Local Government Energy Audit Report

NJ DOT South Region Headquarters

October 11, 2023

Prepared for:

State of New Jersey DOT
1 Executive Campus
Cherry Hill, New Jersey 08002

Prepared by:

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Disclaimer

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

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

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

Incentive values provided in this report are estimated based on previously run state efficiency programs. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available utility program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

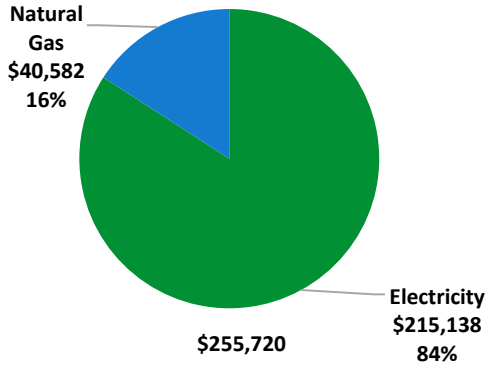
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state, and federal requirements.

Table of Contents

1 EXECUTIVE SUMMARY

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

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $255,720 Electricity: 1,418,135 kWh Natural Gas: 42,282 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

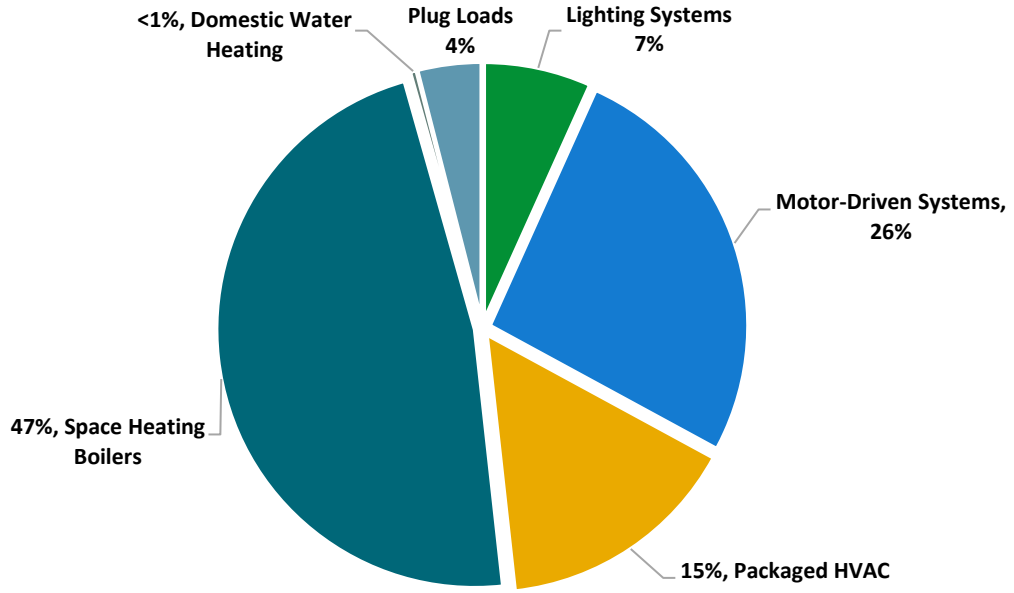


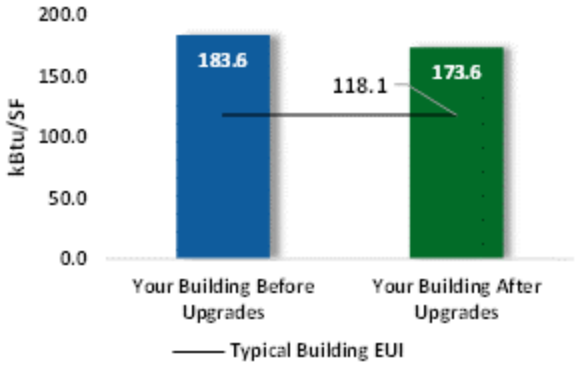
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

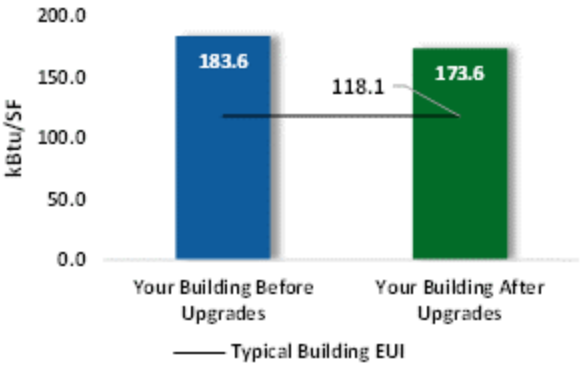
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$89,156
Potential Rebates & Incentives[1]	$9,956
Annual Cost Savings	$22,535
Annual Energy Savings	Electricity: 149,885 kWh Natural Gas: -212 Therms
Greenhouse Gas Emission Savings	74 Tons
Simple Payback	3.5 Years
Site Energy Savings (All Utilities)	5%



Scenario 2: Cost Effective Package[2]

Installation Cost	$89,156
Potential Rebates & Incentives	$9,956
Annual Cost Savings	$22,535
Annual Energy Savings	Electricity: 149,885 kWh Natural Gas: -212 Therms
Greenhouse Gas Emission Savings	74 Tons
Simple Payback	3.5 Years
Site Energy Savings (all utilities)	5%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

[1] Incentives are based on previously run state rebate programs. Contact your utility provider for current program incentives that may apply.

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**67,454**	**11.9**	**-14**	**$10,098**	**$20,568**	**$3,396**	**$17,172**	**1.7**	**66,275**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	919	0.3	0	$138	$522	$60	$462	3.4	903
ECM 2	Retrofit Fixtures with LED Lamps	Yes	60,600	11.0	-13	$9,072	$16,019	$3,336	$12,683	1.4	59,540
ECM 3	Install LED Exit Signs	Yes	5,936	0.6	-1	$889	$4,027	$0	$4,027	4.5	5,832
Lighting Control Measures			**33,899**	**6.1**	**-7**	**$5,075**	**$23,577**	**$3,462**	**$20,115**	**4.0**	**33,306**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	32,186	5.8	-7	$4,818	$22,475	$2,530	$19,945	4.1	31,623
ECM 5	Install High/Low Lighting Controls	Yes	1,712	0.3	0	$256	$1,102	$932	$171	0.7	1,682
Variable Frequency Drive (VFD) Measures			**38,860**	**5.1**	**0**	**$5,895**	**$33,133**	**$3,000**	**$30,133**	**5.1**	**39,132**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	28,607	4.3	0	$4,340	$16,945	$2,700	$14,245	3.3	28,807
ECM 7	Install VFDs on Heating Water Pumps	Yes	10,254	0.8	0	$1,556	$16,188	$300	$15,888	10.2	10,325
Domestic Water Heating Upgrade			**1,472**	**0.0**	**0**	**$223**	**$101**	**$48**	**$53**	**0.2**	**1,482**
ECM 8	Install Low-Flow DHW Devices	Yes	1,472	0.0	0	$223	$101	$48	$53	0.2	1,482
Food Service & Refrigeration Measures			**1,954**	**0.2**	**0**	**$296**	**$535**	**$50**	**$485**	**1.6**	**1,968**
ECM 9	Vending Machine Control	Yes	1,954	0.2	0	$296	$535	$50	$485	1.6	1,968
Custom Measures			**6,246**	**0.0**	**0**	**$948**	**$11,242**	**$0**	**$11,242**	**11.9**	**6,290**
ECM 10	Replace Electric Water Heater with Heat Pump Water Heater	Yes	6,246	0.0	0	$948	$11,242	$0	$11,242	11.9	6,290
TOTALS (COST EFFECTIVE MEASURES)			**149,885**	**23.4**	**-21**	**$22,535**	**$89,156**	**$9,956**	**$79,200**	**3.5**	**148,452**
TOTALS (ALL MEASURES)			**149,885**	**23.4**	**-21**	**$22,535**	**$89,156**	**$9,956**	**$79,200**	**3.5**	**148,452**

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

Options from Your Utility Company

Prescriptive and Custom Rebates

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

Direct Install

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

Engineered Solutions

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

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

Options from New Jersey's Clean Energy Program

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the ESIP. Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as attractive financing for implementing ECMs. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

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

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

Successor Solar Incentive Program (SuSI)

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

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces electric loads at commercial facilities when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. By enabling commercial facilities to reduce electric demand during times of peak demand, the grid is made more reliable, and overall transmission costs are reduced for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

Large Energy User Program (LEUP)

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

For more details on these programs please visit New Jersey's Clean Energy Program website .

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for NJ DOT South Region Headquarters. 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 May 2, 2023, TRC performed an energy audit at NJ DOT South Region Headquarters located in Cherry Hill, New Jersey. TRC met with Paul Laurita to review the facility operations and help focus our investigation on specific energy-using systems.

The State of New Jersey Department of Transportation South Headquarters located at 1 Executive Campus in Cherry Hill is a three-story, 49,396 square foot office building built in the 1980's and renovated in the early 1990's. The facility includes a main lobby reception area, enclosed and large open offices, conference rooms, mail rooms, lobbies, electrical and mechanical rooms, storage rooms and closets.

Lighting is mainly provided by linear fluorescent T8 fixtures and LED fixtures. The building is mainly heated by three condensing boilers and cooled by roof top units (RTUs) equipped with direct expansion (DX) coils.

Recent improvements and Facility Concerns

At the time of the visit, lighting systems in lobbies, open offices, and restrooms had been retrofitted to LED sources. Since the visit even more LED retrofits have happened throughout the facility.

Facility concerns include high electric bills.

2.2 Building Occupancy

The facility is occupied year-round, from Monday to Friday except on holidays. Typical weekday occupancy is approximately 100 staff. It should be noted that the energy and economic analysis for this building is based on the use of the building during the utility billing period, and that results will vary based on changes to building use patterns.

Building Name	Weekday/Weekend	Operating Schedule
NJ DOT South Region Headquarters - General Operating Hours	Weekday	7:30 AM - 4:00 PM
	Weekend	Closed

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a green glass panel façade that appears in good condition. The roof is supported with steel trusses and a reinforced concrete deck. It is finished with a white membrane that is in good condition.

The glass panel walls incorporate windows in some locations; they are tinted to match the appearance of the surrounding wall area. The entrance doors are fully glazed, and aluminum framed doors are set in a "storefront" framing system.

Overall, the building envelope is good condition with no signs of uncontrolled moisture, air leakage, or other energy-compromising issues.


Building Walls


Flat Roof

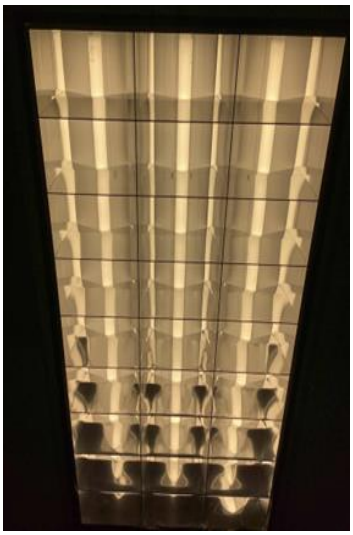
Entrance Doors

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps and LED fixtures. There are also some 40-Watt T12 fixtures, LED linear tubes, LED lamps, and compact fluorescent lamps (CFLs). Fixture types include 1-lamp, 2-lamp, or 3-lamp, 4-foot-long troffer, recessed, surface mounted fixtures and 2-foot fixtures with U-bend linear tube lamps. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts. Most areas, including offices, many service spaces, restrooms, and stairs are illuminated with either linear fluorescent lamps or LED fixtures. A few fluorescent fixtures in electrical closets have been converted to LED lamps. Fluorescent T12 fixtures are found in the boiler room while CFLs are used in the traffic operation room and DMV vestibule. LED plug-in lamps are mainly found in open areas and lobbies.

Most fixtures are in fair or good condition. Exit signs are incandescent. Interior lighting levels were generally sufficient. Light fixtures in spaces are mostly controlled by manual wall switches while some are controlled by occupancy sensors.

Exterior fixtures include LED poles and recessed fixtures that have been retrofitted to use LED A-lamp bulbs. They are controlled by timers and photocells.



Linear Fluorescent Tubes

LED Linear Tubes

T12 Fluorescent Tubes

U-Bend Linear Fluorescents,

U- LED Fixture

LED PL Lamp

Fluorescent Exit Sign

Exterior LED A-Lamp

PL Fluorescent Lamps

Exterior LED Pole

Wall Switch

Occupancy Sensor

2.5 Air Handling Systems

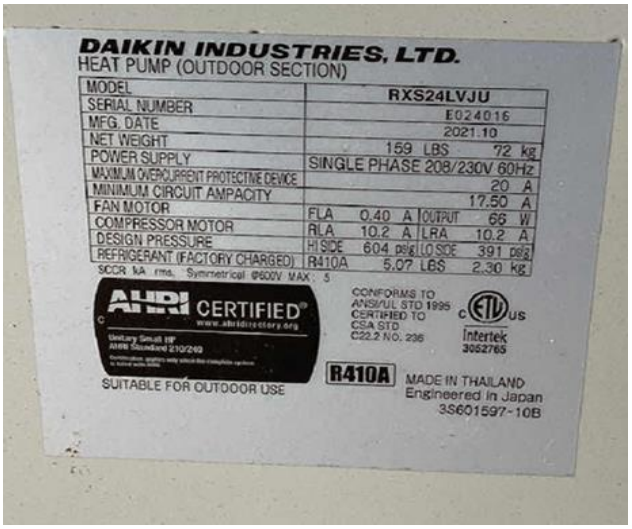
Unitary Electric HVAC Equipment

The DOT South server room is cooled by two, 14-ton rooftop condensing units (DC-1 and DC-2) with an energy efficiency rating (EER) of 12, and a 3-ton split system heat pump with an EER of 20. Two computer room air conditioning (CRAC) units located in the server room supply cold air with 5 hp blowers. The units are in good condition.

The DMV CPU room is cooled by a 2-ton split system heat pump. Installed in 2021, the unit is in good condition and is controlled by a programmable thermostat. The DOT South traffic operation room uses a 4-ton split system air conditioner with an EER of 16.5. The unit provides cooling only, it is in good condition and is controlled by a programmable thermostat.

Condensing Unit

CRAC Unit



Exterior Ground – DMV Condensing Unit and Tag

Exterior Ground – Condensing Unit and Evaporator

Programmable Thermostat

Unitary Heating Equipment

The first and second floor DOT South vestibule, DMV corridor, and DMV vestibule are heated by ceiling and wall mounted electric resistance heaters. The heating output is approximately 5 kW. They are controlled by manual thermostats and are in good condition. The boiler room is heated by a 3-kW suspended electric resistance heater. It is in good condition and controlled by manual dial thermostats.

Suspended Electric

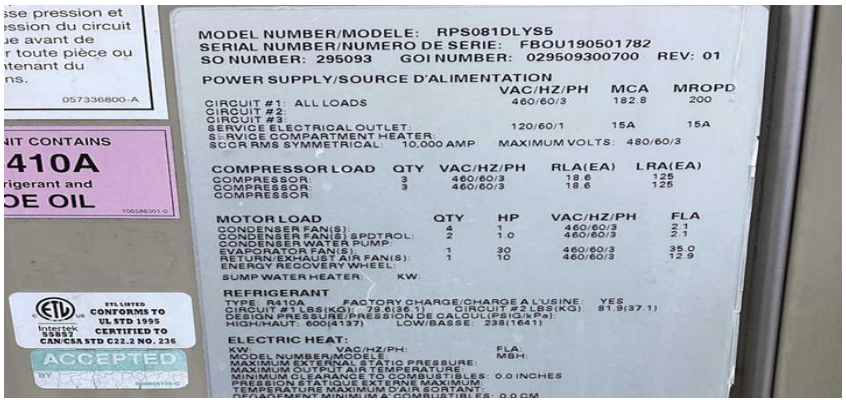
Ceiling Mounted Electric Resistance Heaters

Packaged Units

DOT South and the DMV are served by two, 81-ton roof mounted packaged units (RTU-1 and RTU-2). The units are equipped with direct expansion coils with R-410A refrigerant compressors, supply fans, return fans, and an economizer. The fans are equipped with variable frequency drives (VFDs).

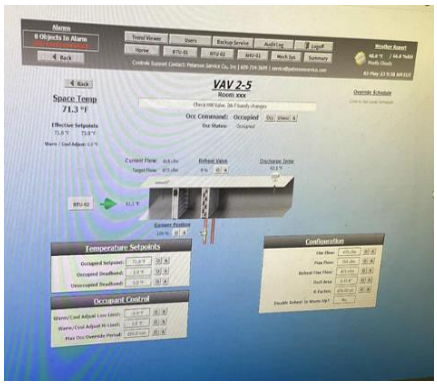
Installed in 2019, the units are in good condition and are controlled by a BAS. Air distribution is provided to air registers through variable air volume (VAV) boxes located above ceilings. The space cooling setpoint is 72°F.

RTU-2



RTU - Tag

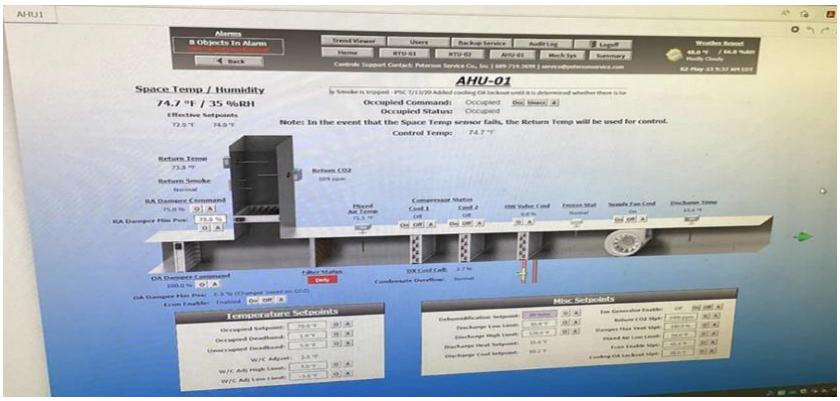
BAS Screenshot – RTU



BAS Screenshot –VAV

Air Handling Units (AHUs)

The traffic operation room is conditioned by an air handling unit. This unit is equipped with a supply fan motor, hot water coil, and refrigerant coil for cooling. It is physically located above the ceiling and was inaccessible during the energy audit. The supply fan motor is assumed to be 5 hp, constant speed, and standard efficiency. This system includes a 4-ton outdoor condensing unit described as part of the Unitary Electric HVAC section above. The heating coil is supplied by the hot water boiler.



BAS Screenshot – AHU-1

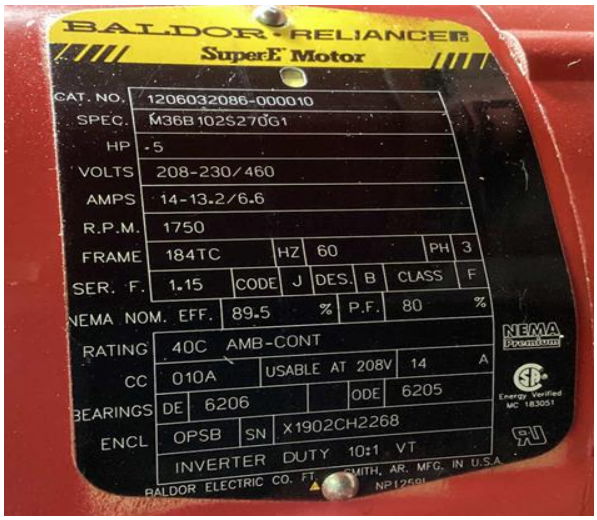
2.6 Heating Hot Water Systems

Three, 952 MBh AERCO condensing hot water boilers serve the building's heating load. The boilers are configured in an automated sequence, running collectively to meet the heating demand while staging based on the outside air temperature.

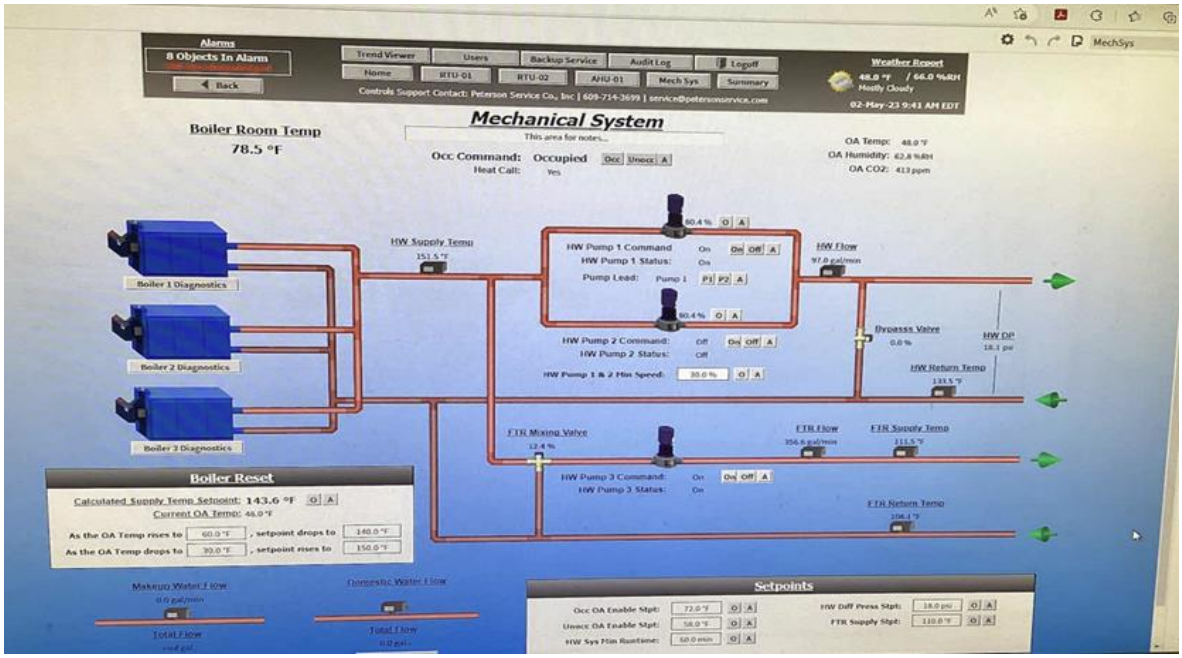
Installed in 2018, the boilers are in good condition. The hydronic distribution system is a two-pipe heating-only system. Two variable flow 5 hp pumps, one constant flow 1.5 hp pump, and three, 1 hp constant flow pumps distribute heating hot water to VAVs and to the traffic operation air handling system. The boilers and the hot water loop are controlled by the BAS. At the time of the audit, the hot water supply and return temperatures were 155.5 and 133.5°F, respectively with an outside air temperature of 48°F.

Condensing Boiler

Constant Flow Pump



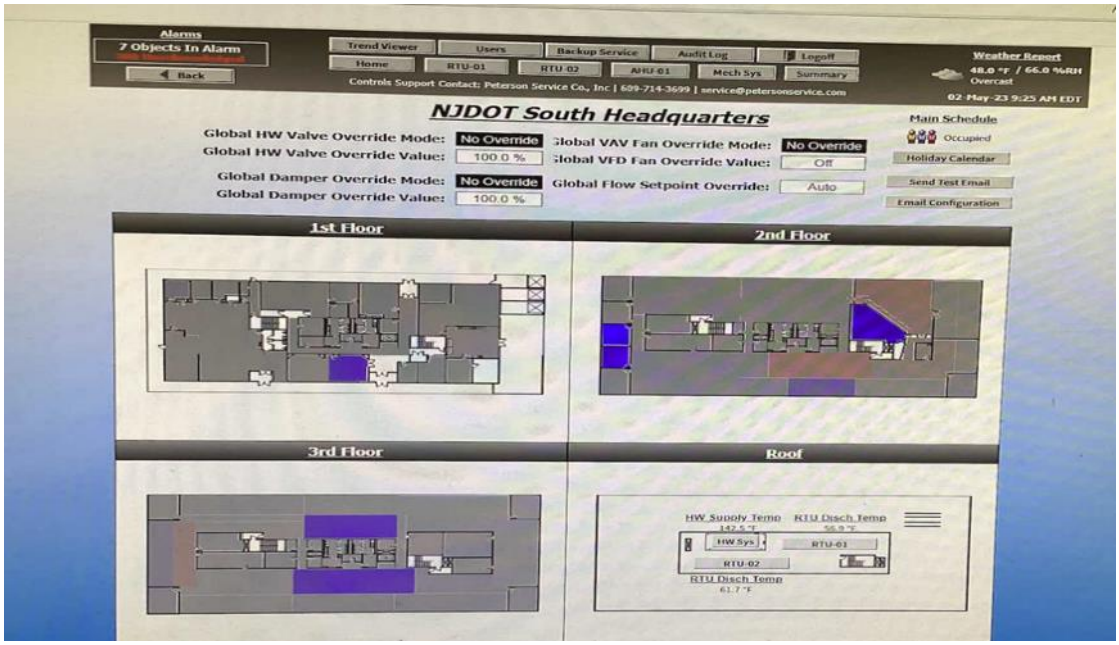
Variable Flow Pumps



BAS Screenshot – Hot Water Loop

2.7 Building Automation System (BAS)

A Honeywell BAS controls the HVAC equipment, boilers, RTUs, VAVs and AHU. The BAS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, heating water loop temperatures, and condenser water loop temperatures.



BAS Screenshot – Main Page

2.8 Domestic Hot Water

The building's domestic hot water needs are served by a 119-gallon, 6 kW State electric storage tank water heater. The unit is in the first-floor sprinkler room. The domestic hot water pipes appear to be insulated, and the insulation is in fair condition.

Electric Domestic Hot Water Heater

2.9 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 159 computer workstations throughout the facility. Plug loads include general café and office equipment such as copiers, printers, microwaves, coffee machines, paper shredders, mini refrigerators, televisions, and water coolers. There are five residential-style refrigerators throughout the building that are used to store food and beverages. These vary in condition and efficiency.

There are two vending machines on the first-floor lunchroom - one refrigerated and one non-refrigerated. Vending machines are not equipped with occupancy-based controls.

Copier/Scanner

Vending Machine

2.10 Water-Using Systems

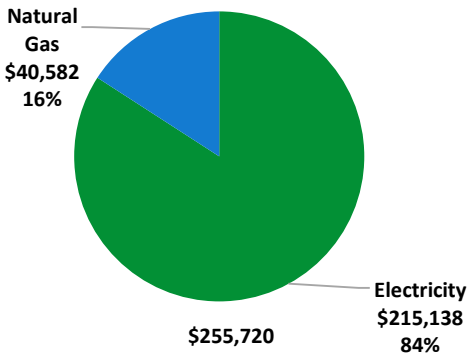
There are several restrooms with toilets, urinals, and sinks. Faucet flows are rated as high. Toilets are rated at 2.0 gallons per flush (gpf) and urinals are rated at 2.0 gpf.

Typical Restroom Sink

3 Energy Use and Costs

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

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	1,418,135 kWh	$215,138
Natural Gas	42,282 Therms	$40,582
Total		**$255,720**



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

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

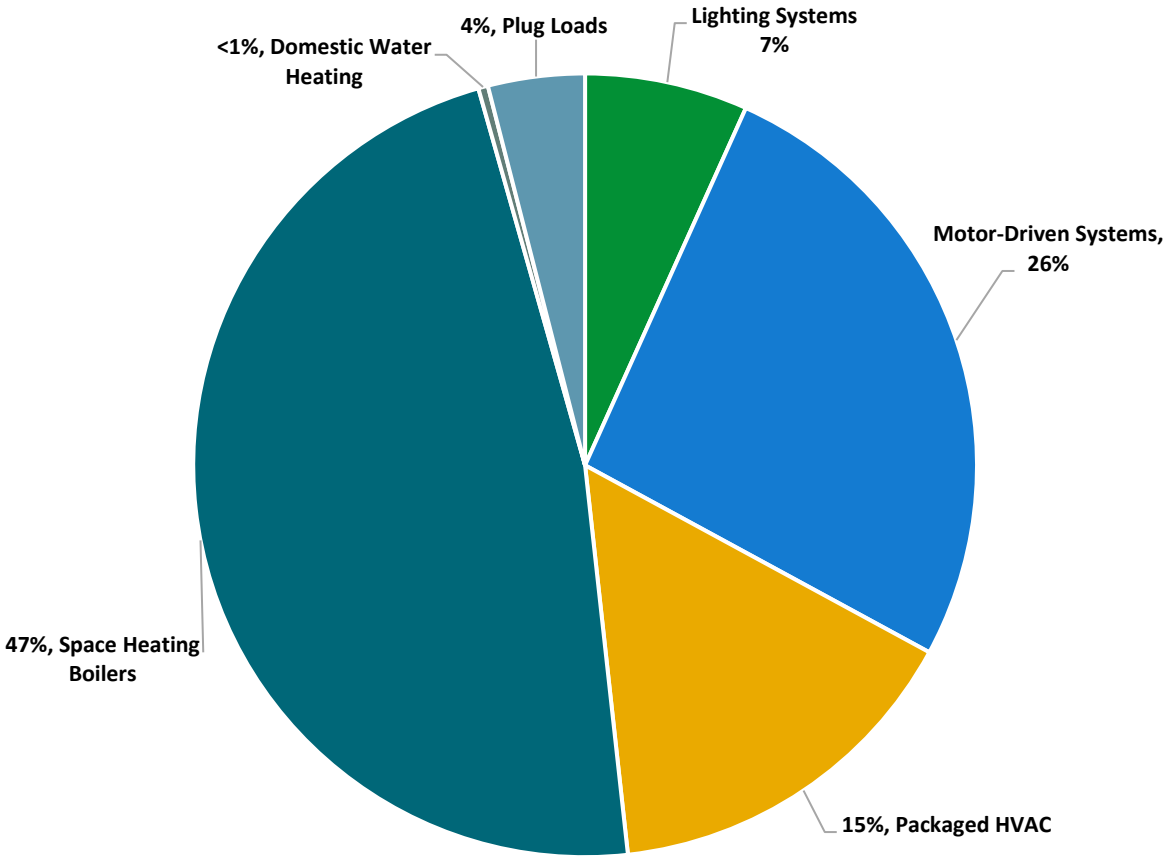
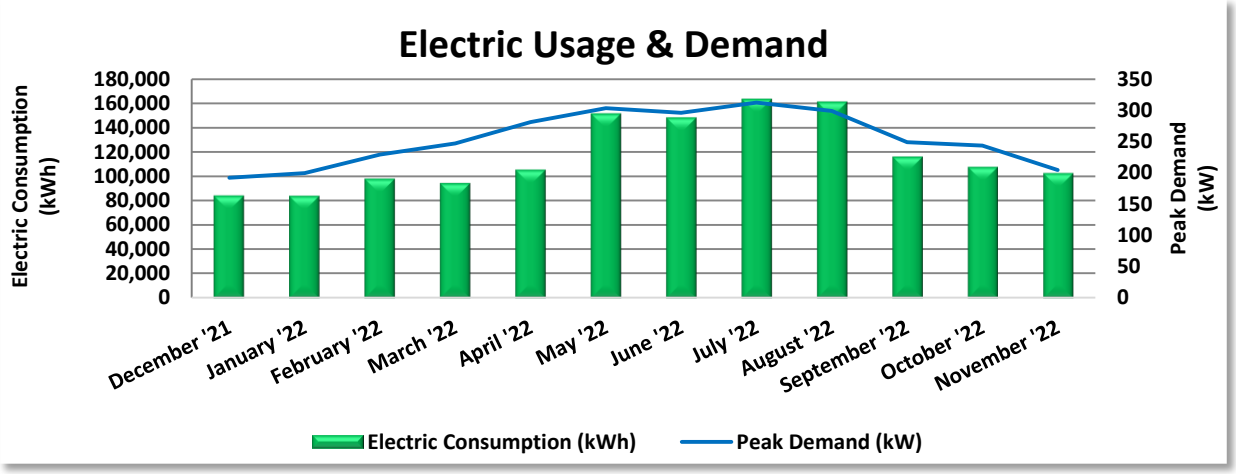


Figure 4 - Energy Balance

3.1 Electricity

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



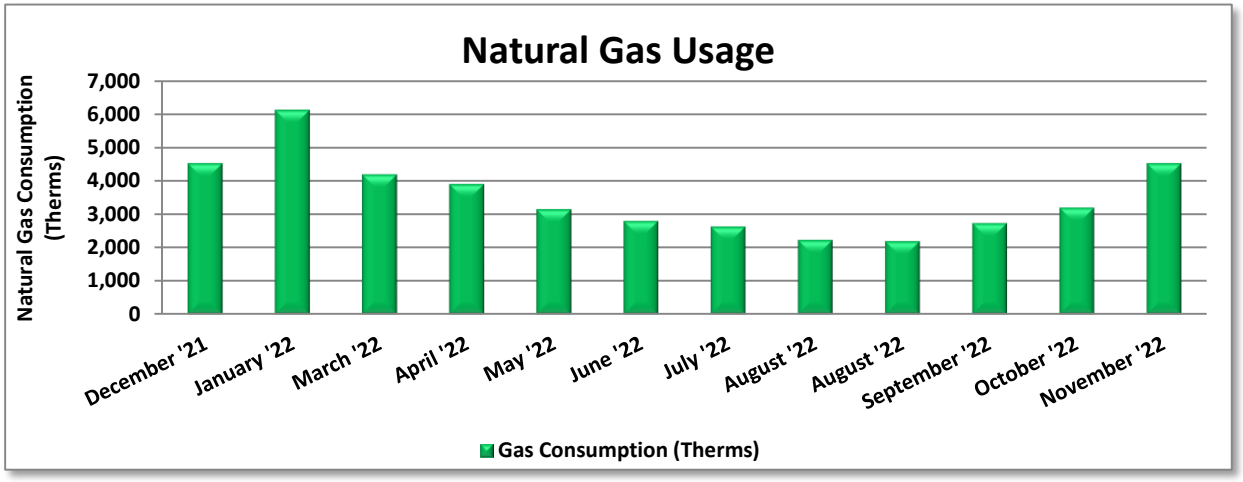
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
1/13/22	31	84,465	192	$727	$12,180
2/11/22	29	83,991	199	$755	$12,144
3/15/22	32	98,236	229	$868	$14,124
4/13/22	29	94,668	247	$1,041	$13,829
5/13/22	30	105,459	281	$1,064	$15,271
6/14/22	32	151,744	304	$3,896	$24,182
7/14/22	30	148,205	296	$4,009	$23,919
8/12/22	29	163,592	312	$4,232	$26,172
9/13/22	32	161,305	299	$4,050	$25,688
10/12/22	29	116,099	249	$1,272	$16,983
11/10/22	29	107,783	244	$1,089	$15,756
12/13/22	33	102,588	204	$912	$14,890
Totals	**365**	**1,418,135**	**312**	**$23,915**	**$215,138**
Annual	**365**	**1,418,135**	**312**	**$23,915**	**$215,138**

Notes:

- Peak demand of 312 kW occurred in July '22.
- Average demand over the past 12 months was 255 kW.
- The average electric cost over the past 12 months was $0.152/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

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



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
1/13/22	29	4,531	$4,698
2/15/22	33	6,136	$6,315
3/17/22	30	4,203	$4,571
4/18/22	32	3,910	$3,495
5/17/22	29	3,156	$2,854
6/16/22	30	2,808	$2,304
7/16/22	30	2,632	$2,084
8/16/22	31	2,235	$1,882
9/15/22	30	2,202	$1,857
10/14/22	29	2,734	$2,293
11/14/22	31	3,204	$3,532
12/15/22	31	4,531	$4,698
Totals	**365**	**42,282**	**$40,582**
Annual	**365**	**42,282**	**$40,582**

Notes:

- The average gas cost for the past 12 months is $0.960/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

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

Benchmarking Score	**N/A**

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

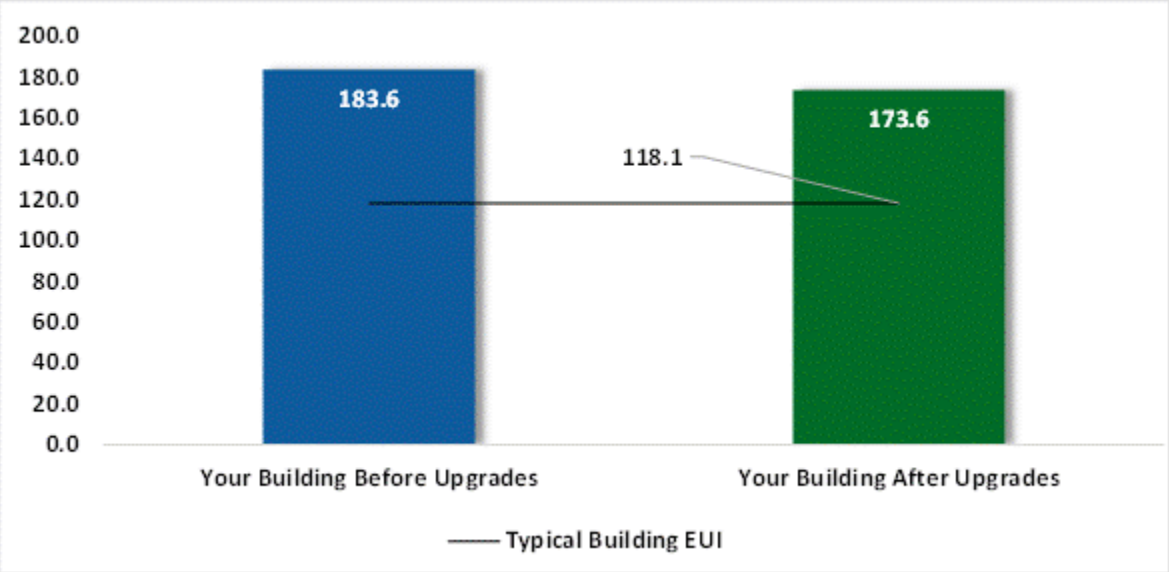


Figure 5 - Energy Use Intensity Comparison[3]

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

Free online training is available to help you use ENERGY STAR Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training.

For more information on ENERGY STAR and Portfolio Manager, visit their website.

4 Energy Conservation Measures

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

Calculations of energy use and savings are based on the current version of the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

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

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**67,454**	**11.9**	**-14**	**$10,098**	**$20,568**	**$3,396**	**$17,172**	**1.7**	**66,275**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	919	0.3	0	$138	$522	$60	$462	3.4	903
ECM 2	Retrofit Fixtures with LED Lamps	Yes	60,600	11.0	-13	$9,072	$16,019	$3,336	$12,683	1.4	59,540
ECM 3	Install LED Exit Signs	Yes	5,936	0.6	-1	$889	$4,027	$0	$4,027	4.5	5,832
Lighting Control Measures			**33,899**	**6.1**	**-7**	**$5,075**	**$23,577**	**$3,462**	**$20,115**	**4.0**	**33,306**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	32,186	5.8	-7	$4,818	$22,475	$2,530	$19,945	4.1	31,623
ECM 5	Install High/Low Lighting Controls	Yes	1,712	0.3	0	$256	$1,102	$932	$171	0.7	1,682
Variable Frequency Drive (VFD) Measures			**38,860**	**5.1**	**0**	**$5,895**	**$33,133**	**$3,000**	**$30,133**	**5.1**	**39,132**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	28,607	4.3	0	$4,340	$16,945	$2,700	$14,245	3.3	28,807
ECM 7	Install VFDs on Heating Water Pumps	Yes	10,254	0.8	0	$1,556	$16,188	$300	$15,888	10.2	10,325
Domestic Water Heating Upgrade			**1,472**	**0.0**	**0**	**$223**	**$101**	**$48**	**$53**	**0.2**	**1,482**
ECM 8	Install Low-Flow DHW Devices	Yes	1,472	0.0	0	$223	$101	$48	$53	0.2	1,482
Food Service & Refrigeration Measures			**1,954**	**0.2**	**0**	**$296**	**$535**	**$50**	**$485**	**1.6**	**1,968**
ECM 9	Vending Machine Control	Yes	1,954	0.2	0	$296	$535	$50	$485	1.6	1,968
Custom Measures			**6,246**	**0.0**	**0**	**$948**	**$11,242**	**$0**	**$11,242**	**11.9**	**6,290**
ECM 10	Replace Electric Water Heater with Heat Pump Water Heater	Yes	6,246	0.0	0	$948	$11,242	$0	$11,242	11.9	6,290
TOTALS			**149,885**	**23.4**	**-21**	**$22,535**	**$89,156**	**$9,956**	**$79,200**	**3.5**	**148,452**

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

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**67,454**	**11.9**	**-14**	**$10,098**	**$20,568**	**$3,396**	**$17,172**	**1.7**	**66,275**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	919	0.3	0	$138	$522	$60	$462	3.4	903
ECM 2	Retrofit Fixtures with LED Lamps	60,600	11.0	-13	$9,072	$16,019	$3,336	$12,683	1.4	59,540
ECM 3	Install LED Exit Signs	5,936	0.6	-1	$889	$4,027	$0	$4,027	4.5	5,832
Lighting Control Measures		**33,899**	**6.1**	**-7**	**$5,075**	**$23,577**	**$3,462**	**$20,115**	**4.0**	**33,306**
ECM 4	Install Occupancy Sensor Lighting Controls	32,186	5.8	-7	$4,818	$22,475	$2,530	$19,945	4.1	31,623
ECM 5	Install High/Low Lighting Controls	1,712	0.3	0	$256	$1,102	$932	$171	0.7	1,682
Variable Frequency Drive (VFD) Measures		**38,860**	**5.1**	**0**	**$5,895**	**$33,133**	**$3,000**	**$30,133**	**5.1**	**39,132**
ECM 6	Install VFDs on Constant Volume (CV) Fans	28,607	4.3	0	$4,340	$16,945	$2,700	$14,245	3.3	28,807
ECM 7	Install VFDs on Heating Water Pumps	10,254	0.8	0	$1,556	$16,188	$300	$15,888	10.2	10,325
Domestic Water Heating Upgrade		**1,472**	**0.0**	**0**	**$223**	**$101**	**$48**	**$53**	**0.2**	**1,482**
ECM 8	Install Low-Flow DHW Devices	1,472	0.0	0	$223	$101	$48	$53	0.2	1,482
Food Service & Refrigeration Measures		**1,954**	**0.2**	**0**	**$296**	**$535**	**$50**	**$485**	**1.6**	**1,968**
ECM 9	Vending Machine Control	1,954	0.2	0	$296	$535	$50	$485	1.6	1,968
Custom Measures		**6,246**	**0.0**	**0**	**$948**	**$11,242**	**$0**	**$11,242**	**11.9**	**6,290**
ECM 10	Replace Electric Water Heater with Heat Pump Water Heater	6,246	0.0	0	$948	$11,242	$0	$11,242	11.9	6,290
TOTALS		**149,885**	**23.4**	**-21**	**$22,535**	**$89,156**	**$9,956**	**$79,200**	**3.5**	**148,452**

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

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

Figure 7 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**67,454**	**11.9**	**-14**	**$10,098**	**$20,568**	**$3,396**	**$17,172**	**1.7**	**66,275**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	919	0.3	0	$138	$522	$60	$462	3.4	903
ECM 2	Retrofit Fixtures with LED Lamps	60,600	11.0	-13	$9,072	$16,019	$3,336	$12,683	1.4	59,540
ECM 3	Install LED Exit Signs	5,936	0.6	-1	$889	$4,027	$0	$4,027	4.5	5,832

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: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit T12 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: boiler room

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent T8 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: closets, open and close office areas, staircases, and storage rooms

ECM 3: Install LED Exit Signs

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

Additional Notes: It should be noted that the facility has done a significant amount of upgrades to their lighting systems since the site visit. Most lighting sources are now LED.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**33,899**	**6.1**	**-7**	**$5,075**	**$23,577**	**$3,462**	**$20,115**	**4.0**	**33,306**
ECM 4	Install Occupancy Sensor Lighting Controls	32,186	5.8	-7	$4,818	$22,475	$2,530	$19,945	4.1	31,623
ECM 5	Install High/Low Lighting Controls	1,712	0.3	0	$256	$1,102	$932	$171	0.7	1,682

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, conference room, open areas, closets, restrooms, and storage rooms

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: first floor lobby and DMV corridor

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**38,860**	**5.1**	**0**	**$5,895**	**$33,133**	**$3,000**	**$30,133**	**5.1**	**39,132**
ECM 6	Install VFDs on Constant Volume (CV) Fans	28,607	4.3	0	$4,340	$16,945	$2,700	$14,245	3.3	28,807
ECM 7	Install VFDs on Heating Water Pumps	10,254	0.8	0	$1,556	$16,188	$300	$15,888	10.2	10,325

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.

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

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

Affected Air Handlers: AHU-1, CRAC-1 and 2

ECM 7: Install VFDs on Heating Water Pumps

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

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

Affected Pumps: one, 1.5 hp secondary pump and three, 1.0 hp circulating pumps

Additional Notes: For VFD measures, it is recommended that you work with your design team, specialists, and contractors to ensure that the measure will work with your existing systems.

4.4 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**1,472**	**0.0**	**0**	**$223**	**$101**	**$48**	**$53**	**0.2**	**1,482**
ECM 8	Install Low-Flow DHW Devices	1,472	0.0	0	$223	$101	$48	$53	0.2	1,482

ECM 8: 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.

4.5 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,954**	**0.2**	**0**	**$296**	**$535**	**$50**	**$485**	**1.6**	**1,968**
ECM 9	Vending Machine Control	1,954	0.2	0	$296	$535	$50	$485	1.6	1,968

ECM 9: Vending Machine Control

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

4.6 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_2e Emissions Reduction (lbs)
Custom Measures		**6,246**	**0.0**	**0**	**$948**	**$11,242**	**$0**	**$11,242**	**11.9**	**6,290**
ECM 10	Replace Electric Water Heater with Heat Pump Water Heater	6,246	0.0	0	$948	$11,242	$0	$11,242	11.9	6,290

CM 10: Replace Electric Water Heater with Heat Pump Water Heater

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 (HPWH) 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.[4] 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 in order 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.

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

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs.

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

You may already be doing some of these things—see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR Portfolio Manager

You've heard it before—you cannot manage what you do not measure. ENERGY STAR Portfolio Manager is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[5]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Weatherization

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

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

Window Treatments/Coverings

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

Lighting Maintenance

- Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.
- In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

Lighting Controls

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

Motor Controls

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

Motor Maintenance

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

Fans to Reduce Cooling Load

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

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. Thermostats should be programmed for a setback of 5°F-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.

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.

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 in order to eliminate unnecessary equipment operation and save energy. Monitoring should be performed often at sites with frequently changing usage patterns – daily in some cases. We recommend using the *optimal start* feature of the 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.

Water Conservation

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

For more information regarding water conservation go to the EPA's WaterSense website[6] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[7] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. Any reduction in water use does however ultimately reduce grid-level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users.

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

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

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

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

Procurement Strategies

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

6 On-site Generation

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

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

6.1 Solar Photovoltaic

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

An additional study for solar photovoltaic for DOT's North Region Headquarters is provided below.

Executive Summary

This section summarizes projected energy and cost impacts, as well as design considerations, for a proposed 457 kW-DC carport solar photovoltaic (PV) system and 325 kWh battery energy storage system (BESS) for the DOT South Region Headquarters site located at 1 Executive Campus, Cherry Hill, NJ 08002. Please note this is a feasibility stage study, and all cost/savings values are solely estimates and not for design level application.

Two pieces of equipment contribute to the system:

- 457 kW Carport Solar PV System: The carport-mounted solar panels are strategically positioned to make the most efficient use of the available parking space, maximizing the coverage of solar energy generation. The projected Solar PV system is expected to generate a total energy output of 618,113 kWh, accounting for 44% of the site's total electricity consumption for the year 2022.
- 325 kWh BESS: The battery was sized to maximize the system's financial return by storing excess energy generation and discharging at peak utility cost periods. Additionally, it was sized to power the site for one hour during the event of an outage.

Equipment	Estimated Max Demand Savings (kW)	Estimated Annual Energy Generation (kWh)	Estimated Annual GHG Reduction ($MT\text{-}CO_2e$)	Estimated Annual Cost Savings ($)	Estimated Gross Project Cost ($)	Total Incentives ($)	Net Project Cost[8] ($)	Simple Payback Period (yr.)
457kW Solar PV	59	618,113	123	$71,237	$2,485,463	$1,367,004	$1,118,458	15.7
325 kWh Battery	23	0	0	$332	$394,537	$216,996	$177,542	535.4
Total	82	618,113	123	$71,569	$2,880,000	$1,584,000	$1,296,000	18.1

Project Summary Table

[8] Simple payback is computed as the "Net Project Cost" divided by the "Estimated Annual Cost Savings".

Equipment	Estimated Gross Project Cost ($)	ITC Rebate (1)	MACRS Rebate (2)	Net Project Cost
457kW Solar PV	$2,485,463	$745,639	$621,366	$1,118,458
325 kWh Battery	$394,537	$118,361	$98,634	$177,542
Total	$2,880,000	$864,000	$720,000	$1,296,000

Incentive Summary Table

Multiple incentives are available to reduce the project cost.

1. Federal Income Tax Credit (ITC): As of the passage of the 2022 Inflation Reduction Act, the ITC refund can be claimed by non-taxable entities as a cash rebate. The ITC is equal to 30% of the system cost and is scheduled to persist until 2033.
2. Modified Accelerated Cost Recovery System (MACRS): As of the passage of the 2022 Inflation Reduction Act, the MACRS refund can be claimed by non-taxable entities as a cash rebate. This rebate allows 85% of the system cost to be claimed as equipment depreciation at Year 1, approximately equivalent to 25% of the system cost.

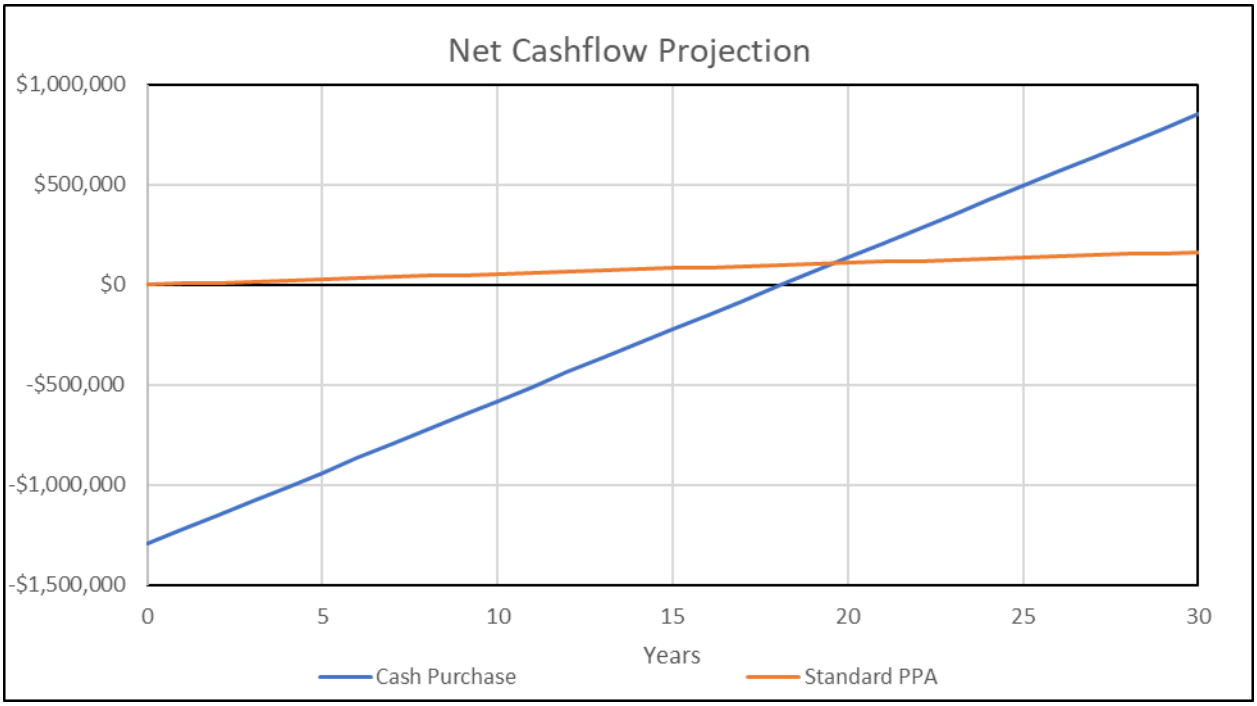
Ownership Models

This report explores two ownership models: Cash Purchase and Power Purchase Agreement (PPA).

- Cash Purchase: In this case, the entire system is purchased upfront by the customer.
- Standard Power Purchase Agreement: In this scenario, a third party installs and owns the system, and sells electricity to the customer at a reduced rate. In the table below, the interest rate is factored in as an offset to the "Annual Savings ($)". Calculations assume the owner charges a 3% interest rate on the system. Return on Investment (ROI) is null because there is no cost to the customer.

Ownership Plan	Upfront Gross Project Cost ($)	Year 1 Cost After Rebates ($)	Annual Savings ($)	Lifetime 30-Year Cost Savings ($)	30-Year ROI
Cash Purchase	$2,880,000	$1,296,000	$71,569	$2,147,063	166%
PPA	$0	$0	$5,448	$163,434	-

Ownership Model Table



Ownership Model Life Cycle Comparison

Emergency Backup System Sizing

As per the most recent 12-month utility data, peak demand is around 312 kW. Therefore, a 325-kWh emergency backup system would be sufficient to power the site for one hour at peak demand.

PV System Sizing

TRC modeled the proposed solar PV system using HelioScope, a meteorologically and location-dependent solar resource, to estimate its available size and component quantities. The software accounts for building shading, tree shading, panel angles, and appropriate spacing. Please note that the PV system has been sized for the available parking space. An additional 591 kW of PV panels are needed to achieve Net Zero Energy.

Project Coordination

As per TRC's cost analysis, some of the cost associated with installing the battery system (i.e., trenching, wiring and site preparation) can be shared with PV installation work. The cost estimate assumes the projects will be implemented concurrently.

Solar PV Layout Figure – HelioScope Design

Energy Generation and Management

A HelioScope model was developed to establish approximate PV system sizing. The output was entered into Energy Toolbase® (ETB), a TOU BESS and utility cost analysis tool that compares the generation profile vs the building's monthly consumption data. Because the site's energy generation rate structure and energy delivery rate structure are provided by different firms, ETB's estimate of baseline utility cost varied from available billing data by 21%, potentially due to rate schedule changes. ETB outputs were supplemented with worksheet calculations to true up the difference.

Cost savings were finalized by applying an 0.5% annual maintenance cost penalty to the solar PV system, and an 0.25% annual maintenance cost penalty to the BESS. The ETB analysis was used to simulate BESS operation throughout the year and to calculate utility cost savings with hourly utility rate sensitivity.

Project Cost

Project cost estimates were calculated using RS Means 2022 Construction Cost Catalogue, along with vendor quotes and guidelines available from the modeling software. Costs include contingencies and markups for all potential project tasks, including design, permitting, taxes, and a 30% contingency for infrastructure upgrades. A line-by-line breakdown of the costs considered is provided in the calculation's worksheet.

At a high level, average system costs are $5.44/Watt solar PV, and $1,214/kWh BESS, based on the gross project cost.

Please note that while detailed, cost estimates are still at the feasibility stage. Costs may vary by 30% relative to engineering assessments of the electrical and structural infrastructure.

Successor Solar Incentive Program (SuSI)

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

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

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

- **Basic Info on Solar PV in NJ**: www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs.
- **Approved Solar Installers in the NJ Market**: www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

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

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has no potential for installing a cost-effective CHP system.

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

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

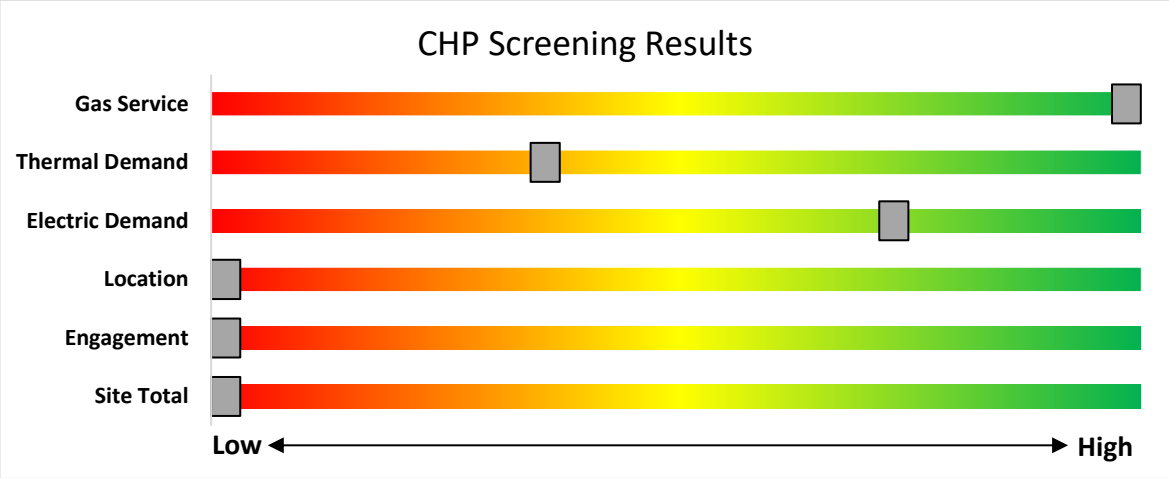


Figure 8 - Combined Heat and Power Screening

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

7 ELECTRIC VEHICLES (EV)

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

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

7.1 Electric Vehicle Charging

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

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

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

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

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

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

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

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

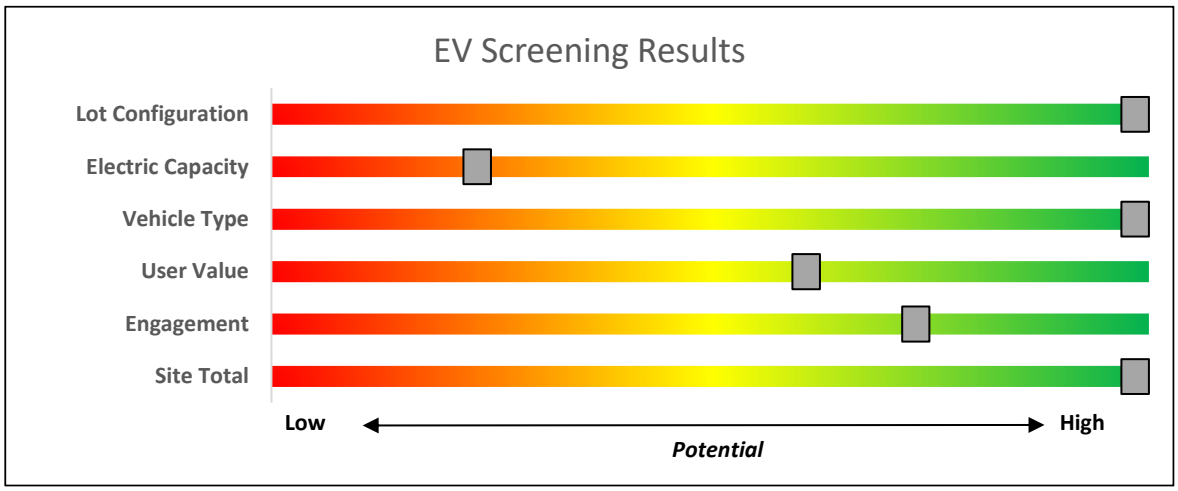


Figure 9 – EV Charger Screening

Electric Vehicle Programs Available

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

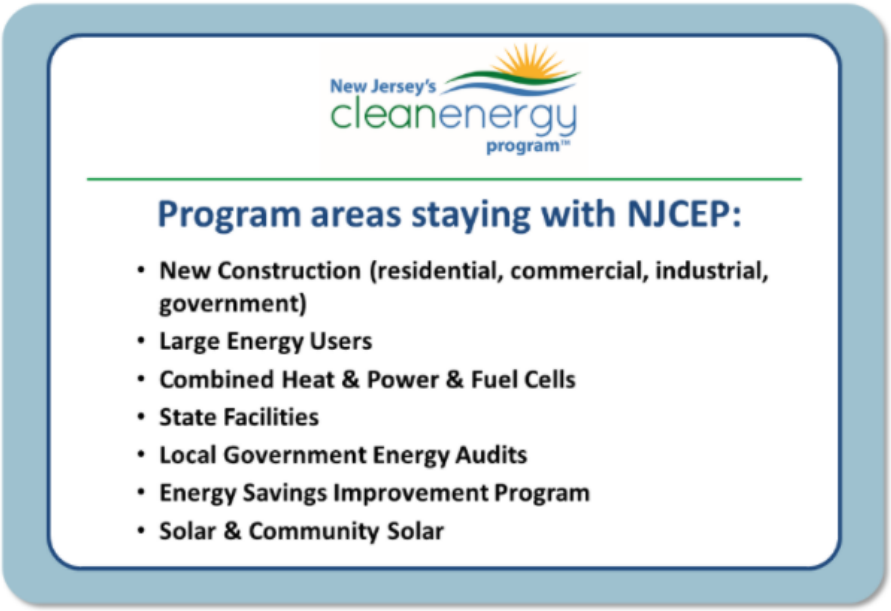
NJCEP offers a variety of EV programs for vehicles, charging stations, and fleets. Certain EV charging stations that receive electric utility service from Atlantic City Electric Company (ACE) or Public Service Electric & Gas Company (PSE&G), may be eligible for additional electric vehicle charging incentives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

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

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

8 Project Funding and Incentives

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



8.1 Utility Energy Efficiency Programs

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

Prescriptive and Custom

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

Equipment Examples

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

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

Direct Install

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

Incentives

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

How to Participate

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

Engineered Solutions

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

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

8.2 New Jersey's Clean Energy Programs

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

Large Energy Users

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

Incentives

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

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

How to Participate

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

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

Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

Successor Solar Incentive Program (SuSI)

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

Administratively Determined Incentive (ADI) Program

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

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

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

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

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

The ADI Program online portal is now open to new registrations.

Competitive Solar Incentive Program

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

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

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

Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. An ESIP is a type of performance contract, whereby school districts, counties, municipalities, housing authorities, and other public and state entities enter into contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the energy conservation measures (ECMs), ensuring that ESIP projects are cash flow positive for the life of the contract.

ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an energy services company or "ESCO."

(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.

(3) Use a hybrid approach of the two options described above where the ESCO is used for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the energy savings plan can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

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

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

9 PROJECT DEVELOPMENT

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

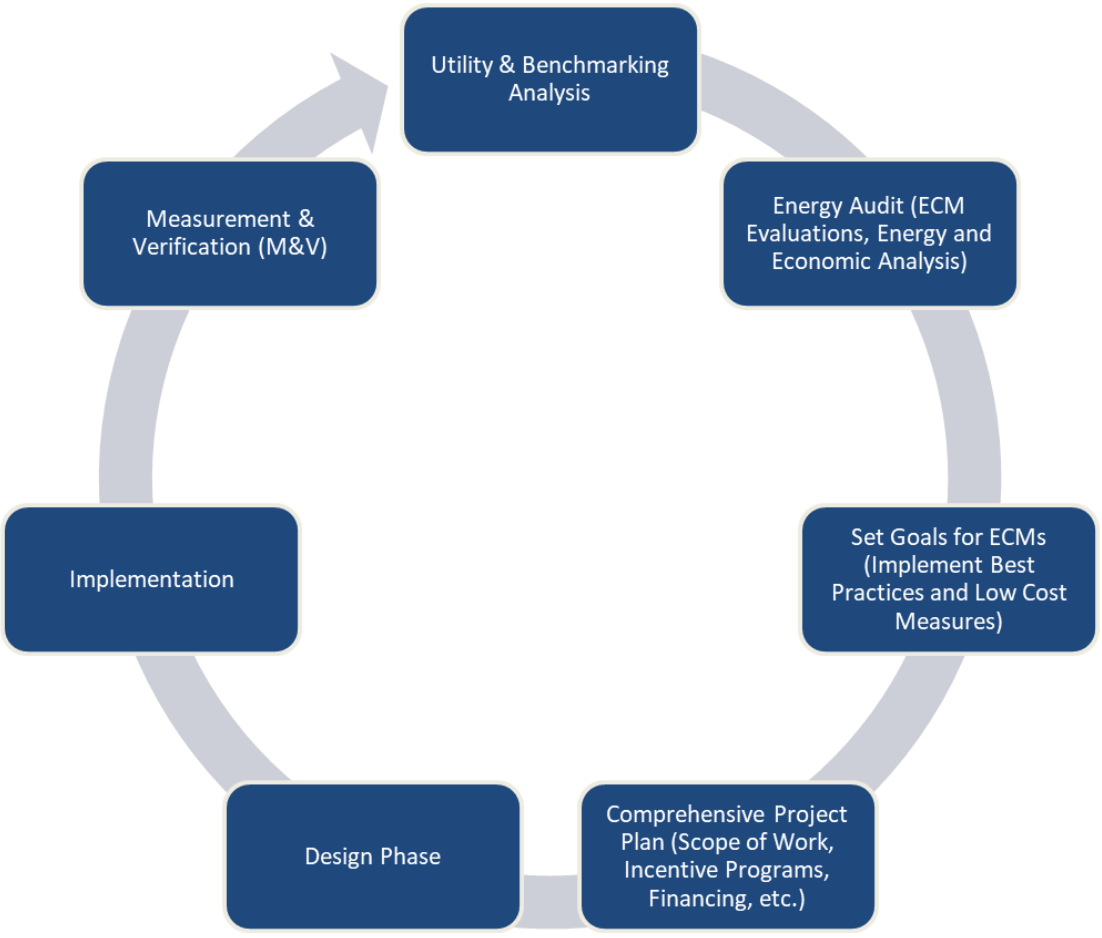


Figure 10 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. Though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website[9].

10.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market based and fluctuate monthly. The utility provides basic gas supply service to customers who choose not to buy from a third-party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier typically depends on whether a customer prefers budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third-party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website[10].

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
1st Floor - Main Sprinkler closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,730	0.0	158	0	$24	$69	$15	2.3
1st Floor Computer Room Open Area	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2, 4	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,884	0.6	1,783	0	$267	$954	$170	2.9
1st Floor Electrical Closet	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,730	4	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,884	0.0	108	0	$16	$331	$0	20.5
1st Floor IT Storage Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,884	0.1	264	0	$40	$234	$20	5.4
1st Floor Lobby	7	Exit Signs: 10 W Exit Sign	None		20	8,760	3	Fixture Replacement	No	7	LED Exit Signs: 2 W Lamp	None	6	8,760	0.1	944	0	$141	$641	$0	4.5
1st Floor Lobby	12	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	5,460	5	None	Yes	12	LED - Fixtures: Ambient 2x2 Fixture	High/Low Control	19	3,767	0.1	425	0	$64	$276	$276	0.0
1st Floor Lobby	21	LED Lamps: (2) 15W Plug-In Lamps	Wall Switch	S	30	5,460	5	None	Yes	21	LED Lamps: (2) 15W Plug-In Lamps	High/Low Control	30	3,767	0.2	1,173	0	$176	$551	$551	0.0
1st Floor Lunch Room	6	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	5,460	4	None	Yes	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	3,767	0.1	324	0	$48	$331	$35	6.1
1st Floor Lunch Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	5,460	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,460	0.0	210	0	$31	$46	$10	1.1
1st Floor Mail Room	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	3,820	4	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	19	2,636	0.0	49	0	$7	$142	$20	16.5
1st Floor Materials Lab Open Area	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	3,820		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	19	3,820	0.0	0	0	$0	$0	$0	0.0
1st Floor Materials Lab Open Area	14	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	14	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.1	529	0	$79	$331	$35	3.7
1st Floor Multi Purpose Room	1	Exit Signs: 10 W Exit Sign	None		20	8,760	3	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	135	0	$20	$92	$0	4.5
1st Floor Multi Purpose Room	8	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	8	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.1	302	0	$45	$331	$35	6.5
1st Floor Personnel Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,730	0.0	105	0	$16	$46	$10	2.3
1st Floor Personnel Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,884	0.2	594	0	$89	$538	$80	5.2
1st Floor Sprinkler Room	1	LED - Fixtures: Ambient 1x4 Fixture	Wall Switch	S	20	2,730		None	No	1	LED - Fixtures: Ambient 1x4 Fixture	Wall Switch	20	2,730	0.0	0	0	$0	$0	$0	0.0
1st Floor State Police Storage Closet	3	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	2,730	4	None	Yes	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	1,884	0.0	81	0	$12	$331	$0	27.3
1st Floor Supplies Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,730	0.0	158	0	$24	$69	$15	2.3
1st Floor Telephone Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,730	0.0	158	0	$24	$69	$15	2.3
1st Floor Vestibule #1	2	LED Lamps: (2) 15W Plug-In Lamps	Wall Switch	S	30	5,460	4	None	Yes	2	LED Lamps: (2) 15W Plug-In Lamps	Occupancy Sensor	30	3,767	0.0	112	0	$17	$142	$20	7.3
1st Floor Vestibule #2	2	LED Lamps: (2) 15W Plug-In Lamps	Wall Switch	S	30	5,460	4	None	Yes	2	LED Lamps: (2) 15W Plug-In Lamps	Occupancy Sensor	30	3,767	0.0	112	0	$17	$142	$20	7.3
2nd Floor Break Area	2	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	5,460	4	None	Yes	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	3,767	0.0	108	0	$16	$142	$20	7.6
2nd Floor Copy Room	2	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	5,460	4	None	Yes	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	3,767	0.0	108	0	$16	$142	$20	7.6
2nd Floor Electrical Closet	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,730	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,884	0.0	54	0	$8	$142	$0	17.6

	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
2nd Floor Men Restroom	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	20	2,830		None	No	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	20	2,830	0.0	0	0	$0	$0	$0	0.0
2nd Floor Men Restroom	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	19	2,830		None	No	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	19	2,830	0.0	0	0	$0	$0	$0	0.0
2nd Floor Men Restroom	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	29	2,830		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,830	0.0	0	0	$0	$0	$0	0.0
2nd Floor Open Area	17	Exit Signs: 10 W Exit Sign	None		20	8,760	3	Fixture Replacement	No	17	LED Exit Signs: 2 W Lamp	None	6	8,760	0.2	2,293	0	$343	$1,556	$0	4.5
2nd Floor Open Area	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	5,460	4	None	Yes	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	19	3,767	0.0	142	0	$21	$0	$0	0.0
2nd Floor Open Area	6	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	5,460	4	None	Yes	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	3,767	0.1	324	0	$48	$331	$35	6.1
2nd Floor Open Area	18	LED Lamps: (2) 15W Plug-In Lamps	Wall Switch	S	30	5,460	4	None	Yes	18	LED Lamps: (2) 15W Plug-In Lamps	Occupancy Sensor	30	3,767	0.2	1,005	0	$151	$661	$70	3.9
2nd Floor Open Area	25	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,460	2, 4	Relamp	Yes	25	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,767	0.5	3,303	-1	$494	$1,238	$195	2.1
2nd Floor Open Area	99	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	5,460	2, 4	Relamp	Yes	99	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,767	6.2	39,234	-8	$5,873	$9,169	$1,730	1.3
2nd Floor Open Area	6	U-Bend Fluorescent - T8: 2' T8U (31W) - 2L	Wall Switch	S	62	5,460	2, 4	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,767	0.2	1,414	0	$212	$880	$95	3.7
2nd Floor Sprinkler Room	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	2,730		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	29	2,730	0.0	0	0	$0	$0	$0	0.0
2nd Floor Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,730	0.0	105	0	$16	$46	$10	2.3
2nd Floor Storage #1	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,884	0.4	1,189	0	$178	$746	$90	3.7
2nd Floor Storage #2	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,884	0.2	793	0	$119	$608	$60	4.6
2nd Floor Telephone Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,730	0.0	105	0	$16	$46	$10	2.3
2nd Floor Women Restroom	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	20	2,830		None	No	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	20	2,830	0.0	0	0	$0	$0	$0	0.0
2nd Floor Women Restroom	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	19	2,830		None	No	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	19	2,830	0.0	0	0	$0	$0	$0	0.0
2nd Floor Women Restroom	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	29	2,830		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,830	0.0	0	0	$0	$0	$0	0.0
3rd Floor Conference Room	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	2,730	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	1,884	0.0	108	0	$16	$142	$20	7.6
3rd Floor Copy Room	2	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	76	0	$11	$142	$20	10.8
3rd Floor Electrical Closet	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,730	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,884	0.0	54	0	$8	$142	$0	17.6
3rd Floor Male Restroom	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	20	2,830		None	No	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	20	2,830	0.0	0	0	$0	$0	$0	0.0
3rd Floor Male Restroom	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	19	2,830		None	No	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	19	2,830	0.0	0	0	$0	$0	$0	0.0
3rd Floor Male Restroom	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	29	2,830		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,830	0.0	0	0	$0	$0	$0	0.0
3rd Floor Open Area	14	Exit Signs: 10 W Exit Sign	None		20	8,760	3	Fixture Replacement	No	14	LED Exit Signs: 2 W Lamp	None	6	8,760	0.2	1,889	0	$283	$1,281	$0	4.5

	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
3rd Floor Open Area	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	5,460		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	19	5,460	0.0	0	0	$0	$0	$0	0.0
3rd Floor Open Area	117	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	5,460	4	None	Yes	117	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	3,767	1.0	6,317	-1	$946	$2,646	$280	2.5
3rd Floor Open Area	14	LED Lamps: (2) 15W Plug-In Lamps	Wall Switch	S	30	5,460	4	None	Yes	14	LED Lamps: (2) 15W Plug-In Lamps	Occupancy Sensor	30	3,767	0.1	782	0	$117	$331	$35	2.5
3rd Floor Open Area	18	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,460	2, 4	Relamp	Yes	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,767	0.4	2,378	0	$356	$1,077	$160	2.6
3rd Floor Open Area	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	5,460	2, 4	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,767	2.0	12,682	-3	$1,898	$3,208	$585	1.4
3rd Floor Open Area	1	U-Bend Fluorescent - T8: 2' T8U (31W) - 2L	Wall Switch	S	62	5,460	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	5,460	0.0	174	0	$26	$92	$10	3.1
3rd Floor Plan Room	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	29	3,820	0.0	0	0	$0	$0	$0	0.0
3rd Floor Sprinkler Room	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	2,730		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	29	2,730	0.0	0	0	$0	$0	$0	0.0
3rd Floor Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,884	0.4	1,189	0	$178	$746	$90	3.7
3rd Floor Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,884	0.2	528	0	$79	$515	$40	6.0
3rd Floor Storage #2	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,884	0.4	1,189	0	$178	$746	$90	3.7
3rd Floor Supplies	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,884	0.2	793	0	$119	$608	$95	4.3
3rd Floor Telephone Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,730	0.0	105	0	$16	$46	$10	2.3
3rd Floor Women Restroom	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	20	2,830		None	No	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	20	2,830	0.0	0	0	$0	$0	$0	0.0
3rd Floor Women Restroom	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	19	2,830		None	No	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	19	2,830	0.0	0	0	$0	$0	$0	0.0
3rd Floor Women Restroom	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	29	2,830		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,830	0.0	0	0	$0	$0	$0	0.0
ADA Room	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	29	3,820	0.0	0	0	$0	$0	$0	0.0
Conference Room	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	5,460	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	3,767	0.0	216	0	$32	$142	$20	3.8
Corridor- DMV	2	Exit Signs: 10 W Exit Sign	None		20	8,760	3	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	270	0	$40	$183	$0	4.5
Corridor- DMV	3	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	5,900	5	None	Yes	3	LED - Fixtures: Ambient 2x2 Fixture	High/Low Control	19	4,071	0.0	115	0	$17	$276	$105	9.9
DMV - Agent Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	3,820	2, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,636	0.2	832	0	$125	$538	$80	3.7
DMV - Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	2,730	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,730	0.0	158	0	$24	$69	$15	2.3
DMV - CPU Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	3,820	2, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,636	0.2	832	0	$125	$538	$80	3.7
DMV - Files Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	96	3,820	2, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,636	0.2	1,109	0	$166	$608	$95	3.1
DMV - Vestibule	2	Compact Fluorescent: (2) 23W Biaxial Plug-In Lamps	Wall Switch	S	46	3,820	2, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	32	2,636	0.0	200	0	$30	$205	$24	6.1

	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
DMV - Waiting Area	3	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	3,820	4	None	Yes	3	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	19	2,636	0.0	74	0	$11	$0	$0	0.0
DMV - Waiting Area	15	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	15	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.1	567	0	$85	$331	$35	3.5
DMV Office - Open Area	3	Exit Signs: 10 W Exit Sign	None		20	8,760	3	Fixture Replacement	No	3	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	405	0	$61	$275	$0	4.5
DMV Office - Open Area	17	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	5,460	4	None	Yes	17	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	19	3,767	0.1	601	0	$90	$661	$70	6.6
DMV Office - Open Area	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	5,460	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,767	0.2	1,057	0	$158	$515	$75	2.8
DMV Restroom #1	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	5,460		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	19	5,460	0.0	0	0	$0	$0	$0	0.0
DMV Restroom #2	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	19	5,460		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	19	5,460	0.0	0	0	$0	$0	$0	0.0
Elevator	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,730	0.0	105	0	$16	$46	$10	2.3
Elevator Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,730	0.0	105	0	$16	$46	$10	2.3
Exterior LED A Lamp	31	LED Lamps: (1) 9W A19 Screw-In Lamp	Timeclock		9	2,730		None	No	31	LED Lamps: (1) 9W A19 Screw-In Lamp	Timeclock	9	2,730	0.0	0	0	$0	$0	$0	0.0
Exterior Pole	12	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell		150	4,380		None	No	12	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	150	4,380	0.0	0	0	$0	$0	$0	0.0
Materials Lab - Room 1000	2	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	76	0	$11	$142	$20	10.8
Materials Lab - Testing Lab	10	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	10	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.1	378	0	$57	$331	$35	5.2
REOC Storage Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,730	0.0	105	0	$16	$46	$10	2.3
Roof - Boiler Room	6	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	80	2,730	1, 4	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,884	0.3	1,081	0	$162	$852	$95	4.7
Room 2000	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	151	0	$23	$142	$20	5.4
Room 2001	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	151	0	$23	$142	$20	5.4
Room 2002	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	151	0	$23	$142	$20	5.4
Room 2100	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	151	0	$23	$142	$20	5.4
Room 2200	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	151	0	$23	$142	$20	5.4
Room 3100	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	151	0	$23	$142	$20	5.4
Room 3200	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	151	0	$23	$142	$20	5.4
Room 3300	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.0	151	0	$23	$142	$20	5.4
Server Room	35	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820	4	None	Yes	35	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	2,636	0.3	1,322	0	$198	$992	$105	4.5
South REOC Room	12	LED Lamps: (2) 15W Plug-In Lamps	Wall Switch	S	30	3,820	4	None	Yes	12	LED Lamps: (2) 15W Plug-In Lamps	Occupancy Sensor	30	2,636	0.1	469	0	$70	$331	$35	4.2

	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
South REOC Room	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	34	3,820	2, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,636	0.1	561	0	$84	$577	$71	6.0
Stairs 1	4	LED - Fixtures: Ambient 1x4 Fixture	Wall Switch		20	5,900	4	None	Yes	4	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	20	4,071	0.0	161	0	$24	$276	$140	5.6
Stairs 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		64	5,900	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,071	0.1	571	0	$85	$368	$90	3.3
Stairs 2	7	LED - Fixtures: Ambient 1x4 Fixture	Wall Switch		20	5,900	4	None	Yes	7	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	20	4,071	0.0	282	0	$42	$276	$245	0.7
Stairs 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		64	5,900	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,900	0.0	227	0	$34	$46	$10	1.1
Testing Lab Closet	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	64	2,730	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,884	0.2	528	0	$79	$327	$40	3.6
Traffic Operation Room	8	Compact Fluorescent: (2) 23W Biaxial Plug-In Lamps	Wall Switch	S	46	5,460	2, 4	Relamp	Yes	8	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	32	3,767	0.2	1,143	0	$171	$584	$51	3.1
Traffic Operation Room	8	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	5,460	4	None	Yes	8	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	29	3,767	0.1	432	0	$65	$331	$35	4.6
Unlabeled Office	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	29	3,820		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	29	3,820	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
Roof	AHU 1 - Traffic Operation Room	1	Supply Fan	5.0	89.5%	No			W	8,760	6	No	89.5%	Yes	1	1.4	10,165	0	$1,542	$5,648	$900	3.1
Roof - Boiler Room	Boiler Room	1	Exhaust Fan	0.1	65.0%	No	Dayton	2C713B	W	3,700		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF-1 - Restrooms	1	Exhaust Fan	0.5	65.0%	No	Greenheck	USF - 324 - B1	W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF-3 - Material Lab	1	Exhaust Fan	0.5	65.0%	No	Greenheck	USF - 313 - B1	W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF-2 - Material Lab	1	Exhaust Fan	0.5	65.0%	No	Greenheck	USF- 3 23 - B1	W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
1st Floor Sprinkler Room	DHW Circulation Pump	1	DHW Circulation Pump	0.2	65.0%	No			W	5,800		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - Boiler Room	P1 & P2 - DOT South	2	Heating Hot Water Pump	5.0	89.5%	Yes			W	5,900		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof - Boiler Room	P3 - DOT South	1	Heating Hot Water Pump	1.5	86.5%	No			W	5,900	7	No	86.5%	Yes	1	0.1	2,322	0	$352	$4,367	$75	12.2
Roof - Boiler Room	Heating Hot Water Pumps	3	Heating Hot Water Pump	1.0	65.0%	No	GRUNDFOS	MAGNA3 65	W	5,900	7	No	85.5%	Yes	3	0.7	7,932	0	$1,203	$11,822	$225	9.6
Elevator Room	DOT South	1	Other	30.0	91.7%	No			W	500		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 1 - DMV & Half of DOT South	1	Supply Fan	30.0	93.2%	Yes			W	8,760		No	93.2%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 1 - DMV & Half of DOT South	1	Return Fan	10.0	91.7%	Yes			W	8,760		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 2 - DOT South	1	Supply Fan	30.0	93.2%	Yes			W	8,760		No	93.2%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 2 - DOT South	1	Return Fan	10.0	91.7%	Yes			W	8,760		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Ceiling	1st Floor - VAV	18	Supply Fan	0.5	65.0%	No			W	5,900		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Ceiling	2nd Floor - VAV	20	Supply Fan	0.5	65.0%	No			W	5,900		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Ceiling	3rd Floor - VAV	23	Supply Fan	0.5	65.0%	No			W	5,900		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	DC-1	3	Supply Fan	3.0	89.5%	Yes			W	5,900		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	DC-2	3	Supply Fan	3.0	89.5%	Yes			W	5,900		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	CRAC - 1 - Server Room	1	Supply Fan	5.0	89.5%	No			W	5,900	6	No	89.5%	Yes	1	1.4	9,221	0	$1,399	$5,648	$900	3.4

		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
Roof	CRAC - 2 - Server Room	1	Supply Fan	5.0	89.5%	No			W	5,900	6	No	89.5%	Yes	1	1.4	9,221	0	$1,399	$5,648	$900	3.4

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
Exterior Grounds	CPU Room	1	Ductless Mini-Split HP	2.00	24.00	20.00	10.6 HSPF	DAIKIN	RXS24LVJU	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior Grounds	Server Room	1	Ductless Mini-Split HP	3.00	36.00	17.50	3 COP	DAIKIN	RZQ36PVJU9	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior Grounds	Condensing Unit - Traffic Operation Room	1	Split-System	4.00		16.50		LENNOX	SSB048H4S43Y	W		No							0.0	0	0	$0	$0	$0	0.0
1st Floor Vestibule	1st Floor Vestibule	1	Electric Resistance Heat		17.06		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
1st Floor Vestibule #2	1st Floor Vestibule #2	1	Electric Resistance Heat		17.06		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Corridor - DMV	Corridor - DMV	1	Electric Resistance Heat		17.06		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
DMV - Vestibule	DMV - Vestibule	1	Electric Resistance Heat		17.06		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Boiler Room	1	Electric Resistance Heat		10.24		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Roof	DC 1 & 2 - Server Room	2	Split-System	14.06		12.00		DATA AIRE		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 1 - DMV & Half of DOT South	1	Package Unit	81.00		12.00		DAIKIN	RPS081DLYS5	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 2 - DOT South	1	Package Unit	81.00		12.00		DAIKIN	RPS081DLYS5	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	DOT South	3	Condensing Hot Water Boiler	952	AERCO INT.	AM 1000B HXV	W		No						0.0	0	0	$0	$0	$0	0.0

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	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
1st Floor Sprinkler Room	DOT South	1	Storage Tank Water Heater (> 50 Gal)	State Water Heaters	SB6 120	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
2nd Floor Men Restroom	8	3	Faucet Aerator (Lavatory)	2.00	0.50	0.0	368	0	$56	$25	$12	0.2
2nd Floor Women Restroom	8	3	Faucet Aerator (Lavatory)	2.00	0.50	0.0	368	0	$56	$25	$12	0.2
3rd Floor Male Restroom	8	3	Faucet Aerator (Lavatory)	2.00	0.50	0.0	368	0	$56	$25	$12	0.2
3rd Floor Women Restroom	8	3	Faucet Aerator (Lavatory)	2.00	0.50	0.0	368	0	$56	$25	$12	0.2

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Various Spaces	5	Coffee Machine	900	No		
Various Spaces	159	Desktop	270	No		
Various Spaces	10	Microwave	1,000	No		
Various Spaces	1	Other	500	Yes		
Various Spaces	1	Other	500	No		
Various Spaces	1	Other	10,800	No		
Various Spaces	2	Paper Shredder	150	No		
Various Spaces	23	Printer (Medium/Small)	240	No		
Various Spaces	1	Printer (Large)	600	No		
Various Spaces	5	Refrigerator (Residential)	400	No		
Various Spaces	23	Television	220	No		
Various Spaces	1	Toaster	850	No		
Various Spaces	6	Water Cooler	92	No		
Various Spaces	3	Refrigerator (Mini)	180	No		

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
1st Floor Lunch Room	1	Non-Refrigerated	9	Yes	0.0	343	0	$52	$268	$0	5.2
1st Floor Lunch Room	1	Refrigerated	9	Yes	0.2	1,612	0	$245	$268	$50	0.9

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.

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)	DOT South	7,400	Electric	6.0	119	Heat Pump Water Heater	2.5	119	$9,400.00	0.00	6,246	0	$948	$11,242	$0	$0	$0	$11,242	11.86	11.86
			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.

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ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

DOT - South Region Headquarters

Primary Property Type: Office
Gross Floor Area (ft²): 49,396
Built: 1985

For Year Ending: December 31, 2022
Date Generated: July 19, 2023

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
DOT - South Region Headquarters 1 Executuve Campus Cherry Hill, New Jersey 08002	State of New Jersey 428 East State Street Trenton, NJ 08625 (609) 940-4129	New Jersey Board of Public Utilities State Energy Services 44 South Clinton Ave Trenton, NJ 08625 (609) 633-9666 BPU.EnergyServices@bpu.nj.gov

Property ID: 25132827

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
183.5 kBtu/ft²

Source EUI
364.7 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	4,208,678 (46%)
Electric - Grid (kBtu)	4,854,898 (54%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	118.1
National Median Source EUI (kBtu/ft²)	234.8
% Diff from National Median Source EUI	55%

Annual Emissions	
Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	646

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)

Summary

Solar kW: 457 | Battery kWh: 325

DER	Gross Project Cost ($)	Energy Generation (kWh)	Demand Reduction (kW)	GHG Reduction (MT CO2)	Total Annual Utility Cost Savings ($/yr)	New Maintenance Penalty ($/yr)	Net Annual Cost Savings ($/yr)	Incentives (ITC) ($)	Depreciation (MACRS) ($)	Net Project Cost ($)	Net Simple Payback (yr)
457kW Solar PV	$2,485,463	618,113	59	123.0	$83,664	$12,427	$71,237	$745,639	$621,366	$1,118,458	15.7
325 kWh Battery	$394,537	0	23	0.0	$1,318	$986	$332	$118,361	$98,634	$177,542	535.4
Total	$2,880,000	618,113	82	123.0	$84,982	$13,414	$71,569	$864,000	$720,000	$1,296,000	18.1

PPA Alternative:	$5,448

Annual Utility Savings

Baseline kWh	1,418,134
Saved kWh	618,113
% NZE	44%
NZE Solar Size kW	1048

Equipment	Estimated Max Demand Savings (kW)	Estimated Annual Energy Generation (kWh)	Estimated Annual GHG Reduction ($MT\text{-}CO_2e$)	Estimated Annual Cost Savings ($)	Estimated Gross Project Cost ($)	Total Incentives ($)	Net Project Cost ($)	Simple Payback Period (yr)
457kW Solar PV	59	618,113	123	$71,237	$2,485,463	$1,367,004	$1,118,458	15.7
325 kWh Battery	23	0	0	$332	$394,537	$216,996	$177,542	535.4
Total	82	618,113	123	$71,569	$2,880,000	$1,584,000	$1,296,000	18.1

Ownership Plan	Upfront Cost	Year 1 Cost After Rebates	Annual Savings	Lifetime 30-Year Cost Savings ($)	30-Year ROI
Cash Purchase	$2,880,000	$1,296,000	$71,569	$2,147,063	166%
PPA	$0	$0	$5,448	$163,434	-

Equipment	Estimated Gross Project Cost ($)	ITC Rebate	MACRS Rebate	Net Project Cost
457kW Solar PV	$2,485,463	$745,639	$621,366	$1,118,458
325 kWh Battery	$394,537	$118,361	$98,634	$177,542
Total	$2,880,000	$864,000	$720,000	$1,296,000

System Description	Qty	Unit	Equipment Cost per Unit ($)	Labor Cost Per Unit ($)	Material Cost Per Unit ($)	Total Material Cost ($)	Total Equipment Cost ($)	Total Labor Cost ($)	Total Cost ($)	Source	Notes
Solar Array											
PV Modules (LG 400 W)	457,000	Watts DC			$ 0.45	$205,650.00	$ -	$ -	$ 205,650.00	PV size from ETB, cost from NREL report	https://www.nrel.gov/docs/fy22osti/83586.pdf
Inverter, 24 kW	16	Ea.		$ 400.40	$ 4,300.00	$ 68,800.00	$ -	$ 25,625.60	$ 94,425.60	Inverter size from Helioscope - Cost from online quote Labor - 4 Hrs Electrician per unit	https://sunwatts.com/24kw-fronius-symo-advanced-24-0-3-480v-3-phase-string-inverter/
Carport Structure and Racking Cost/Labor/Installation	457,000	Watts DC		$ 1.21	$ 1.00	$457,000.00	$ -	$553,472.70	$1,010,472.70	Energy ToolBase	
PV String Combiner Panels	9	Ea.		$ 100.10	$ 568.40	$ 5,186.65	$ -	$ 1,826.83	$ 7,013.48	Online Quote Labor - 1 Hrs Electrician per unit	https://www.solaris-shop.com/sma-cu1000-us-11-string-combiner-w-disconnect Each 1000V combiner box with disconnet switch can accommodate 8 strings total Project site hasup to 180 strings
Electrical BOS Carpot	1,995	m^2	$ -	$ -	$ 50.00	$ 99,750.00	$ -	$ -	$ 99,750.00	assumed the same cost as the ground mounted U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022 (nrel.gov)	U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022
Carport Linear LED Surface Mount Lighting Fixture	10	Ea.		$ 100.10	$ 61.83	$ 616.75	$ -	$ 998.50	$ 1,615.25	RS Means Line #: 26 51 13 44 2010 https://www.1000bulbs.com/product/217486/PLT-90093.html	(1) Electrican to install
Installation rental equipment carport	1,995	m^2	$ 14.60	$ -	$ -	$ -	$ 29,127.00	$ -	$ 29,127.00	assumed the same cost as the ground mounted U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022 (nrel.gov)	U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022
Battery Storage System											
Li-ion Battery + cabinet	325	kWh		$ -	$ 393.00	$127,725.00	$ -	$ -	$ 127,725.00	https://www.nrel.gov/docs/fy22osti/83586.pdf	U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022
Battery Installation - Labor and equipment	325	kWh		$ 265.00	$ -	$ -	$ -	$ 86,125.00	$ 86,125.00	https://www.nrel.gov/docs/fy22osti/83586.pdf	U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022 2.91 hrs @ RS Means labor rate
Electrical BOS	325	kWh	$ -	$ -	$ 69.16	$ 22,477.81	$ -	$ -	$ 22,500.00	https://www.nrel.gov/docs/fy22osti/83586.pdf	
Trenching/Site Prep and Wiring											
Schedule 80 PVC Piping 6" Diameter	100	LF	$ -	$ 45.24	$ 53.00	$ 5,300.00	$ -	$ 4,523.65	$ 9,823.65	RS means - 221113742560	

Trenching and Backfill 12" wide, 36" Deep	3	Day.	$ 425.00	$1,836.40	$ -	$ -	$ 1,275.00	$ 5,509.20	$ 6,784.20	Includes B-54 Crew - reference 312316142850	(5) Days of work (2) Laborers (1) 40 HP Chain Trencher (1) Light Equip Operator
Soil Excavation, Removal, loading, and hauling	50	L.C.Y	$ 6.78	$ 6.15	$ -	$ -	$ 339.00	$ 307.50	$ 646.50	Includes B-34D Crew - reference 312323204304	Includes (1) Truck Driver (1) Truck Tractor (1) Dump Trailer
Backfill and Asphalt Paving 8" Thick	2	Day.	$3,427.86	$6,777.20	$ 30.00	$ 3,213.00	$ 6,855.72	$ 13,554.40	$ 23,623.12	Includes B-25 Crew - reference 32 11 26 13 0560	2 Day of Filling Trench and Repaving Asphalt Includes (1) Labor Foreman (7) Laborers (3) Equipment Operators (1) Asphalt Paver, 130 H.P. (1) Tandem Roller, 10 Ton (1) Roller, Pneum. Wheel, 12 Ton
Other Costs											
New ATS - 1200 Amp	1	Ea.		$1,182.00	$23,339.20	$ 23,339.20	$ -	$ 1,182.00	$ 24,521.20	RS means - 263623100070	
Permitting, inspection, and interconnection	1	Ea.	$6,908.46	$ -			$ 6,908.46	$ -	$ 6,908.46	https://www.nrel.gov/docs/fy22osti/83586.pdf	For construction permits fee, interconnection study fees for existing substation, testing, and commissioning For standalone systems - (Rooftop - $105/kW-DC, Ground mount - $46/kW-DC, Battery - $13.6/kWh) For PV+Storage combined - Battery PII*1.02 = $20.84/kWh*1.02
User Training	8	Hr.	$ -	$ 150.00	$ -	$ -	$ -	$ 1,200.00	$ 1,200.00		
Total						**$ 1,023,100**	**$ 44,500**	**$ 698,300**	**$ 1,757,911**		

Markup	Cost
System Cost	$1,757,911
Tax (6.625%)	$67,780
O&P Cost (10%)	$175,791
EPC Markup (10%)	$175,791
Contingency (30%)	$527,373
2023 Inflation Markup (10%)	$175,791
Total Cost	$2,880,000

Battery Cost	$387,214.11	
Solar Cost	$2,439,328.46	
Electrical Upgrades, Permitting and Misc…	$53,457.43	
Battery Cost with Elec Upgrades	$394,537.36	$1,213.96
Solar Cost with Elec Upgrades	$2,485,462.64	$5.44

PPA Analysis

	Income			Net		
Year	Cash Purchase	Standard PPA	PPA with Year 10 Buyout	Cash Purchase	Standard PPA	PPA with Year 10 Buyout
0	-$1,296,000	$0	$0	-$1,296,000	$0	$0
1	$71,569	$5,448	$5,448	-$1,224,431	$5,448	$5,448
2	$71,569	$5,448	$5,448	-$1,152,862	$10,896	$10,896
3	$71,569	$5,448	$5,448	-$1,081,294	$16,343	$16,343
4	$71,569	$5,448	$5,448	-$1,009,725	$21,791	$21,791
5	$71,569	$5,448	$5,448	-$938,156	$27,239	$27,239
6	$71,569	$5,448	$5,448	-$866,587	$32,687	$32,687
7	$71,569	$5,448	$5,448	-$795,019	$38,135	$38,135
8	$71,569	$5,448	$5,448	-$723,450	$43,582	$43,582
9	$71,569	$5,448	$5,448	-$651,881	$49,030	$49,030
10	$71,569	$5,448	$5,448	-$580,312	$54,478	$54,478
11	$71,569	$5,448	-$658,440	-$508,744	$59,926	-$603,962
12	$71,569	$5,448	$71,569	-$437,175	$65,374	-$532,394
13	$71,569	$5,448	$71,569	-$365,606	$70,821	-$460,825
14	$71,569	$5,448	$71,569	-$294,037	$76,269	-$389,256
15	$71,569	$5,448	$71,569	-$222,469	$81,717	-$317,687
16	$71,569	$5,448	$71,569	-$150,900	$87,165	-$246,119
17	$71,569	$5,448	$71,569	-$79,331	$92,612	-$174,550
18	$71,569	$5,448	$71,569	-$7,762	$98,060	-$102,981
19	$71,569	$5,448	$71,569	$63,806	$103,508	-$31,412
20	$71,569	$5,448	$71,569	$135,375	$108,956	$40,157
21	$71,569	$5,448	$71,569	$206,944	$114,404	$111,725
22	$71,569	$5,448	$71,569	$278,513	$119,851	$183,294
23	$71,569	$5,448	$71,569	$350,081	$125,299	$254,863
24	$71,569	$5,448	$71,569	$421,650	$130,747	$326,432
25	$71,569	$5,448	$71,569	$493,219	$136,195	$398,000
26	$71,569	$5,448	$71,569	$564,788	$141,643	$469,569
27	$71,569	$5,448	$71,569	$636,356	$147,090	$541,138
28	$71,569	$5,448	$71,569	$707,925	$152,538	$612,707
29	$71,569	$5,448	$71,569	$779,494	$157,986	$684,275
30	$71,569	$5,448	$71,569	$851,063	$163,434	$755,844

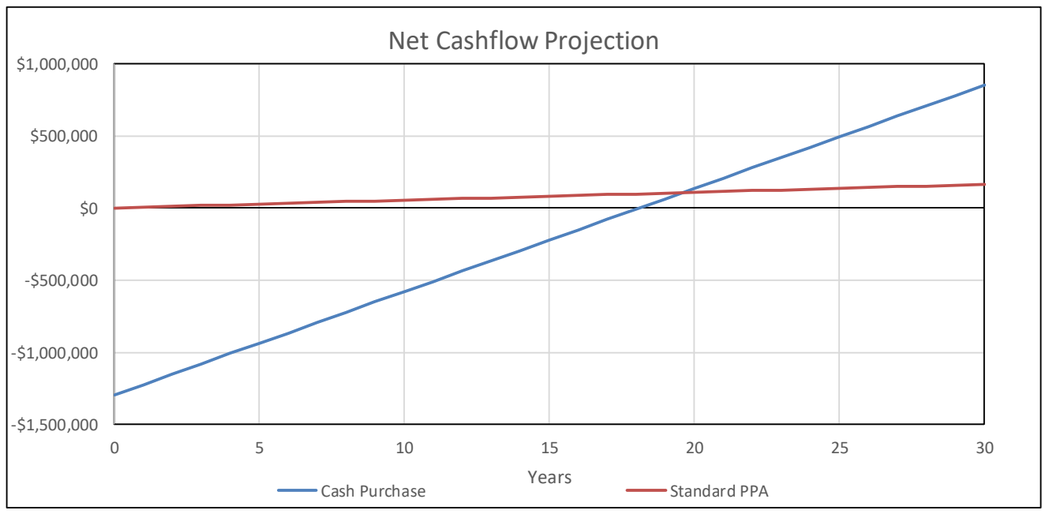
Cash Purchase	
Gross Project Cost	$2,880,000
Rebates	-$864,000
85% Depreciation	-$720,000
n/a	$0
Final Cost	$1,296,000
Utility Savings	$71,569
Payback	18.1
Financial Life (yr)	30
ROI (Over EUL)	166%

Battery Cost: $394,537
Solar Cost: $2,485,463

Standard PPA	
Gross Project Cost	$2,880,000
Rebates	-$864,000
85% Depreciation	-$720,000
n/a	$0
Final Cost	$1,296,000
Financial Life (yr)	30
Interest Rate	3.0%
Contractor's Income	$66,121
Utility Savings	$71,569
Customer Savings	$5,448

Battery Cost: $394,537
Solar Cost: $2,485,463

PPA with Year 10 Buyout	
Gross Project Cost	$2,880,000
Rebates	-$864,000
85% Depreciation	-$720,000
n/a	$0
Final Cost	$1,296,000
Financial Life (yr)	30
Interest Rate	3.0%
Years 1-10	
Contractor's Income	$66,121
Utility Savings	$71,569
Customer Savings	$5,448
Years 11-30	
Contractor O&P	15%
Buyout Cost	$730,009
Utility Savings	$71,569
Year 11-25 Payback	10.2
Lifetime Savings	$1,485,853
ROI (Over RUL)	204%



ETB Outputs

Bill Date Ranges			Energy Before PV/ESS (kWh)	Max Demand Before PV/ESS (kW)	**Raw Utility Info** Charges Before PV/ESS ($)				**21%** Cost Markup Charges Before PV/ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/13/2022	2/13/2022	W	83991	199	370.81	8953.44	748.58	10072.83	449.42172	10851.57	907.27896	12208.27
2/13/2022	3/13/2022	W	98236	229	370.81	10471.96	861.43	11704.2	449.42172	12692.02	1044.05316	14185.49
3/13/2022	4/13/2022	W	94668	247	370.81	10091.61	929.14	11391.56	449.42172	12231.03	1126.11768	13806.57
4/13/2022	5/13/2022	W	105459	281	370.81	11241.93	1057.04	12669.78	449.42172	13625.22	1281.13248	15355.77
5/13/2022	6/1/2022	W	83214	303	227.27	8870.61	698.58	9796.47	275.45124	10751.18	846.67896	11873.32
6/1/2022	6/13/2022	S	68530	303	143.54	7305.3	1485.63	8934.47	173.97048	8854.024	1800.58356	10828.58
6/13/2022	7/13/2022	S	148205	295	370.81	15798.65	3736.56	19906.02	449.42172	19147.96	4528.71072	24126.1
7/13/2022	8/13/2022	S	163592	312	370.81	17438.91	3951.89	21761.6	449.42172	21135.96	4789.69068	26375.06
8/13/2022	9/13/2022	S	161305	298	370.81	17195.11	3774.56	21340.48	449.42172	20840.47	4574.76672	25864.66
9/13/2022	10/1/2022	S	65789	248	222.49	7013.11	1884.75	9120.34	269.65788	8499.889	2284.317	11053.85
10/1/2022	10/13/2022	W	50309	248	148.32	5362.94	373.16	5884.42	179.76384	6499.883	452.26992	7131.917
10/13/2022	11/13/2022	W	107783	243	370.81	11489.67	914.09	12774.57	449.42172	13925.48	1107.87708	15482.78
11/13/2022	12/13/2022	W	102588	204	370.81	10935.88	767.39	12074.08	449.42172	13254.29	930.07668	14633.78
12/13/2021	1/13/2022	W	84465	192	370.81	9003.97	722.25	10097.03	449.42172	10912.81	875.367	12237.6
Subtotal			1418134		4449.72	151173.08	21905.04	0	5393.06064	183221.8	26548.9085	0
Adjustments			0		0	0	0	0	0	0	0	0
Total			1418134		4449.72	151173.08	21905.04	177527.84	5393.06064	183221.8	26548.9085	215163.7

Bill Date Ranges			Energy After PV & Before ESS (kWh)	Max Demand After PV & Before ESS (kW)	Charges After PV & Before ESS ($)				Charges After PV & Before ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/13/2022	2/13/2022	W	47566	199	370.81	5070.54	748.58	6189.92	449.42172	6145.494	907.27896	7502.183
2/13/2022	3/13/2022	W	54056	229	370.81	5762.37	861.43	6994.61	449.42172	6983.992	1044.05316	8477.467
3/13/2022	4/13/2022	W	42075	247	370.81	4485.2	929.14	5785.14	449.42172	5436.062	1126.11768	7011.59
4/13/2022	5/13/2022	W	35829	217	370.81	3819.37	816.29	5006.47	449.42172	4629.076	989.34348	6067.842
5/13/2022	6/1/2022	W	38484	231	227.27	4102.39	532.58	4862.25	275.45124	4972.097	645.48696	5893.047
6/1/2022	6/13/2022	S	45729	253	143.54	4874.71	1240.48	6258.73	173.97048	5908.149	1503.46176	7585.581
6/13/2022	7/13/2022	S	76051	231	370.81	8107.04	2925.92	11403.76	449.42172	9825.732	3546.21504	13821.36
7/13/2022	8/13/2022	S	90033	250	370.81	9597.52	3166.58	13134.9	449.42172	11632.19	3837.89496	15919.5
8/13/2022	9/13/2022	S	100810	248	370.81	10746.35	3141.24	14258.4	449.42172	13024.58	3807.18288	17281.18
9/13/2022	10/1/2022	S	36289	218	222.49	3868.41	1656.75	5747.65	269.65788	4688.513	2007.981	6966.152
10/1/2022	10/13/2022	W	36863	228	148.32	3929.6	343.07	4420.99	179.76384	4762.675	415.80084	5358.24
10/13/2022	11/13/2022	W	63138	243	370.81	6730.51	914.09	8015.41	449.42172	8157.378	1107.87708	9714.677
11/13/2022	12/13/2022	W	74070	204	370.81	7895.86	767.39	9034.06	449.42172	9569.782	930.07668	10949.28
12/13/2021	1/13/2022	W	59028	192	370.81	6292.38	722.25	7385.44	449.42172	7626.365	875.367	8951.153
Subtotal			800021		4449.72	85282.24	18765.78	0	5393.06064	103362.1	22744.1254	0
Adjustments			0		0	0	0	0	0	0	0	0
Total			800021		4449.72	85282.24	18765.78	108497.74	5393.06064	103362.1	22744.1254	131499.3

Bill Date Ranges			Energy After PV/ESS (kWh)	Max Demand After PV/ESS (kW)	Charges After PV/ESS ($)				Charges After PV/ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/13/2022	2/13/2022	W	49180	149	370.81	5242.59	560.49	6173.89	449.42172	6354.019	679.31388	7482.755
2/13/2022	3/13/2022	W	55187	180	370.81	5882.93	677.11	6930.85	449.42172	7130.111	820.65732	8400.19
3/13/2022	4/13/2022	W	43036	184	370.81	4587.64	692.15	5650.6	449.42172	5560.22	838.8858	6848.527
4/13/2022	5/13/2022	W	36906	175	370.81	3934.18	658.3	4963.29	449.42172	4768.226	797.8596	6015.507
5/13/2022	6/1/2022	W	39158	202	227.27	4174.24	465.72	4867.24	275.45124	5059.179	564.45264	5899.095
6/1/2022	6/13/2022	S	46417	230	143.54	4948.05	1127.71	6219.3	173.97048	5997.037	1366.78452	7537.792
6/13/2022	7/13/2022	S	77689	199	370.81	8281.65	2520.59	11173.05	449.42172	10037.36	3054.95508	13541.74
7/13/2022	8/13/2022	S	91532	220	370.81	9757.31	2786.59	12914.71	449.42172	11825.86	3377.34708	15652.63
8/13/2022	9/13/2022	S	102134	226	370.81	10887.48	2862.58	14120.88	449.42172	13195.63	3469.44696	17114.51
9/13/2022	10/1/2022	S	36998	181	222.49	3943.99	1375.56	5542.03	269.65788	4780.116	1667.17872	6716.94
10/1/2022	10/13/2022	W	37299	201	148.32	3976.07	302.44	4426.84	179.76384	4818.997	366.55728	5365.33
10/13/2022	11/13/2022	W	64543	196	370.81	6880.28	737.29	7988.39	449.42172	8338.899	893.59548	9681.929
11/13/2022	12/13/2022	W	75432	171	370.81	8041.05	643.25	9055.11	449.42172	9745.753	779.619	10974.79
12/13/2021	1/13/2022	W	60357	154	370.81	6434.06	579.3	7384.17	449.42172	7798.081	702.1116	8949.614
Subtotal			815868		4449.72	86971.53	15989.09	0	5393.06064	105409.5	19378.7771	0
Adjustments			0		0	0	0	0	0	0	0	0
Total			815868		4449.72	86971.53	15989.09	107410.34	5393.06064	105409.5	19378.7771	130181.3

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PV SYSTEM DETAILS

GENERAL INFORMATION

Facility: DOT South Region Headquarters
Address: 1 Executive Campus, Cherry Hill, NJ 08002

SOLAR PV SYSTEM RATING

Power Rating: 457,200 W-DC
Power Rating: 390,037 W-AC-CEC

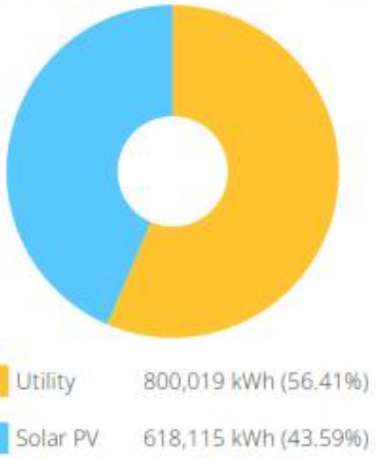
SOLAR PV EQUIPMENT DESCRIPTION

Solar Panels: (1143) LG Electronics LG400N2W-V5_R12

Inverters: (16) SMA Sunny Tripower 24000TL-US STPTL-US12-30-DUS173127

ENERGY CONSUMPTION MIX

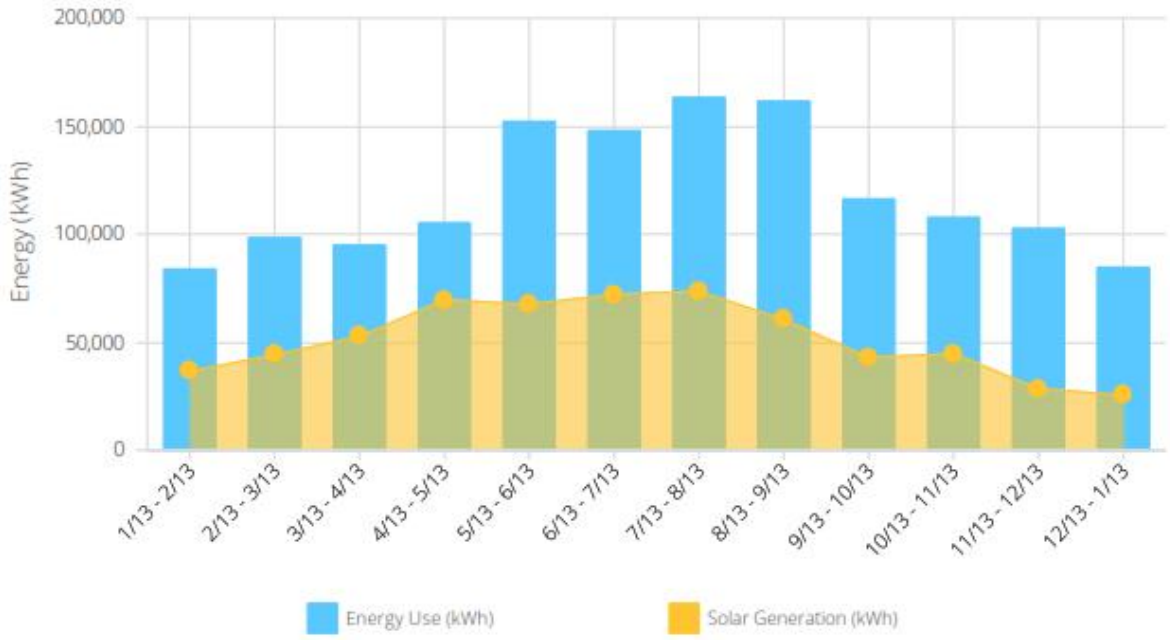
Annual Energy Use: 1,418,134 kWh



SOLAR PV EQUIPMENT TYPICAL LIFESPAN

Solar Panels: Greater than 30 Years
Inverters: 15 Years

MONTHLY ENERGY USE VS SOLAR GENERATION



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ENERGY STORAGE SYSTEM (ESS) DETAILS

GENERAL INFORMATION

Facility: Meter #1
Address: Cherry Hill NJ 08002

ESS EQUIPMENT DESCRIPTION

Battery Banks: 325kw/325kWh Energy Storage System
Inverters: 325kw/325kWh Energy Storage System

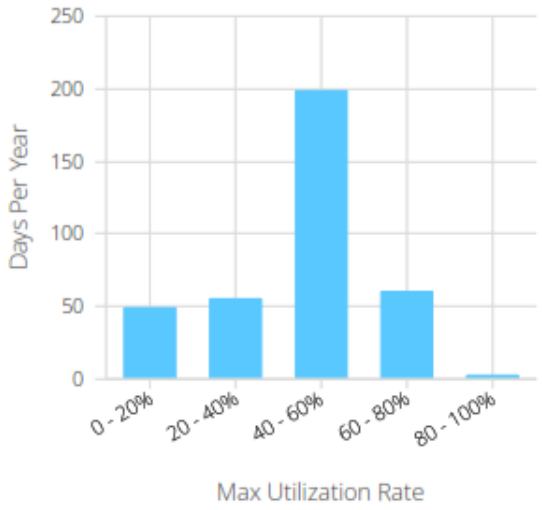
ESS EQUIPMENT TYPICAL LIFESPAN

Battery Banks: 15 Years
Inverters: 15 Years

ESS SYSTEM RATINGS

Energy Capacity: 325.0 kWh
Power Rating: 325.0 kW

ENERGY STORAGE ANNUAL UTILIZATION



Energy Output and Demand Savings From Solar PV and Energy Storage				
Date Range	ESS Energy Discharge (kWh)	Solar PV Generation (kWh)	ESS Energy as % of PV Energy	Total Demand Savings
1/13/2022 - 2/13/2022	4,200	36,425	11.53%	$188
2/13/2022 - 3/13/2022	2,946	44,181	6.67%	$184
3/13/2022 - 4/13/2022	2,500	52,593	4.75%	$237
4/13/2022 - 5/13/2022	2,804	69,630	4.03%	$399
5/13/2022 - 6/13/2022	3,546	67,531	5.25%	$591
6/13/2022 - 7/13/2022	4,411	72,154	6.11%	$1,216
7/13/2022 - 8/13/2022	3,777	73,559	5.13%	$1,165
8/13/2022 - 9/13/2022	3,537	60,496	5.85%	$912
9/13/2022 - 10/13/2022	2,917	42,946	6.79%	$580
10/13/2022 - 11/13/2022	3,615	44,645	8.10%	$177
11/13/2022 - 12/13/2022	3,546	28,518	12.43%	$124
12/13/2021 - 1/13/2022	3,460	25,437	13.60%	$143
Total	41,259	618,115	6.67%	$5,916

ENVIRONMENTAL BENEFITS

OVER THE NEXT 20 YEARS, YOUR SYSTEM WILL DO MORE THAN JUST SAVE YOU MONEY. ACCORDING TO THE EPA'S GREENHOUSE GAS EQUIVALENCIES CALCULATOR (SOURCE), YOUR SOLAR PV SYSTEM WILL HAVE THE IMPACT OF REDUCING:

9,686

tons of CO2 Offset

22,017,256

Miles Driven By Cars

145,257

Trees Planted

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APPENDIX D: GLOSSARY

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

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

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