



Local Government Energy Audit Report

CCRNJ Terminal, Gate House & Security Screening Center

March 4, 2024

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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.

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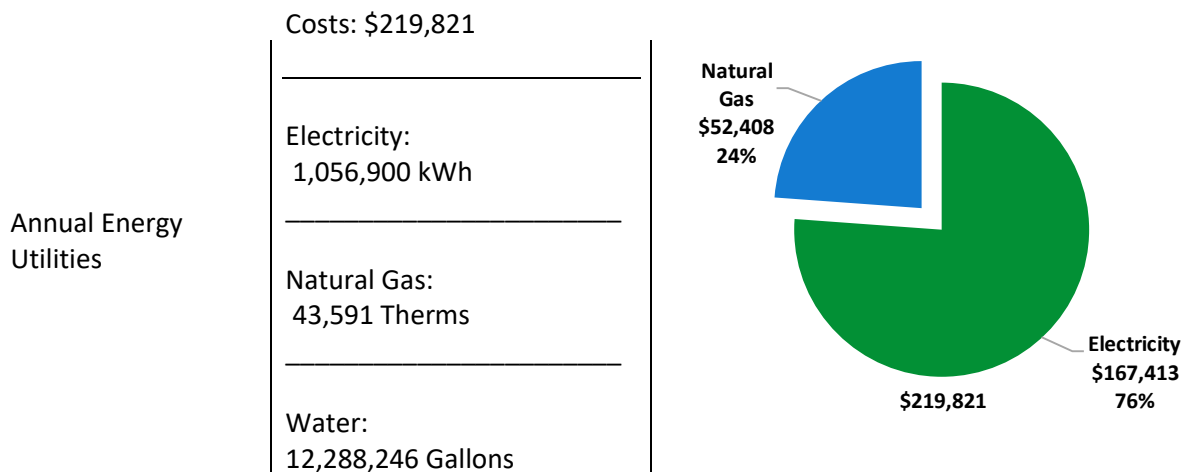
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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBP) has sponsored this Local Government Energy Audit (LGEA) report for CCRNJ Terminal, Gate House & Security Screening Center. 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.

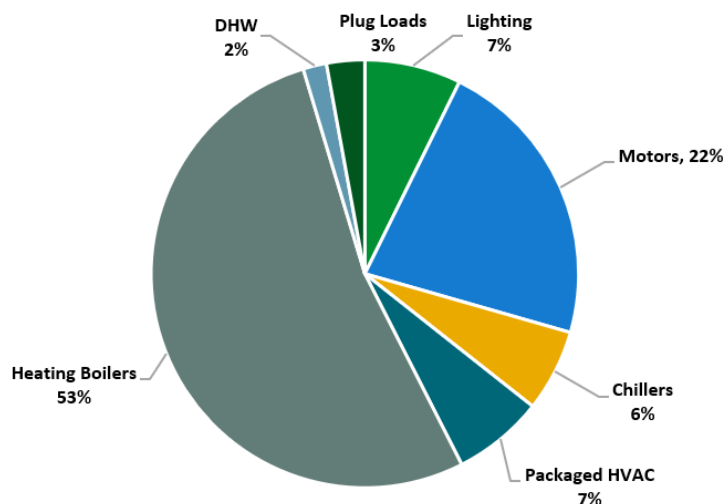
BUILDING PERFORMANCE REPORT



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.



Energy Use by System

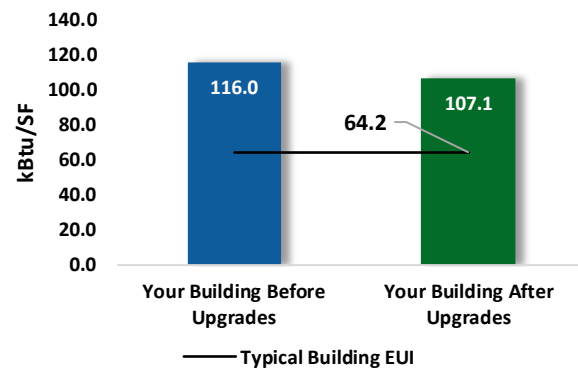
POTENTIAL IMPROVEMENTS



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.

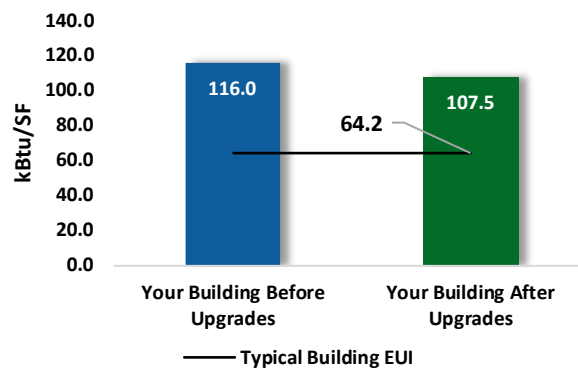
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	\$156,040
Potential Rebates & Incentives ¹	\$15,960
Annual Cost Savings	\$28,318
Annual Energy Savings	Electricity: 178,402 kWh Natural Gas: 49 Therms
Greenhouse Gas Emission Savings	90 Tons
Simple Payback	4.9 Years
Site Energy Savings (All Utilities)	8%



Scenario 2: Cost Effective Package²

Installation Cost	\$132,440
Potential Rebates & Incentives	\$13,860
Annual Cost Savings	\$27,765
Annual Energy Savings	Electricity: 176,763 kWh Natural Gas: -195 Therms
Greenhouse Gas Emission Savings	88 Tons
Simple Payback	4.3 Years
Site Energy Savings (all utilities)	7%



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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades			71,030	15.0	-15	\$11,072	\$39,580	\$4,290	\$35,290	3.2	69,782
ECM 1	Install LED Fixtures	Yes	9,986	2.3	-2	\$1,557	\$12,720	\$1,000	\$11,720	7.5	9,811
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,848	0.4	0	\$288	\$780	\$90	\$690	2.4	1,814
ECM 3	Retrofit Fixtures with LED Lamps	Yes	59,197	12.2	-12	\$9,227	\$26,080	\$3,200	\$22,880	2.5	58,157
Lighting Control Measures			21,417	4.6	-5	\$3,338	\$25,570	\$5,960	\$19,610	5.9	21,032
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	15,816	3.9	-3	\$2,465	\$19,960	\$2,360	\$17,600	7.1	15,532
ECM 5	Install High/Low Lighting Controls	Yes	5,601	0.7	-1	\$873	\$5,610	\$3,600	\$2,010	2.3	5,501
Variable Frequency Drive (VFD) Measures			76,664	10.7	0	\$12,144	\$63,900	\$3,500	\$60,400	5.0	77,200
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	76,664	10.7	0	\$12,144	\$63,900	\$3,500	\$60,400	5.0	77,200
Unitary HVAC Measures			1,638	2.9	0	\$260	\$15,200	\$600	\$14,600	56.3	1,650
ECM 7	Install High Efficiency Heat Pumps	No	1,638	2.9	0	\$260	\$15,200	\$600	\$14,600	56.3	1,650
Gas Heating (HVAC/Process) Replacement			0	0.0	24	\$293	\$8,400	\$1,500	\$6,900	23.6	2,853
ECM 8	Install High Efficiency Furnaces	No	0	0.0	24	\$293	\$8,400	\$1,500	\$6,900	23.6	2,853
HVAC System Improvements			2,152	0.0	0	\$341	\$350	\$50	\$300	0.9	2,167
ECM 9	Install Pipe Insulation	Yes	2,152	0.0	0	\$341	\$350	\$50	\$300	0.9	2,167
Domestic Water Heating Upgrade			1,807	0.0	0	\$286	\$140	\$60	\$80	0.3	1,820
ECM 10	Install Low-Flow DHW Devices***	Yes	1,807	0.0	0	\$286	\$140	\$60	\$80	0.3	1,820
Custom Measures			3,693	0.0	0	\$585	\$2,900	\$0	\$2,900	5.0	3,719
ECM 11	Replace Electric Water Heater with Heat Pump Water Heater	Yes	3,693	0.0	0	\$585	\$2,900	\$0	\$2,900	5.0	3,719
TOTALS (COST EFFECTIVE MEASURES)			176,763	30.2	-19	\$27,765	\$132,440	\$13,860	\$118,580	4.3	175,720
TOTALS (ALL MEASURES)			178,402	33.1	5	\$28,318	\$156,040	\$15,960	\$140,080	4.9	180,223

* - 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).

All Evaluated Energy Improvements³

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

³ 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.

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decision 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 for the largest energy consumers in the state. Customers in this category spend about \$5 million a year on energy bills. This program 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](https://www.nj.gov/energy/programs/clean-energy-program/).



2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPUB) has sponsored this Local Government Energy Audit (LGEA) report for CCRNJ Terminal, Gate House & Security Screening Center. 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 October 25, 2023 TRC performed an energy audit at CCRNJ Terminal, Gate House & Security Screening Center located in Jersey City, New Jersey. TRC met with Gregory Wentzel to review the facility operations and help focus our investigation on specific energy-using systems.

This report addresses three different building on the campus: the Train Terminal, the Security Screening Center, and the Gate House. The CCRNJ Terminal is a multi-story, 61,545 square foot building built in 1889. Spaces include classrooms, offices, corridors, stairwells, an auditorium, and a mechanical space. This facility is where the public comes to purchase tickets for the ferry. There are also several offices for site staff, DEP employees, and teaching spaces. The Security Screening center is a semi-permanent 4,600 square foot structure that operates climate control and security equipment. Spaces include a large atrium and a small area for employees to rest and eat lunch. The Gate House consists of two structures totaling to 2,500 square feet and includes restrooms, a lofted mechanical space, and a space for sewage pumps and circuit breakers.

Recent Improvements and Facility Concerns

In April of 2022 the Security Screening Center moved from the Train Terminal to the semi-permanent structure it now occupies.

2.2 Building Occupancy

All the facilities in this report are occupied seven days a week. The Train Terminal and the Security Screening Center are open from 8:00 AM to 4:00 PM. The Gate House is open from 6:00 AM to 10:00 PM. Maintenance occurs after hours or as needed for upkeep and operations.

Building Name	Weekday/Weekend	Operating Schedule
CNJ Main Terminal & Train Shed	Weekday	8:00 AM - 4:00 PM
	Weekend	8:00 AM - 4:00 PM
Gate House & Restrooms	Weekday	6:00 AM - 10:00 PM
	Weekend	6:00 AM - 10:00 PM
Security Screening Center	Weekday	8:00 AM - 4:00 PM
	Weekend	8:00 AM - 4:00 PM

Building Occupancy Schedule

2.3 Building Envelope

The building walls of the CCRNJ Terminal are constructed of all brick. Part of the roof covering the conditioned spaces is pitched and covered with asphalt shingles. Another section of the roof is flat and covered with black membrane, and it is in fair to poor condition. The security screening center is a stand-alone structure with metal siding and two sets of glass doors on the front and back of the structure. It has no windows. The Gatehouse consists of two buildings made from concrete blocks with a brick veneer façade. The roof is pitched and covered with asphalt shingles.

The terminal building windows have wooden frames. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have wooden frames as well and are in fair condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration. The windows and doors at the security screening center have aluminum frames and are in good condition, appearing to be relatively new. The Gate House has a few different types of windows. There are two small windows with thick panes of glass on the front of the building and a few other windows with metal frames



CCRNJ Terminal



Security Screening Center



Gate House Restroom Door



Gate House window

2.4 Lighting Systems

The primary interior lighting system in CCRNJ Terminal and Gate House mainly use 32-Watt linear fluorescent T8 lamps. There are also several 40-Watt T12 fixtures. The Security Screening Center is illuminated solely by LED fixtures.

Fixture types include 2-lamp, 4-foot-long troffer and surface mounted fixtures and several 2-foot fixtures with U-bend tube lamps and compact fluorescents in the terminal. The exit signs observed used LED sources. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Some of the linear fixtures have been converted to operate LED tube lamps. The facility has been replacing fluorescent lamps with LED replacement tube lamps and retaining the T8 fluorescent ballasts. Once the T8 ballasts reach the end of their lifetime the facility staff change it over to an LED ballast.



CCRNJ Terminal LED Tubes



CCRNJ Terminal T8 U-Bend



Gate House Linear T8



Security Screening Center LEDs

Most lighting fixtures are controlled manually by wall switches and there are a few lights in storage and corridor that are controlled by occupancy sensors.



Blue Commons Auditorium Dimming Switch

Exterior fixtures on the outside of the terminal are LED. Four-foot LED fixtures wrap around the exterior of the conditioned portion, controlled by photocell. Timeclock controlled high bay fixtures illuminate the unconditioned walkway of the train concourse. A “corn cob” style LED lamp is mounted to the roof of the CCRNJ Terminal. Timeclock controlled LED linear strips illuminate the 9/11 memorial. Gate House has timeclock controlled incandescent downlights illuminating restroom entrances. Security Screening Center has a pole mounted HID lamp illuminating the exterior HVAC units.



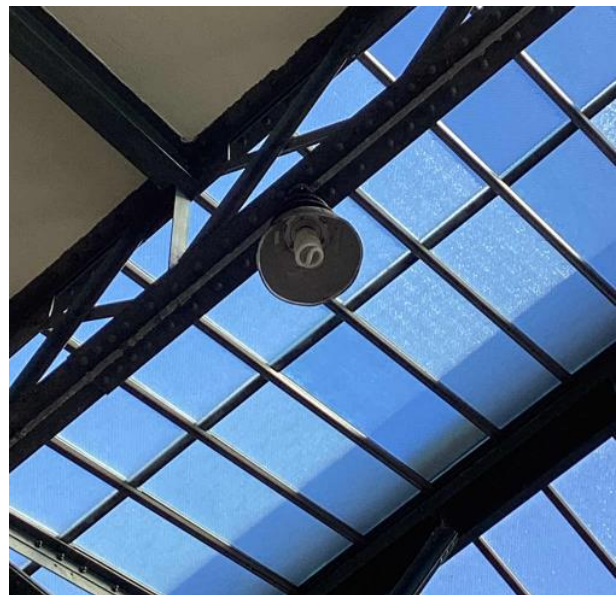
Chiller area CFL



Gate House exterior Incandescent



Security Screening HID



High Bay CFL in CCRNJ Terminal Concourse

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

The CCRNJ Terminal train museum is conditioned by split system heat pumps. The units are in good condition. The units have a cooling capacity of 2 tons, a heating capacity of 27.6 MBh and a heating mode of efficiency of 8.0 HSPF.



Train Museum Mini-Split

Unitary Heating Equipment

The terminal is primarily heated and cooled using circulated hot and chilled water but there are several electric resistance heaters. The chiller building, electrical room, restrooms, and closets are heated using electric resistance heaters.

The Gate House is mainly heated by three furnaces, one of which is no longer operational. Heating for the janitorial closet is supplemented by an electric resistance heater.



Electric Resistance Heat



Electric Resistance Heat

Packaged Units

The Security Screening Center is served with gas-fired packaged units. The units are controlled by room thermostats. These 13.5 EER units have a heating capacity of 12.2 MBh and 12.5-ton cooling capacity. These units are not equipped with VFD or economizer but are in good condition and operating within their useful life.

The security screening center is served by multiple packaged roof top units, including:

Unit	Area Served	Size (Tons)	Heating Capacity Output (kWh)
RTU-1	Security Screening Center	12.5	54
RTU-2	Security Screening Center	12.5	54

Refer to Appendix A for detailed information about each unit.



Security Screening Center RTU

Air Handling Units (AHUs)

The first floor of the terminal is conditioned by air-handling units which are each equipped with a supply fan, cooling coil, and hot water coil. These units are located above the ceiling and were inaccessible during the audit. There are two additional makeup air units that serve the train terminal. Supply fan motor data was provided by facility staff. They were reportedly fractional horsepower multi-speed ECM fan motors.

Cooling is provided by outdoor chiller and the heating source is provided by the condensing hot water boiler. Note that these units are called as they are named in the BMS at the time of the audit.

- AHU-2 serves the first-floor hallway,
- AHU-3 serves Main Atrium, Restrooms & Restroom Corridor, AHU-4 serves the Main Atrium
- AHU 5 serves the Old Security Screening Office,
- AHU 6 serves the Old Security Screening Office,
- AHU-7 serves the Old Security Screening Office,
- RTU-1 is a makeup air unit that serves the train terminal,
- RTU-2 is also a makeup air unit serving the train terminal,
- RTU-10 serves the blue commons auditorium.

RTU 1 and 2 are makeup air units. RTU 10 is a unit with hot water, chilled water, and a glycol loop. It serves the Blue Commons Auditorium.

The HVAC systems are controlled by the facility BAS.



Old Security Office AHU

The rooms and offices in the train terminal are conditioned by fan coil units which are each equipped with a supply fan and hot and chilled water coil; and the conditioning is provided by fans. These units are located above the ceiling and were inaccessible during the audit. The supply fan motor data was provided by the facility. They are all fractional horsepower multi-speed fan motors. Cooling is provided by outdoor chiller and the heating source is provided by the condensing hot water boilers.

- FCU-1 serves the first-floor hallway,
- FCU2-1 serves room 206,
- FCU2-2 serves room 207,
- FCU2-3 serves room 208,
- FCU2-4 serves Ticketing offices and the adjacent office,
- FCU2-5 serves room 211 and the lobby,
- FCU2-6 serves room 216,
- FCU2-7 serves room 218,
- FCU2-8 serves room 201,
- FCU2-9 serves room 202,
- FCU2-10 serves room 203,
- FCU2-11 serves room 204,
- FCU2-12 serves room 205,
- FCU2-13 serves room 221,
- FCU2-14 serves Ellis classroom,
- FCU2-15 serves second floor bathrooms and the corridor,
- FCU3-1 serves room 302,
- FCU3-2 serves room 210 and the corridor,
- FCU3-3 serves 3rd floor center room,
- FCU3-4 serves room 308, 307, and 308 bathroom,
- FCU3-5 serves room 309.

2.6 Heating [Hot Water/Steam] Systems

Two 2,790 MBh condensing hot water boilers serve the CCRNJ Terminal heating load. The burners are fully modulating with a nominal efficiency of 93 percent. The boilers are configured in an automated lead-lag control scheme. Both boilers are required under high load conditions. They are in good condition and operating within their useful life.

The hydronic distribution system is a 3-pipe heating and cooling system.

The boilers are configured in a variable flow primary distribution with six VFD controlled hot water pumps operating with an automated lead-lag control scheme. The boilers provide hot water to unit ventilators, fan coil units, and makeup air units throughout the building and on the roof.

The boilers and pumping system are controlled by the BAS.

RTU 1, 2, and 10 have a heat exchanger that heats a glycol loop for the units to provide heating to the respective spaces.



Condensing hot water boilers in CCRNJ Terminal

2.7 Chilled Water Systems

The chiller plant consists of a one 240-ton, Airstack, R-410A, centrifugal chiller. The chiller consists of 4 modules. The lead module, Module 1 is the primary module. The other three modules are backup and are controlled by the BMS. If the system calls for more cooling an additional module will kick on to serve the cooling load. All the chiller fan motors are VFD controlled. The chiller is configured in a primary-secondary distribution loop with two 30 hp variable flow primary pumps (CHWP 1 and 2). The chiller modules are controlled by BMS and kick on to provide additional cooling as called for by the BMS. They operate in a lead lag fashion.

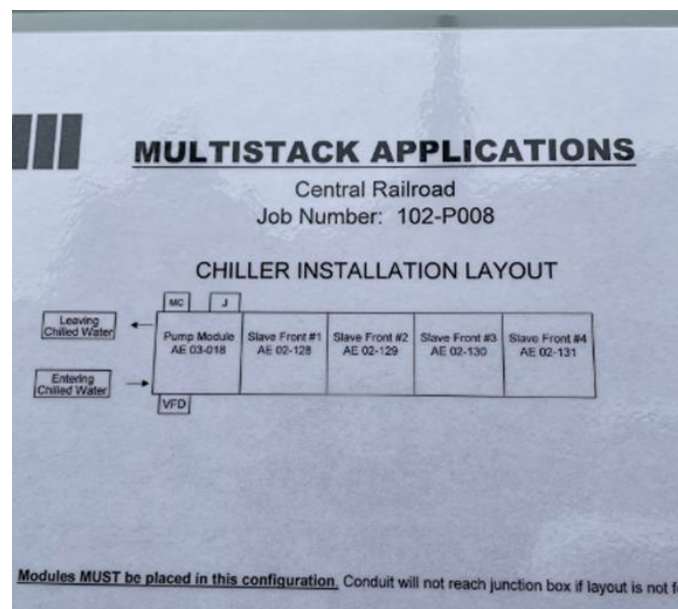
The chiller plant supplies chilled water to air handlers and fan coils inside the building and to the RTU on the roof. The BMS and VFDs stage chillers to meet the load, operating the least number of chiller sections required. The chiller plant is operating within its useful life and is well maintained.



Airstack Chiller



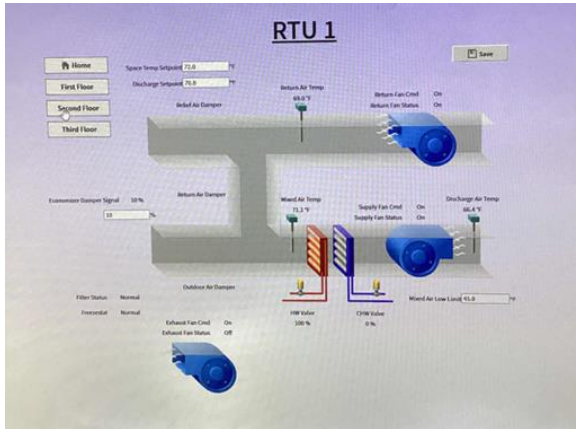
Chilled Water Pumps



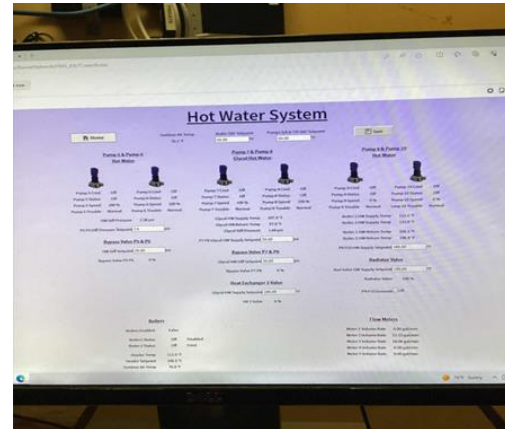
Chiller Configuration

2.8 Building Automation System (BAS)

A BAS controls the HVAC equipment, the boilers, the chiller, the air handlers, and the package units. The BAS provides equipment scheduling control and [monitors and controls] space temperatures, supply air temperatures, humidity, heating water loop temperatures, and chilled water loop temperatures



RTU 1 BMS



Heating Hot Water BMS

2.9 Domestic Hot Water

The hot water for CCRNJ Terminal is produced by several domestic hot water. There are three 50-gallon electric storage tank water heaters, two 12 kW and one that is 4.5 kW. There is also a 10-gallon 6 kW electric storage water heater, a 6-gallon 1.5 kW electric storage water heater, and a 20-gallon 3 kW electric storage water heater. Gate House domestic hot water is produced by a 50 gallon natural gas fired water heater with an input capacity of 40 MBh and a system efficiency of 80%. The Security Screening Center has no water heater.

The domestic hot water pipes in the Gate House requires insulation. CCRNJ Terminal hot water pipes are partially insulated, and the insulation is in fair to poor condition.



CCRNJ Terminal Electric Water Heater



Gate House Gas Water Heater

2.10 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 approximately 20 computer workstations throughout CCRNJ Terminal and approximately 10 in the Security Screening Center. The terminal has the greatest amount of electrical plug load. It has typical café equipment such as refrigerators, microwaves, and water coolers. and general office equipment such as printers, desktops, and copy machines. Residential style refrigerators throughout the building are used to store employee meals. These vary in condition and efficiency. The Security Screening Center has general café equipment, X ray, and metal detector machines. The only plug load noted in the Gate House were hand dryers and automatic fences.



Security Screening Center Metal Detector



Gate House Hand Dryers



Terminal Walkie-Talkie Charging Dock



Gate House Automatic Fence

2.11 Water-Using Systems

Water is mainly provided by a municipal water supply company.

Potable water is used for drinking, cleaning, and sanitary fixtures. Water leaks were not observed.

EPA WaterSense® has set maximum flow rates for sanitary fixtures. They are: 1.28 gallons per flush (gpf) for toilets, 0.5 gpf for urinals, 1.5 gallons per minute (gpm) for lavatory faucets, and 2.0 gpm for showerheads.

There are approximately three restrooms with toilets, urinals, and sinks in the terminal. Faucet flow rates are at 1.7 gallons per minute (gpm) or higher. The Gate House has two restrooms both with faucet flow rate rated at or above 2 gallons per minute. The Security Screening Center has no water using systems.



CCRNJ Terminal Restroom Sink

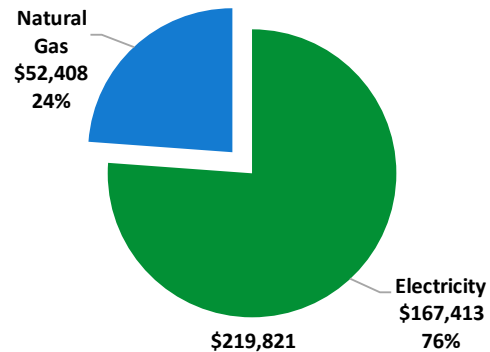


Gate House Restroom Sink

3 ENERGY AND WATER USE AND COSTS

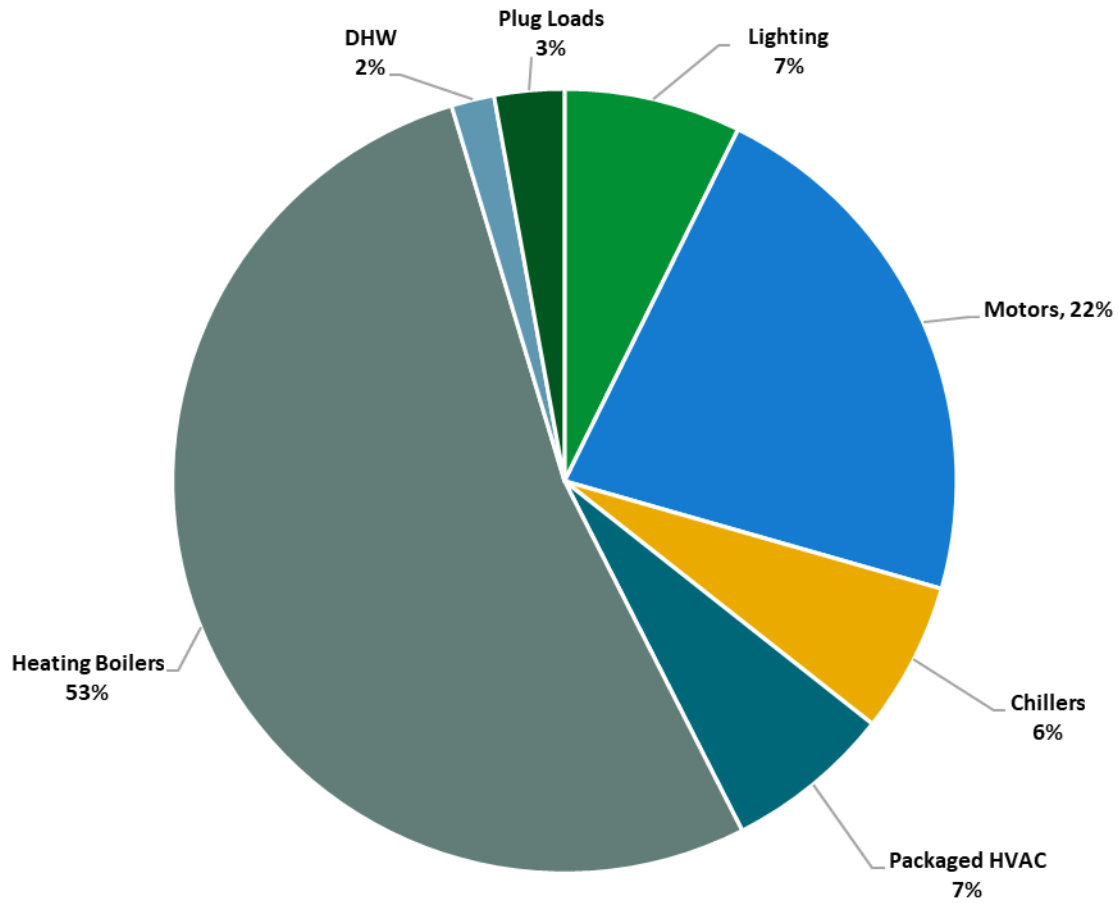
Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	Usage	Cost
Electricity	1,056,900 kWh	\$167,413
Natural Gas	43,591 Therms	\$52,408
Total		\$219,821



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.

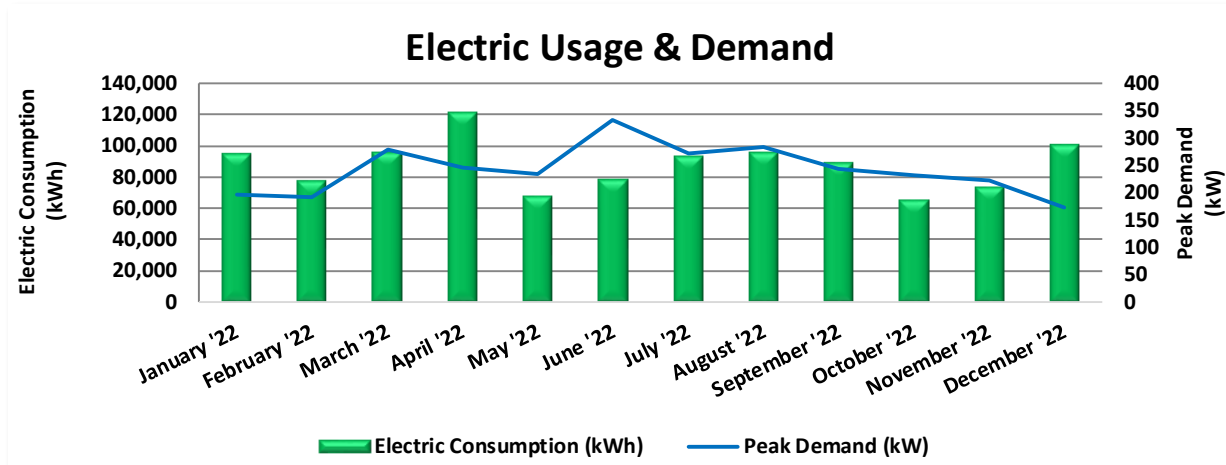
The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated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



Energy Balance by System

3.1 Electricity

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



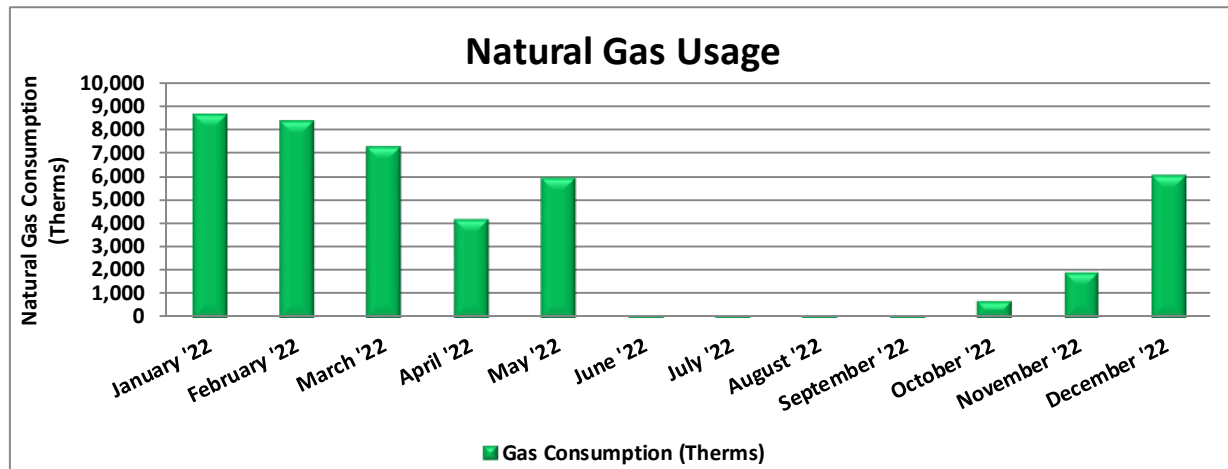
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
1/20/22	34	95,257	197	760	13,759
2/17/22	28	78,704	191	739	11,523
3/21/22	32	96,612	278	1,070	14,288
4/20/22	30	122,399	247	1,224	18,396
5/19/22	29	68,129	234	1,182	10,245
6/20/22	32	79,273	334	4,413	15,126
7/20/22	30	93,936	273	3,752	16,422
8/18/22	29	96,658	284	3,903	17,349
9/19/22	32	90,058	244	3,215	15,825
10/18/22	29	66,094	232	1,050	9,927
11/16/22	29	73,802	223	1,012	10,927
12/19/22	33	101,770	172	785	14,544
Totals	367	1,062,692	334	\$23,107	\$168,330
Annual	365	1,056,900	334	\$22,981	\$167,413

Notes:

- Peak demand of 334 kW occurred in June '22.
- Average demand over the past 12 months was 242 kW.
- The average electric cost over the past 12 months was \$0.158/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.
- The high electric usage in April is attributed to the security center moving out of the train terminal and into the stand alone structure they currently operate in.

3.2 Natural Gas

PSE&G delivers natural gas under rate class Large Volume Gas , with natural gas supply provided by UGI, a third-party supplier.



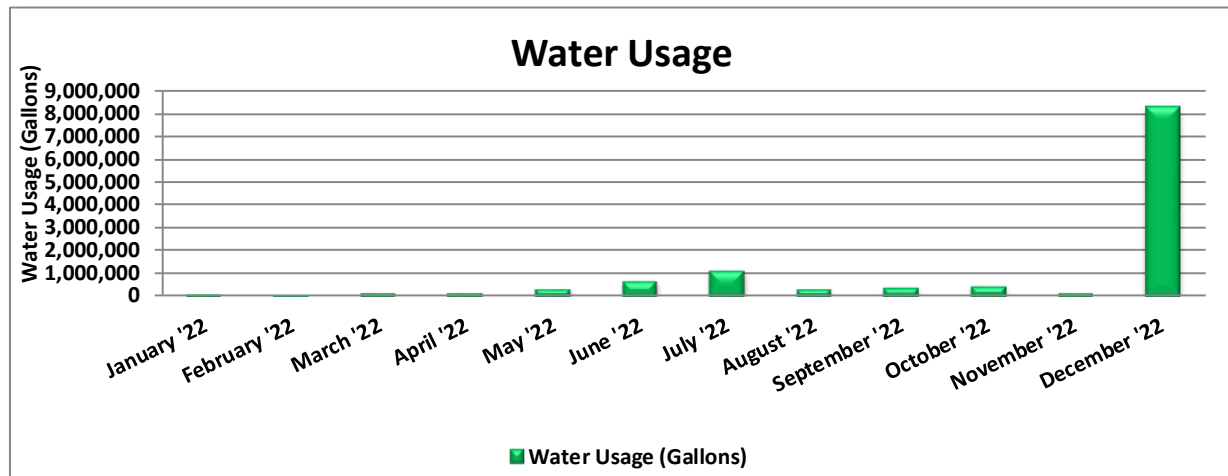
Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
1/19/22	33	8,687	\$8,989
2/17/22	29	8,427	\$9,927
3/21/22	32	7,318	\$8,576
4/21/22	31	4,193	\$4,262
5/19/22	28	5,986	\$6,936
6/17/22	29	46	\$235
7/20/22	33	37	\$229
8/18/22	29	4	\$195
9/16/22	29	17	\$208
10/17/22	31	729	\$1,114
11/15/22	29	1,944	\$3,508
12/16/22	31	6,084	\$8,087
Totals	364	43,471	\$52,265
Annual	365	43,591	\$52,408

Notes:

- The average gas cost for the past 12 months is \$1.202/therm, which is the blended rate used throughout the analysis.

Water

Jersey City Municipal Utilities Authority / Veolia delivers water to the project site.



Water Billing Data			
Period Ending	Days in Period	Water Usage (gallons)	Water Cost
2/14/22	35	135,397	\$1,214.84
3/8/22	22	64,332	\$641.75
4/11/22	34	176,540	\$1,495.84
5/6/22	25	171,304	\$1,363.37
6/6/22	31	330,639	\$2,441.26
7/11/22	35	694,192	\$4,793.86
8/9/22	29	1,131,055	\$7,501.72
9/1/22	23	324,655	\$2,315.07
10/5/22	34	389,735	\$2,849.59
11/7/22	33	442,847	\$3,175.81
12/5/22	28	159,335	\$1,320.44
1/11/23	37	8,301,881	\$53,123.41
Totals	366	12,321,913	\$82,237
Annual	365	12,288,246	\$82,012

Notes:

- The average cost of water for the past 12 months is \$0.0067/gal.
- This site has landscape irrigation during the summer months for irrigation. The sprinkler system is on a timer and has a rain meter. The sprinkler system on operates during the summer. Additionally, water metering is connected to the marina which may also be the reason for the unusually high water usage.
- There seems to be a substantial in water usage during December 2022 and January of 2023. This may partly be due to a series of estimated meter readings in the preceding months. This may have been an isolated incident, but we suggest tracking water use patterns, especially during the winter months.
- Water benchmarking has not been provided for this site because metered water is allocated to areas not included in this report.

3.3 Benchmarking

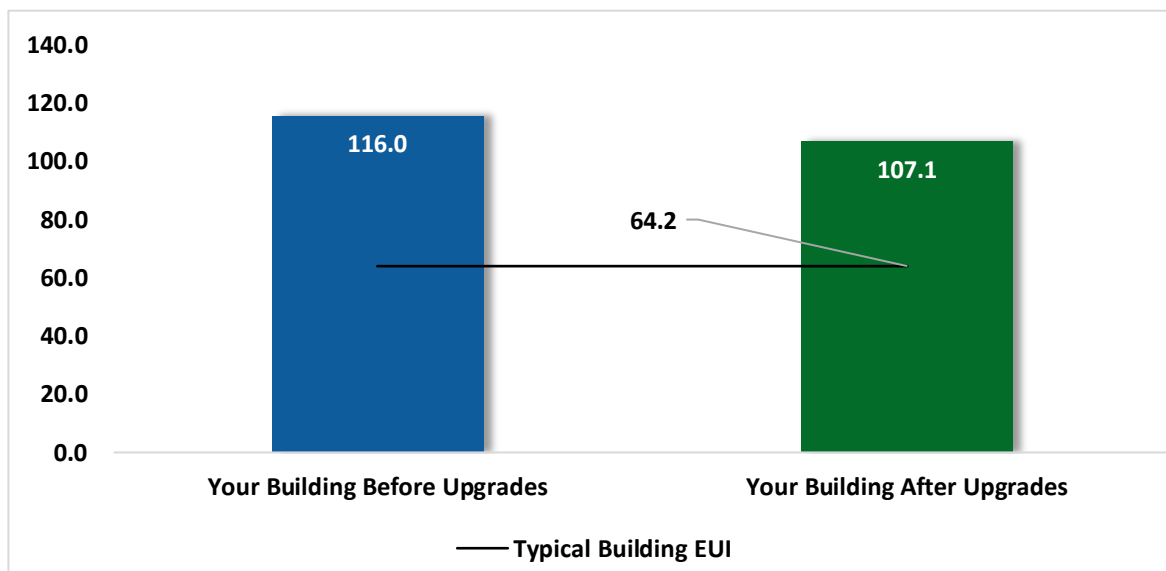
Your building was benchmarked using the United States Environmental Protection Agency's (EPA) Portfolio Manager® software. Benchmarking compares your building's energy use to that of similar buildings across the country, while neutralizing variations due to location, occupancy, and operating hours. Some 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.



Energy Use Intensity Comparison⁴

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.

⁴ Based on all evaluated ECMs

Water Benchmarking

A benchmark is not provided for your building's water use because the water which is metered to this building is also used elsewhere, and it would not be possible to calculate the annual water use in gallons per square foot of building area (gal/sf-yr).

Water use varies considerably depending mainly on the extent of outdoor water use and whether process water is used, such as for vehicle washing and for laboratory sterilizers. Cooling towers and steam boilers are also significant water users. Kitchens and sanitary fixtures may use varying amounts of water.

Tracking your Energy Performance

Keeping track of your energy and water use on a monthly basis is one of the best ways to keep utility costs in check and keep your facility operating efficiently. 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](#).

3.4 Understanding Your Utility Bills

The State of New Jersey Department of the Public Advocate provides detailed information on how to read natural gas and electric bills. Your bills contain important information including account numbers, meter numbers, rate schedules, meter readings, and the supply and delivery charges. Gas and electric bills both provide comparisons of current energy consumption with prior usage.

Sample bills, with annotation, may be viewed at:

https://www.nj.gov/rpa/docs/Understanding_Electric_Bill.pdf

https://www.nj.gov/rpa/docs/Understanding_Gas_Bill.pdf

Why Utility Bills Vary

Utility bills vary from one month to another for many reasons. For this reason, assessing the effects of your energy savings efforts can be difficult.

Billing periods vary, typically ranging between 28 and 33 days. Electric bills provide the kilowatt-hours (kWh) used per month while gas bills provide therms (or hundreds of cubic feet - CCF) per month consumption information. Monthly consumption information can be helpful as a tool to assess your efforts to reduce energy, particularly when compared to monthly usage from a similar calendar period in a prior year.

Bills typically vary seasonally, often with more gas consumed in the winter for heating, and more electricity used in the summer when air conditioning is used. Facilities with electric heating may experience higher electricity use in the winter. Seasonal variance will be impacted by the type of heating and cooling systems used. Normal seasonal fluctuations are further impacted by the weather. Extremely cold or hot weathers causes HVAC equipment to run longer, increasing usage. Other monthly fluctuations in usage can be caused by changes in building occupancy. Utility bills provide a comparison of usage between the current period and comparable billing month period of the prior year. Year-to-year monthly use comparisons can point to trends with energy savings for measures/projects that were implemented within the timeframe, but these comparisons do not account for changing weather or occupancy patterns.

The price of fuel and purchased power used to produce and delivery electricity and gas fluctuates. Any increase or decrease in these costs will be reflected in your monthly bill. Additionally, billing rates occasionally change after justification and approval of the NJBPU. For this reason, it is more useful to review energy use rather than cost when assessing energy use trends or the impact of energy conservation measures implemented.

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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades			71,030	15.0	-15	\$11,072	\$39,580	\$4,290	\$35,290	3.2	69,782
ECM 1	Install LED Fixtures	Yes	9,986	2.3	-2	\$1,557	\$12,720	\$1,000	\$11,720	7.5	9,811
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,848	0.4	0	\$288	\$780	\$90	\$690	2.4	1,814
ECM 3	Retrofit Fixtures with LED Lamps	Yes	59,197	12.2	-12	\$9,227	\$26,080	\$3,200	\$22,880	2.5	58,157
Lighting Control Measures			21,417	4.6	-5	\$3,338	\$25,570	\$5,960	\$19,610	5.9	21,032
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	15,816	3.9	-3	\$2,465	\$19,960	\$2,360	\$17,600	7.1	15,532
ECM 5	Install High/Low Lighting Controls	Yes	5,601	0.7	-1	\$873	\$5,610	\$3,600	\$2,010	2.3	5,501
Variable Frequency Drive (VFD) Measures			76,664	10.7	0	\$12,144	\$63,900	\$3,500	\$60,400	5.0	77,200
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	76,664	10.7	0	\$12,144	\$63,900	\$3,500	\$60,400	5.0	77,200
Unitary HVAC Measures			1,638	2.9	0	\$260	\$15,200	\$600	\$14,600	56.3	1,650
ECM 7	Install High Efficiency Heat Pumps	No	1,638	2.9	0	\$260	\$15,200	\$600	\$14,600	56.3	1,650
Gas Heating (HVAC/Process) Replacement			0	0.0	24	\$293	\$8,400	\$1,500	\$6,900	23.6	2,853
ECM 8	Install High Efficiency Furnaces	No	0	0.0	24	\$293	\$8,400	\$1,500	\$6,900	23.6	2,853
HVAC System Improvements			2,152	0.0	0	\$341	\$350	\$50	\$300	0.9	2,167
ECM 9	Install Pipe Insulation	Yes	2,152	0.0	0	\$341	\$350	\$50	\$300	0.9	2,167
Domestic Water Heating Upgrade			1,807	0.0	0	\$286	\$140	\$60	\$80	0.3	1,820
ECM 10	Install Low-Flow DHW Devices	Yes	1,807	0.0	0	\$286	\$140	\$60	\$80	0.3	1,820
Custom Measures			3,693	0.0	0	\$585	\$2,900	\$0	\$2,900	5.0	3,719
ECM 11	Replace Electric Water Heater with Heat Pump Water Heater	Yes	3,693	0.0	0	\$585	\$2,900	\$0	\$2,900	5.0	3,719
TOTALS			178,402	33.1	5	\$28,318	\$156,040	\$15,960	\$140,080	4.9	180,223

* - 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).

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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		71,030	15.0	-15	\$11,072	\$39,580	\$4,290	\$35,290	3.2	69,782
ECM 1	Install LED Fixtures	9,986	2.3	-2	\$1,557	\$12,720	\$1,000	\$11,720	7.5	9,811
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,848	0.4	0	\$288	\$780	\$90	\$690	2.4	1,814
ECM 3	Retrofit Fixtures with LED Lamps	59,197	12.2	-12	\$9,227	\$26,080	\$3,200	\$22,880	2.5	58,157
Lighting Control Measures		21,417	4.6	-5	\$3,338	\$25,570	\$5,960	\$19,610	5.9	21,032
ECM 4	Install Occupancy Sensor Lighting Controls	15,816	3.9	-3	\$2,465	\$19,960	\$2,360	\$17,600	7.1	15,532
ECM 5	Install High/Low Lighting Controls	5,601	0.7	-1	\$873	\$5,610	\$3,600	\$2,010	2.3	5,501
Variable Frequency Drive (VFD) Measures		76,664	10.7	0	\$12,144	\$63,900	\$3,500	\$60,400	5.0	77,200
ECM 6	Install VFDs on Constant Volume (CV) Fans	76,664	10.7	0	\$12,144	\$63,900	\$3,500	\$60,400	5.0	77,200
HVAC System Improvements		2,152	0.0	0	\$341	\$350	\$50	\$300	0.9	2,167
ECM 9	Install Pipe Insulation	2,152	0.0	0	\$341	\$350	\$50	\$300	0.9	2,167
Domestic Water Heating Upgrade		1,807	0.0	0	\$286	\$140	\$60	\$80	0.3	1,820
ECM 10	Install Low-Flow DHW Devices	1,807	0.0	0	\$286	\$140	\$60	\$80	0.3	1,820
Custom Measures		3,693	0.0	0	\$585	\$2,900	\$0	\$2,900	5.0	3,719
ECM 11	Replace Electric Water Heater with Heat Pump Water Heater	3,693	0.0	0	\$585	\$2,900	\$0	\$2,900	5.0	3,719
TOTALS		176,763	30.2	-19	\$27,765	\$132,440	\$13,860	\$118,580	4.3	175,720

* - 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).

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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		71,030	15.0	-15	\$11,072	\$39,580	\$4,290	\$35,290	3.2	69,782
ECM 1	Install LED Fixtures	9,986	2.3	-2	\$1,557	\$12,720	\$1,000	\$11,720	7.5	9,811
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,848	0.4	0	\$288	\$780	\$90	\$690	2.4	1,814
ECM 3	Retrofit Fixtures with LED Lamps	59,197	12.2	-12	\$9,227	\$26,080	\$3,200	\$22,880	2.5	58,157

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 HID and fluorescent 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: the old security office in the terminal and the Security Screening Center exterior fixtures

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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

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

Affected Building Areas: T-12 lamps in the clock tower, restrooms, and the Gate House power room

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. 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: Ticket Office, Blue Common Auditorium, elevator room, lobby of old security office, offices 202 – 211, 216, 306A, 308, 201, 218, restrooms, restroom corridors, Gate House office area, and attic space

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 ₂ e Emissions Reduction (lbs)
Lighting Control Measures		21,417	4.6	-5	\$3,338	\$25,570	\$5,960	\$19,610	5.9	21,032
ECM 4	Install Occupancy Sensor Lighting Controls	15,816	3.9	-3	\$2,465	\$19,960	\$2,360	\$17,600	7.1	15,532
ECM 5	Install High/Low Lighting Controls	5,601	0.7	-1	\$873	\$5,610	\$3,600	\$2,010	2.3	5,501

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: offices, blue commons auditorium, the chiller building, the electrical room, the closets, storage rooms, and restrooms in both the Train Terminal and Gate House

ECM 5: Install High/Low Lighting Controls

Install occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons.

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety code requirements for egress. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. In parking lots and parking garages with significant ambient lighting, this control can sometimes be combined with photocell controls to turn the lights off when there is sufficient daylight.

The controller lowers the light level by dimming the fixture output. Therefore, the controlled fixtures need to have a dimmable ballast or driver. This will need to be considered when selecting retrofit lamps and bulbs for the areas proposed for high/low control.

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

This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

Affected Building Areas: all corridors in the terminal

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 ₂ e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		76,664	10.7	0	\$12,144	\$63,900	\$3,500	\$60,400	5.0	77,200
ECM 6	Install VFDs on Constant Volume (CV) Fans	76,664	10.7	0	\$12,144	\$63,900	\$3,500	\$60,400	5.0	77,200

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 6: 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.

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

Affected Air Handlers: CCRNJ Terminal makeup air fans and exhaust fan; Security Screening Center packaged units

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 ₂ e Emissions Reduction (lbs)
Unitary HVAC Measures		1,638	2.9	0	\$260	\$15,200	\$600	\$14,600	56.3	1,650
ECM 7	Install High Efficiency Heat Pumps	1,638	2.9	0	\$260	\$15,200	\$600	\$14,600	56.3	1,650

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

ECM 7: Install High Efficiency Heat Pumps

We evaluated replacing standard efficiency heat pumps with high efficiency heat pumps. 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: heat pumps 1, 2, 3

4.5 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		0	0.0	24	\$293	\$8,400	\$1,500	\$6,900	23.6	2,853
ECM 8	Install High Efficiency Furnaces	0	0.0	24	\$293	\$8,400	\$1,500	\$6,900	23.6	2,853

ECM 8: Install High Efficiency Furnaces

We evaluated replacing standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases, which can significantly improve furnace efficiency. Savings result from improved system efficiency.

Note: these units produce acidic condensate that require proper drainage.

Affected Units: Gate House furnaces

4.6 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
HVAC System Improvements		2,152	0.0	0	\$341	\$350	\$50	\$300	0.9	2,167
ECM 9	Install Pipe Insulation	2,152	0.0	0	\$341	\$350	\$50	\$300	0.9	2,167

ECM 9: Install Pipe Insulation

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

Affected Systems: chilled water piping, hot water piping, and domestic hot water piping in the terminal; domestic hot water piping in the Gate House

4.7 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 ₂ e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		1,807	0.0	0	\$286	\$140	\$60	\$80	0.3	1,820
ECM 10	Install Low-Flow DHW Devices	1,807	0.0	0	\$286	\$140	\$60	\$80	0.3	1,820

ECM 10: 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.

4.8 Custom 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 ₂ e Emissions Reduction (lbs)
Custom Measures		3,693	0.0	0	\$585	\$2,900	\$0	\$2,900	5.0	3,719
ECM 11	Replace Electric Water Heater with Heat Pump Water Heater	3,693	0.0	0	\$585	\$2,900	\$0	\$2,900	5.0	3,719

ECM 11: Replace Electric Water Heater with Heat Pump Water Heater

Replace the existing 50-gallon electric water heater in the train terminal storage with a heat pump water heater (HPWH).

A typical electric water heater uses electric resistance coils to heat water at a coefficient of performance (COP) of 1. Air source heat pump water heaters use a refrigeration cycle to transfer heat from the surrounding air to the domestic water. The typical average COP for a HPWH is about 2.5, so they require significantly less electricity to produce the same amount of hot water as a traditional electric water heater. There are two types of HPWH, those integrated with the heat pump and storage tank in the same unit, and those that are split into two sections (with the storage tank separate from the heat pump). The following addresses integrated HPWH.

HPWH reject cold air. As such, they need to be installed in an unconditioned space of about 750 cubic feet with good ventilation. Ideal locations are garages, large enclosed, unconditioned storage areas, or areas with excess heat such as a furnace or boiler room.⁵ The HPWH will also produce condensate so accommodations for draining the condensate need to be provided.

Most HPWH operate effectively down to an air temperature of 40 °F. Below that temperature, an electric resistance booster heater is typically required to achieve full heating capacity. It is critical that the HPWH controls are set up so that the electric resistance heat only engages when the air temperature is too cold for the HPWH to extract heat from it. HPWHs have a slow recovery. During periods of high demand, the electric resistance heating element, if enabled, may be energized to maintain set point, thus reducing the overall efficiency of the unit. It is recommended that a careful analysis of the hot water demand be conducted to determine if the application makes economic sense, and the HPWH heating capacity and storage are properly sized.

HPWH operate most effectively when the temperature difference between the incoming and outgoing water is high. Generally, this means that cold make-up water should be piped to the bottom of the tank and return water should be piped to the top of the tank to maintain stratification within the storage tank. Water should be drawn from the bottom of the tank to be heated. If there is a DHW recirculation pump, it should only be operated during high hot water demand periods.

Affected Units: 50-gallon electric storage tank water heater in the CCRNJ Terminal storage room

⁵<https://basc.pnnl.gov/code-compliance/heat-pump-water-heaters-code-compliance-brief#:~:text=HPWH%20must%20have%20unrestricted%20airflow,depending%20on%20size%20of%20system>

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 emissions⁶. 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.

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-

⁶ <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>

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 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.

Economizer Maintenance

Economizers can significantly reduce cooling system load. A malfunctioning economizer can increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air. Common economizer malfunctions include broken outdoor thermostat or enthalpy control or dampers that are stuck or improperly adjusted.

Periodic inspection and maintenance will keep economizers working in sync with the heating and cooling system. This maintenance should be part of annual system maintenance, and it should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position.

Chiller Maintenance

Service chillers regularly to keep them operating properly. Chillers are responsible for a substantial portion of a commercial building's overall energy usage, and when they do not work well, there is usually a noticeable increase in energy bills and increased occupant complaints. Regular diagnostics and service can save five to ten percent of the cost of operating your chiller. If you already have a maintenance contract in place, your existing service company should be able to provide these services.

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.

Ductwork Maintenance

Duct maintenance has two primary goals: keep the ducts clean to avoid air quality problems and seal leaks to save energy. Check for cleanliness, obstructions that block airflow, water damage, and leaks. Ducts should be inspected at least every two years.

The biggest symptoms of clogged air ducts are differing temperatures throughout the building and areas with limited airflow from supply registers. If a particular air duct is clogged, then air flow will only be cut off to some rooms in the building—not all of them. The reduced airflow will make it more difficult for those areas to reach the temperature setpoint, which will cause the HVAC system to run longer to cool or heat that area properly. If you suspect clogged air ducts, ensure that all areas in front of supply registers are clear of items that may block or restrict air flow, and you should check for fire dampers or balancing dampers that have failed closed.

Duct leakage in commercial buildings can account for 5%–25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building wasting conditioned air. Check ductwork for leakage. Eliminating duct leaks can improve ventilation system performance and reduce heating and cooling system operation.

Distribution system losses are dependent on air system temperature, the size of the distribution system, and the level of insulation of the ductwork. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is missing or worn, the system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

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.

Label HVAC Equipment

For improved coordination in maintenance practices, we recommend labeling or re-labeling the site HVAC equipment. Maintain continuity in labeling by following labeling conventions as indicated in the facility drawings or BAS building equipment list. Use weatherproof or heatproof labeling or stickers for permanence, but do not cover over original equipment nameplates, which should be kept clean and readable whenever possible. Besides equipment, label piping for service and direction of flow when possible. Ideally, maintain a log of HVAC equipment, including nameplate information, asset tag designation, areas served, installation year, service dates, and other pertinent information.

This investment in your equipment will enhance collaboration and communication between your staff and your contracted service providers and may help you with regulatory compliance.

Optimize HVAC Equipment Schedules

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

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

Water Heater Maintenance

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

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

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

Compressed Air System Maintenance

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

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

Procurement Strategies

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

6 WATER BEST PRACTICES

Getting Started



The commercial and institutional sector is the second largest consumer of publicly supplied water in the United States, accounting for 17% of the withdrawals from public water supplies⁷. In New Jersey, excluding water used for power generation, approximately 80% of total water use was attributed to potable supply during the period of 2009 to 2018. Water withdrawals for potable supply have not changed noticeably during the period from 1990 to 2018⁸.

Water management planning serves as the foundation for any successful water reduction effort. It is the first step a commercial or institutional facility owner or manager should take to achieve and sustain long-term water savings. Understanding how water is used within a facility is critical for the water management planning process. A water assessment provides a comprehensive account of all known water uses at the facility. It allows the water management team to establish a baseline from which progress and program success can be measured. It also enables the water management team to set achievable goals and identify and prioritize specific projects based on the relative savings opportunities and project cost-effectiveness.

Water conservation devices may significantly reduce your water and sewer usage costs. Any reduction in water use reduces grid-level electricity use since a significant amount of electricity is used to treat and deliver water from reservoirs to end users.

For more information regarding water conservation or additional details regarding the practices shown below go to the EPA's WaterSense website⁹ or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"¹⁰ to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water Metering and Submetering

Tracking a facility's total water use, as well as specific end uses, is a key component of a facility's water-efficiency efforts. Accurately measuring water use can help facility managers identify areas for targeted reductions and track progress from water-efficiency upgrades. If possible, install meters to measure all water conveyed to the facility, regardless of the source. Each source should be metered separately. Consider developing a metering plan and installing separate submeters to measure specific end uses. There are many types and sizes of meters intended for different uses. Installing the correct type and size of meter are critical to accurate water measurement. Sub-metering applications may include:

⁷ Estimated from analyzing data in: [Solley, Wayne B., et al, "Estimated Use of Water in the United States in 1995", U.S Geological Survey Circular 1200, \(1998\)](#)

⁸ <https://dep.nj.gov/wp-content/uploads/dsr/trends-water-supply.pdf>

⁹ <https://www.epa.gov/watersense>

¹⁰ <https://www.epa.gov/watersense/watersense-work-0>

- Individual tenant spaces
- Cooling tower make-up and blowdown water supply
- Water lines serving other HVAC systems including water circulating loops
- Make up water supply for steam boiler plants with a capacity of 500,000 Btu/hr or greater
- Systems or equipment that use single pass cooling water
- Irrigation systems
- Roof spray systems (for irrigating vegetated roofs or thermal conditioning)
- Ornamental water features
- Indoor and outdoor pools and spas
- Industrial water using processes

Leak Detection and Repair

Identifying and repairing leaks and other water use anomalies within a facility's water distribution system or from processes or equipment can keep a facility from wasting significant quantities of water. Examples of common leaks include leaking toilets and faucets, drip irrigation malfunctions, stuck float valves, and broken distribution lines. Reading meters, installing failure abatement technologies, and conducting visual and auditory inspections are important best practices to detect leaks. Train building occupants, employees, and visitors to report any leaks that they detect. To reduce unnecessary water loss, detected leaks should be repaired quickly. Repairing leaks in water distribution that is pressurized by on-site pumps or in heated or chilled water piping will also reduce energy use.

Toilets and Urinals

Toilets and urinals are considered sanitary fixtures and are found in most facilities. High efficiency fixtures are at least 20% more efficient than available standard products. Leaking or damaged equipment is a substantial source of water waste. Train users to report continuously flushing, leaking, or otherwise improperly operating equipment to the appropriate personnel. Depending on the age of the equipment and the frequency of use, it may be cost effective to replace older inefficient fixtures with current generation WaterSense labeled equipment.

Commercial facilities typically use tank toilets or wall-mount flushometers. Educate and inform users with restroom signage and other means to avoid flushing inappropriate objects. For tank toilets, periodically check to ensure fill valves are working properly and that water level is set correctly. Annually test toilets to ensure the flappers are not worn or allowing water to seep from the tank into the bowl and down the sewer. Control stops and piston valves on flushometer toilets should be checked at least annually.

Most urinals use water to flush liquid. These standard single-user fixtures are present in most facilities. Non-water urinals use a specially designed trap that allows liquid waste to drain out of the fixture through a trap seal, and into the drainage system. Flushing urinals should be inspected at least annually for proper valve and sensor operation. For non-water urinals, follow maintenance practices as directed by the manufacturer to ensure products perform as expected. Non-water urinals can be considered during urinal replacement, however, review the condition and design of the existing plumbing system and the expected usage patterns to ensure that these products will provide the anticipated performance.

Faucets and Showerheads

Faucets and showerheads are sanitary fixtures that generally dispense heated water. Reducing water use by these fixtures translates into a reduction of site fuel or electric use depending on how water is heated. High efficiency fixtures are at least 20% more efficient than available standard products. Leaking or damaged equipment is a substantial source of water waste. Train users to report continuously dripping, leaking, or otherwise improperly operating equipment to the appropriate personnel. Depending on the

age of the equipment and the frequency of use, it may be cost effective to replace older fixtures with current generation WaterSense labeled equipment.

Faucets are used for a variety of purposes, and standard flow rates are dictated by the intended use. Public use lavatory faucets and kitchen faucets are subject to maximum flow rates while service sinks are not. Periodically inspect faucet aerators for scale buildup to ensure flow is not being restricted. Clean or replace the aerator or other spout end device as needed. Check and adjust automatic sensors (where installed) to ensure they are operating properly to avoid faucets running longer than necessary. Post materials in restrooms and kitchens to ensure user awareness of the facility's water-efficiency goals. Remind users to turn off the tap when they are done and to consider turning the tap off during sanitation activities when it is not being used. Consider installing lavatory and kitchen faucet fixtures with reduced flow. Federal standards limit kitchen and restroom faucet flows to 2.2 gpm. To qualify for a WaterSense label a faucet cannot exceed 1.5 gpm.

Effective in 1992, the maximum allowable flow rate for all showerheads sold in the United States is 2.5 gpm. Since this standard was enacted, many showerheads have been designed to use even less water. WaterSense labeled equipment is designed to use 2.0 gpm, or less. For optimum showerhead efficiency, the system pressure should be tested to make sure that it is between 20 and 80 pounds per square inch (psi). Verify that plumbing lines are routed through a shower valve to prevent water pressure fluctuations. Periodically inspect showerheads for scale buildup to ensure flow is not being restricted. In general, replace showerheads with 2.5 gpm flow rates or higher with WaterSense labeled models. Note: Use of poor performing replacement reduced flow showerheads may result in increased use if the duration of use is increased to compensate for reduced performance. WaterSense labeled showerheads are independently certified to meet or exceed minimum performance requirements for spray coverage and force.

Landscaping and Irrigation

Most facilities that own or maintain surrounding landscape will have outdoor water use. The amount of outdoor water use is dictated by the size and design of the landscape and the need for supplemental irrigation. Studies show that average landscape water use in the institutional sector can range from 7% of total water use for hospitals, 22% for office buildings, and up to 30% for schools.

Proper landscape design can help minimize outdoor water use. Regionally appropriate plant choices, healthy soils with appropriate grading, the use of mulches, and limiting the use of high water-using plants such as turfgrass can significantly reduce the need for supplemental irrigation. In addition, proper design, installation, and maintenance of irrigation equipment can have a dramatic impact on outdoor water use.

- Retain a landscape professional certified in water-efficient landscaping.
- Maintain soil quality by applying mulch, soil amendments, and good topsoil.
- Maintain existing plants by manually pulling weeds, raising the blade on mowers, and including shaded areas in the overall landscape design.
- Minimize water used for hardscape cleaning and use recycled or reclaimed water where applicable, especially in water features.

Irrigation system optimization combines efficient irrigation practices with efficient technologies and can be complex. Irrigation professionals who are properly educated on water-efficient practices can help ensure that existing irrigation systems are efficiently operated and properly maintained. In general, plan for or adjust irrigation systems to prevent over (or under) watering.

- Improve distribution uniformity so water is evenly applied over the landscape.
- Irrigation schedules should be updated based on changing weather conditions.
- In general, apply water in larger amounts, but less frequently, resulting in deep watering.
- If a dedicated landscape water meter is installed, incorporate an outdoor water budget.
- Routinely look for leaks, overwatering, or overspray.
- Require a full irrigation system audit every 3 years by a qualified irrigation auditor.
- Consider drip irrigation systems for plant beds as they can reduce irrigation water use by 20% to 50% as compared to traditional sprinklers.
- More efficient sprinkler heads can reduce irrigation water use by 30%.
- Smart irrigation controllers can schedule irrigation based on weather data or on-site conditions, reducing irrigation water use by 15% compared to manual or clock timer irrigation systems.

7 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.

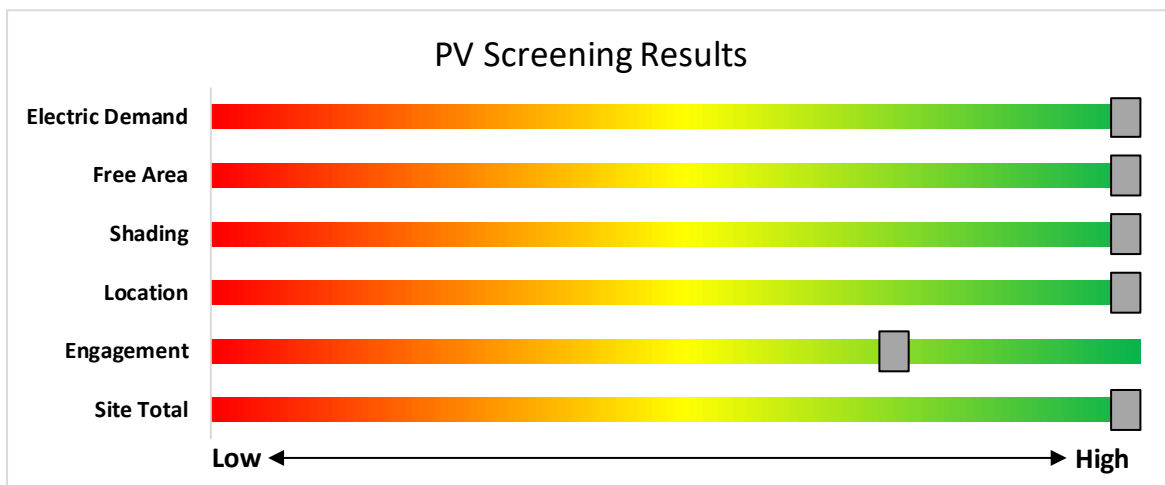
7.1 Solar Photovoltaic

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	160	kW DC STC
Electric Generation	190,619	kWh/yr
Displaced Cost	\$30,190	/yr
Installed Cost	\$416,000	

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:** <http://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:** http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

7.2 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.

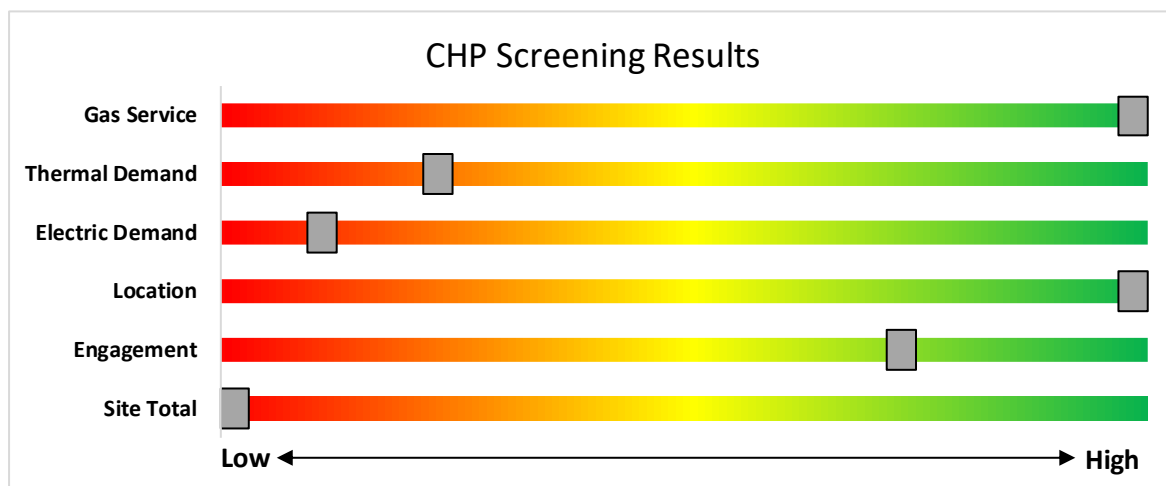
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be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



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/

8 ELECTRIC VEHICLES

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.

8.1 EV 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.

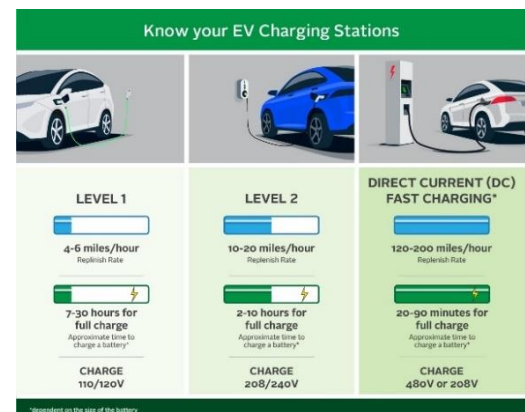
The preliminary assessment of EV charging at the facility shows that there is medium potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

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.

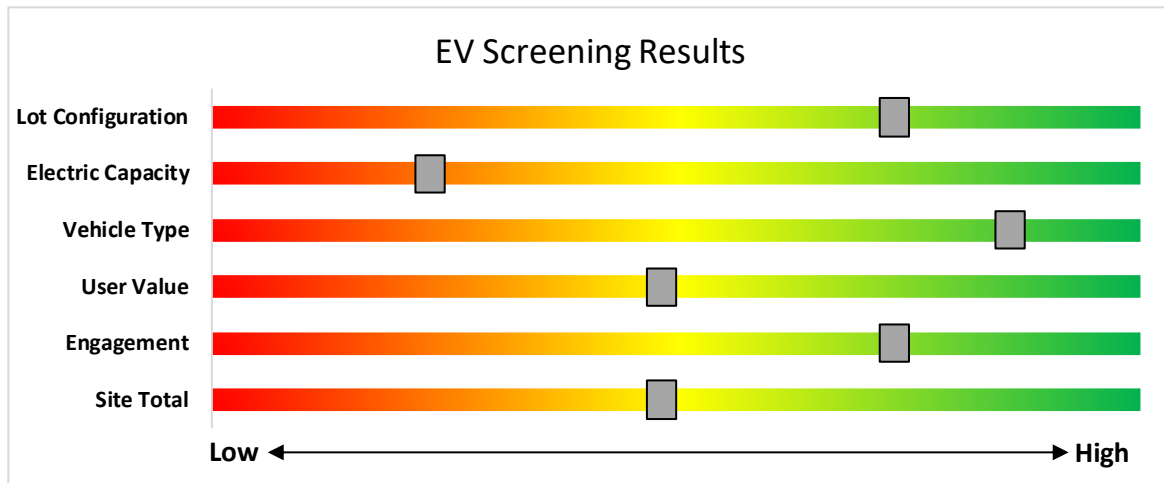
The type and size of the parking area impact the costs and feasibility of adding EV charging. Parking structure installations can be less costly than surface lot installations as power may be readily available, and equipment and wiring can be surface mounted. Parking lot installations often require trenching 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.



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), Public Service Electric and Gas Company (PSE&G) or Jersey Central Power and Light (JCP&L), 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, PSE&G or JCP&L, up to 90% of the combined charger purchase and installation costs. Please check ACE, PSE&G or JCP&L program eligibility requirements before purchasing EV charging equipment, as additional conditions on types of eligible chargers may apply for utility incentives.

EV Charging incentive information is available from Atlantic City Electric, PSE&G and JCP&L. 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>

9 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.

NJBPU and NJCEP Administered Programs



- New Construction (residential, commercial, industrial, government)
- Large Energy Users
- Energy Savings Improvement Program (financing)
- State Facilities Initiative*
- Local Government Energy Audits
- Combined Heat & Power & Fuel Cells

*State facilities are also eligible for utility programs

Utility Administered Programs



- Existing buildings (residential, commercial, industrial, government)
- Efficient Products
 - Lighting & Marketplace
 - HVAC
 - Appliance Rebates
 - Appliance Recycling

9.1 New Jersey's Clean Energy Program

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. To qualify entities must have incurred at least \$5 million in total 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 (FEED). Once the FEED is approved, the proposed work can begin.

Detailed program descriptions, instructions for applying, and applications can be found at <http://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. ≤

Incentives¹¹

Eligible Technology	Size (Installed Rated Capacity)	Incentive (\$/Watt) ⁵	% of Total Cost Cap per Project	\$ Cap per Project
CHPs powered by non-renewable or renewable fuel source, or a combination: ⁴ - Gas Internal Combustion Engine - Gas Combustion Turbine - Microturbine	≤500 kW ¹	\$2.00	30-40% ²	\$2 million
	>500 kW - 1 MW ¹	\$1.00		
	> 1 MW - 3 MW ¹	\$0.55	30%	\$3 million
	>3 MW ¹	\$0.35		
Fuel Cells ≥60%				
Fuel Cells ≥40%	Same as above ¹	Applicable amount above	30%	\$1 million
Waste Heat to Power (WHP) ³ Powered by non-renewable fuel source. Heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine)	≤1MW ¹	\$1.00	30%	\$2 million
	> 1MW ¹	\$0.50	30%	\$3 million

¹¹

¹ Incentives are tiered, which means the incentive levels vary based upon the installed rated capacity, as listed in the chart above. For example, a 4 MW CHP system would receive \$2.00/watt for the first 500 kW, \$1.00/watt for the second 500 kW, \$0.55/watt for the next 2 MW and \$0.35/watt for the last 1 MW (up to the caps listed).

² The maximum incentive will be limited to 30% of total project. For CHP projects up to 1 MW, this cap will be increased to 40% where a cooling application is used or included with the CHP system (e.g. absorption chiller).

³ Projects will be eligible for incentives shown above, not to exceed the lesser of % of total project cost per project cap or maximum \$ per project cap. Projects installing CHP or FC with WHP will be eligible for incentive shown above, not to exceed the lesser caps of the CHP or FC incentive. Minimum efficiency will be calculated based on annual total electricity generated, utilized waste heat at the host site (i.e. not lost/rejected), and energy input.

⁴ Systems fueled by a Class 1 Renewable Fuel Source, as defined by N.J.A.C. 14:8-2.5, are eligible for a 30% incentive bonus. If the fuel is mixed, the bonus will be prorated accordingly. For example, if the mix is 60/40 (60% being a Class 1 renewable), the bonus will be 18%. This bonus will be included in the final performance incentive payment, based on system performance and fuel mix consumption data. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

⁵ CHP-FC systems located at Critical Facility and incorporating blackstart and islanding technology are eligible for a 25% incentive bonus. This bonus incentive will be paid with the second/Installation incentive payment. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.



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 <http://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 (CSI) Program

The CSI Program opened on April 15, 2023, and will serve as the permanent program within the SuSI Program providing incentives to larger solar facilities. The CSI Program is open to qualifying grid supply solar facilities, non-residential net metered solar installations with a capacity greater than five (5) megawatts (“MW”), and to eligible grid supply solar facilities installed in combination with energy storage. CSI eligible facilities will only be allowed to register in the CSI program upon award of a bid pursuant to N.J.A.C. 14:8-11.10.

The CSI program structure has separate categories, or tranches, to ensure that a range of solar project types, including those on preferred sites, are able to participate despite potentially different project cost profiles. The Board has approved four tranches for grid supply and large net metered solar and an additional fifth tranche for storage in combination with grid supply solar. The following table lists procurement targets for the first solicitation:

Tranche	Project Type	MW (dc) Targets
Tranche 1.	Basic Grid Supply	140
Tranche 2.	Grid Supply on the Built Environment	80
Tranche 3.	Grid Supply on Contaminated Sites and Landfills	40
Tranche 4.	Net Metered Non- Residential	40
Tranche 5.	*Storage Paired with Grid	160 MWh

*The storage tranche of 160 MWh corresponds to a 4-hour storage pairing of 40 MW of solar

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 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 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.

Demand Response (DR) Energy Aggregator

Demand Response Energy Aggregator is a program designed to reduce the electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Grid operators call upon curtailment service providers and commercial facilities to reduce electric usage during times of peak demand, making the grid more reliable and reducing transmission costs for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail its electric usage.

Typically, an electric customer must be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with greater capability to quickly curtail their demand during peak hours receive higher payments. Customers with back-up generators on site may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in DR programs often find it to be a valuable source of revenue for their facility, because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature setpoints on thermostats (so that air conditioning units run less frequently) or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a DR activity in most situations.

The first step toward participation in a DR program is to contact a curtailment service provider. A list of these providers is available on the website of the independent system operator, PJM, and it includes contact information for each company, as well as the states where they have active business¹². PJM also posts training materials for program members interested in specific rules and requirements regarding DR activity along with a variety of other DR program information¹³.

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

¹² <http://www.pjm.com/markets-and-operations/demand-response.aspx>.

¹³ <http://www.pjm.com/training/training-events.aspx>.

9.2 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.

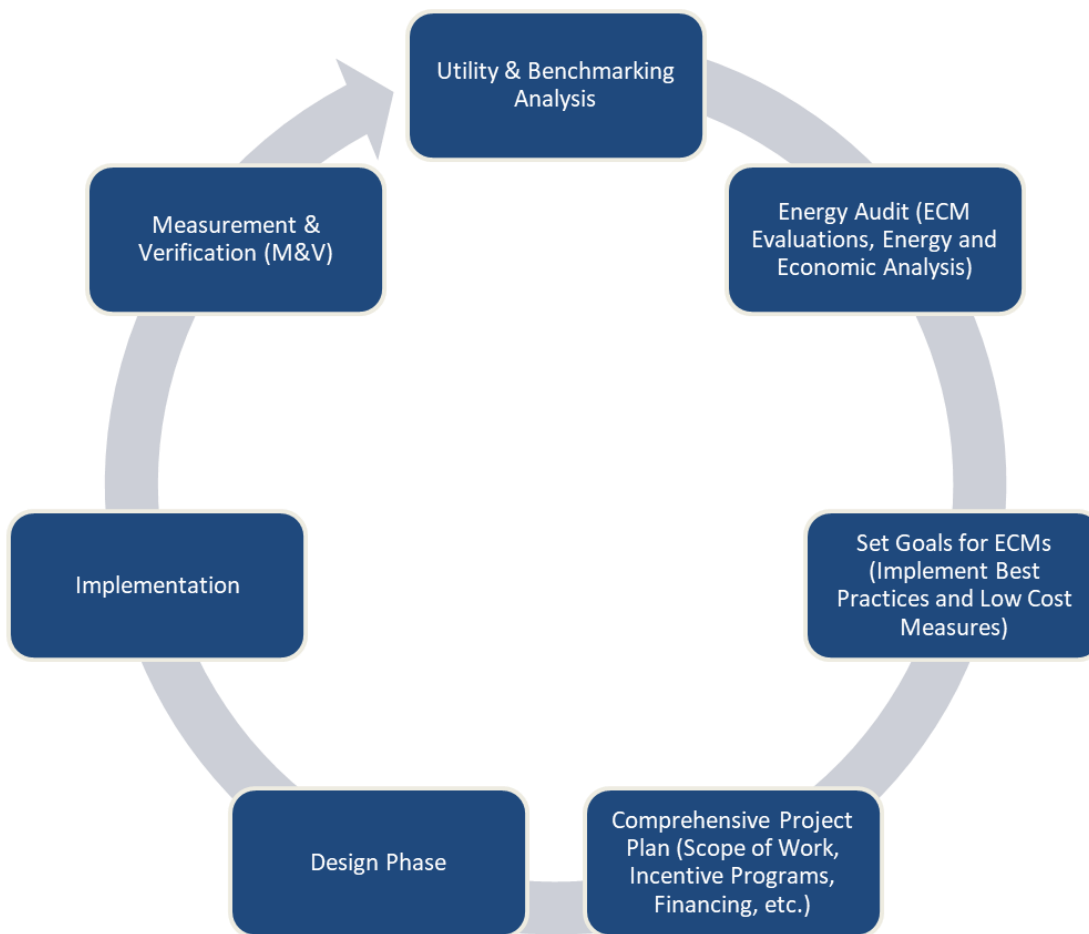
Engineered Solutions

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>.

10 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.



Project Development Cycle

11 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

11.1 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 website¹⁴.

11.2 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 website¹⁵.

¹⁴ www.state.nj.us/bpu/commercial/shopping.html

¹⁵ www.state.nj.us/bpu/commercial/shopping.html



APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

Location	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
	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
Train Terminal - 108C Ticket Office	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	74	2,912		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	74	2,912	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - 108C Ticket Office	4	Linear Fluorescent - T8: 3' T8 (25W) - 2L	Wall Switch	S	48	2,912	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 3' Lamps	Occupancy Sensor	21	2,009	0.1	422	0	\$66	\$530	\$80	6.8
Train Terminal - 108C Ticket Office	7	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,912	3, 4	Relamp	Yes	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,009	0.2	864	0	\$135	\$950	\$110	6.2
Train Terminal - Blue Common Auditorium	12	Compact Fluorescent: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	2,912	3, 4	Relamp	Yes	12	LED Lamps: A19 Lamps	Occupancy Sensor	11	2,009	0.1	280	0	\$44	\$630	\$50	13.3
Train Terminal - Blue Common Auditorium	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
Train Terminal - Blue Common Auditorium	31	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,912	3, 4	Relamp	Yes	31	LED Lamps: A19 Lamps	Occupancy Sensor	9	2,009	1.5	5,244	-1	\$817	\$1,770	\$140	2.0
Train Terminal - Blue Common Auditorium	7	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,912	4	None	Yes	7	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	2,009	0.0	61	0	\$10	\$330	\$40	30.3
Train Terminal - Blue Common Auditorium	96	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,912	3, 4	Relamp	Yes	96	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,009	1.9	6,641	-1	\$1,035	\$4,750	\$730	3.9
Train Terminal - Boiler Room	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	2,912	4	None	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,009	0.1	325	0	\$51	\$330	\$40	5.7
Train Terminal - Central Railroad Waiting Room	12	Compact Fluorescent: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	2,912	3, 4	Relamp	Yes	12	LED Lamps: A19 Lamps	Occupancy Sensor	11	2,009	0.1	280	0	\$44	\$630	\$50	13.3
Train Terminal - Chiller Building	2	Compact Fluorescent: (1) 45W A19 Screw-In Lamp	Timeclock		45	4,380	3	Relamp	No	2	LED Lamps: A19 Lamps	Timeclock	32	4,380	0.0	123	0	\$19	\$50	\$0	2.6
Train Terminal - Chiller Building	8	Compact Fluorescent: (1) 45W Circline/T6 Plug-In Lamp	None		45	2,912	3, 4	Relamp	Yes	8	LED Lamps: LED Lamp (Circline)	Occupancy Sensor	32	2,009	0.2	577	0	\$90	\$630	\$80	6.1
Train Terminal - Chiller Building	15	Compact Fluorescent: (1) 45W Circline/T6 Plug-In Lamp	None		45	2,912	3, 4	Relamp	Yes	15	LED Lamps: LED Lamp (Circline)	Occupancy Sensor	32	2,009	0.3	1,081	0	\$168	\$900	\$120	4.6
Train Terminal - Chiller Building	6	Compact Fluorescent: (2) 45W Circline/T6 Plug-In Lamps	Wall Switch	S	90	2,912	3, 4	Relamp	Yes	6	LED Lamps: LED Lamp (Circline)	Occupancy Sensor	63	2,009	0.2	878	0	\$137	\$710	\$100	4.5
Train Terminal - Chiller Building	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	2,912	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,009	0.0	72	0	\$11	\$150	\$20	11.6
Train Terminal - Clock Tower	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	2,912	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,912	0.1	270	0	\$42	\$160	\$20	3.3
Train Terminal - Coal Dumper Corridor	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
Train Terminal - Coal Dumper Corridor	3	LED - Linear Tubes: (2) 4' Lamps	None		37	6,570	5	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	37	4,533	0.0	244	0	\$38	\$280	\$110	4.5
Train Terminal - Corridor 3rd Floor	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Corridor 3rd Floor	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	6,570	5	None	Yes	9	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	37	4,533	0.1	732	0	\$114	\$560	\$320	2.1
Train Terminal - Corridor Mechanical Room	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	6,570		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	6,570	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Electrical Room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	3,490	4	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,408	0.0	173	0	\$27	\$330	\$40	10.8
Train Terminal - Elevator	1	LED - Fixtures: Ceiling Mount	None		6	3,490		None	No	1	LED - Fixtures: Ceiling Mount	None	6	3,490	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Elevator Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.1	317	0	\$49	\$250	\$40	4.3
Train Terminal - Exterior	134	LED - Linear Tubes: (1) 4' Lamp	Timeclock		15	4,380		None	No	134	LED - Linear Tubes: (1) 4' Lamp	Timeclock	15	4,380	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
Train Terminal - Exterior 9/11 Memorial	80	LED - Fixtures: Linear Strip	Timeclock		26	4,380		None	No	80	LED - Fixtures: Linear Strip	Timeclock	26	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Exterior Roof	1	LED Lamps: (1) 175W A19 Screw-In Lamp	Photocell		175	4,380		None	No	1	LED Lamps: (1) 175W A19 Screw-In Lamp	Photocell	175	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Janitorial	1	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	2,912	3	Relamp	No	1	LED Lamps: G25 Lamps	Wall Switch	45	2,912	0.0	60	0	\$9	\$60	\$0	6.4
Train Terminal - Janitorial Closet	1	Compact Fluorescent: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	2,912	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	11	2,912	0.0	13	0	\$2	\$30	\$0	15.3
Train Terminal - Janitorial Closet	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,912	4	None	Yes	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	2,009	0.0	19	0	\$3	\$150	\$20	42.8
Train Terminal - Liberty Classroom - 221	16	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,490	3, 4	Relamp	Yes	16	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,408	0.5	1,987	0	\$310	\$1,670	\$130	5.0
Train Terminal - Liberty Classroom - 221	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
Train Terminal - Lobby Old Security Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Other		62	8,736	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Other	29	8,736	0.0	311	0	\$49	\$50	\$10	0.8
Train Terminal - Maintenance Storage	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	37	2,009		None	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,009	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Office - 202	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
Train Terminal - Office - 202	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.8	3,324	-1	\$518	\$1,720	\$280	2.8
Train Terminal - Office - 203	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.4	1,899	0	\$296	\$940	\$160	2.6
Train Terminal - Office - 204	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.1	633	0	\$99	\$530	\$80	4.6
Train Terminal - Office - 205	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.2	950	0	\$148	\$630	\$100	3.6
Train Terminal - Office - 216	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	11	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,408	0.4	1,627	0	\$253	\$1,300	\$150	4.5
Train Terminal - Office - 304	2	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,490	3, 4	Relamp	Yes	2	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,408	0.1	248	0	\$39	\$280	\$30	6.5
Train Terminal - Office - 306A	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
Train Terminal - Office - 306A	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.4	1,899	0	\$296	\$940	\$160	2.6
Train Terminal - Office - 307	2	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,490	3, 4	Relamp	Yes	2	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,408	0.1	248	0	\$39	\$280	\$30	6.5
Train Terminal - Office - 308	4	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,490	3, 4	Relamp	Yes	4	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,408	0.1	497	0	\$77	\$580	\$60	6.7
Train Terminal - Office - 308	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
Train Terminal - Office - 308	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.1	317	0	\$49	\$250	\$40	4.3
Train Terminal - Office - 309	7	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,490	3, 4	Relamp	Yes	7	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,408	0.2	869	0	\$135	\$770	\$70	5.2
Train Terminal - Office 201	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
Train Terminal - Office 201	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.4	1,583	0	\$247	\$840	\$140	2.8

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
Train Terminal - Office 218	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	11	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,408	0.4	1,627	0	\$253	\$1,300	\$150	4.5
Train Terminal - Office 218	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,408	0.1	317	0	\$49	\$250	\$40	4.3
Train Terminal - Office 302	9	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,490	3, 4	Relamp	Yes	9	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,408	0.3	1,118	0	\$174	\$900	\$80	4.7
Train Terminal - Old Security Office	7	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Old Security Office	18	Metal Halide: (1) 150W Lamp	Wall Switch	S	190	3,490	1, 4	Fixture Replacement	Yes	18	LED - Fixtures: High-Bay	Occupancy Sensor	45	2,408	2.5	10,784	-2	\$1,681	\$13,170	\$970	7.3
Train Terminal - Restroom - Female	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	3,650	4	None	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,519	0.1	317	0	\$49	\$330	\$40	5.9
Train Terminal - Restroom - Female	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	3,650	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,650	0.1	233	0	\$36	\$90	\$10	2.2
Train Terminal - Restroom - Female	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	3,650	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	3,650	0.0	65	0	\$10	\$30	\$10	2.0
Train Terminal - Restroom - Male	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	3,650	4	None	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,519	0.1	317	0	\$49	\$330	\$40	5.9
Train Terminal - Restroom - Male	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	3,650	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,650	0.1	233	0	\$36	\$90	\$10	2.2
Train Terminal - Restroom - Male	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	3,650	3	Relamp	No	1	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	3,650	0.0	65	0	\$10	\$30	\$10	2.0
Train Terminal - Restroom Corridor	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
Train Terminal - Restroom Corridor	4	Linear Fluorescent - T8: 3' T8 (25W) - 2L	Wall Switch	S	48	6,570	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 3' Lamps	High/Low Control	21	4,533	0.1	951	0	\$148	\$480	\$180	2.0
Train Terminal - Restroom Hallway	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
Train Terminal - Restroom Hallway	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	6,570	5	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	37	4,533	0.0	163	0	\$25	\$280	\$70	8.3
Train Terminal - Restroom Hallway	13	LED - Fixtures: Downlight Recessed	Wall Switch	S	12	6,570	5	None	Yes	13	LED - Fixtures: Downlight Recessed	High/Low Control	12	4,533	0.0	343	0	\$53	\$560	\$460	1.9
Train Terminal - Restroom Hallway	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Occupancy Sensor	S	22	2,009	3	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,009	0.0	29	0	\$5	\$30	\$0	6.6
Train Terminal - Restroom Janitorial Closet	1	Compact Fluorescent: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	3,650	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	11	3,650	0.0	16	0	\$2	\$30	\$0	12.2
Train Terminal - Staff Office 108A	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,490	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,408	0.0	166	0	\$26	\$200	\$30	6.6
Train Terminal - Staff Office 108A	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,490	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,408	0.1	558	0	\$87	\$330	\$60	3.1
Train Terminal - Staff Office Mechanical	2	Compact Fluorescent: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	3,490	3, 4	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	7	2,408	0.0	31	0	\$5	\$200	\$20	36.7
Train Terminal - Stair 3 Ground Floor	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
Train Terminal - Stair 3 Ground Floor	1	LED - Linear Tubes: (2) 4' Lamps	None		37	8,760		None	No	1	LED - Linear Tubes: (2) 4' Lamps	None	37	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Stairs 3	13	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Other		32	8,760	3, 5	Relamp	Yes	13	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	6,044	0.3	2,705	-1	\$422	\$890	\$530	0.9
Train Terminal - Storage Rom 311	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,912	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,912	0.0	104	0	\$16	\$50	\$10	2.5

	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
Train Terminal - Storage Under Steps to Nowhere	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	2,912	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,009	0.0	72	0	\$11	\$150	\$20	11.6
Train Terminal - Terminal Concourse	36	Compact Fluorescent: (1) 68W A19 Screw-In Lamp	Timeclock		68	4,380	3	Relamp	No	36	LED Lamps: A19 Lamps	Timeclock	48	4,380	0.6	3,406	-1	\$531	\$910	\$40	1.6
Train Terminal - Terminal Storage	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	2,912	4	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,009	0.0	144	0	\$22	\$330	\$40	12.9
Train Terminal - Ticket Office Hallway	34	Compact Fluorescent: (2) 18W A-Series Screw-In Lamps	Wall Switch	S	36	6,570	3, 5	Relamp	Yes	34	LED Lamps: A19 Lamps	High/Low Control	26	4,533	0.5	4,357	-1	\$679	\$2,980	\$1,260	2.5
Train Terminal - Ticket Office Hallway	8	Compact Fluorescent: (2) 32W A-Series Screw-In Lamps	Wall Switch	S	64	6,570	3, 5	Relamp	Yes	8	LED Lamps: A19 Lamps	High/Low Control	45	4,533	0.2	1,870	0	\$291	\$580	\$300	1.0
Train Terminal - Ticket Office Hallway	3	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	6,570	3, 5	Relamp	Yes	3	LED Lamps: A19 Lamps	High/Low Control	9	4,533	0.1	1,145	0	\$178	\$360	\$110	1.4
Train Terminal - Ticket Office Hallway	5	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	6,570	5	None	Yes	5	LED Lamps: (1) 10W A19 Screw-In Lamp	High/Low Control	10	4,533	0.0	110	0	\$17	\$280	\$180	5.8
Train Terminal - 211/210 Lobby	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,408	0.1	444	0	\$69	\$600	\$70	7.7
Train Terminal - Ellis Classroom -222	12	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,490	3, 4	Relamp	Yes	12	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,408	0.3	1,490	0	\$232	\$1,090	\$90	4.3
Train Terminal - Ellis Classroom -222	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
Train Terminal - Office 206	12	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,408	0.4	1,774	0	\$277	\$1,390	\$160	4.4
Train Terminal - Office 207	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
Train Terminal - Office 207	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,408	0.3	1,331	0	\$207	\$1,130	\$130	4.8
Train Terminal - Office 208	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
Train Terminal - Office 208	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,408	0.3	1,331	0	\$207	\$1,130	\$130	4.8
Train Terminal - Office 210	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
Train Terminal - Office 210	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,408	0.3	1,479	0	\$230	\$1,210	\$140	4.6
Train Terminal - Office 211	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,490	0.0	124	0	\$19	\$50	\$10	2.1
Train Terminal - Office 211	16	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,490	3, 4	Relamp	Yes	16	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,408	0.6	2,366	-1	\$369	\$2,080	\$230	5.0
Train Terminal - Restroom - Female	3	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,650	3, 4	Relamp	Yes	3	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,519	0.1	390	0	\$61	\$520	\$50	7.7
Train Terminal - Restroom - Female	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,650	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,650	0.0	130	0	\$20	\$50	\$10	2.0
Train Terminal - Restroom - Female	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	3,650	4	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,519	0.0	136	0	\$21	\$330	\$40	13.7
Train Terminal - Restroom - Female	3	LED - Fixtures: Downlight Recessed	Wall Switch	S	12	3,650	4	None	Yes	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	12	2,519	0.0	44	0	\$7	\$0	\$0	0.0
Train Terminal - Restroom - Male	3	Compact Fluorescent: (2) 32W G25 Screw-In Lamps	Wall Switch	S	64	3,650	3, 4	Relamp	Yes	3	LED Lamps: G25 Lamps	Occupancy Sensor	45	2,519	0.1	390	0	\$61	\$520	\$50	7.7
Train Terminal - Restroom - Male	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,650	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,650	0.0	130	0	\$20	\$50	\$10	2.0

	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
Train Terminal - Restroom - Male	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	3,650	4	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,519	0.0	136	0	\$21	\$330	\$40	13.7
Train Terminal - Restroom - Male	3	LED - Fixtures: Downlight Recessed	Wall Switch	S	12	3,650	4	None	Yes	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	12	2,519	0.0	44	0	\$7	\$0	\$0	0.0
Train Terminal - Restroom Corridor 2	8	Incandescent: (3) 60W A19 Screw-In Lamps	Wall Switch	S	180	6,570	3, 5	Relamp	Yes	8	LED Lamps: A19 Lamps	High/Low Control	27	4,533	1.1	9,160	-2	\$1,428	\$1,070	\$300	0.5
Train Terminal - Office - 305	2	Compact Fluorescent: (1) 32W Plug-In Lamp	Wall Switch	S	32	3,490	3, 4	Relamp	Yes	2	LED Lamps: G25 Lamps	Occupancy Sensor	22	2,408	0.0	127	0	\$20	\$230	\$20	10.6
Train Terminal - Office - 305	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,490	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,490	0.0	124	0	\$19	\$50	\$10	2.1
Train Terminal - Restroom - Unisex	1	Compact Fluorescent: (2) 26W Plug-In Lamps	Wall Switch	S	52	3,650	3	Relamp	No	1	LED Lamps: G25 Lamps	Wall Switch	36	3,650	0.0	63	0	\$10	\$60	\$0	6.1
Train Terminal - Restroom - Unisex	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	3,650	4	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	37	2,519	0.0	136	0	\$21	\$330	\$40	13.7
Train Terminal - Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,912	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,912	0.0	104	0	\$16	\$50	\$10	2.5
Gate House - Attic HVAC Room	1	Incandescent: (1) 40W A19 Screw-In Lamp	Wall Switch		40	3,490	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	6	3,490	0.0	128	0	\$20	\$30	\$0	1.5
Gate House -Exterior	4	Incandescent: (1) 60W A19 Screw-In Lamp	Timeclock		60	4,380	3	Relamp	No	4	LED Lamps: A19 Lamps	Timeclock	9	4,380	0.0	894	0	\$142	\$100	\$0	0.7
Gate House - Gatehouse Power Room	5	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	3,490	2	Relamp & Reballast	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,490	0.3	1,112	0	\$173	\$440	\$50	2.3
Gate House -Janitorial Closet	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	37	2,912		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	37	2,912	0.0	0	0	\$0	\$0	\$0	0.0
Gate House -Old Gate House Office Area	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
Gate House -Old Gate House Office Area	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,490	3, 4	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,408	0.3	1,394	0	\$217	\$770	\$140	2.9
Gate House - Restroom - Female	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,650	3, 4	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,519	0.1	347	0	\$54	\$680	\$120	10.4
Gate House - Restroom - Male	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,650	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,519	0.1	662	0	\$103	\$530	\$80	4.4
Security Center - Dining Area	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch		50	3,490		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	50	3,490	0.0	0	0	\$0	\$0	\$0	0.0
Security Center - Nat.Park Security Tent	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
Security Center - Nat.Park Security Tent	17	LED - Fixtures: Ambient 2x2 Fixture	Timeclock		50	4,032		None	No	17	LED - Fixtures: Ambient 2x2 Fixture	Timeclock	50	4,032	0.0	0	0	\$0	\$0	\$0	0.0
Security Center - Police Center Exterior	1	High-Pressure Sodium: (1) 50W Lamp	Wall Switch		66	2,912	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	15	2,912	0.0	149	0	\$24	\$210	\$100	4.7
Security Center - Screening Center Lobby 1	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
Security Center - Screening Center Lobby 1	1	LED - Fixtures: Ambient 2x2 Fixture	Timeclock		50	4,032		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Timeclock	50	4,032	0.0	0	0	\$0	\$0	\$0	0.0
Security Center - Screening Center Lobby 2	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Security Center - Screening Center Lobby 2	1	LED - Fixtures: Ambient 2x2 Fixture	Timeclock		50	4,032		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Timeclock	50	4,032	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
Train Terminal -Chiller Building	Fire Supression	1	Air Compressor	0.17	65.0%	No	Marathon Motors	5KH33GN293KX	W	2,920		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Terminal Storage	Fire Supression	1	Air Compressor	3.00	86.5%	No	Marathon Motors	182TTDB6026	W	2,920		No	86.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 305	Fire Supression	1	Air Compressor	0.17	65.0%	No	General Air Products	OL36550AC	W	2,920		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Chiller Building	Fire Supression	1	Other	75.00	91.7%	No			W	12		No	91.7%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Chiller Building	CCRNJ Train Terminal	2	Chilled Water Pump	30.00	91.0%	Yes	Weg	03036EP3E286JM-W22	W	2,920		No	91.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Chiller Building	Chiller Building	1	Exhaust Fan	0.33	70.0%	No	Dayton	XXMTHX6083	W	3,640		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Exterior Roof	CCRNJ Train Terminal	2	Exhaust Fan	0.33	70.0%	No	Greenheck	SFB-18-30-CH-TH	W	3,640		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Roof	CCRNJ Train Terminal	1	Exhaust Fan	0.33	70.0%	No	Greenheck	CUE-090-VG-6-X	W	3,640		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Roof	CCRNJ Train Terminal	1	Exhaust Fan	0.33	70.0%	No	Greenheck	GB-131-5-X	W	3,640		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Roof	CCRNJ Train Terminal	1	Exhaust Fan	0.33	70.0%	No			W	3,640		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Roof	Restroom - Unisex	1	Exhaust Fan	0.33	70.0%	No			W	3,640		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Boiler Room	CCRNJ Train Terminal	1	Heating Hot Water Pump	2.00	86.5%	Yes	Baldor Reliance	VEJMM3157T	W	5,840		No	86.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Boiler Room	CCRNJ Train Terminal	2	Heating Hot Water Pump	3.00	89.5%	Yes	Baldor Reliance	VEJMM3211T	W	5,840		No	89.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Boiler Room	CCRNJ Train Terminal	1	Heating Hot Water Pump	7.50	91.0%	Yes	Marathon Motors	VVK213TTDBD6026AAM	W	5,840		No	91.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Boiler Room	CCRNJ Train Terminal	1	Heating Hot Water Pump	7.50	91.0%	Yes	Baldor Reliance	EM3311T	W	5,840		No	91.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Boiler Room	CCRNJ Train Terminal	1	Heating Hot Water Pump	2.00	84.0%	Yes	Marathon Motors	XVC145TTDR6036AAK	W	5,840		No	84.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Chiller Building	CCRNJ Train Terminal	1	Other	3.00	89.5%	No	Primex	PX4102002	W	2,745		No	89.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Clock Tower	CCRNJ Train Terminal	1	Other	0.50	75.0%	No			W	8,760		No	75.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Elevator Room	CCRNJ Train Terminal	1	Other	2.00	84.0%	No	Watt Saver	C134T11FK6A	W	5,840		No	84.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Boiler Room	CCRNJ Train Terminal	1	Water Supply Pump	0.50	75.0%	No	Bluffton Motor Works	4103007457		2,190		No	75.0%	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
Train Terminal -Boiler Room	CCRNJ Train Terminal	1	Water Supply Pump	0.50	75.0%	No	Bluffton Motor Works	4103007458		2,190		No	75.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Chiller Building	CCRNJ Train Terminal	1	Water Supply Pump	0.75	80.0%	No	US Motor	7220 BEP		2,190		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Floor One	AHU-3 : Serves Main Atrium, Restrooms & Restroom Corridor	1	Supply Fan	5.00	86.0%	No	Carrier	39MHSTD01FYPX FXJBA	B	8,736	6	No	89.5%	Yes	1	1.5	11,165	0	\$1,769	\$5,600	\$900	2.7
Train Terminal -Floor One	AHU-6	1	Supply Fan	5.00	86.0%	No	Carrier		B	8,736	6	No	89.5%	Yes	1	1.5	11,165	0	\$1,769	\$5,600	\$900	2.7
Train Terminal -Floor One	AHU-7	1	Supply Fan	3.00	84.0%	No	Carrier		B	8,736	6	No	89.5%	Yes	1	0.9	7,064	0	\$1,119	\$5,100	\$200	4.4
Train Terminal -Floor One	AHU-5	1	Supply Fan	3.00	84.0%	No	Carrier		B	8,736	6	No	89.5%	Yes	1	0.9	7,064	0	\$1,119	\$5,100	\$200	4.4
Train Terminal -Floor One	AHU-4 : Serves Main Atrium	1	Supply Fan	3.00	84.0%	No	Carrier	39MN10B0053JN 11XS	B	8,736	6	No	89.5%	Yes	1	0.9	7,064	0	\$1,119	\$5,100	\$200	4.4
Train Terminal -Floor One	AHU-2 : Serves Hallway	1	Supply Fan	3.00	84.0%	No	Trane	MCCA010BBD0A AAA00000	B	8,736	6	No	89.5%	Yes	1	0.9	7,064	0	\$1,119	\$5,100	\$200	4.4
Train Terminal - Classroom -221	FCU 2-13 : Serves Classroom 221	1	Supply Fan	0.75	80.0%	No	Trane		B	8,736		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 202	FCU 2-9 serves room 202	1	Supply Fan	1.00	84.0%	No	Trane	BCHC090E1A0A1 NA5F	B	8,736		No	84.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 203	FCU 2-10 serves rooms 203	1	Supply Fan	0.75	80.0%	No	Trane	BCHC054E1A0A1 NA3E	B	8,736		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 204	FCU 2-11 serves room 204. Similar unit to one in bathroom	1	Supply Fan	0.75	80.0%	No	Trane	BCHC036A1ADA1 NA1F	B	8,736		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 205	FCU 2-12 serves 205	1	Supply Fan	0.33	70.0%	No	Trane	BCHC036A1ADA1 NA1F	B	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 216	FCU 2-6 serves room 216	1	Supply Fan	0.33	70.0%	No	Trane		B	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 306A	FCU 3-3 serves center office space	1	Supply Fan	0.75	80.0%	No	Trane		B	8,736		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 308	FCU 3-4 serves 308, 307, 308 bathroom	1	Supply Fan	0.75	80.0%	No	Trane	BCHC072E1A0A2 NA3E	B	8,736		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 309	FCU 3-5 Serves Office 309	1	Supply Fan	0.50	75.0%	No	Trane	BCHC090E1A0A1 NA5F	B	8,736		No	75.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 201	FCU 2-8 serves 201	1	Supply Fan	0.33	70.0%	No	Trane	BCHC054E1A0A1 NA3E	B	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 218	FCU 2-7 serves 218.	1	Supply Fan	0.33	70.0%	No	Trane		B	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 302	FCU 3-1 Serves Office 302 .	1	Supply Fan	1.00	84.0%	No	Trane	BCHC090E1A0A1 NA5F	B	8,736		No	84.0%	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
Train Terminal -Floor Two	FCU 2-15 serves bathrooms and corridor	1	Supply Fan	0.33	70.0%	No	Trane	BCHC012A1A0A2 A01E	B	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Floor Two	FCU 2-4 serves Offices and ticket box	1	Supply Fan	0.75	80.0%	No			B	8,736		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Floor Two	FCU 2-5 serves 211 and lobby.	1	Supply Fan	0.75	80.0%	No	Trane		B	8,736		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Classroom -222	FCU 2-14 serves Ellis classroom	1	Supply Fan	0.50	75.0%	No	Trane		B	8,736		No	75.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 206	FCU 2-1 serves 206	1	Supply Fan	0.50	75.0%	No	Trane		B	8,736		No	75.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 207	FCU 2-2 serves 207	1	Supply Fan	0.50	75.0%	No	Trane		B	8,736		No	75.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 208	FCU 2-3 serves 208	1	Supply Fan	0.33	70.0%	No	Trane		B	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Office 210	FCU 3-2 Serves Room 210 and corridor	1	Supply Fan	0.33	70.0%	No	Trane		B	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Restroom - Unisex	FCU1-1 Serves Restrooms	1	Supply Fan	0.33	70.0%	No	Trane		B	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Gate House - Attic HVAC Room	Gate House	3	Supply Fan	0.20	70.0%	No	Greenheck	CK48HB03K08	W	8,736		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Gate House - Exterior	Automatic Gate	2	Other	0.50	80.0%	No	Viking Gate Operator	F-1	W	365		No	80.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Gate House - Gatehouse Power Room	Marina Sewage Pumps	2	Other	5.00	86.5%	No	CSI Controls	B-RP0022	W	1,460		No	86.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Gate House - Janitorial Closet	Gate House Sewage Pumps	2	Other	10.00	86.5%	No	Panel-Line Controls	814080759	W	1,460		No	86.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Train Museum	Train Car Museum	3	Fan Coil Unit	0.33	70.0%	No	Fujitsu	AOU24RLXFW	W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Security Screening - Police Center Exterior	RTU-Police Center	2	Exhaust Fan	1.50	84.0%	No			W	8,760	6	No	86.5%	Yes	2	0.9	5,819	0	\$922	\$8,700	\$200	9.2
Security Screening - Police Center Exterior	RTU-Police Center	2	Supply Fan	3.00	89.0%	No			W	8,760	6	No	89.5%	Yes	2	1.7	12,364	0	\$1,958	\$10,200	\$400	5.0
Train Terminal -Roof	CCRNJ Train Terminal	2	Makeup Air Fan	1.50	80.0%	No	Carrier	39MW25B0053	W	8,760	6	No	84.0%	Yes	2	0.9	6,887	0	\$1,091	\$9,500	\$200	8.5
Train Terminal -Roof	CCRNJ Train Terminal	1	Supply Fan	0.33	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Roof	CCRNJ Train Terminal	1	Exhaust Fan	1.00	82.0%	No	Trane		W	2,745	6	No	85.5%	Yes	1	0.3	1,005	0	\$159	\$3,900	\$100	23.9
Train Terminal - Boiler Room	Boiler Room Hydronic Heater	3	Fan Coil Unit	0.17	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0



Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Train Terminal -Boiler Room	Boiler Room	2	Unit Heater		18.00			Sterling	HS-018	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Boiler Room	Boiler Room	1	Unit Heater		18.00			Sterling	HS-019	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Chiller Building	Chiller Room Pipes	4	Electric Resistance Heat		8.19		1 COP	Chromalox	DTS-HAZ	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal -Chiller Building	Chiller Building	2	Electric Resistance Heat		8.19		1 COP	Qmark	MUH0541	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Electrical Room	Electrical Room	1	Electric Resistance Heat		8.19		1 COP	Qmark	MUH074	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Janitorial Closet	Janitorial Closet	1	Electric Resistance Heat		8.19		1 COP	Qmark	MUH0541	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Restroom - Female	Restroom - Female	1	Electric Resistance Heat		8.19		1 COP			W		No							0.0	0	0	\$0	\$0	\$0	0.0
Train Terminal - Restroom - Male	Restroom - Male	1	Electric Resistance Heat		8.19		1 COP			W		No							0.0	0	0	\$0	\$0	\$0	0.0
Gate House - Janitorial Closet	Janitorial Closet	1	Electric Resistance Heat		17.06		1 COP			W		No							0.0	0	0	\$0	\$0	\$0	0.0
Gate House - Attic HVAC Room	Gate House	2	Forced Air Furnace		53.00		0.8 AFUE	Carrier	58STA070-08	B	8	Yes	2	Forced Air Furnace		53.00		0.97 AFUE	0.0	0	16	\$187	\$5,500	\$1,000	24.1
Gate House - Janitorial Closet	Janitorial Closet	1	Forced Air Furnace		60.00		0.8 AFUE	Heil Quaker	H8MPN075B12A1	B	8	Yes	1	Forced Air Furnace		60.00		0.97 AFUE	0.0	0	9	\$106	\$2,900	\$500	22.7
Gate House - Train Car Museum	Train Car Museum	3	Split-System Air-Source HP	2.00	27.60	11.00	8 HSPF	Fujitsu	AOU24RLXFW	B	7	Yes	3	Split-System Air-Source HP	2.00	27.60	15.50	8.5 HSPF	2.9	1,638	0	\$260	\$15,200	\$600	56.3
Security Screening: Police Center Exterior	Police Center	2	Package Unit	12.50	184.25	13.50	1 COP	Trane	TSH150F3RPA0307B0A1A001D	W		No						0.0	0	0	\$0	\$0	\$0	0.0	

Electric Chiller Inventory & Recommendations

		Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Chiller Building	CCRNJ Train Terminal	1	Air-Cooled Centrifugal Chiller	240.00	Multistack	ASP060XC14H2AL1	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
Boiler Room	Train Terminal	2	Condensing Hot Water Boiler	2,790	Aerco	BMK3000	W		No						0.0	0	0	\$0	\$0	\$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Terminal Old Sec Office	Restroom DHW	9	20	0.75	0.0	1,656	0	\$262	\$270	\$40	0.9
Terminal Janitorial	Restroom DHW	9	6	0.75	0.0	497	0	\$79	\$80	\$10	0.9

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
CCRNJ Train Shed : Janitorial	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	EGSP10	W		No						0.0	0	0	\$0	\$0	\$0	0.0
Janitorial Closet	Restrooms	2	Storage Tank Water Heater (≤ 50 Gal)	A.O. Smith	DEL 50 102	W		No						0.0	0	0	\$0	\$0	\$0	0.0
Old Security Office	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	A.O. Smith	DEL 6 102	W		No						0.0	0	0	\$0	\$0	\$0	0.0
Terminal Storage	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	A.O. Smith	DEL 50 110	W		No						0.0	0	0	\$0	\$0	\$0	0.0
Janitorial Closet	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	A.O. Smith	DEL 20 102	W		No						0.0	0	0	\$0	\$0	\$0	0.0
Gate House :Janitorial Closet	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	Bradford White	MI5036FBN	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
CCRNJ Ellis Classroom -222	10	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	139	0	\$22	\$10	\$0	0.5
Train Terminal - Restroom - Female	10	6	Faucet Aerator (Lavatory)	1.70	0.50	0.0	589	0	\$93	\$50	\$20	0.3
Train Terminal - Restroom - Male	10	6	Faucet Aerator (Lavatory)	1.70	0.50	0.0	589	0	\$93	\$50	\$20	0.3
Gate House	10	4	Faucet Aerator (Lavatory)	2.00	0.50	0.0	491	0	\$78	\$30	\$20	0.1



Plug Load Inventory

Existing Conditions						
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
CNJ Terminal & Train Shed	2	Coffee Machine	1,200	No		
CNJ Terminal & Train Shed	21	Desktop	270	No		
CNJ Terminal & Train Shed	4	Microwave	1,300	No		
CNJ Terminal & Train Shed	1	Walkie Talkie Stand	75	No		
CNJ Terminal & Train Shed	4	Printer (Medium/Small)	150	No		
CNJ Terminal & Train Shed	1	Printer/Copier (Large)	1,500	No		
CNJ Terminal & Train Shed	2	Projector	150	No		
CNJ Terminal & Train Shed	1	Refrigerator (Mini)	224	No		
CNJ Terminal & Train Shed	2	Refrigerator (Residential)	450	No		
CNJ Terminal & Train Shed	2	Television	224	No		
CNJ Terminal & Train Shed	1	Toaster	800	No		
CNJ Terminal & Train Shed	3	Water Cooler	192	No		
Gate House	6	Hand Dryer	500	No		
Security Screening Ctr.	1	Coffee Machine	800	No		
Security Screening Ctr.	9	Desktop	270	No		
Security Screening Ctr.	1	Microwave	1,000	No		
Security Screening Ctr.	5	Smith Detecion XRAY Machine	800	No		
Security Screening Ctr.	3	Ceia Metal Detector	25	No		
Security Screening Ctr.	1	Refrigerator (Residential)	450	No		
Security Screening Ctr.	1	Water Cooler	192	No		
CNJ Terminal & Train Shed	1	Server Closet	2,000	No		
CNJ Terminal & Train Shed	1	Temporary Stand Alone Structure	5,000	No		

Custom (High Level) Measure Analysis



Electric Tank Water Heater to HPWH


NOTE: HPWH calculation should not be used for existing water heaters with a storage capacity greater than 120 gal or less than 30 gal.

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	SF of Area Served	Fuel Type	Input Capacity per Unit (kW)	Tank Capacity per Unit (Gal)	Description	COP	Tank Capacity per Unit (Gal)	Estimated Unit Cost	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Payback w/ Incentives in Years
Storage Tank Water Heater (≤50 Gal)	Terminal Storage Restrooms	10,000	Electric	4.5	50	Heat Pump Water Heater	2.5	50	\$2,383.17	0.00	3,693	0	\$585	\$2,900	\$0	\$0	\$0	\$2,900	4.96	4.96
			Electric																	
			Electric																	

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.

NJCEP uses the EPA's ENERGY STAR Portfolio Manager system to generate baseline energy usage results and comparable building EUIs. Portfolio Manager is specifically designed for benchmarking energy consumption within a building. In this case, we have generated an SEP for the entire campus because the individual bills for the two smaller buildings addressed in this report seem abnormally high for buildings of this size.



ENERGY STAR® Statement of Energy Performance

N/A

**ENERGY STAR®
Score¹**

DEP - Liberty State Park (Campus)

Primary Property Type: Other - Public Services
Gross Floor Area (ft²): 107,533
Built: 1889

For Year Ending: November 30, 2022
Date Generated: November 28, 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 DEP - Liberty State Park (Campus) 1 Audrey Zapp Drive Jersey City, New Jersey 07305	Property Owner State of New Jersey 428 East State Street Trenton, NJ 08625 (609) 940-4129	Primary Contact New Jersey Board of Public Utilities State Energy Services 44 South Clinton Ave Trenton, NJ 08625 6096339666 BPU.EnergyServices@bpu.nj.gov	
Property ID: 28242378			

Energy Consumption and Energy Use Intensity (EUI)			
Site EUI	Annual Energy by Fuel	National Median Comparison	
105.7 kBtu/ft²	Electric - Grid (kBtu) 5,200,406 (46%)	National Median Site EUI (kBtu/ft²)	48.2
	Natural Gas (kBtu) 6,165,485 (54%)	National Median Source EUI (kBtu/ft²)	89.3
		% Diff from National Median Source EUI	119%
Source EUI		Annual Emissions	
195.6 kBtu/ft²		Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	795

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	<i>British thermal unit</i> : 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	<i>Combined heat and power</i> . Also referred to as cogeneration.
COP	<i>Coefficient of performance</i> : 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	<i>Demand control ventilation</i> : a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	<i>United States Department of Energy</i>
EC Motor	<i>Electronically commutated motor</i>
ECM	<i>Energy conservation measure</i>
EER	<i>Energy efficiency ratio</i> : a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	<i>Energy Use Intensity</i> : 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	<i>United States Environmental Protection Agency</i>
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	<i>Greenhouse gas</i> 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	<i>Gallons per flush</i>

gpm	<i>Gallon per minute</i>
HID	<i>High intensity discharge:</i> high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	<i>Horsepower</i>
HPS	<i>High-pressure sodium:</i> a type of HID lamp.
HSPF	<i>Heating seasonal performance factor:</i> a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	<i>Heating, ventilating, and air conditioning</i>
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	<i>Integrated part load value:</i> a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	<i>Kilowatt:</i> equal to 1,000 Watts.
kWh	<i>Kilowatt-hour:</i> 1,000 Watts of power expended over one hour.
LED	<i>Light emitting diode:</i> a high-efficiency source of light with a long lamp life.
LGEA	<i>Local Government Energy Audit</i>
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	<i>Metal halide:</i> a type of HID lamp.
MBh	<i>Thousand Btu per hour</i>
MBtu	<i>One thousand British thermal units</i>
MMBtu	<i>One million British thermal units</i>
MV	<i>Mercury Vapor:</i> a type of HID lamp.
NJBPU	<i>New Jersey Board of Public Utilities</i>
NJCEP	<i>New Jersey's Clean Energy Program:</i> 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	<i>Pounds per square inch gauge</i>
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	<i>Photovoltaic:</i> refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	<i>Seasonal energy efficiency ratio:</i> a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	<i>Statement of energy performance:</i> 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)	<i>Solar renewable energy credit:</i> 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	<i>Variable air volume</i>
VFD	<i>Variable frequency drive:</i> 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.