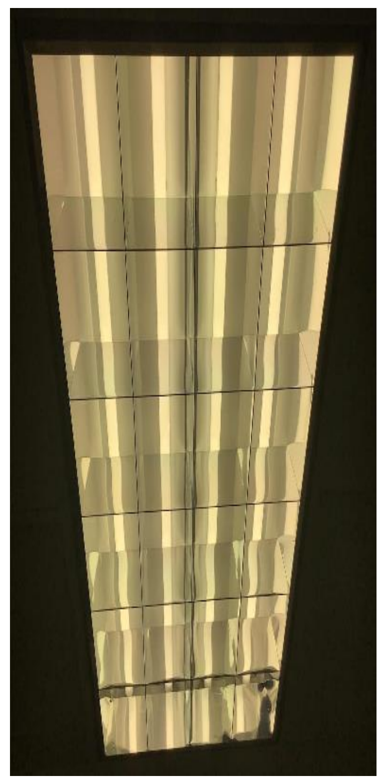
The primary interior lighting system for the facility uses 32-Watt fluorescent T8 lamps. Fixture types include 1-lamp, 2-lamp, and 4-lamp, 2-foot and 4-foot long recessed, surface mounted, and pendant fixtures with linear and U-bend tube lamps.

Additionally, incandescent, compact fluorescent lamps (CFL), high-pressure sodium (HPS), fluorescent T12HO, fluorescent T12, and LED lamps are also used in some spaces. Typically, incandescent lamps at this facility require 50-Watts, CFL lamps use 40att-Ws, HPS lamps draw 100-Watts to 250-Watts, fluorescent T12HO lamps use 60-Watts, and fluorescent T12 lamps use 40-Watts. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts. High-bay fixtures use a mix of manually controlled LED and CFLs. Exit signs use LED sources.

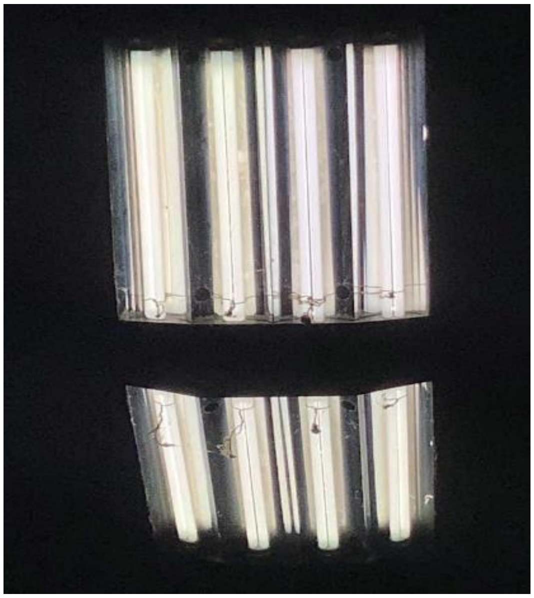
Interior light fixtures are primarily controlled by manual wall switches, with occupancy sensors for the main building restrooms. All light fixtures are in good condition. Interior lighting levels were generally sufficient.

Exterior fixtures illuminate building exteriors and work areas, including limited pole-mounted yard lighting and a maintenance pit. Fixtures use a mix of metal halide (MH), CFL, HPS, and LED lamps, and linear fluorescent T12HO lamps provide in-wall lighting for the maintenance pit. Exterior fixtures are photocell controlled.





Fluorescent T8 Fixtures



CFL Fixture

HPS High-Bay Fixture

Exterior LED Fixture

Exterior HPS Fixture

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

The mechanical department, main building, and communications trailer are conditioned by unitary electric HVAC equipment. Systems include eight through-the-wall air conditioning (AC) units, two window AC units, and one split-system connected to the mechanical department air handling unit.

The units have cooling capacities ranging from 0.5 tons to 6 tons, with efficiency ratings between 6.5 EER and 12 EER. The through-the-wall AC units are each equipped with a 10-kW electric resistance heater and a fractional hp supply fan. Of this equipment, the split system is the most efficient cooling source while the window air conditioning units are the least. The units are in good condition; however, the through-the-wall units are operating beyond their useful life and have been evaluated for replacement.

Split-System

Through-the-Wall AC Units

Unitary Heating Equipment

The mechanical department is heated using one Reznor gas-fired furnace, and areas of the compressor building, and sub station (B) are heated by a total of four electric resistance heaters.

The gas-fired furnace has a heating capacity of 180 MBh with a nominal efficiency of 80%. The electric units each have a heating capacity of 10 kW. The units are in good condition. Equipment is thermostatically controlled using manual dial thermostats.

Forced Air Furnace

Air Handling Unit (AHU)

The mechanical department building is conditioned by one air handling unit. The unit is connected to the exterior split-system to provide cooling and the gas-fired furnace to provide heating. The unit has a constant speed supply fan with a 2 hp motor. Equipment is thermostatically controlled and in good condition.

Air Handling Unit

2.6 Steam Heating Systems

The engine house's steam heating system consists of one Smith gas-fired steam boiler with an output capacity of 2,845 MBh. The burner is fully modulating with a nominal efficiency of 80%. The boiler is configured in a manual control scheme. Installed in 1985, the boiler is in poor condition. There is a service contract in place.

A one-pipe steam distribution system serves the building's heating terminals. There are two fractional hp condensate pumps in the mechanical room, but one of the condensate pumps was not operational at the time of the site visit.

Steam Boiler

2.7 Domestic Hot Water

Hot water for the mechanical department is produced by one, 76 MBh gas-fired storage water heater with a 75-gallon capacity and a nominal efficiency of 80%. Hot water for the main building is provided by one, 4.5 kW storage water heater with a 40-gallon capacity and one, 4.5 kW storage water heater with a 30-gallon capacity.

Installed between 2010 and 2022, the units are in good condition. The domestic hot water pipes are insulated, and the insulation is in good condition.

Water Heaters

2.8 Plug Load and Vending Machines

The location is doing a great job managing the electrical plug loads. This report makes additional suggestions for ECMs in this area as well as energy efficient best practices.

There are 15 computer workstations throughout the facility. Plug loads throughout the buildings include general office equipment. There are typical office loads such as copiers, printers, microwaves, televisions, and mini fridges. The garage areas include various shop tools.

There are four residential-style refrigerators and one commercial stand-up refrigerator throughout the buildings that are used to store food and drinks. These vary in condition and efficiency. There are two refrigerated beverage vending machines and two non-refrigerated vending machines located in the main building. Vending machines are not equipped with occupancy-based controls.

Vending Machine

Residential-style Refrigerator

2.9 Water-Using Systems

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

Typical Restroom Sinks

2.10 Process Equipment

The compressor building is dedicated to two large air compressors each equipped with a 75 hp drive motor and a 5 hp fan motor, and the engine house has a 10 hp compressor. Compressed air is used in the workshop for pneumatic tools, train car and locomotive brake repair and testing, and other equipment testing. The compressors are in fair condition, and it was noted that one of the compressors in the compressor building was down at the time of the site visit.

The fuel shed has four, 12,000-gallon diesel tanks, and multiple pumps with 5 hp motors dedicated to diesel fuel, waste oil, lube oil, and fuel offloading. The pumps are frequently used throughout the week, with some being used daily. A sanding system equipped with a 15 hp motor is used in brake testing.

A significant amount of electricity is used for powering train cars, with several 800-amp train chargers in the Raritan Yard utilized every night from 7:00 PM to 4:00 AM. The engine house has equipment associated with powering and operating train cars and their lighting, heaters, and batteries. Additionally, there is a manually controlled electric rail heater system used throughout the Raritan Yard to melt snow and ice around the switches. In all, it is estimated that process equipment accounts for about two-thirds of the facility energy consumption.

Air Compressors

Diesel Fuel Tanks

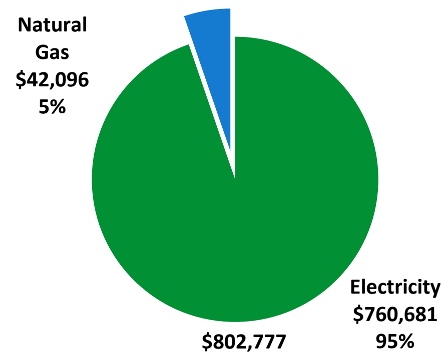
Train Charger

Rail Heater Panel

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	7,031,321 kWh	$760,681
Natural Gas	53,499 Therms	$42,096
Total		**$802,777**



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.

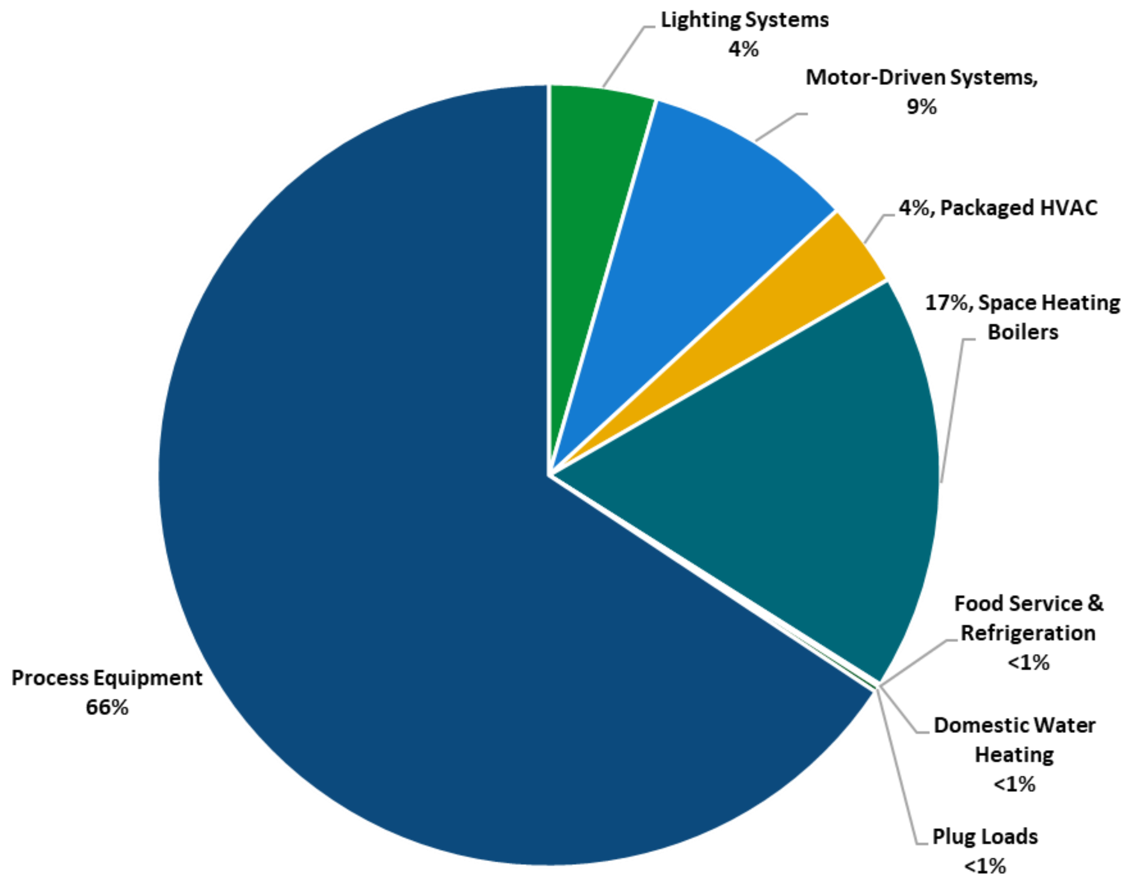
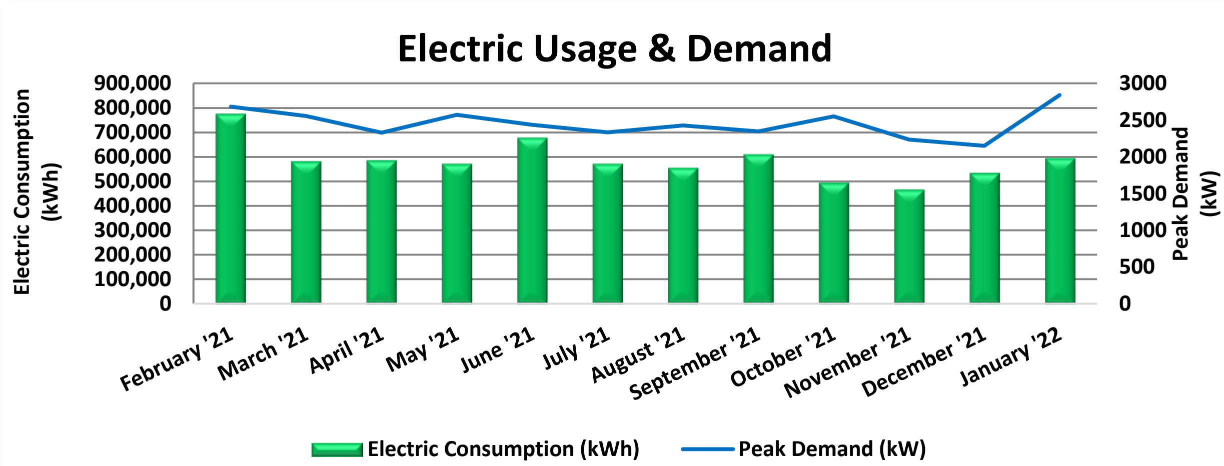


Figure 4 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class Large Power & Lighting Primary (LPLP), with electric production provided by Direct Energy, a third-party supplier.



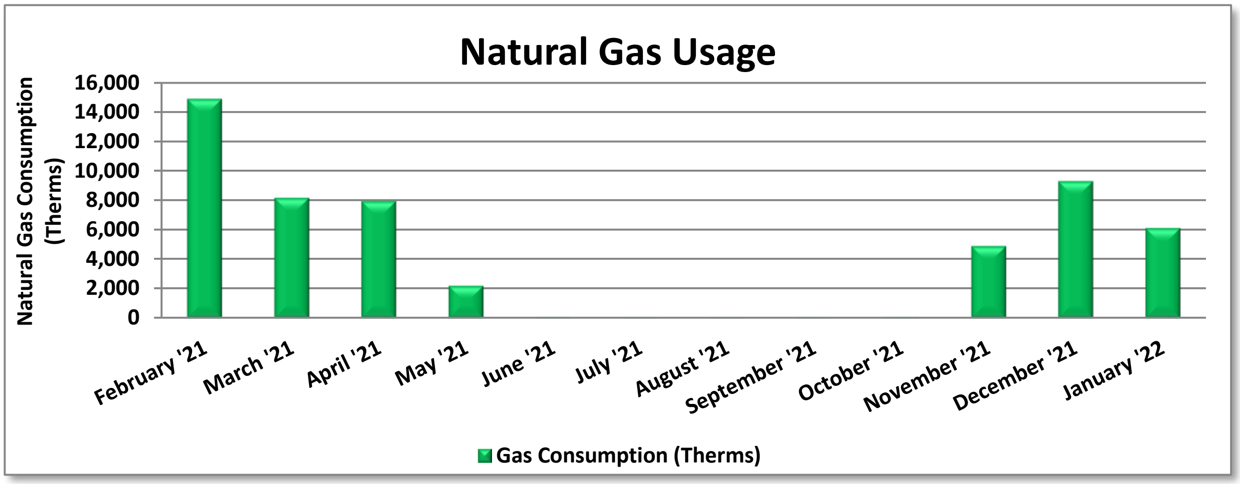
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/19/21	29	776,019	2,684	$4,705	$73,444
3/22/21	31	583,050	2,555	$4,480	$56,586
4/21/21	30	587,373	2,328	$4,082	$56,684
5/20/21	29	573,094	2,574	$4,531	$55,908
6/21/21	32	678,798	2,436	$20,663	$80,377
7/21/21	30	572,420	2,336	$18,674	$69,229
8/19/21	29	555,741	2,429	$18,801	$67,770
9/20/21	32	610,645	2,346	$19,901	$73,385
10/19/21	29	496,155	2,550	$4,497	$49,140
11/17/21	29	467,460	2,238	$3,946	$46,224
12/20/21	33	535,278	2,151	$3,793	$51,340
1/21/22	32	595,288	2,843	$5,013	$80,594
Totals	**365**	**7,031,321**	**2,843**	**$113,085**	**$760,681**
Annual	**365**	**7,031,321**	**2,843**	**$113,085**	**$760,681**

Notes:

- Peak demand of 2,843 kW occurred in January '22.
- Average demand over the past 12 months was 2,456 kW.
- The average electric cost over the past 12 months was $0.108/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.
- Usage is relatively flat across the year. There is little seasonal variation because of the high baseload energy use, mainly for process equipment.

3.2 Natural Gas

PSE&G delivers natural gas under rate class Large Volume Gas (LVG), with natural gas supply provided by Direct Energy, a third-party supplier.



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/19/21	29	14,869	$10,176
3/22/21	31	8,144	$6,458
4/21/21	30	7,939	$4,808
5/20/21	29	2,183	$1,428
6/21/21	32	28	$161
7/21/21	30	15	$155
8/19/21	29	16	$156
9/20/21	32	16	$156
10/19/21	29	34	$167
11/17/21	29	4,874	$4,612
12/21/21	34	9,283	$7,322
1/21/22	31	6,100	$6,498
Totals	**365**	**53,499**	**$42,096**
Annual	**365**	**53,499**	**$42,096**

Notes:

- The average gas cost for the past 12 months is $0.787/therm, which is the blended rate used throughout the analysis.
- The minimal summer gas consumption can be attributed to domestic hot water usage.

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.

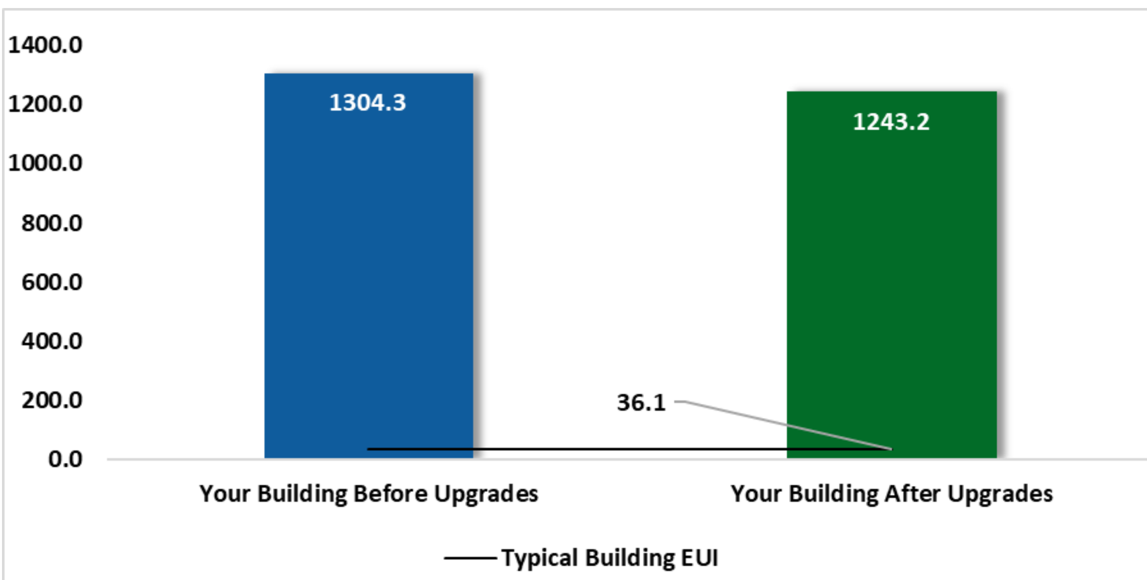


Figure 5 - Energy Use Intensity Comparison[3]

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. Several factors can cause a building to vary from 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 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 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 in this report are based on the previously run state rebate program SmartStart, which has been retired. Now, all investor-owned gas and electric utility companies are offering complementary energy efficiency programs directly to their customers. Some measures and proposed upgrades may be eligible for higher incentives than those shown below. The incentives in the summary tables should be used for high-level planning purposes. To verify incentives, reach out to your utility provider or visit the NJCEP website for more information.

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			**230,652**	**7.1**	**-20**	**$24,799**	**$60,614**	**$9,676**	**$50,938**	**2.1**	**229,971**
ECM 1	Install LED Fixtures	Yes	145,624	3.1	-9	$15,681	$47,816	$7,630	$40,186	2.6	145,549
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	45,559	0.5	-1	$4,919	$6,537	$960	$5,577	1.1	45,737
ECM 3	Retrofit Fixtures with LED Lamps	Yes	39,468	3.5	-9	$4,199	$6,261	$1,086	$5,175	1.2	38,686
Lighting Control Measures			**24,175**	**1.9**	**-6**	**$2,572**	**$5,016**	**$680**	**$4,336**	**1.7**	**23,693**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	24,175	1.9	-6	$2,572	$5,016	$680	$4,336	1.7	23,693
Variable Frequency Drive (VFD) Measures			**67,974**	**12.2**	**0**	**$7,354**	**$44,688**	**$4,500**	**$40,188**	**5.5**	**68,449**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	67,974	12.2	0	$7,354	$44,688	$4,500	$40,188	5.5	68,449
Unitary HVAC Measures			**83,372**	**32.0**	**0**	**$9,020**	**$12,655**	**$0**	**$12,655**	**1.4**	**83,955**
ECM 6	Install High Efficiency Heat Pumps	Yes	83,372	32.0	0	$9,020	$12,655	$0	$12,655	1.4	83,955
Domestic Water Heating Upgrade			**222**	**0.0**	**1**	**$30**	**$57**	**$29**	**$29**	**1.0**	**313**
ECM 7	Install Low-Flow DHW Devices	Yes	222	0.0	1	$30	$57	$29	$29	1.0	313
Food Service & Refrigeration Measures			**3,909**	**0.4**	**0**	**$423**	**$920**	**$100**	**$820**	**1.9**	**3,936**
ECM 8	Vending Machine Control	Yes	3,909	0.4	0	$423	$920	$100	$820	1.9	3,936
TOTALS			**410,304**	**53.7**	**-24**	**$44,197**	**$123,952**	**$14,985**	**$108,967**	**2.5**	**410,317**

* - All incentives presented in this table are included as placeholders for planning purposes 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		**230,652**	**7.1**	**-20**	**$24,799**	**$60,614**	**$9,676**	**$50,938**	**2.1**	**229,971**
ECM 1	Install LED Fixtures	145,624	3.1	-9	$15,681	$47,816	$7,630	$40,186	2.6	145,549
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	45,559	0.5	-1	$4,919	$6,537	$960	$5,577	1.1	45,737
ECM 3	Retrofit Fixtures with LED Lamps	39,468	3.5	-9	$4,199	$6,261	$1,086	$5,175	1.2	38,686
Lighting Control Measures		**24,175**	**1.9**	**-6**	**$2,572**	**$5,016**	**$680**	**$4,336**	**1.7**	**23,693**
ECM 4	Install Occupancy Sensor Lighting Controls	24,175	1.9	-6	$2,572	$5,016	$680	$4,336	1.7	23,693
Variable Frequency Drive (VFD) Measures		**67,974**	**12.2**	**0**	**$7,354**	**$44,688**	**$4,500**	**$40,188**	**5.5**	**68,449**
ECM 5	Install VFDs on Constant Volume (CV) Fans	67,974	12.2	0	$7,354	$44,688	$4,500	$40,188	5.5	68,449
Unitary HVAC Measures		**83,372**	**32.0**	**0**	**$9,020**	**$12,655**	**$0**	**$12,655**	**1.4**	**83,955**
ECM 6	Install High Efficiency Heat Pumps	83,372	32.0	0	$9,020	$12,655	$0	$12,655	1.4	83,955
Domestic Water Heating Upgrade		**222**	**0.0**	**1**	**$30**	**$57**	**$29**	**$29**	**1.0**	**313**
ECM 7	Install Low-Flow DHW Devices	222	0.0	1	$30	$57	$29	$29	1.0	313
Food Service & Refrigeration Measures		**3,909**	**0.4**	**0**	**$423**	**$920**	**$100**	**$820**	**1.9**	**3,936**
ECM 8	Vending Machine Control	3,909	0.4	0	$423	$920	$100	$820	1.9	3,936
TOTALS		**410,304**	**53.7**	**-24**	**$44,197**	**$123,952**	**$14,985**	**$108,967**	**2.5**	**410,317**

* - All incentives presented in this table are included as placeholders for planning purposes 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		**230,652**	**7.1**	**-20**	**$24,799**	**$60,614**	**$9,676**	**$50,938**	**2.1**	**229,971**
ECM 1	Install LED Fixtures	145,624	3.1	-9	$15,681	$47,816	$7,630	$40,186	2.6	145,549
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	45,559	0.5	-1	$4,919	$6,537	$960	$5,577	1.1	45,737
ECM 3	Retrofit Fixtures with LED Lamps	39,468	3.5	-9	$4,199	$6,261	$1,086	$5,175	1.2	38,686

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 is 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 high-intensity discharge (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 fixtures.

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: mainly exterior HID fixtures; interior HID fixtures in the engine house and fuel shed

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: all areas with fluorescent fixtures with T12 tubes; mainly four-foot T12HO lamps in the pit area

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent, CFL, and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

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

Affected Building Areas: all areas with fluorescent fixtures with T8 tubes, or CFL and incandescent 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		**24,175**	**1.9**	**-6**	**$2,572**	**$5,016**	**$680**	**$4,336**	**1.7**	**23,693**
ECM 4	Install Occupancy Sensor Lighting Controls	24,175	1.9	-6	$2,572	$5,016	$680	$4,336	1.7	23,693

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 4: 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: locker rooms, offices, restrooms, storage areas, and service spaces as noted in Appendix A

4.3 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		**67,974**	**12.2**	**0**	**$7,354**	**$44,688**	**$4,500**	**$40,188**	**5.5**	**68,449**
ECM 5	Install VFDs on Constant Volume (CV) Fans	67,974	12.2	0	$7,354	$44,688	$4,500	$40,188	5.5	68,449

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 5: Install VFDs on Constant Volume (CV) Fans

Install 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.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating. Prior to implementation, verify minimum fan speed in cooling mode with the manufacturer. Note that savings will vary depending on the operating characteristics of each AHU.

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

Affected Systems: AHU in mechanical department and larger exhaust fans as noted in Appendix A

4.4 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		**83,372**	**32.0**	**0**	**$9,020**	**$12,655**	**$0**	**$12,655**	**1.4**	**83,955**
ECM 6	Install High Efficiency Heat Pumps	83,372	32.0	0	$9,020	$12,655	$0	$12,655	1.4	83,955

ECM 6: Install High Efficiency Heat Pumps

Replace standard through-the-wall AC systems with high efficiency heat pumps. Since the existing units are equipped with inefficient electric resistance heaters, the measure payback is relatively short.

When choosing the replacement unit, note that a higher EER or SEER rating indicates a more efficient cooling system, and a higher HSPF rating indicates more efficient heating mode. 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 heating and cooling loads, and the estimated annual operating hours.

Affected Units: main office and communications trailer units

4.5 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		**222**	**0.0**	**1**	**$30**	**$57**	**$29**	**$29**	**1.0**	**313**
ECM 7	Install Low-Flow DHW Devices	222	0.0	1	$30	$57	$29	$29	1.0	313

ECM 7: Install Low-Flow DHW Devices

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

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 gpm
Pre-rinse spray valve (kitchen)	1.28 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.

4.6 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		**3,909**	**0.4**	**0**	**$423**	**$920**	**$100**	**$820**	**1.9**	**3,936**
ECM 8	Vending Machine Control	3,909	0.4	0	$423	$920	$100	$820	1.9	3,936

ECM 8: 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.

4.7 Measures for Future Consideration

The process equipment in the Raritan Yard facility accounts for two-thirds of the total energy consumption. We have identified two additional opportunities for improvement that the facility may wish to consider.

1. Air Compressor Optimization
2. Advance Snow Melt Systems for Railyards

These measures/methodologies typically require further analysis, involve substantial capital investment, and/or include significant system reconfiguration. These are described here to support a whole building approach to energy efficiency and sustainability.

Raritan Yard may wish to consider the Energy Savings Improvement Program (ESIP) or other programs with a whole building approach. With interest in implementing comprehensive, largescale and/or complex system wide projects, these measures may be pursued during development of a future energy savings plan. We recommend that you work with your energy service company (ESCO) and/or design team to:

- Evaluate these measures further.
- Develop firm costs.
- Determine measure savings.
- Prepare detailed implementation plans.

Other modernization or capital improvement funds may be leveraged for these types of refurbishments. As you plan for capital upgrades, be sure to consider the energy impact of the building systems and controls being specified.

Air Compressor Optimization[4]

Compressed air systems consist of a supply side and a demand side. The supply side includes compressors and air treatment (dryers and filters). The demand side includes distribution and end-use equipment. A properly managed supply side will result in clean, appropriately dried, stable air being delivered at the appropriate pressure in a dependable, cost-effective manner. A properly managed demand side minimizes wasted air and uses compressed air for appropriate applications. Improving and maintaining peak compressed air system performance requires not only addressing individual components, but also analyzing both the supply and demand sides of the system and how they interact.

As noted in Section 2.10, the Compressor Building is dedicated to two large air compressors each equipped with a 75 hp drive motor and a 5 hp fan motor, and the Engine House has a 10 hp compressor. Compressed air is used in the workshop for pneumatic tools, train car and locomotive brake repair and testing, and other equipment testing. One of the compressors was observed to be down at the time of audit.

Some opportunities for improving compressed air system performance were identified and are discussed below:

[4] https://www.compressedairchallenge.org/data/sites/1/media/library/sourcebook/Improving_Compressed_Air-Sourcebook.pdf

- Compressed air leaks
- Compressed air system controls
- Variable speed drives
- Compressed air storage

Compressed Air Leaks[5]

In industrial compressed air systems, leaks cause a drop in system pressure which can make air tools function less efficiently, forcing equipment to run longer and shortening the life of the equipment. This in turn leads to higher maintenance, higher downtime, and increased energy consumption.

Most common problem areas that cause leaks include couplings, hoses, tubes, and fittings; pressure regulators; open condensate traps and shut-off valves; pipe joints, disconnects, and thread sealants.

Leaks can be controlled by devising a strategy to identify, control and repair the leaks. The following steps can help:

- Estimate amount of leakage by measuring compressor cycle time under no load conditions,
- Detect leakage with ultrasonic acoustic detectors or by applying soapy water to suspect areas,
- Stop leaks by tightening connection or replacing faulty couplings, fittings, hoses, etc.,
- Reduce leaks by lowering the demand pressure of the system,
- Institute a leak prevention program to track, repair, verify leaks with employee involvement.

One of the air compressors was identified to be not working at the time of the audit. Non-operating equipment can be an additional source of leaks. Equipment no longer in use should be isolated with a valve in the distribution system.

Compressed Air System Controls

The controls system regulates pressure by matching the air supply with the system demand. This also determines system efficiency. A good control system is necessary for efficient operation and high performance. The objective of such a control strategy is to turn off unnecessary compressors or delay the requirement of additional compressors. A typical system consists of multiple compressors delivering air to end uses and, in some cases, to receivers (storage). The combined capacity is regulated to meet the system's air demand. Controls are also used to lower the output of the individual compressors during times of lower demand.

The compressor control strategies used at this facility were not evaluated, however, the equipment appears to have some basic controls. The air braking system and locomotive testing are intermittent loads, and the braking loads depend on the descending speed of the trains. We recommend that the facility investigate more accurate microprocessor-based control opportunities and variable speed compressors with tighter control ranges to allow for drops in the system pressure set points.

Variable Speed Drives

Compressor motors can be equipped with variable speed drives (VSD) to adjust the motor speed to match the variable demand of the system. At or near full-output capacity, a variable speed drive compressor will use more input power than a comparable fixed speed unit due to the inherent drive losses. Also, at very low speeds the overall efficiency of variable speed compressors falls off. Therefore, VSDs may not be the

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[5] https://www.compressedairchallenge.org/data/sites/1/media/library/factsheets/factsheet07.pdf

optimum solution for systems that require continuous operation at full (or minimum) speeds. VSDs can work in parallel with compressed air receivers to optimize operations.

Compressed Air Receiver (Storage)

One of the most important components of larger compressed air systems is the air receiver. The basic purpose of an air receiver is to store a volume of compressed air for use when needed. Adequate storage acts to effectively increase efficiency. Storage can also be used to:

- Control demand events (peak demand periods) in a compressed air system by reducing both the amount of pressure drop and the rate of decay,
- Protect critical pressure applications from other events in the system,
- Control the rate of pressure drop to end uses.

Many systems have an extra compressor operating inefficiently in modulation to support occasional demand events, and sometimes strategic storage solutions can allow for this compressor to be turned off.

We recommend the site review air pressure requirements and associated usage patterns for the various end uses and investigate appropriate storage solutions accordingly.

Railway Snow Melt Systems[6]

Railway systems in cold climates often experience service delays due to functional failures caused by snow or ice. Heating systems, especially around the railway switches and track, ensures smoother operations. Electric resistance heating systems are generally used consuming a great deal of energy with conduction, convection, and radiation losses.

The Raritan Yard currently consists of a manually controlled electric rail heater system to melt snow and ice around the switches. According to facility staff, the electric resistance heating system consists of wires of varying length installed along several sections of the railway tracks, with a heating capacity of 300W/ft.

A central control box provides switching for the various sections. These need to be manually turned on and off. The system has a single temperature setting with no thermostat, temperature control, or remote controlling capabilities. At the time of audit, it was a 50-degree day with no snow on the ground. It was observed that the heating system was running, hence consuming energy.

This section provides information about improved technologies and/or control strategies that have been successfully implemented in North America and elsewhere. In general, improved systems continue to rely on resistance heating. However, these systems better direct the heat to specific locations using insulation and targeted placement.

Thermon, a US based company has a line of railway track and switch heating systems (Fastrax™) that focuses on different methods to eliminate snow and ice from various parts of the railway track based on electric resistance heating (examples: Trip Stop Heaters, Track and Switch heaters, Crib Heaters). They also incorporate sophisticated controls to vary the heat provided.

Some examples of innovative snow melt solutions are provided below.

[6] https://go.nvent.com/rs/760-EGW-100/images/nVent-SB-H84327-RailHeatingSystems-USEN.pdf
https://www.midwestind.com/rail-lubrication/rail-switch-ice-prevention/
https://content.thermon.com/pdf/fastrax/fastrax_catalog.pdf

Constant Wattage Technology with Control Options

The "nVent Flat MI Switch Heating System", for example, provides a flat MI (mineral insulated) heating element that delivers powerful convective heat to a large surface area at a constant wattage to prevent ice buildup and keep track switches functioning properly. This type of system incorporates snow sensors and advanced control systems with remote monitoring and telemetry.

Self-Regulating Heating Cable Technology

Self-regulating cables automatically vary power output in response to sensed changes in ambient temperature at every point along the length of the cables. As surrounding temperatures change, the "nVent Self-Regulating Switch Heating System" provides heat where and when it is needed. The manufacturer claims these systems are up to 30% more energy efficient than conventional systems.

Ice Free Switching

A preventive measure is available that relies on manual application of a multi component glycol-based liquid that flows at sub-zero temperatures. When applied by sprayer to the railroad switch points, plates and rail before snow falls on the ground, Midwest's "Ice Free Switch" will remain in place and activate when needed. This system quickly melts falling and blowing snow to prevent switches from freezing, ensuring uninterrupted switch operation in freezing temperatures. This "smart fluid" technology also has several other applications on the railway track. This can be used as a standalone measure or in tandem with an improved snow melt system.

Raritan yard site should consider adding or improving the existing controls or explore of the available technologies and vendors to reduce energy consumption from the snow melt systems.

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 5% –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, and planned capital upgrades, and it 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 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 cannot manage what you do not 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[7] . 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, 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 can lead to increased occupant comfort as well as heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

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

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.

Motor Controls

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Whenever possible, use automatic devices such as twist timers or occupancy sensors to turn off motors when they are not needed.

Motor Maintenance

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

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.

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. Thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

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.

Steam Trap Repair and Replacement

Steam traps are a crucial part of delivering heat from the boiler to the space heating units. Steam traps are automatic valves that remove condensate from the system. If the traps fail closed, condensate can build up in the steam supply side of the trap, which reduces the flow in the steam lines and thermal capacity of the radiators. Or they may fail open, allowing steam into the condensate return lines resulting in wasted energy, water, and hammering. Losses can be significantly reduced by testing and replacing equipment as they start to fail. Repair or replace traps that are blocked or allowing steam to pass. Inspect steam traps as part of a regular steam system maintenance plan.

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.

Furnace Maintenance

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt, or debris build-up; ensure the ignition system is working properly; test and adjust operation and safety controls; inspect electrical connections; and lubricate motors and bearings.

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.
- Reduce pressure setting to minimum needed for air operated equipment.
- Turn off compressor if not routinely needed.
- Use low pressure blower air rather than high pressure compressed air.

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

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[8] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[9] 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

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

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

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.

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.

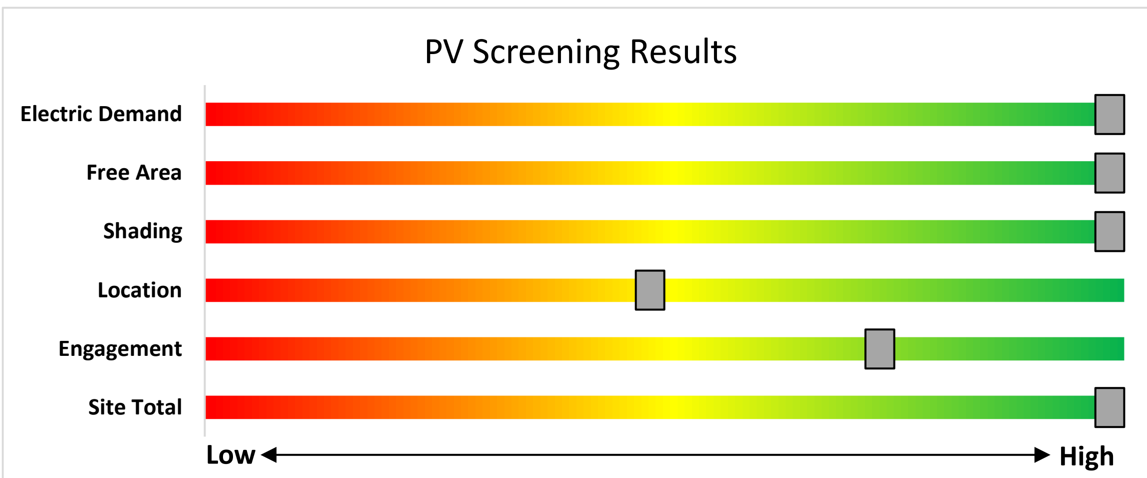
6.1 Solar Photovoltaic

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 high potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential. A PV array located on the roof may be feasible. If you are interested in pursuing the installation of PV, we recommend conducting a full feasibility study.

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



Potential	High	
System Potential	204	kW DC STC
Electric Generation	243,039	kWh/yr
Displaced Cost	$26,290	/yr
Installed Cost	$795,600	

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.

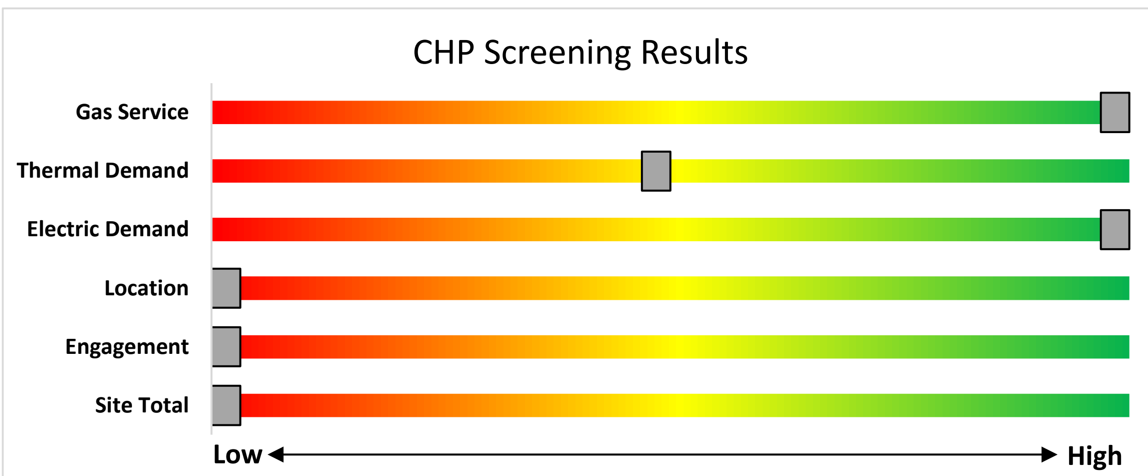


Figure 9 - Combined Heat and Power Screening

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 Electric Vehicles (EV)

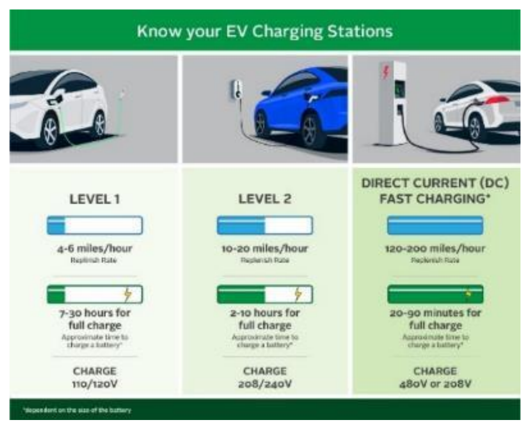
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes all-electric vehicles as zero-emission vehicles because they produce no direct exhaust or tailpipe emissions.

EVs are typically more expensive than similar conventional and hybrid vehicles, although some cost can be recovered through fuel savings, federal tax credit, or state incentives.

7.1 Electric Vehicle Charging

EV charging stations provide a means for electric vehicle operators to recharge their batteries at a facility. While many EV drivers charge at home, others do not have access to regular home charging, and the ability to charge at work or in public locations is critical to making EVs practical for more drivers. Charging can also be used for electric fleet vehicles, which can reduce fuel and maintenance costs for fleets that replace gas or diesel vehicles with EVs.

EV charging comes in three main types. For this assessment, the screening considers addition of Level 2 charging, which is most common at workplaces and other public locations. Depending on the site type and usage, other levels of charging power may be more appropriate.



The preliminary assessment of EV charging at the facility shows that there is **high** potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

The primary costs associated with installing EV charging are the charger hardware and the cost to extend power from the facility to parking spaces. This may include upgrades to electric panels to serve increased loads.

The type and size of the parking area impact the costs and feasibility of adding EV charging. Parking structure installations can be less costly than surface lot installations as power may be readily available, and equipment and wiring can be surface mounted. Parking lot installations often require trenching through concrete or asphalt surface. Large parking areas provide greater flexibility in charger siting than smaller lots.

The location and capacity of facility electric panels also impact charger installation costs. A Level 2 charger generally requires a dedicated 208-240V, 40 Amp circuit. The electric panel nearest the planned installation may not have available capacity and may need to be upgraded to serve new EV charging loads. Alternatively, chargers could be powered from a more distant panel. The distance from the panel to the location of charging stations ties directly to costs, as conduits, cables, and potential trenching costs all increase on a per-foot basis. The more charging stations planned, the more likely it is that additional electrical capacity will be needed.

Other factors to consider when planning for EV charging at a facility include who the intended users are, how long they park vehicles at the site, and whether they will need to pay for the electricity they use.

The graphic below displays the results of the EV charging assessment conducted as part of this audit. The position of each slider indicates the impact each factor has on the feasibility of installing EV charging at the site.

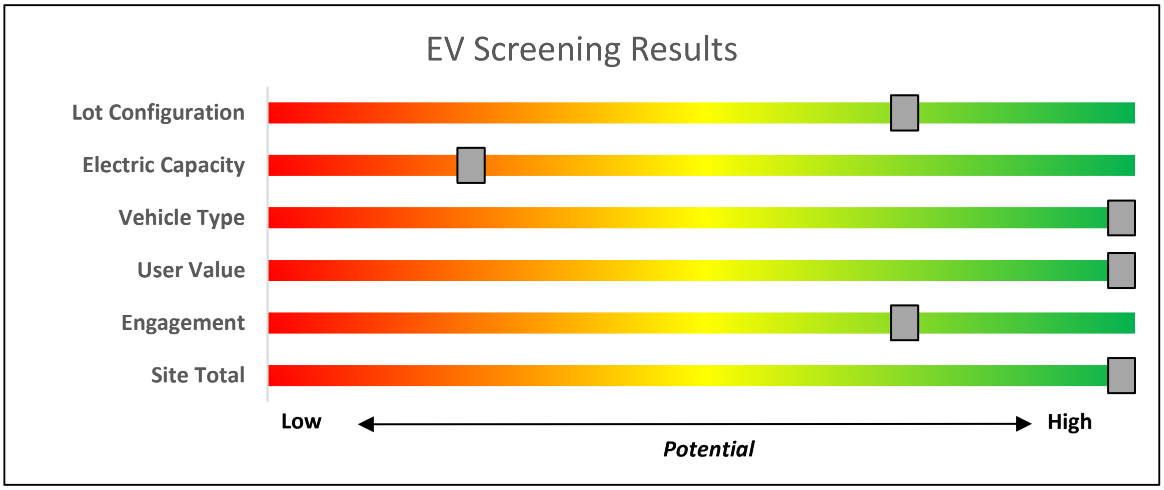


Figure 10 – EV Charger Screening

Electric Vehicle Programs Available

New Jersey is leading the way on electric vehicle (EV) adoption on the East Coast. There are several programs designed to encourage EV adoption in New Jersey, which is crucial to reaching a 100% clean energy future.

NJCEP offers a variety of EV programs for vehicles, charging stations, and fleets. Certain EV charging stations that receive electric utility service from Atlantic City Electric Company (ACE) or Public Service Electric & Gas Company (PSE&G), may be eligible for additional electric vehicle charging incentives directly from the utility. Projects may be eligible for both the incentives offered by this BPU program and incentives offered by ACE or PSE&G, up to 90% of the combined charger purchase and installation costs. Please check ACE or PSE&G program eligibility requirements before purchasing EV charging equipment, as additional conditions on types of eligible chargers may apply for utility incentives.

Both Jersey Central Power & Light (JCP&L) and Rockland Electric (RECO) have filed proposals for EV charging programs. BPU staff is currently reviewing those proposals.

For more information and to keep up to date on all EV programs please visit https://www.njcleanenergy.com/commercial-industrial/programs/electric-vehicle-programs

8 Project Funding and Incentives

Ready to improve your building's performance? New Jersey's Clean Energy Programs and Utility Energy Efficiency Programs can help. Pick the program that works best for you. This section provides an overview of currently available incentive programs in.

8.1 Utility Energy Efficiency Programs

The Clean Energy Act, signed into law by Governor Murphy in 2018, requires New Jersey's investor-owned gas and electric utilities to reduce their customers' use by set percentages over time. To help reach these targets the New Jersey Board of Public Utilities approved a comprehensive suite of energy efficiency programs to be run by the utility companies.

Prescriptive and Custom

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

Equipment Examples

Lighting
Lighting Controls
HVAC Equipment
Refrigeration
Gas Heating
Gas Cooling
Commercial Kitchen Equipment
Food Service Equipment
Variable Frequency Drives
Electronically Commutate Motors
Variable Frequency Drives
Plug Loads Controls
Washers and Dryers
Agricultural
Water Heating

The Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type. The Custom program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives.

Direct Install

Direct Install is a turnkey program available to existing small to medium-sized facilities with an average peak electric demand that does not exceed 200 kW or less over the recent 12-month period. You work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives, and controls

Incentives

The program pays up to 70% of the total installed cost of eligible measures.

How to Participate

To participate in Direct Install, you will work with a participating contractor. The contractor will be paid the measure incentives directly by the program, which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the Direct Install program, subject to program rules and eligibility, while the remaining percent of the cost is paid to the contractor by the customer.

Engineered Solutions

The Engineered Solutions Program provides tailored energy-efficiency assistance and services to municipalities, universities, schools, hospitals and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. Customers receive expert guided services, including investment-grade energy auditing, engineering design, installation assistance, construction administration, commissioning, and measurement and verification (M&V) services to support the implementation of cost-effective and comprehensive efficiency projects. Engineered Solutions is generally a good option for medium to large sized facilities with a peak demand over 200 kW looking to implement as many measures as possible under a single project to achieve deep energy savings. Engineered Solutions has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program. Incentives for this program are based on project scope and energy savings achieved.

For more information on any of these programs, contact your local utility provider or visit https://www.njcleanenergy.com/transition.

8.2 New Jersey's Clean Energy Programs

Save money while saving the planet! New Jersey's Clean Energy Program is a statewide program that offers incentives, programs, and services that benefit New Jersey residents, businesses, educational, non-profit, and government entities to help them save energy, money, and the environment.

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.

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	>3 MW	$350		
Fuel Cells with Heat Recovery				
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 will 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.

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.

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 (dc). The program is currently under development. 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.

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 energy conservation measures (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 can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

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

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

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. Note that some of the identified projects may be mutually exclusive, such as replacing equipment versus upgrading motors or controls. 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 that includes the review of multiple bids for project work, incorporates potential operations and maintenance (O&M) cost savings, and maximizes your incentive potential.

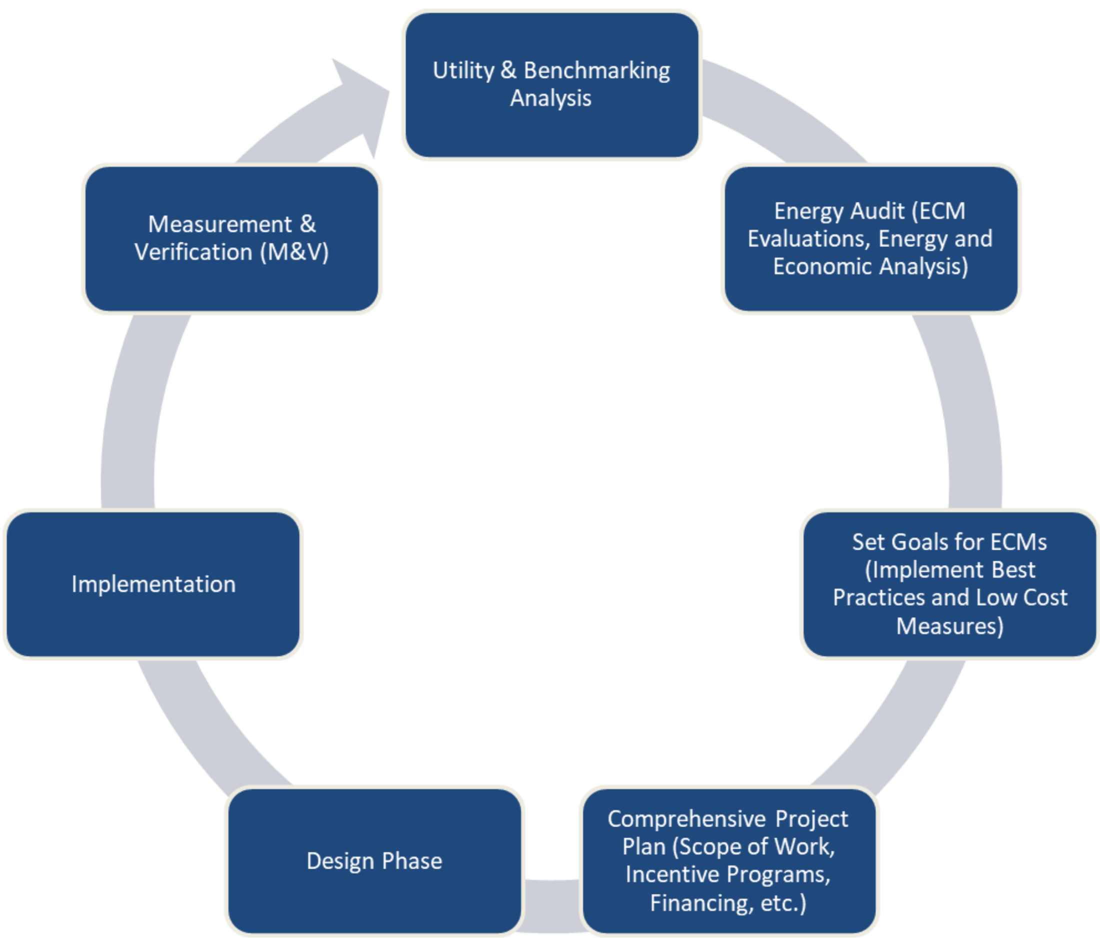


Figure 11 – Project Development Cycle

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. 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[10].

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 fluctuate monthly. The utility provides basic gas supply service 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[11].

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

[11] 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
Mechanical - Fuel Shed	8	High-Pressure Sodium: (1) 100W Lamp	Wall Switch	S	138	8,736	1	Fixture Replacement	No	8	LED - Fixtures: Close to Ceiling Mount	Wall Switch	30	8,736	0.6	7,548	-2	$803	$2,377	$40	2.9
Mechanical - Fuel Shed	12	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	S	295	8,736	1	Fixture Replacement	No	12	LED - Fixtures: High-Bay	Wall Switch	75	8,736	1.7	23,063	-5	$2,453	$6,061	$600	2.2
Exterior - Fuel Shed	5	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	3,132	0	$339	$1,729	$250	4.4
Electrical Room - Compressor Building	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.1	825	0	$88	$380	$65	3.6
Mechanical - Compressor Building	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.3	3,459	-1	$368	$584	$160	1.2
Exterior - Compressor Building	10	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	10	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	6,263	0	$678	$3,458	$500	4.4
Janitorial - Mech Department	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	6,552	0.0	105	0	$11	$33	$6	2.4
Locker Room - Female - Mech Department	1	Compact Fluorescent: (2) 13W Biaxial Plug-In Lamps	Wall Switch	S	26	6,552	3, 4	Relamp	Yes	1	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	19	4,521	0.0	84	0	$9	$25	$2	2.6
Locker Room - Female - Mech Department	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
Locker Room - Female - Mech Department	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	6,552	2, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,521	0.2	1,782	0	$190	$507	$75	2.3
Locker Room - Female - Mech Department	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	6,552	3, 4	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,521	0.0	485	0	$52	$73	$20	1.0
Locker Room - Female - Mech Department	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	6,552	3, 4	Relamp	Yes	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,521	0.0	144	0	$15	$18	$5	0.9
Locker Room - Male - Mech Department	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
Locker Room - Male - Mech Department	1	LED Lamps: (2) 9W Biax Lamps	Wall Switch	S	18	6,552	4	None	Yes	1	LED Lamps: (2) 9W Biax Lamps	Occupancy Sensor	18	4,521	0.0	37	0	$4	$0	$0	0.0
Locker Room - Male - Mech Department	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	6,552	4	None	Yes	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,521	0.0	29	0	$3	$0	$0	0.0
Locker Room - Male - Mech Department	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	6,552	4	None	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,521	0.0	118	0	$13	$0	$0	0.0
Locker Room - Male - Mech Department	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	6,552	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,521	0.1	969	0	$103	$416	$75	3.3
Locker Room 1 - Mech Department	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	6,552	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	6,552	0.0	367	0	$39	$73	$20	1.4
Locker Room 2 - Mech Department	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
Locker Room 2 - Mech Department	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.1	550	0	$59	$189	$40	2.5
Lounge - Break Room - Mech Department	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
Lounge - Break Room - Mech Department	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	8,736	3, 4	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.2	2,568	-1	$273	$526	$105	1.5
Lounge - Break Room - Mech Department	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	8,736	3, 4	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,028	0.0	343	0	$36	$72	$10	1.7
Mechanical - Mech Department	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 - Mech Department	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552		None	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Office - Mech Department	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
Office - Mech Department	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	8,736	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,028	0.2	2,056	0	$219	$705	$95	2.8
Storage - Mech Department	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	216	0	$23	$37	$10	1.2
Exterior - Mech Department	4	Compact Fluorescent: (1) 32W Double Biaxial Plug-In Lamp	Photocell		32	4,380	3	Relamp	No	4	LED Lamps: GX23 (Plug-In) Lamps	Photocell	23	4,380	0.0	158	0	$17	$50	$4	2.7
Exterior - Mech Department	1	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	626	0	$68	$346	$50	4.4
Mechanical - Boiler - Engine House	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler - Engine House	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552		None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	0	0	$0	$0	$0	0.0
Mechanical - Compressor Room - Engine House	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	0	0	$0	$0	$0	0.0
Engine House	24	Compact Fluorescent: (8) 40W Biaxial Plug-In Lamps	Wall Switch	S	320	8,736	3, 4	Relamp	Yes	24	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	224	6,028	2.6	34,687	-8	$3,690	$3,132	$262	0.8
Engine House	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Engine House	8	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	S	188	8,736	1, 4	Fixture Replacement	Yes	8	LED - Fixtures: Close to Ceiling Mount	Occupancy Sensor	45	6,028	0.8	10,969	-3	$1,167	$2,647	$75	2.2
Engine House	2	LED - Fixtures: High-Bay	Wall Switch	S	80	8,736	4	None	Yes	2	LED - Fixtures: High-Bay	Occupancy Sensor	80	6,028	0.0	433	0	$46	$270	$35	5.1
Engine House	2	LED - Fixtures: High-Bay	Wall Switch	S	85	8,736	4	None	Yes	2	LED - Fixtures: High-Bay	Occupancy Sensor	85	6,028	0.0	460	0	$49	$270	$35	4.8
Engine House	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	S	9	8,736	4	None	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	6,028	0.0	46	0	$5	$0	$0	0.0
Engine House	2	Linear Fluorescent - T12HO: 8' T12HO (110W) - 2L	Wall Switch	S	252	8,736	2, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,028	0.3	3,535	-1	$376	$373	$60	0.8
Steel Shop - Engine House	5	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	S	72	8,736	4	None	Yes	5	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,028	0.1	975	0	$104	$270	$35	2.3
Storage - Exterior - Engine House	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	6,552	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	6,552	0.1	563	0	$60	$129	$20	1.8
Woodshop - Engine House	7	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	S	72	8,736	4	None	Yes	7	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,028	0.1	1,365	0	$145	$270	$35	1.6
Exterior - Engine House	29	High-Pressure Sodium: (1) 400W Lamp	Photocell		465	4,380	1	Fixture Replacement	No	29	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	120	4,380	0.0	43,822	0	$4,741	$16,239	$2,900	2.8
Exterior - Engine House	1	Metal Halide: (1) 175W Lamp	Photocell		215	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Architectural Flood/Spot Luminaire	Photocell	53	4,380	0.0	710	0	$77	$517	$50	6.1
Electrical Room - Comms - Main Office	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	6,552	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,521	0.0	279	0	$30	$181	$32	5.0
Electrical Room - Comms - Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3, 4	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.0	275	0	$29	$37	$10	0.9
Kitchen - Complex B - Main Office	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.0	118	0	$13	$116	$20	7.7
Locker Room - Complex B #1 - Main Office	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	0	0	$0	$0	$0	0.0
Locker Room - Complex B #2 - Main Office	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Locker Room - Complex B #3 - Main Office	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	0	0	$0	$0	$0	0.0
Locker Room - Complex B #4 - Main Office	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	0	0	$0	$0	$0	0.0
Lounge - Complex B - Main Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.1	550	0	$59	$189	$40	2.5
Office - Complex A - Main Office	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
Office - Complex A - Main Office	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.6	5,777	-1	$615	$1,307	$280	1.7
Office - Complex A #1 - Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	216	0	$23	$37	$10	1.2
Office - Complex A #2 - Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	216	0	$23	$37	$10	1.2
Office - Complex A #3 - Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	216	0	$23	$37	$10	1.2
Office - Complex A #4 - Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	216	0	$23	$37	$10	1.2
Office - Complex A #5 - Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	216	0	$23	$37	$10	1.2
Office - Complex B - Main Office	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Complex B - Main Office	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552	4	None	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.1	766	0	$81	$270	$35	2.9
Restroom - Female A - Main Office	1	Incandescent: (1) 50W A19 Screw-In Lamp	Occupancy Sensor	S	50	6,028	3	Relamp	No	1	LED Lamps: A19 Lamps	Occupancy Sensor	8	6,028	0.0	253	0	$27	$17	$1	0.6
Restroom - Female B - Main Office	1	Incandescent: (1) 50W A19 Screw-In Lamp	Occupancy Sensor	S	50	6,028	3	Relamp	No	1	LED Lamps: A19 Lamps	Occupancy Sensor	8	6,028	0.0	253	0	$27	$17	$1	0.6
Restroom - Male A - Main Office	1	Incandescent: (1) 50W A19 Screw-In Lamp	Occupancy Sensor	S	50	6,028	3	Relamp	No	1	LED Lamps: A19 Lamps	Occupancy Sensor	8	6,028	0.0	253	0	$27	$17	$1	0.6
Restroom - Male B - Main Office	1	Incandescent: (1) 50W A19 Screw-In Lamp	Occupancy Sensor	S	50	6,028	3	Relamp	No	1	LED Lamps: A19 Lamps	Occupancy Sensor	8	6,028	0.0	253	0	$27	$17	$1	0.6
Storage - Complex A Files - Main Office	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
Storage - Complex A Files - Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	216	0	$23	$37	$10	1.2
Storage - Complex B - Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,552	0.0	216	0	$23	$37	$10	1.2
Exterior - Main Office	3	LED Lamps: (1) 9W A19 Screw-In Lamp	Photocell		9	4,380		None	No	3	LED Lamps: (1) 9W A19 Screw-In Lamp	Photocell	9	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior - Main Office	1	LED - Fixtures: Wall Pack	Photocell		18	4,380		None	No	1	LED - Fixtures: Wall Pack	Photocell	18	4,380	0.0	0	0	$0	$0	$0	0.0
Mechanical - Substation B	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	200	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	200	0.2	53	0	$6	$292	$80	37.8
Exterior - Substation B	6	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	3,758	0	$407	$2,075	$300	4.4
Office 1 - Comm Trailer	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,552	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.1	825	0	$88	$380	$65	3.6
Office 2 - Comm Trailer	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.0	118	0	$13	$116	$20	7.7

	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
Restroom - Comm Trailer	1	Incandescent: (1) 50W A19 Screw-In Lamp	Wall Switch	S	50	6,552	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	8	6,552	0.0	275	0	$29	$17	$1	0.6
Exterior - Comm Trailer	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Photocell		9	4,380		None	No	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Photocell	9	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Pit Lighting - Yard	8	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	8	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	45	4,380	0.0	5,011	0	$542	$2,594	$800	3.3
Exterior Pit Lighting - Yard	10	LED - Fixtures: Wall Pack	Photocell		63	4,380		None	No	10	LED - Fixtures: Wall Pack	Photocell	63	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Pit Lighting - Yard	86	Linear Fluorescent - T12HO: 4' T12HO (60W) - 2L	Photocell		136	4,380	2	Relamp & Reballast	No	86	LED - Linear Tubes: (2) 4' Lamps	Photocell	29	4,380	0.0	40,305	0	$4,360	$5,914	$860	1.2
Exterior Tower Lighting - Yard	5	High-Pressure Sodium: (1) 1000W Lamp	Photocell		1,100	4,380	1	Fixture Replacement	No	5	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	300	4,380	0.0	17,520	0	$1,895	$1,084	$500	0.3
Exterior Pole Lighting Yard	16	High-Pressure Sodium: (1) 400W Lamp	Photocell		465	4,380	1	Fixture Replacement	No	16	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	120	4,380	0.0	24,178	0	$2,616	$8,959	$1,600	2.8
Exterior Pole Lighting Yard	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Photocell		64	4,380		None	No	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Photocell	64	4,380	0.0	0	0	$0	$0	$0	0.0

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 - Fuel Shed	Fuel Shed	4	Exhaust Fan	2.0	86.5%	No			W	8,760	5	No	86.5%	Yes	4	2.4	14,304	0	$1,547	$16,726	$400	10.6
Mechanical - Fuel Shed	Fuel Shed	2	Exhaust Fan	7.5	88.5%	No			W	8,760	5	No	91.0%	Yes	2	4.6	28,874	0	$3,124	$11,890	$2,000	3.2
Mechanical - Fuel Shed	Dust Collector	1	Other	5.0	88.5%	No			W	2,190		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Fuel Shed	Fuel Offloading Pumps	2	Other	5.0	89.5%	No			W	800		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Fuel Shed	Diesel Fuel Pumps	4	Other	5.0	89.5%	No			W	800		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Fuel Shed	Lube Oil Pumps	1	Other	5.0	89.5%	No			W	800		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Fuel Shed	Sand System	1	Other	15.0	91.0%	No			W	2,190		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Fuel Shed	Waste Oil Pumps	1	Other	5.0	89.5%	No			W	800		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Compressor Building	Compressor Drive Motor	2	Air Compressor	75.0	94.1%	No			W	4,380		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Compressor Building	Compressor Fan Motor	2	Air Compressor	5.0	87.5%	No			W	4,380		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Mech Department	Mech Department	1	Exhaust Fan	0.3	65.0%	No			W	4,368		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Mech Department	Mech Department	1	Supply Fan	2.0	84.0%	No			N	4,368	5	No	86.5%	Yes	1	0.6	3,061	0	$331	$4,182	$100	12.3
Mechanical - Compressor Room - Engine House	Air Compressor	1	Air Compressor	10.0	91.7%	No			W	4,380		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler - Engine House	Engine House - Heating System	1	Combustion Air Fan	2.0	84.0%	No			W	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler - Engine House	Engine House - Condensate System	1	Condensate Pump	0.3	65.0%	No			B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Engine House	Engine House	2	Exhaust Fan	7.5	88.5%	No			W	4,368	5	No	91.0%	Yes	2	4.6	21,735	0	$2,351	$11,890	$2,000	4.2
Mechanical - Engine House	Garage Door	2	Other	1.0	82.5%	No			W	800		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Engine House	Pressure Washer	1	Other	7.5	88.5%	No			W	250		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Engine House	Sump Pumps	2	Process Pump	0.3	65.0%	No			W	800		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Engine House	Engine House - Unit Heaters	2	Supply Fan	5.0	87.5%	No			W	4,368		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0

		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 - Engine House	Engine House - Unit Heaters	6	Supply Fan	0.8	78.0%	No			W	4,368		No	78.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Main Office	Main Office	7	Supply Fan	0.2	62.5%	No			W	4,368		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Comm Trailer	Comm Trailer	1	Supply Fan	0.2	62.5%	No			W	4,368		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Yard	Compactor	1	Other	10.0	92.4%	No			W	800		No	92.4%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Yard	Pit Sump Pump	2	Other	15.0	91.0%	No			W	800		No	91.0%	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
Electrical Room - Compressor Building	Electrical Room - Compressor Building	1	Electric Resistance Heat		34.12		1 COP	TPI		W		No							0.0	0	0	$0	$0	$0	0.0
Mechanical - Compressor Building	Mechanical - Compressor Building	2	Electric Resistance Heat		34.12		1 COP	TPI		W		No							0.0	0	0	$0	$0	$0	0.0
Mechanical - Mech Department	Mech Department	1	Forced Air Furnace		180.00		0.8 Et	Nortek	EEDU-225	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior - Mech Department	Mech Department	1	Split-System	6.00		12.00		Allied Commercial	ELS072S4	N		No							0.0	0	0	$0	$0	$0	0.0
Electrical Room - Comms - Main Office	Electrical Room - Comms - Main Office	1	Window AC	0.50		9.00				W		No							0.0	0	0	$0	$0	$0	0.0
Exterior - Main Office	Main Office	7	Through-The-Wall AC	2.00	34.12	9.70	1 COP	Bard	W24A1-A10	W	6	Yes	7	Through-The-Wall HP	2.00	34.12	12.00	3.3 COP	28.0	72,950	0	$7,892	$11,074	$0	1.4
Mechanical - Substation B	Mechanical - Substation B	1	Electric Resistance Heat		34.12		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Exterior - Comm Trailer	Comm Trailer	1	Through-The-Wall AC	2.00	34.12	9.70	1 COP	Bard	W24A1-A10	W	6	Yes	1	Through-The-Wall HP	2.00	34.12	12.00	3.3 COP	4.0	10,421	0	$1,127	$1,582	$0	1.4
Office - Comm Trailer	Comm Trailer	1	Window AC	0.50		6.50		LG	LP0621WSR	W		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
Mechanical - Boiler - Engine House	Engine House	1	Forced Draft Steam Boiler	2,845	Smith	3500A	B		No						0.0	0	0	$0	$0	$0	0.0

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	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
Mechanical - Mech Department	Domestic Hot Water - Mech Department	1	Storage Tank Water Heater (> 50 Gal)	Bradford White	RG275H6N	N		No						0.0	0	0	$0	$0	$0	0.0
Office - Complex A	Domestic Hot Water - Complex A - Main Office	1	Storage Tank Water Heater (≤ 50 Gal)	Bradford White	RE340S6	W		No						0.0	0	0	$0	$0	$0	0.0
Lounge - Complex B	Domestic Hot Water - Complex B - Main Office	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	3WA66	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation 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
Mech Department	7	4	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	$6	$29	$14	2.4
Main Office	7	4	Faucet Aerator (Lavatory)	2.20	0.50	0.0	222	0	$24	$29	$14	0.6

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	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
Kitchen - Complex B - Main Office	1	Self-Contained Unit (≥175 lbs/day), Batch	Hoshizaki	KM-255BAH	No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Mech Department	1	Coffee Machine	500	No		
Mech Department	2	Desktop	120	No		
Mech Department	3	Microwave	1,000	No		
Mech Department	2	Printer (Medium/Small)	450	No		
Mech Department	1	Printer/Copier (Large)	600	No		
Mech Department	1	Refrigerator (Mini)	174	No		
Mech Department	2	Refrigerator (Residential)	340	No		
Mech Department	1	Toaster	600	No		
Mech Department	1	Toaster Oven	600	No		
Engine House	1	Fan (Large)	1,000	No		
Engine House	1	Engine Heaters (100A)	83,100	No		
Engine House	1	Train Battery Charger (12.4A)	10,300	No		
Engine House	1	Train Charger (15A)	1,800	No		
Engine House	9	Power Tools	1,000	No		
Engine House	1	Welder	8,000	No		
Engine House	1	Refrigerator (Residential)	340	No		
Main Office	2	Coffee Machine	500	No		
Main Office	11	Desktop	120	No		
Main Office	2	Microwave	1,000	No		
Main Office	2	Paper Shredder	200	No		
Main Office	5	Printer (Medium/Small)	450	No		
Main Office	1	Printer/Copier (Large)	600	No		
Main Office	2	Refrigerator (Mini)	174	No		
Main Office	1	Refrigerator (Residential)	340	No		
Main Office	2	Television	224	No		
Main Office	1	Toaster Oven	600	No		
Comm Trailer	2	Desktop	120	No		
Comm Trailer	1	Microwave	1,000	No		
Comm Trailer	1	Printer (Medium/Small)	450	No		
Comm Trailer	2	Refrigerator (Mini)	174	No		
Comm Trailer	1	Toaster Oven	600	No		
Exterior - Yard	12	Train Charger (800A)	665,100	No		
Exterior - Yard	12	Rail Heater / Snow Melter	9,600	No		
Exterior - Yard	12	Rail Heater / Snow Melter	1,800	No		
Exterior - Yard	12	Rail Heater / Snow Melter	5,500	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
Mech Department	1	Non-Refrigerated	8	Yes	0.0	343	0	$37	$230	$0	6.2
Mech Department	1	Refrigerated	8	Yes	0.2	1,612	0	$174	$230	$50	1.0
Main Office	1	Non-Refrigerated	8	Yes	0.0	343	0	$37	$230	$0	6.2
Main Office	1	Refrigerated	8	Yes	0.2	1,612	0	$174	$230	$50	1.0

APPENDIX B: ENERGY STAR STATEMENT OF ENERGY PERFORMANCE

Energy use intensity (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.

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ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

1333 - Rail Maintenance Facility, Raritan Yard (Campus)

Primary Property Type: Other - Public Services
Gross Floor Area (ft²): 22,495
Built: 1965

For Year Ending: December 31, 2021
Date Generated: June 25, 2023

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
1333 - Rail Maintenance Facility - Raritan Yard (Campus) 24 Johnson Drive Raritan, New Jersey 08869	NJ Transit 1 Penn Plaza Newark, NJ 07015 (973) 491-4140	Erin Hill One Penn Plaza East 8th Floor Newark, NJ 07015 (973) 491-4140 erhill@njtransit.com

Property ID: 24629178

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
1,346.4 kBtu/ft²

Source EUI
3,326.2 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	24,583,440 (81%)
Natural Gas (kBtu)	5,704,168 (19%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	36.1
National Median Source EUI (kBtu/ft²)	89.3
% Diff from National Median Source EUI	3626%
Annual Emissions	
Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	2,445

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 (II)	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of $1/8^{th}$ 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.