

Local Government Energy Audit Report

DPW Offices, Operations Garage, Salt Shed, and Brine Shed

August 10, 2023

Prepared for:

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Disclaimer

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

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

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

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

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

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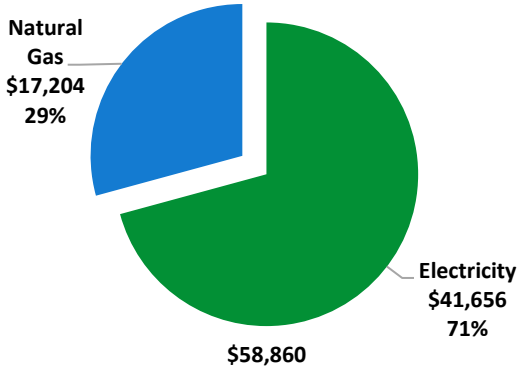
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Offices, Garage, Salt, and Brine. 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: $58,860 Electricity: 365,755 kWh Natural Gas: 15,912 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.

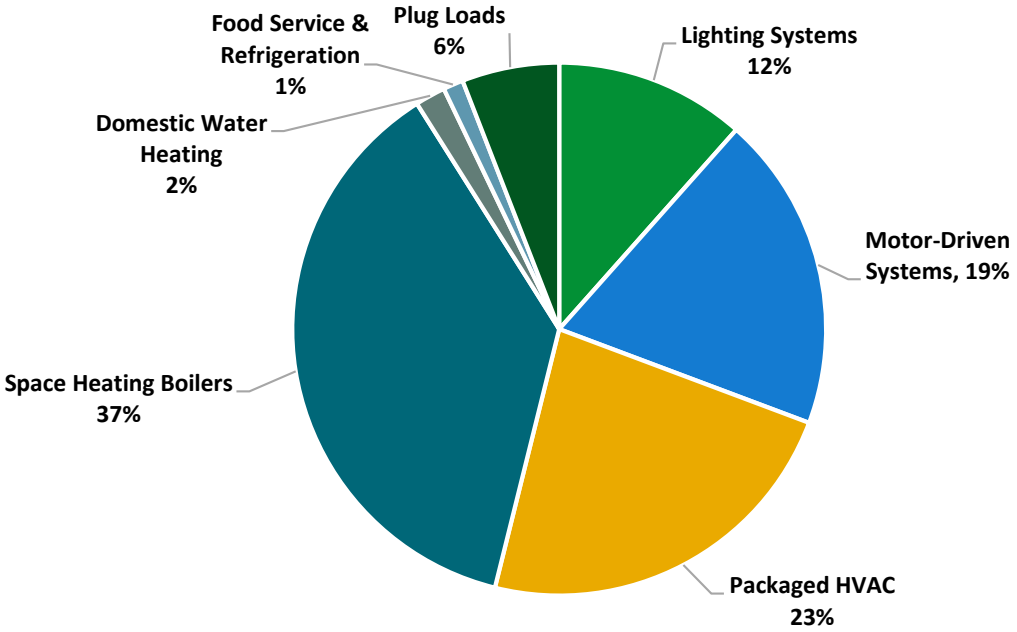


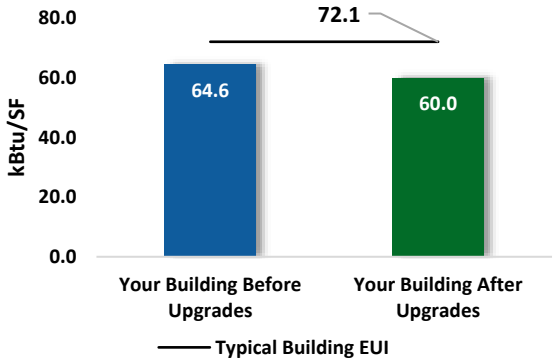
Figure 1 - Energy Use by System

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.

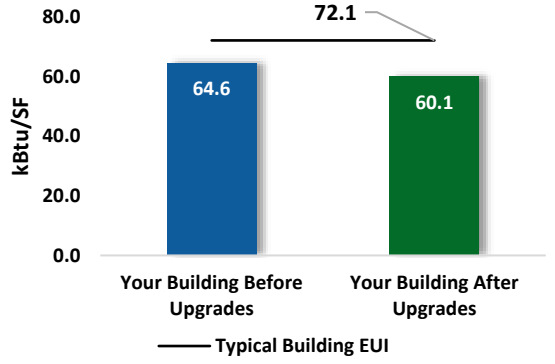
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$58,765
Potential Rebates & Incentives[1]	$9,547
Annual Cost Savings	$6,696
Annual Energy Savings	Electricity: 58,641 kWh Natural Gas: 16 Therms
Greenhouse Gas Emission Savings	30 Tons
Simple Payback	7.4 Years
Site Energy Savings (All Utilities)	7%



Scenario 2: Cost Effective Package[2]

Installation Cost	$41,689
Potential Rebates & Incentives	$8,147
Annual Cost Savings	$6,653
Annual Energy Savings	Electricity: 58,641 kWh Natural Gas: -24 Therms
Greenhouse Gas Emission Savings	29 Tons
Simple Payback	5.0 Years
Site Energy Savings (all utilities)	7%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**43,125**	**17.6**	**-8**	**$4,820**	**$24,927**	**$5,736**	**$19,191**	**4.0**	**42,433**
ECM 1	Install LED Fixtures	Yes	3,504	1.8	0	$398	$4,125	$500	$3,625	9.1	3,512
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	3,213	1.8	-1	$359	$3,093	$450	$2,643	7.4	3,156
ECM 3	Retrofit Fixtures with LED Lamps	Yes	36,408	14.0	-8	$4,064	$17,709	$4,786	$12,923	3.2	35,765
Lighting Control Measures			**7,690**	**3.0**	**-2**	**$858**	**$10,660**	**$1,920**	**$8,740**	**10.2**	**7,552**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	7,043	2.8	-1	$786	$9,760	$1,290	$8,470	10.8	6,917
ECM 5	Install High/Low Lighting Controls	Yes	648	0.2	0	$72	$900	$630	$270	3.7	636
Variable Frequency Drive (VFD) Measures			**5,291**	**1.3**	**0**	**$603**	**$4,555**	**$200**	**$4,355**	**7.2**	**5,328**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	5,291	1.3	0	$603	$4,555	$200	$4,355	7.2	5,328
HVAC System Improvements			**674**	**0.0**	**3**	**$108**	**$1,014**	**$170**	**$844**	**7.8**	**1,015**
ECM 7	Install Pipe Insulation	Yes	674	0.0	3	$108	$1,014	$170	$844	7.8	1,015
Domestic Water Heating Upgrade			**123**	**0.0**	**9**	**$116**	**$17,148**	**$1,431**	**$15,717**	**135.2**	**1,231**
ECM 8	Install High Efficiency Gas-Fired Water Heater	No	0	0.0	4	$43	$17,076	$1,400	$15,676	360.8	471
ECM 9	Install Low-Flow DHW Devices	Yes	123	0.0	5	$73	$72	$31	$41	0.6	761
Food Service & Refrigeration Measures			**1,612**	**0.2**	**0**	**$184**	**$230**	**$50**	**$180**	**1.0**	**1,623**
ECM 10	Vending Machine Control	Yes	1,612	0.2	0	$184	$230	$50	$180	1.0	1,623
TOTALS (COST EFFECTIVE MEASURES)			**58,515**	**22.1**	**-2**	**$6,645**	**$41,457**	**$8,107**	**$33,350**	**5.0**	**58,713**
TOTALS (ALL MEASURES)			**58,515**	**22.1**	**2**	**$6,688**	**$58,533**	**$9,507**	**$49,026**	**7.3**	**59,183**

* - 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 Offices, Garage, Salt, and Brine. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

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

2.1 Site Overview

On February 23, 2023, TRC performed an energy audit at the DPW Offices, Operations Garage, Salt Shed, and Brine Shed located in Piscataway Township, New Jersey. TRC met with Jim Ferratti to review the facility operations and help focus our investigation on specific energy-using systems.

Aerial View of Facilities

The DPW campus includes the DPW Offices, Operations Garage, Salt Shed, and Brine Shed. The buildings are served in entirety by a combination of electric and gas meters, and by on-site photovoltaic systems. These sites have been combined to ensure that the utility data is accurate and balanced to represent historical utility usage.

The DPW Office is a two-story, 22,536 square foot building built in 1979. Spaces include offices, meeting rooms, corridors, restrooms, server room, garage, and electrical and mechanical spaces. The facility is 50% cooled by a 30-ton roof top unit (RTU) and supplementary systems including two split-system air source heat pumps. Two gas-fired hot water boilers are responsible for most of the building's heating. The garage area is served by two air handling unit (AHUs) equipped with a supply fan and a heating hot water (HHW) coil. An oil burner in the garage provides under floor radiant heating using heating coils. This unit consumes refuse oil and kerosene to produce heat; this fuel source was not accounted for in the analysis. There is no cooling present in the garage.

The DPW Operations Garage is a single-story, 16,067 square foot building. Spaces include a break room, garage mechanical spaces, shop, corridors, restroom, and mechanical spaces. The facility is not cooled apart from a small, packaged terminal heat pump (PTHP) which serves the break room. The building is mainly heated by gas-fired unit heaters of varying sizes.

The Salt Shed is a single-story, 5,200 square foot building. The building's single space is an open floor design where salt is stored. The facility is not cooled or heated.

The Brine Shed is a single-story, 150 square foot building. The shed's interior is used to store two brine machines. The space heated by a single electric resistance unit heater and has no cooling.

Recent improvements and Facility Concerns

There have been no recent improvements at the DPW Offices. Primary concerns for this location include the replacement of the lighting systems.

The DPW Operations Garage has seen no recent improvements. The replacement of the gas fired unit heaters are the facility's primary concern.

There have been no recent improvements for the Salt Shed and Brine Shed. There are no critical facility concerns at these locations.

2.2 Building Occupancy

The DPW Office operates from 7:00 AM to 4:30 PM during the week. There is an average occupancy count of 35 staff with another 45 out on the field. A garage located at the back of the building operates on the same schedule as the offices.

The Operations Garage operates from 7:00 AM to 4:30 PM during the week.

The Salt Shed and Brine Shed are continuously available for the roads crew, but seldom occupied.

Note: 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 depending on changes to building use patterns.

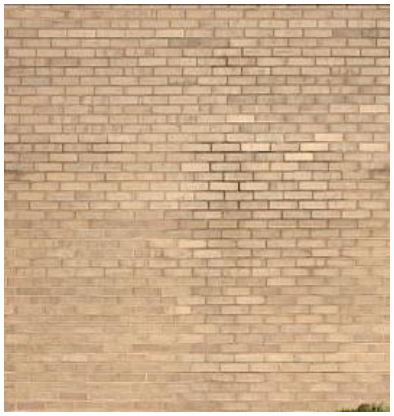
Building Name	Weekday/Weekend	Operating Schedule
DPW Office	Weekday	7:00 AM – 4:30 PM
	Weekend	N/A
DPW Operations Garage	Weekday	7:00 AM – 3:30 PM
	Weekend	N/A
Salt Shed	Weekday	12:00 AM – 12:00 AM
	Weekend	12:00 AM – 12:00 AM
Brine Shed	Weekday	12:00 AM – 12:00 AM
	Weekend	12:00 AM – 12:00 AM

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

The DPW Office is comprised of concrete masonry units (CMUs) with a red brick façade. The roof is flat with an EPDM cover and is in good condition. A large solar panel array is housed on the roof along with exhaust fans and a roof top unit (RTU).

The building envelope and EPDM roof are in good condition. Facility windows are a mix of operable and non-operable, double-paned glass windows with aluminum frames. All windows are in good condition. Exterior doors consist of a mix of solid metal and aluminum framed glass units; both types are in good condition.



Exterior Walls

Exterior Walls

Solar Panel Array

EPDM Roof

Facility Windows

Glass Door

Solid Metal Door

The DPW Operations Garage is comprised of a section of concrete masonry units (CMUs) with a red brick façade combined with a standard structural steel framed section. The roof is flat with an EPDM cover and is in good condition. A solar panel array is housed on the roof along with the garage exhaust fans.

The building envelope and EPDM roof are in good condition. Non-operable facility windows exist on the garage doors and are in good condition. Exterior doors consist of solid metal and are in good condition.

Exterior Walls

Solar Panel Array

EPDM Roof

Garage Door Windows

Exterior Door

The lower wall section of the Salt Shed is comprised of CMUs, extending to about ten feet in height. A wooden frame is built on top of the CMU base, with wood panel walls. Wood beams support a pitched roof with a wood deck and asphalt shingles. Both the CMU and wooden envelope are in good condition with minor signs of wear present on the wooden section. There are no windows or doors present at the Salt Shed.

Building Envelope

Building Walls

The Brine Shed is comprised of a wooden frame and walls with exterior vinyl siding. The roof is pitched with asphalt shingles. The exterior walls and the roof are in good condition. Exterior doors are metal units which are in good condition. The DPW Office canopy is on the same electric meter as the Brine Shed. This canopy is in good condition and has been evaluated for a solar panel array; see Sections 2.13 and 6.1.

Exterior Doors

Windows

Asphalt Shingle Roof

Exterior Doors

2.4 Lighting Systems

The primary lighting system for the DPW Office consists mainly of fluorescent lighting. Common indoor lighting includes 4-foot T8 linear fluorescent tubes, 8-foot T12 linear fluorescent tubes, and various sized compact fluorescent lamps (CFL). Emergency exit signs are up to date with LED technology. High bay LED fixtures illuminate the garage space with additional lighting provided by T8 and T12 linear fluorescent tubes. Other lighting technology includes 2-foot T8 U-bend fluorescent tubes and A19 LED lamps. Common fixtures include parabolic, can, and retrofit drop ceiling fixtures with one, two, or three lamps per fixture.

All interior lighting is controlled by manual wall switches. The garage is the only space that has upgraded to LED light sources. Overall, the current lighting system is in good condition with adequate light levels.

Exterior lighting is provided by high pressure sodium (HPS), CFLs, and LED technology. Fixtures are in good condition and are controlled by photocell.

2-Foot T8 U-Bend Fluorescent Tube

LED High Bay

Emergency Exit

4-Foot T8 Linear Fluorescent Tube

8-Foot T12 Linear Fluorescent Tube

Exterior Pole Mounted HPS

LED Wall Pack

The lighting system for the DPW Operations Garage uses a mix of LED and fluorescent lighting. Common indoor lighting includes 4-foot T8 linear fluorescent tubes and 4-foot T8 equivalent linear LED tubes. Emergency exit signs are up to date with LED technology. Other lighting technology includes 8-foot T12 linear fluorescent tubes and 8-foot T8 equivalent linear LED tubes. Common fixtures include parabolic and pendant fixtures with one, two, or four lamps per fixture.

All interior lighting is controlled by manual wall switches. Overall, the current lighting system is in good condition with adequate light levels.

Exterior lighting is provided by BR30 CFLs and LED wall packs. Fixtures are in good condition and photocells control the lighting.

8-Foot T8 Equivalent LED Linear Tube

T8 Fluorescent Linear Tube

Exterior CFL and LED Lighting

The Salt Shed is illuminated with 400-Watt high bay metal halide fixtures. This lighting system has been evaluated for replacement given the high wattage of the lights.

Interior lighting is controlled by manual wall switches and used intermittently. Overall, the current lighting system is in good condition with adequate light levels.

Exterior lighting is provided by LED wall packs. Fixtures are in good condition and are controlled by photocell.

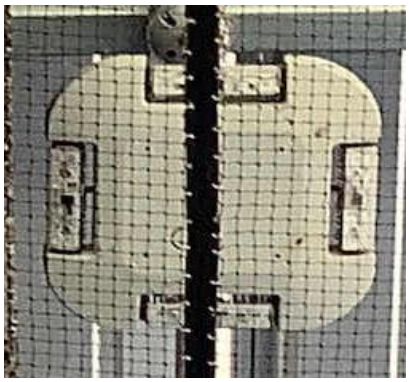
Interior Metal Halide Lighting

Exterior LED Wall Pack

The Brine Shed is illuminated with LED technology. A total of 12, 4-foot T8 equivalent LED linear tubes serve the interior of the shed. All interior lighting is controlled by manual wall switches. Overall, the current lighting system is in good condition with adequate light levels.

No exterior lighting is provided for the Brine Shed, however, the DPW Office Canopy shares an electric meter with the Brine Shed. The DPW Office Canopy uses a combination of 12 LED wall packs and 12 LED high bay fixtures to light the surrounding area. These fixtures are in good condition and are controlled by photocell.

4-Foot T8 Equivalent LED Linear Tube



Exterior LED High Bay Fixture

LED Wall Pack

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

The DPW Office uses two split system air source heat pumps to supplement the conditioning of the office spaces. AC-1 is a 2-ton unit with a seasonal energy efficiency ratio (SEER) of 9; AC-2 is a 3-ton unit with a SEER of 9.11. Both units are also capable of providing heating. AC-1's heating capacity is 22 MBh and AC-2's is 34.6 MBh. Both units are operating within their useful life and are in good condition.

AC-1 HP

Name Plate

Unitary Heating Equipment

A single TPI Corporation electric resistance unit heater warms the Brine Shed. The unit has a heating output of 4.8 kW and is locally controlled. The heater is in good condition and is operating beyond its useful life.

Electric Resistance Unit Heater

The Operations Garage is heated by a total of six small gas-fired unit heaters and two medium sized gas-fired unit heaters. The smaller units have a heating capacity of 166 MBh, and the heating capacity of the larger units was estimated at 249 MBh because they were inaccessible. The heaters are in good condition and are controlled by local thermostats. The units are operating beyond their useful life.

Gas Fired Unit Heater


Thermostat

Packaged Units

One 30-ton roof top unit (RTU) serves the DPW Offices. The RTU provides cooling only and has an integrated energy efficiency ratio (EER) of 13.5. The 15 hp supply fan and a 7.5 hp return fan are both equipped with variable frequency drives (VFD). The unit is in good condition and is operating within its useful life. A building automated system (BAS) controls the RTU.


RTU

Supply Fan Motor

VFD

The DPW Operations Garage uses a single Friedrich packaged terminal heat pump (PTHP) to condition the small office break room in the center of the building. This unit can provide both heating and cooling and has been estimated as the nameplate was not accessible. A local thermostat controls the unit. The unit is approximately an 0.8-ton unit with a cooling and EER of 11 and heating seasonal performance factor (HSPF) of 10.5. This unit is operating beyond its useful life and is in fair condition.

PTHP Unit

Air Handling Units (AHUs)

The DPW Office garage space is conditioned by two air handling unit (AHUs). AHU-1 is in the elevated mechanical room in the garage while HV-1 is suspended in the garage. Both units supply heating-only and are equipped with hot water coils and a constant speed supply fan. Units are controlled by a BAS.

The supply fan for AHU-1 is nearing the end of its useful life. The installation of a VFD and compatible motor has been evaluated for this system.

Unit	Area Served	Cooling Coil	Hot Water Coil	Supply Fan (hp)	Return/Exhaust Fan (hp)
AHU-1	DPW Office Garage	No	Yes	3.0	N/A
HV-1	DPW Office Garage	No	Yes	5.0	N/A

AHU-1 and AHU2

CO_2 Air Scrubbers

The DPW Office garage uses a total of nine make up air unit (MUA) CO_2 scrubbers to detect CO_2 build up in the garage and ventilate the space as needed. They are locally controlled. The units were not accessible during the audit and have been estimated.

CO_2 Air Scrubber

2.6 Building General Exhaust Air Systems

General exhaust fans ventilate restrooms, corridors, offices, and other spaces.

Fractional horsepower motors drive the DPW Office fans, which appear to be in good condition. These units are controlled by the BAS.

Exhaust Fan

Name Plate

A large exhaust fan located in the DPW Operations Garage serves to ventilate the space. A timer located on the wall can manually turn on the fan for a set amount of time. This unit was inaccessible and has been estimated.

Exhaust Fan

Timer Override

2.7 Heating Hot Water Systems

Two, 850 MBh Lochinvar Power Fin hot water boilers serve the DPW Office. The boilers run on a lead lag scheme at a nominal efficiency of 85%. The units are from 2013 and are in good condition.

Seven constant speed heating hot water (HHW) pumps located in the boiler and mechanical rooms distribute hot water to AHUs and hydronic unit heaters. The HHW pumps range from 0.1 hp to 5.0 hp. The HHW pipes are well insulated. Overall, the boilers and pumps are in good condition and are operating within their useful life.

The BAS controls the boilers which run on an algorithm based on outside air temperature.

HHW Boilers

2.8 Building Automation System (BAS)

An Automated Logic system controls the HVAC equipment, boilers, RTUs, and AHUs.

The system provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, and heating water loop temperatures.

DPW Office BAS Screenshot

2.9 Domestic Hot Water

A Bradford White 80-gallon, natural gas, water heater serves the DPW Office's domestic hot water (DHW) demand. The tank is 80% efficient. One fractional horsepower DHW pump circulates the water. The heater is in good condition, nearing the end of its useful life, and the water pipes are insulated.

There are two additional DHW tanks that serve the car wash area. A Rheem 115-gallon, natural gas water heater and a Bradford White 40-gallon, 4.5 kW electric water heater supply water to the car wash systems. The units are in good condition. The Rheem DHW tank is 80% efficient and is equipped with a DHW circulation pump. The tank is operating beyond its useful life and has been evaluated for replacement.

The car wash DHW piping systems lack insulation. The addition of insulation has been evaluated, with an estimated 60 feet of 1-inch diameter and 25 feet of 0.75-inch diameter insulation required.

DHW Tanks

DHW Circulation Pump

A Rheem 20-gallon, 6 kW, electric water heater, provides DHW to the DPW Operations Garage. This unit is operating within its useful life; the pipes are insulated, and in good condition.

Operations Garage DHW Tank

2.10 Refrigeration

DPW Office Building includes several residential-style refrigerators. Also, there is an ice machine located in the DPW Office assembly room. This unit can produce 400 pounds of ice per day and is not ENERGY STAR® qualified. Overall, the ice machine is in good condition.

DPW Office Ice Machine

The DPW Operations Garage uses a single 14.3 ft^3 glass door reach in refrigerator to store lunch and beverages. The unit is not ENERGY STAR® qualified and is in good condition.

DPW Operations Garage Glass Door Refrigerator

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

2.11 Plug Load and Vending Machines

You may wish to consider paying particular attention to minimizing your plug load usage. This report makes suggestions for ECMs in this area as well as energy efficient best practices.

Plug loads at the DPW Office include standard office equipment, mechanic, and shop equipment. Typical office loads include computers, server room, printers, coffee machines, microwaves, and televisions. There are 45 desktop computers throughout the DPW Office. Other special equipment includes a MIG welder, car battery chargers, and wheel balancer. There are two mini size and two full-size residential refrigerators. Equipment condition and efficiencies vary.

DPW Operations Garage plug loads include various office equipment including a coffee machine, microwaves, tool battery chargers, and fish tank air pump. There are two residential-style refrigerators. Equipment condition and efficiencies vary. Note that mechanical and shop equipment have been accounted for as motor loads rather than plug loads if they utilize motors of significant size.

Snack Vending Machine

Large Copier

2.12 Water-Using Systems

There are numerous restrooms with toilets, urinals, and sinks throughout the DPW Campus. There is a single shower in the DPW Office men's locker room rated at 1.5 gallons per minute (gpm).

Faucet flow rates are 2.2 gpm or lower. Toilets are rated at 2.5 gallons per flush (gpf) and urinals are rated at 2.5 gpf. There is room for improvement to reduce the site's water usage.

Restroom Faucets

2.13 On-Site Generation

The DPW Office has a 107-kW photovoltaic (PV) array with a consumed annual generation of 72,288 kWh. The system uses a bidirectional meter and provides approximately 23% of the electricity used. The array is owned and not leased.

Facility staff have expressed interest in the installation of a PV array on the DPW Office Canopy. Site staff will need to investigate whether the DPW Canopy is equipped to handle the installation of a PV array.

PV Array

PV Electrical Panel Data

DPW Office Canopy

The DPW Operations Garage has a photovoltaic (PV) array of an unknown kW size. The site consumes an annual generation of 26,000 kWh The system does not use a bidirectional meter and provides approximately 82% of the electricity used.

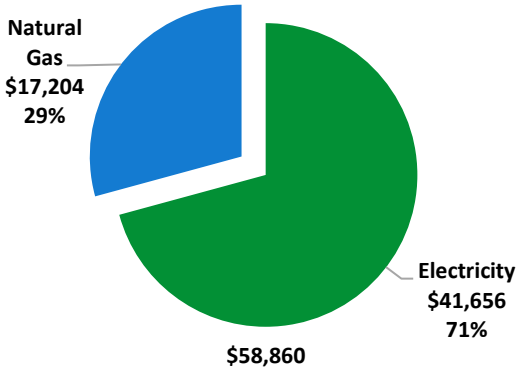
PV Array

PV Array Data

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	365,755 kWh	$41,656
Natural Gas	15,912 Therms	$17,204
Total		**$58,860**



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.

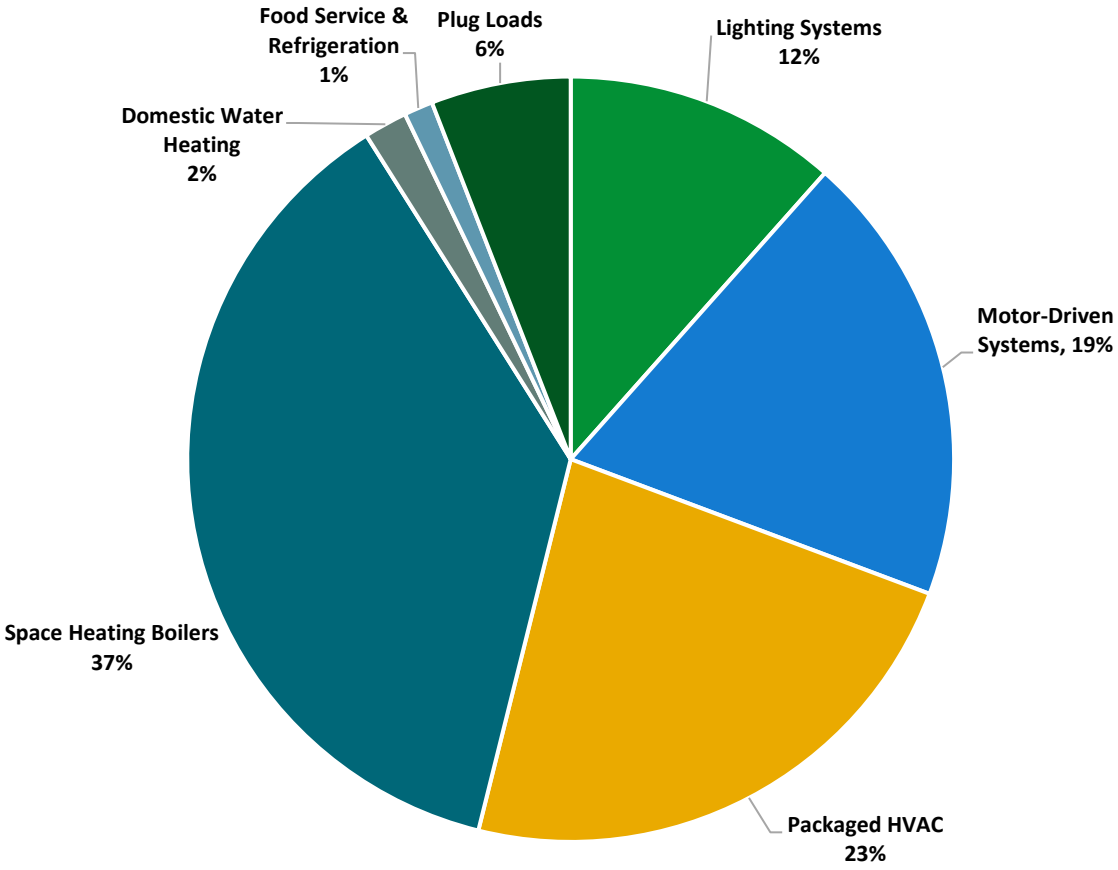
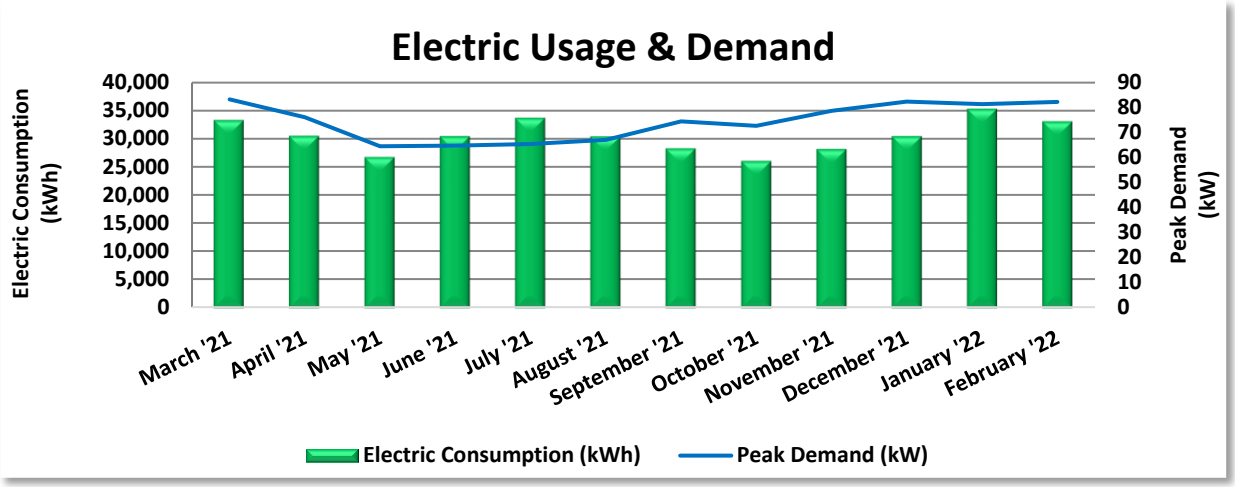


Figure 4 - Energy Balance

3.1 Electricity

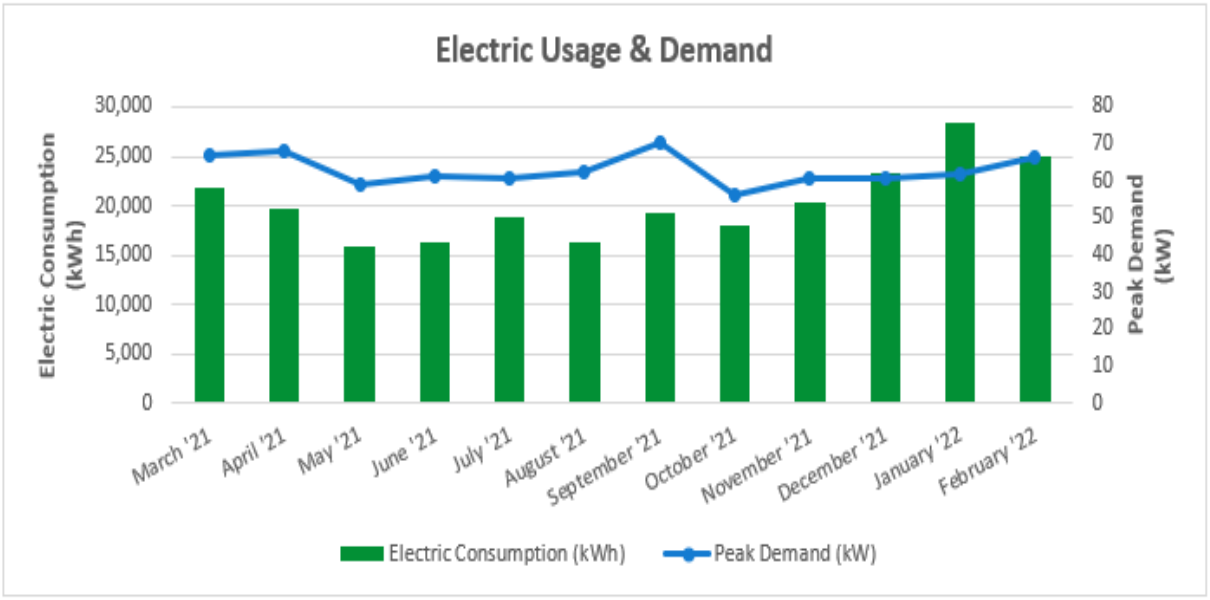
PSE&G delivers electricity under rate class General Lighting & Power (GLP), with electric production provided by EDF Energy Services, a third-party supplier.



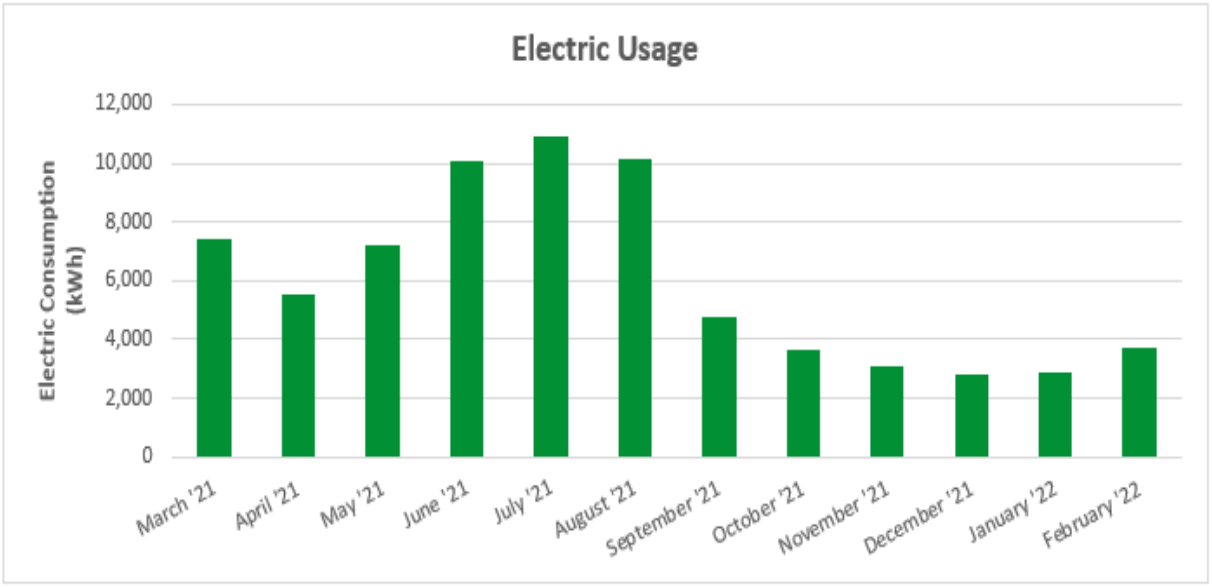
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
3/18/21	30	33,224	83	$328	3,311
4/19/21	32	30,442	76	$300	$3,359
5/18/21	29	26,687	65	$255	$2,710
6/18/21	31	30,413	65	$293	$3,006
7/20/21	32	33,634	65	$910	$3,349
8/17/21	28	30,349	67	$932	$3,052
9/16/21	30	28,254	74	$933	$3,518
10/15/21	29	26,001	73	$290	$2,984
11/15/21	31	28,106	79	$314	$3,443
12/16/21	31	30,393	82	$330	$4,045
1/19/22	34	35,246	81	$324	$4,826
2/16/22	28	33,006	82	$332	$4,055
Totals	**365**	**365,755**	**83**	**$5,541**	**$41,656**
Annual	**365**	**365,755**	**83**	**$5,541**	**$41,656**

Notes:

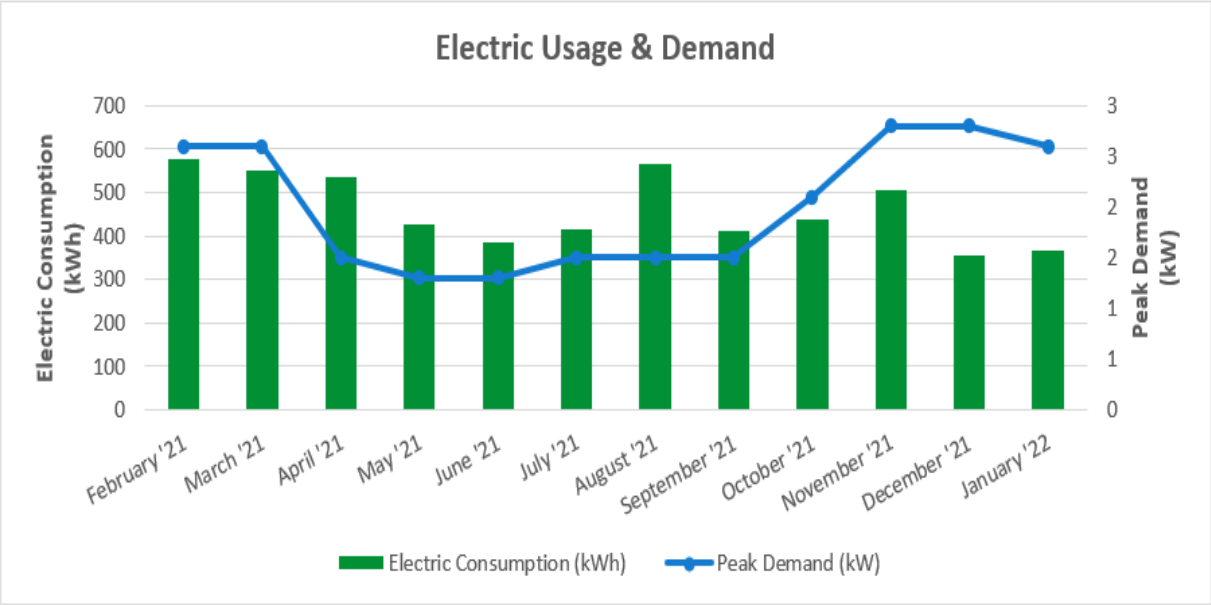
- Peak demand of 83 kW occurred in March '21.
- Average demand over the past 12 months was 74 kW.
- The average electric cost over the past 12 months was $0.114/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.
- Note: The utility data from the DPW Campus which includes the DPW Office, DPW Operations Garage, the Salt Shed, and the Brine Shed have been combined. The buildings are served in entirety by a combination of electric meters and by on-site photovoltaic systems.
- The on-site generation for the DPW Office and DPW Operations Garage is owned by Piscataway Township.



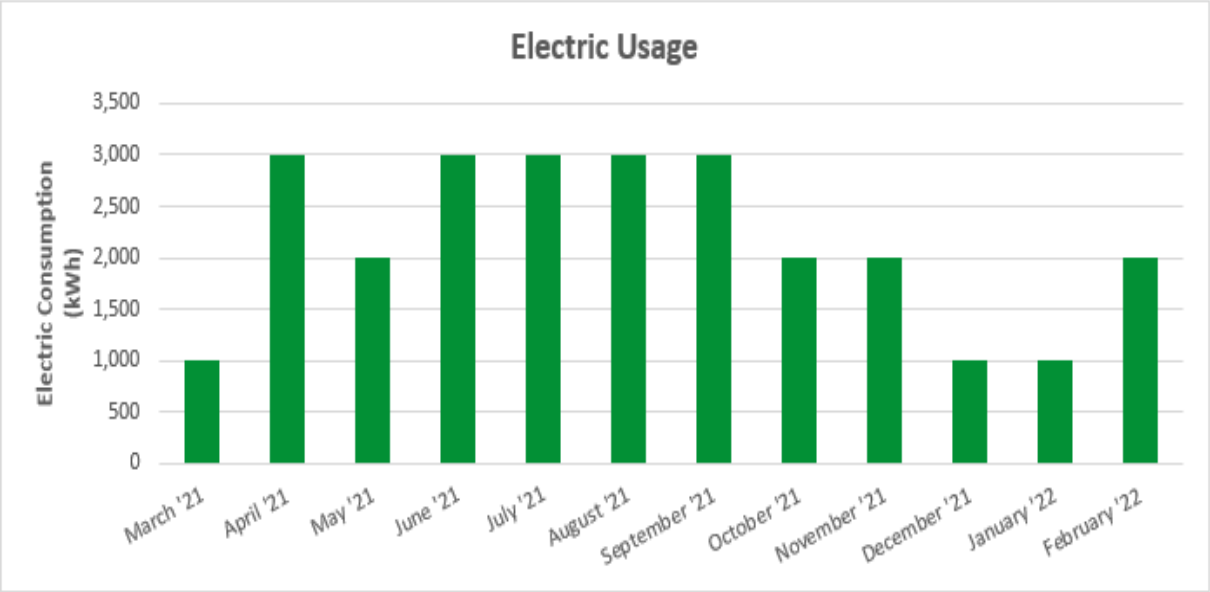
DPW Office Purchased Electricity Data



DPW Office Generated Electricity Consumption Data



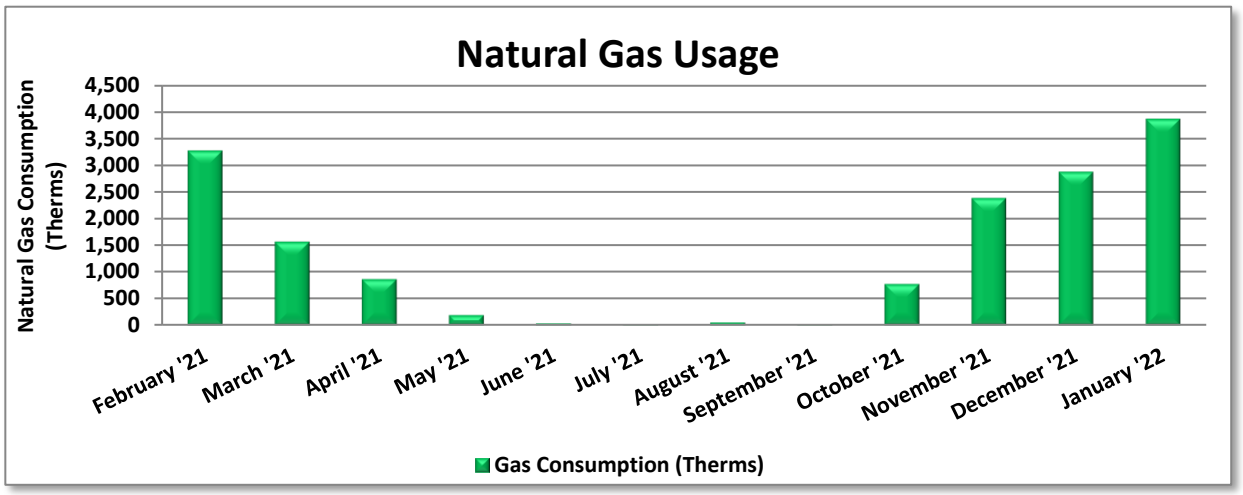
DPW Operations Garage Purchased Electricity Data



DPW Operations Garage Generated Electricity Consumption Data

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
3/15/21	33	3,270	$3,028
4/14/21	30	1,564	$1,297
5/13/21	29	864	$809
6/11/21	29	193	$423
7/13/21	32	37	$337
8/12/21	30	14	$328
9/13/21	32	56	$348
10/13/21	30	24	$330
11/10/21	28	776	$1,370
12/13/21	33	2,382	$2,483
1/13/22	31	2,872	$2,848
2/10/22	28	3,861	$3,603
Totals	**365**	**15,912**	**$17,204**
Annual	**365**	**15,912**	**$17,204**

Notes:

- The average gas cost for the past 12 months is $1.081/therm, which is the blended rate used throughout the analysis.
- Note: The utility data from the DPW Campus which includes the DPW Office, DPW Operations Garage, the Salt Shed, and the Brine Shed have been combined. The buildings are served in entirety by a combination of gas meters.

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.

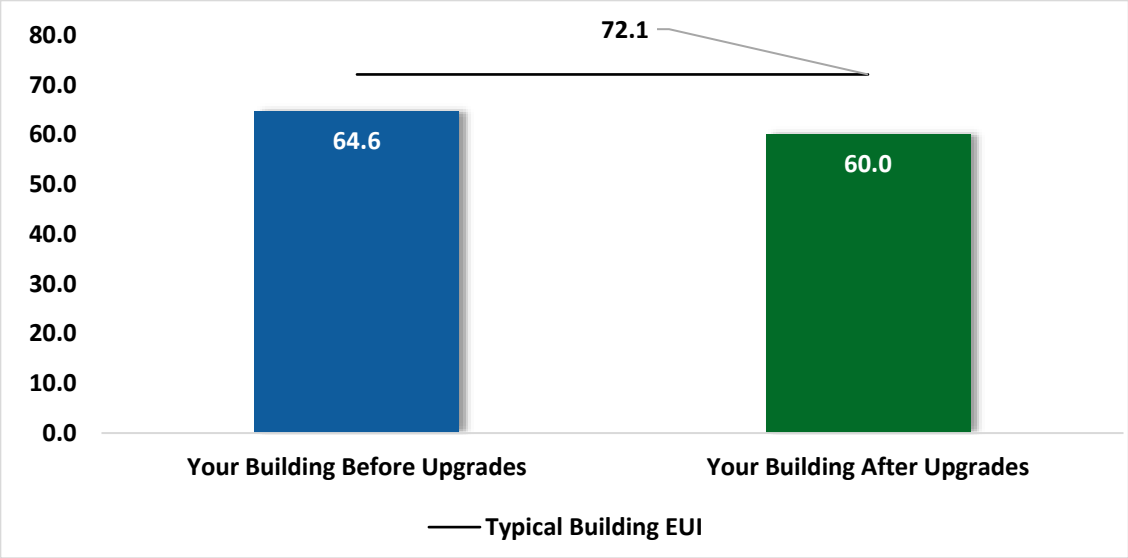


Figure 5 - Energy Use Intensity Comparison[3]

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			**43,125**	**17.6**	**-8**	**$4,820**	**$24,927**	**$5,736**	**$19,191**	**4.0**	**42,433**
ECM 1	Install LED Fixtures	Yes	3,504	1.8	0	$398	$4,125	$500	$3,625	9.1	3,512
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	3,213	1.8	-1	$359	$3,093	$450	$2,643	7.4	3,156
ECM 3	Retrofit Fixtures with LED Lamps	Yes	36,408	14.0	-8	$4,064	$17,709	$4,786	$12,923	3.2	35,765
Lighting Control Measures			**7,690**	**3.0**	**-2**	**$858**	**$10,660**	**$1,920**	**$8,740**	**10.2**	**7,552**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	7,043	2.8	-1	$786	$9,760	$1,290	$8,470	10.8	6,917
ECM 5	Install High/Low Lighting Controls	Yes	648	0.2	0	$72	$900	$630	$270	3.7	636
Variable Frequency Drive (VFD) Measures			**5,291**	**1.3**	**0**	**$603**	**$4,555**	**$200**	**$4,355**	**7.2**	**5,328**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	5,291	1.3	0	$603	$4,555	$200	$4,355	7.2	5,328
HVAC System Improvements			**674**	**0.0**	**3**	**$108**	**$1,014**	**$170**	**$844**	**7.8**	**1,015**
ECM 7	Install Pipe Insulation	Yes	674	0.0	3	$108	$1,014	$170	$844	7.8	1,015
Domestic Water Heating Upgrade			**123**	**0.0**	**9**	**$116**	**$17,148**	**$1,431**	**$15,717**	**135.2**	**1,231**
ECM 8	Install High Efficiency Gas-Fired Water Heater	No	0	0.0	4	$43	$17,076	$1,400	$15,676	360.8	471
ECM 9	Install Low-Flow DHW Devices	Yes	123	0.0	5	$73	$72	$31	$41	0.6	761
Food Service & Refrigeration Measures			**1,612**	**0.2**	**0**	**$184**	**$230**	**$50**	**$180**	**1.0**	**1,623**
ECM 10	Vending Machine Control	Yes	1,612	0.2	0	$184	$230	$50	$180	1.0	1,623
TOTALS			**58,515**	**22.1**	**2**	**$6,688**	**$58,533**	**$9,507**	**$49,026**	**7.3**	**59,183**

* - 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		**43,125**	**17.6**	**-8**	**$4,820**	**$24,927**	**$5,736**	**$19,191**	**4.0**	**42,433**
ECM 1	Install LED Fixtures	3,504	1.8	0	$398	$4,125	$500	$3,625	9.1	3,512
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	3,213	1.8	-1	$359	$3,093	$450	$2,643	7.4	3,156
ECM 3	Retrofit Fixtures with LED Lamps	36,408	14.0	-8	$4,064	$17,709	$4,786	$12,923	3.2	35,765
Lighting Control Measures		**7,690**	**3.0**	**-2**	**$858**	**$10,660**	**$1,920**	**$8,740**	**10.2**	**7,552**
ECM 4	Install Occupancy Sensor Lighting Controls	7,043	2.8	-1	$786	$9,760	$1,290	$8,470	10.8	6,917
ECM 5	Install High/Low Lighting Controls	648	0.2	0	$72	$900	$630	$270	3.7	636
Variable Frequency Drive (VFD) Measures		**5,291**	**1.3**	**0**	**$603**	**$4,555**	**$200**	**$4,355**	**7.2**	**5,328**
ECM 6	Install VFDs on Constant Volume (CV) Fans	5,291	1.3	0	$603	$4,555	$200	$4,355	7.2	5,328
HVAC System Improvements		**674**	**0.0**	**3**	**$108**	**$1,014**	**$170**	**$844**	**7.8**	**1,015**
ECM 7	Install Pipe Insulation	674	0.0	3	$108	$1,014	$170	$844	7.8	1,015
Domestic Water Heating Upgrade		**123**	**0.0**	**5**	**$73**	**$72**	**$31**	**$41**	**0.6**	**761**
ECM 8	Install High Efficiency Gas-Fired Water Heater	0	0.0	0	$0	$0	$0	$0	0.0	0
ECM 9	Install Low-Flow DHW Devices	123	0.0	5	$73	$72	$31	$41	0.6	761
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$184**	**$230**	**$50**	**$180**	**1.0**	**1,623**
ECM 10	Vending Machine Control	1,612	0.2	0	$184	$230	$50	$180	1.0	1,623
TOTALS		**58,515**	**22.1**	**-2**	**$6,645**	**$41,457**	**$8,107**	**$33,350**	**5.0**	**58,713**

* - 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		**45,063**	**17.6**	**-9**	**$5,036**	**$24,927**	**$5,736**	**$19,191**	**3.8**	**44,336**
ECM 1	Install LED Fixtures	3,504	1.8	0	$398	$4,125	$500	$3,625	9.1	3,512
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	3,309	1.8	-1	$369	$3,093	$450	$2,643	7.2	3,250
ECM 3	Retrofit Fixtures with LED Lamps	38,249	14.0	-8	$4,269	$17,709	$4,786	$12,923	3.0	37,574

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

ECM 1: Install LED Fixtures

Replace existing fixtures containing metal halide and high-pressure sodium (HPS) HID lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

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

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

Affected Building Areas:

- **DPW Office:** exterior floodlights.
- **Salt Shed:** The main floor area.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit T-12 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:

- **DPW Office:** car wash, car wash mechanical room, car wash side room, and the garage
- **DPW Operations Garage:** shop area

ECM 3: Retrofit Fixtures with LED Lamps

Replace linear and compact fluorescent 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:

- **DPW Office:** all office spaces, mechanical room, boiler room, corridors, garage, car wash, and restrooms.
- **DPW Operations Garage:** all garage spaces, shop, restroom, office, and mechanical room.

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		**8,596**	**3.1**	**-2**	**$959**	**$10,892**	**$1,960**	**$8,932**	**9.3**	**8,442**
ECM 4	Install Occupancy Sensor Lighting Controls	7,915	2.9	-2	$883	$9,992	$1,330	$8,662	9.8	7,773
ECM 5	Install High/Low Lighting Controls	682	0.2	0	$76	$900	$630	$270	3.5	669

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:

- **DPW Office: o**ffice spaces, garage, and restrooms.
- **DPW Operations Garage:** garage spaces, office, shop, shop side room, second-floor elevated platform.

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:

- **DPW Office:** main corridor and back hallway 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		**2,574**	**0.9**	**0**	**$293**	**$4,555**	**$200**	**$4,355**	**14.9**	**2,592**
ECM 6	Install VFD on Variable Air Volume (VAV) Fans	2,574	0.9	0	$293	$4,555	$200	$4,355	14.9	2,592

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 VFD on Variable Air Volume (VAV) Fans

Replace existing air volume control devices on variable volume fans, such as inlet vanes and variable pitch fan blades, with VFDs. Inlet guide vanes and variable pitch fan blades are an inefficient means of controlling the air volume compared to VFDs. The existing volume control device will be removed or permanently disabled, and the control signal will be redirected to the VFD to determine proper fan motor speed.

Energy savings result from using a more efficient control device to regulate the air flow provided by the fan. Additional maintenance savings may result from this measure. VFDs are solid state electronic devices, which generally require less maintenance than mechanical air volume control devices.

Affected Air Handlers: DPW Office, AHU-1.

4.4 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**674**	**0.0**	**3**	**$108**	**$1,014**	**$170**	**$844**	**7.8**	**1,015**
ECM 7	Install Pipe Insulation	674	0.0	3	$108	$1,014	$170	$844	7.8	1,015

ECM 7: Install Pipe Insulation

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

Affected Systems:

- **DPW Office:** car wash mechanical room natural gas DHW tank and car wash side room electric DHW tank.

4.5 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**123**	**0.0**	**9**	**$116**	**$17,148**	**$1,431**	**$15,717**	**135.2**	**1,231**
ECM 8	Install High Efficiency Gas-Fired Water Heater	0	0.0	4	$43	$17,076	$1,400	$15,676	360.8	471
ECM 9	Install Low-Flow DHW Devices	123	0.0	5	$73	$72	$31	$41	0.6	761

ECM 8: Install High Efficiency Gas-Fired Water Heater

We evaluated replacing the existing tank water heater with a high-efficiency condensing tank water heater. Energy savings result from the increased efficiency of the unit, which uses less gas to heat water, and fewer operating hours to maintain the tank water temperature.

ECM 9: Install Low-Flow DHW Devices

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

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

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

Additional cost savings may result from reduced water usage.

4.6 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$184**	**$230**	**$50**	**$180**	**1.0**	**1,623**
ECM 10	Vending Machine Control	1,612	0.2	0	$184	$230	$50	$180	1.0	1,623

ECM 10: Vending Machine Control

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

5 Energy Efficient Best Practices

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

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save 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[4]. 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.

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

Lighting Maintenance

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

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

Lighting Controls

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

Motor 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.

HVAC Filter Cleaning and Replacement

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

Boiler Maintenance

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

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.

Compressed Air System Maintenance

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

- Inspection, cleaning, and replacement of inlet filter cartridges.
- Cleaning of drain traps.
- Daily inspection of lubricant levels to reduce unwanted friction.
- Inspection of belt condition and tension.
- Check for leaks and adjust loose connections.
- Overall system cleaning.
- Reduce pressure setting to minimum needed for air operated equipment.
- Turn off compressor if not routinely needed.
- Use low pressure blower air rather than high pressure compressed air.

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

Water Conservation

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

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

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

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

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

use does however ultimately reduce grid-level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users.

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

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

Procurement Strategies

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

6 On-site Generation

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

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

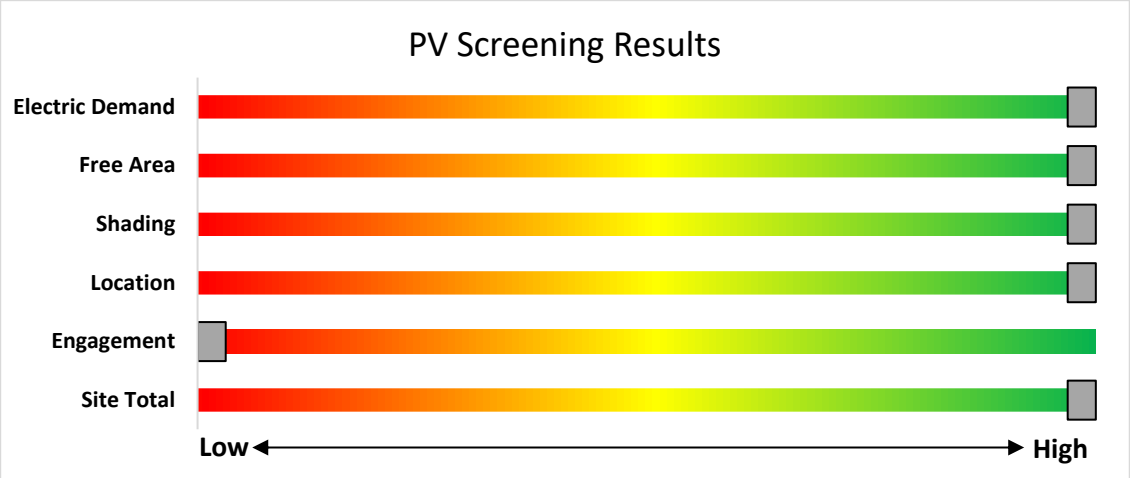
6.1 Solar Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has high potential for installing a PV array.

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

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



Potential	High	
System Potential	63	kW DC STC
Electric Generation	75,057	kWh/yr
Displaced Cost	$8,550	/yr
Installed Cost	$163,800	

Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

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

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

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

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

6.2 Combined Heat and Power

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

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

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

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

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

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

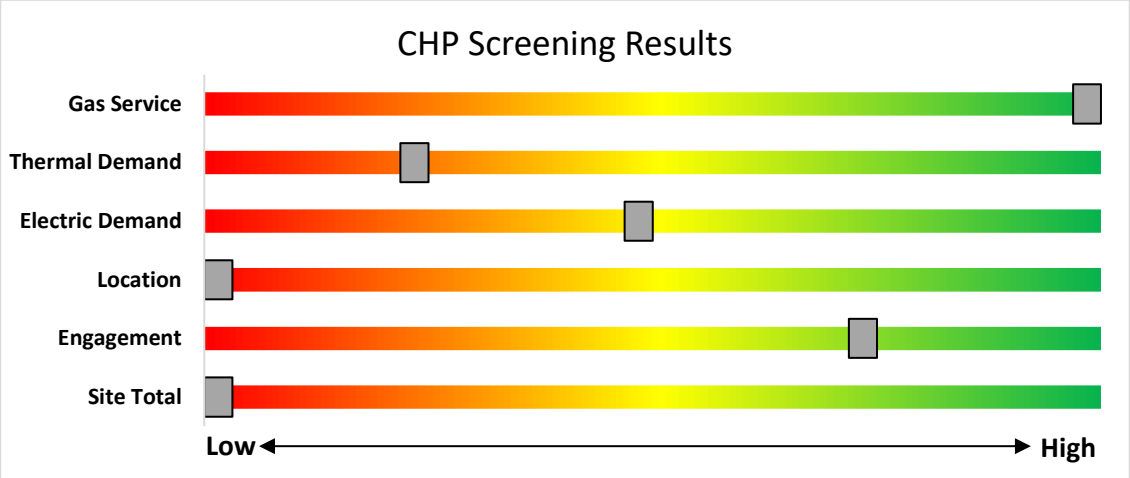


Figure 9 - Combined Heat and Power Screening

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

7 Electric Vehicles (EV)

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

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

7.1 Electric Vehicle Charging

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

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

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

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

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

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

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

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

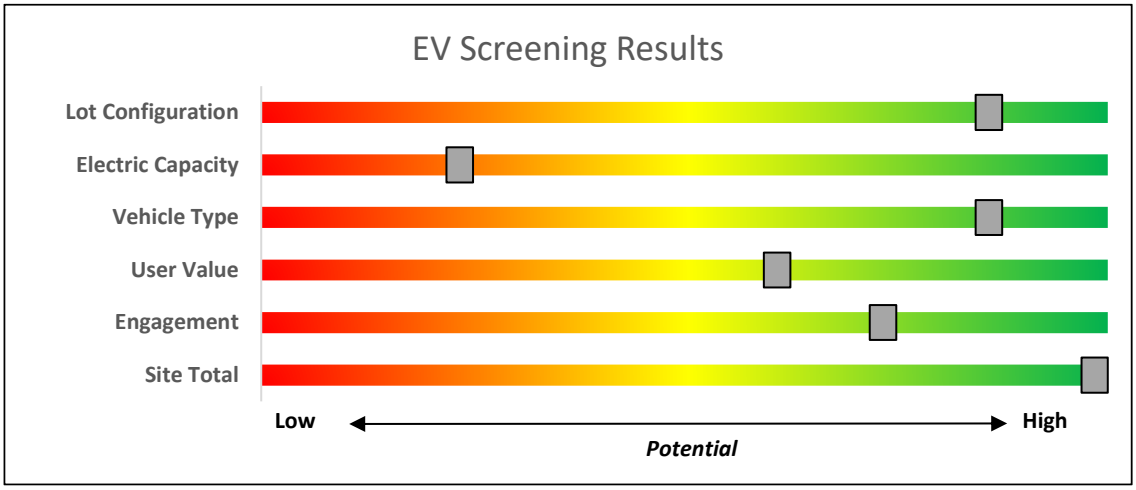


Figure 10 – EV Charger Screening

Electric Vehicle Programs Available

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

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

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

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

8 Project Funding and Incentives

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

8.1 Utility Energy Efficiency Programs

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

Prescriptive and Custom

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

Equipment Examples

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

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

Direct Install

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

Incentives

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

How to Participate

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

Engineered Solutions

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

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

8.2 New Jersey's Clean Energy Programs

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

Large Energy Users

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

Incentives

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

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

How to Participate

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

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

Combined Heat and Power

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

Incentives

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

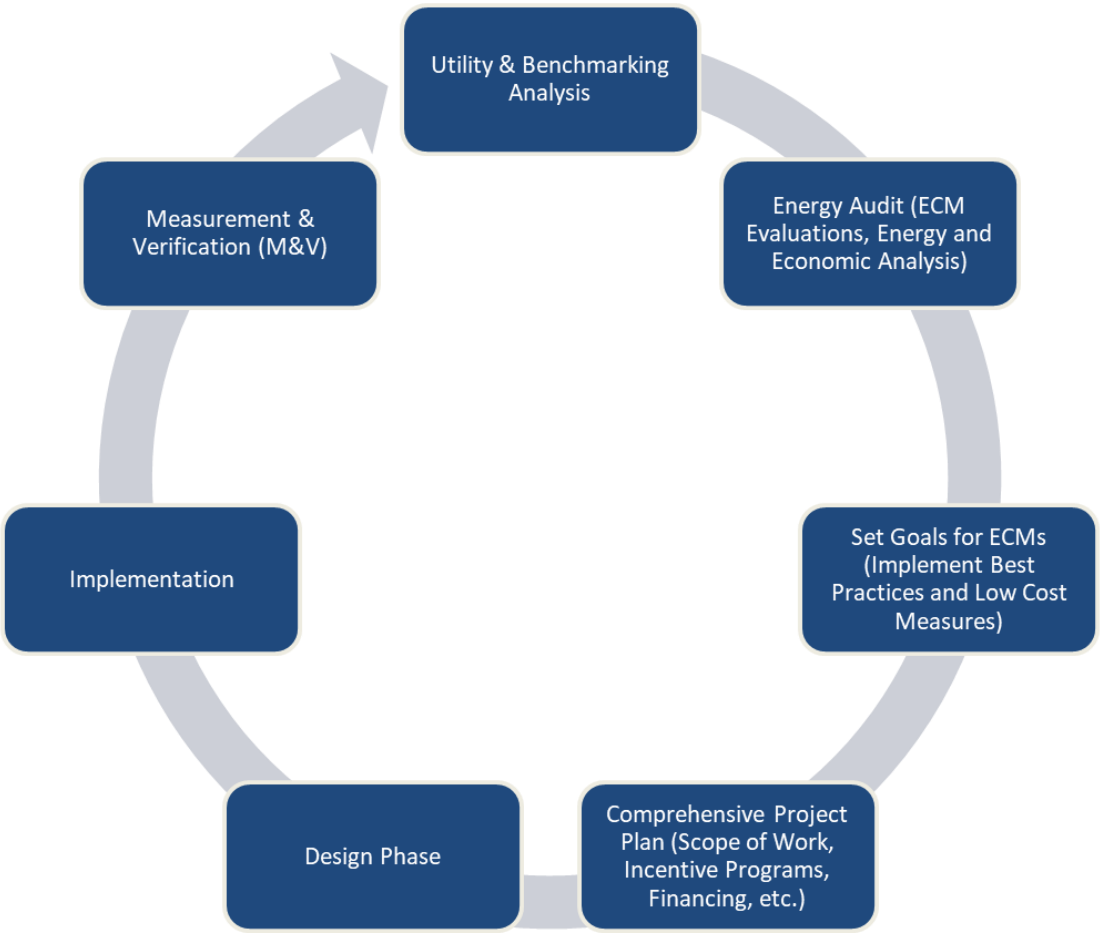


Figure 11 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 Retail Electric Supply Options

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

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

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

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[8].

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Assembly Room - DPW Office	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.6	1,769	0	$197	$818	$185	3.2
Boiler Room - DPW Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,600	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.1	371	0	$41	$146	$40	2.6
Building Department - DPW Office	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.9	2,830	-1	$316	$1,416	$310	3.5
Building Department Office - DPW Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.2	707	0	$79	$489	$95	5.0
Building Department Vault - DPW Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,500	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,500	0.1	160	0	$18	$110	$30	4.4
Community Development - DPW Office	1	Exit Signs: LED - 2 W Lamp	None	S	6	2,600		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	2,600	0.0	0	0	$0	$0	$0	0.0
Community Development - DPW Office	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.9	3,007	-1	$336	$1,471	$325	3.4
Community Development Copier Room - DPW Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.1	354	0	$39	$226	$50	4.4
Community Development File Storage - DPW Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,500	3	Relamp	No	12	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,500	0.2	340	0	$38	$219	$60	4.2
Community Development Office 1 - DPW Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.2	707	0	$79	$489	$95	5.0
Community Development Office 2 - DPW Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.3	884	0	$99	$544	$110	4.4
Community Development Office 3 - DPW Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.1	354	0	$39	$226	$50	4.4
Community Development Office 4 - DPW Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.2	707	0	$79	$489	$95	5.0
Community Development Office 5 - DPW Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.2	707	0	$79	$489	$95	5.0
Community Development Section 2 - DPW Office	1	Exit Signs: LED - 2 W Lamp	None	S	6	2,600		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	2,600	0.0	0	0	$0	$0	$0	0.0
Community Development Section 2 - DPW Office	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.9	3,007	-1	$336	$1,471	$325	3.4
Community Development Side Storage - DPW Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,500	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,500	0.1	160	0	$18	$110	$30	4.4
Community Development Vault - DPW Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,500	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,500	0.1	160	0	$18	$110	$30	4.4
Conference Room - DPW Office	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	500	3, 4	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	345	0.5	306	0	$34	$763	$170	17.4
Corridor Back Hallway - DPW Office	2	Exit Signs: LED - 2 W Lamp	None	S	6	2,600		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	2,600	0.0	0	0	$0	$0	$0	0.0
Corridor Back Hallway - DPW Office	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 5	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,794	0.6	1,769	0	$197	$998	$500	2.5
Corridor Main - DPW Office	1	Exit Signs: LED - 2 W Lamp	None	S	6	2,600		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	2,600	0.0	0	0	$0	$0	$0	0.0
Corridor Main - DPW Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 5	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,794	0.4	1,415	0	$158	$888	$400	3.1
Department of Public Works Side Office - DPW Office	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.7	2,299	0	$257	$982	$230	2.9
Car Wash - DPW Office	8	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	1,000	2	Relamp & Reballast	No	8	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	1,000	0.6	743	0	$83	$1,030	$160	10.5

	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
Car Wash Mechanical Room - DPW Office	1	Exit Signs: LED - 2 W Lamp	None	S	6	2,600		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	2,600	0.0	0	0	$0	$0	$0	0.0
Car Wash Mechanical Room - DPW Office	4	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	2,000	2	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,000	0.3	743	0	$83	$515	$80	5.2
Car Wash Side Room - DPW Office	4	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	200	2	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	200	0.3	74	0	$8	$515	$80	52.4
Garage - DPW Office	23	LED - Fixtures: High-Bay	Wall Switch	S	150	2,600		None	No	23	LED - Fixtures: High-Bay	Wall Switch	150	2,600	0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	2	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	2,600	2	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,600	0.1	177	0	$20	$101	$10	4.6
Garage - DPW Office	8	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	S	92	2,600	2	Relamp & Reballast	No	8	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	2,600	0.4	1,258	0	$140	$675	$80	4.2
Garage - DPW Office	29	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,600	3	Relamp	No	29	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.8	2,687	-1	$300	$1,059	$290	2.6
Garage - DPW Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,600	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,794	0.3	943	0	$105	$408	$100	2.9
Garage Compressor Room - DPW Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,500	3	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,500	0.4	642	0	$72	$438	$120	4.4
Garage Office - DPW Office	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,600	3, 4	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,794	0.5	1,651	0	$184	$781	$175	3.3
Garage Office 2 - DPW Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,794	0.1	472	0	$53	$416	$75	6.5
Garage Office 3 - DPW Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,600	3, 4	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,794	0.2	623	0	$70	$489	$95	5.7
Garage Office 3 - DPW Office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,600	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,600	0.0	81	0	$9	$72	$10	6.9
Garage Side Storage - DPW Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,200	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,200	0.0	43	0	$5	$37	$10	5.6
Garage Tire Room - DPW Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,200	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	828	0.3	435	0	$49	$562	$115	9.2
Storage - DPW Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,200	3	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,200	0.2	257	0	$29	$219	$60	5.6
Exterior Flood - DPW Office	2	High-Pressure Sodium: (1) 400W Lamp	Photocell		465	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	140	4,380	0.0	2,847	0	$324	$1,170	$200	3.0
Exterior Recessed - DPW Office	4	Compact Fluorescent: (1) 26W Double Biaxial Plug-In Lamp	Photocell		26	4,380	3	Relamp	No	4	LED Lamps: GX23 (Plug-In) Lamps	Photocell	19	4,380	0.0	123	0	$14	$50	$4	3.3
Exterior Wall Pack - DPW Office	9	LED - Fixtures: Wall Pack	Photocell		35	4,380		None	No	9	LED - Fixtures: Wall Pack	Photocell	35	4,380	0.0	0	0	$0	$0	$0	0.0
Men's Locker Room - DPW Office	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,794	0.7	2,255	0	$252	$672	$145	2.1
Women's Locker Room - DPW Office	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,600		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,600	0.0	0	0	$0	$0	$0	0.0
Women's Locker Room - DPW Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.1	354	0	$39	$380	$65	8.0
Mechanical Room - DPW Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,500	3	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,500	0.1	240	0	$27	$438	$120	11.9
Public Works Department - DPW Office	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.9	2,830	-1	$316	$1,416	$310	3.5
Public Works Department Office 1 - DPW Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.1	354	0	$39	$226	$50	4.4

	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
Public Works Department Office 2 - DPW Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,600	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,794	0.1	354	0	$39	$226	$50	4.4
Men's Restroom - DPW Office	2	Compact Fluorescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,500	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,500	0.0	53	0	$6	$110	$0	18.4
Men's Restroom - DPW Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,500	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,035	0.2	408	0	$46	$489	$95	8.7
Men's Restroom - DPW Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,500	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,500	0.1	160	0	$18	$110	$30	4.4
Women's Restroom - DPW Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,500	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,035	0.2	306	0	$34	$434	$80	10.4
DPW Garage - DPW Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,500	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,795	0.2	1,247	0	$139	$299	$70	1.6
Exterior Flood - DPW Garage	2	Compact Fluorescent: (2) 60W BR30 Screw-In Lamps	Photocell		120	4,380	3	Relamp	No	2	LED Lamps: LED Lamps	Photocell	84	4,380	0.0	315	0	$36	$96	$12	2.3
Exterior LED - DPW Garage	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		10	4,380		None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	10	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wallpack - DPW Garage	8	LED - Fixtures: Wall Pack	Photocell		35	4,380		None	No	8	LED - Fixtures: Wall Pack	Photocell	35	4,380	0.0	0	0	$0	$0	$0	0.0
Garage Mechanical Room - DPW Garage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,690	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,690	0.0	102	0	$11	$73	$20	4.6
Garage Office - DPW Garage	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,690	3, 4	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,166	0.3	675	0	$75	$635	$135	6.6
Grounds Garage - DPW Garage	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,690	3, 4	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,166	0.9	1,839	0	$205	$1,416	$310	5.4
Plow Garage - DPW Garage	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,690	3, 4	Relamp	Yes	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,166	1.1	2,299	0	$257	$1,635	$370	4.9
Restroom Garage - DPW Garage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	18	0	$2	$37	$10	13.3
Second Floor Sewers Garage - DPW Garage	1	Exit Signs: LED - 2 W Lamp	None		6	1,690		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	1,690	0.0	0	0	$0	$0	$0	0.0
Second Floor Sewers Garage - DPW Garage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,690	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,166	0.1	307	0	$34	$416	$75	10.0
Sewers Garage - DPW Garage	1	Exit Signs: LED - 2 W Lamp	None		6	1,690		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	1,690	0.0	0	0	$0	$0	$0	0.0
Sewers Garage - DPW Garage	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	1,690		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,690	0.0	0	0	$0	$0	$0	0.0
Sewers Garage - DPW Garage	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,690	3, 4	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,166	0.9	1,839	0	$205	$1,416	$310	5.4
Sewers Tool Room - DPW Garage	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	1,690		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,690	0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	1,690		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,690	0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	3	LED - Linear Tubes: (2) 8' Lamp	Wall Switch	S	45	1,690		None	No	3	LED - Linear Tubes: (2) 8' Lamp	Wall Switch	45	1,690	0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	2	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	1,690	2	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	1,690	0.2	314	0	$35	$257	$40	6.2
Shop - DPW Garage	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,690	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,166	0.4	766	0	$86	$905	$170	8.6
Shop Side Room - DPW Garage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,690	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,166	0.1	153	0	$17	$189	$40	8.7

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior Wallpack - DPW Salt Shed	2	LED - Fixtures: Wall Pack	Photocell		35	4,380		None	No	2	LED - Fixtures: Wall Pack	Photocell	35	4,380	0.0	0	0	$0	$0	$0	0.0
Main Area - DPW Salt Shed	6	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	300	1	Fixture Replacement	No	6	LED - Fixtures: High-Bay	Wall Switch	120	300	1.8	657	0	$73	$2,955	$300	36.2
Canopy - DPW Brine Shed	12	LED - Fixtures: High-Bay	Photocell		75	4,380		None	No	12	LED - Fixtures: High-Bay	Photocell	75	4,380	0.0	0	0	$0	$0	$0	0.0
Canopy - DPW Brine Shed	12	LED - Fixtures: Wall Pack	Photocell		35	4,380		None	No	12	LED - Fixtures: Wall Pack	Photocell	35	4,380	0.0	0	0	$0	$0	$0	0.0
Shed - DPW Brine Shed	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	200		None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	200	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
Men's Restroom - DPW Office	EF - Restroom	1	Exhaust Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.3	65.0%	No	Greenheck		W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.3	65.0%	No	Centri Master	PV150 E3	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.5	76.2%	No	Greenheck	CBE14 4	B	2,745		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.5	76.2%	No	Cook	150 ACE	W	2,745		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.1	68.5%	No	Centri Master	PRN 100	B	2,745		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.3	65.0%	No	Cook		B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.3	65.0%	No	Cook	135 ACE	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.3	65.0%	No	Centri Master	PV100	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.3	65.0%	No	Centri Master		B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.3	65.0%	No	Cook	120 ACE	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	EF - DPW Office	1	Exhaust Fan	0.2	68.5%	No	Greenheck	G-098-B-X	W	2,745		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room - DPW Office	HHWP - Office	2	Heating Hot Water Pump	0.5	76.2%	No	Taco	ZXM101050A	W	2,000		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room - DPW Office	HHWP - Office	1	Heating Hot Water Pump	0.1	68.5%	No	US Motors	SA55JXFSN-3748	B	2,000		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room - DPW Office	HHWP - Office	1	Heating Hot Water Pump	0.5	76.2%	No	Taco		W	2,000		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room - DPW Office	HHWP - Office	2	Heating Hot Water Pump	0.5	76.2%	No	Taco		W	2,000		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room - DPW Office	HHWP AHU - Office	1	Heating Hot Water Pump	3.0	89.5%	No	Armstrong	2x2x8 4380	W	2,000		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash - DPW Office	Car Wash Track Motor	1	Other	3.0	89.5%	No			W	100		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash - DPW Office	Garage Door Motor	2	Other	0.5	76.2%	No			W	10		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Car Wash - DPW Office	Car Wash Air Blowers	7	Other	10.0	90.2%	No	TechTop	GR3-AL-TF-215	B	100		No	90.2%	No		0.0	0	0	$0	$0	$0	0.0
Car wash Mechanical room - DPW Office	Water Softener Supplementary Motor 1 & 2	2	Other	0.8	81.8%	No	Marathon Electric		B	100		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Car wash Mechanical room - DPW Office	Refuse Oil Boiler Motor	1	Other	0.3	65.0%	No	Emerson Motors		B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Car wash Mechanical room - DPW Office	Water Softener Primary Motor 1 & 2	1	Other	25.0	85.7%	No	US Motors	T811A	B	100		No	85.7%	No		0.0	0	0	$0	$0	$0	0.0
Car wash Mechanical room - DPW Office	Cleaning Solution Pumps	2	Other	0.3	64.0%	No	Baldor	17E09W230C1	W	100		No	64.0%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash Side Room - DPW Office	Garage Door Motor	1	Other	0.5	76.2%	No	Wayne Dalton		W	10		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash Side Room - DPW Office	Pressure Washer	1	Other	5.0	87.5%	No	PSC Cleaning	ES420EA3-460	B	10		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash Side Room - DPW Office	Industrial Vacuum	1	Other	2.0	84.0%	No	Industrial Vacuum Systems	100000	B	10		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	Garage Door Motor	6	Other	0.5	76.2%	No	Lift Master		W	10		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0
Garage Compressor Room - DPW Office	Garage Compression System	1	Air Compressor	15.0	91.0%	No	Ingersoll Rand	UP6-15CTAS-150w	W	2,500		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Garage Tire Room - DPW Office	Tire Lift	1	Other	1.2	70.0%	No			W	100		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room - DPW Office	AHU-1 - Garage	1	Supply Fan	3.0	89.5%	No	US Motors		B	2,745	6	No	89.5%	Yes	1	0.9	2,574	0	$293	$4,555	$200	14.9
Car Wash - DPW Office	Hydronic Unit Heater	2	Fan Coil Unit	0.1	68.5%	No			W	2,745		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	Hydronic Unit Heater	4	Fan Coil Unit	0.3	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	CO2 Scrubber	9	Other	1.0	85.5%	No			W	1,500		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	RTU-1 Supply Fan	1	Supply Fan	15.0	93.0%	Yes	Baldor	39E386X745G1	W	3,200		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	RTU-1 Return Fan	1	Exhaust Fan	7.5	91.0%	Yes	Baldor	37F614T863G1	W	3,200		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash Mechanical Room - DPW Office	DHW Circulation Pump	1	DHW Circulation Pump	0.1	68.5%	No	Emerson Motors		B	3,200		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	Drill Press	1	Other	0.8	81.8%	No			W	150		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash Mechanical Room - DPW Office	Air Compressor	1	Air Compressor	7.5	91.0%	No	Speed Aire	WW295-3	W	1,500		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Garage - DPW Office	Bench Grinder	2	Other	0.3	65.0%	No			W	300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	Horizontal Band Saw	1	Other	0.8	81.8%	No	Jet Equipment & Tools	OCP 03-04	W	50		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	Crimper	1	Other	1.0	85.5%	No			W	20		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	Brake Lathe	1	Other	1.0	85.5%	No	Magnetek	8-176095-20	B	50		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Garage - DPW Office	HV-1 - Garage	1	Supply Fan	5.0	89.5%	No	York		W	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash Mechanical Room - DPW Office	DHW Circulation Pump	1	DHW Circulation Pump	0.3	65.0%	No			W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Car Wash Mechanical Room - DPW Office	Refuse Oil Boiler Circulation Motor	2	Other	0.3	165.0%	No			W	2,745		No	165.0%	No		0.0	0	0	$0	$0	$0	0.0
Grounds Garage - DPW Garage	EF-Garage	1	Exhaust Fan	5.0	87.5%	No	Cook	402C11B	B	2,000		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Garage Mechanical Room - DPW Garage	Air Compressor	1	Air Compressor	2.0	86.5%	No	Baldor	EM3157T-3	B	3,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Sewers Garage Second Floor - DPW Garage	Garage Door Motor	4	Other	0.3	65.0%	No			W	20		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Plow Garage - DPW Garage	Drill Press	1	Other	0.8	81.8%	No			B	150		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	Miter Saw	1	Other	1.0	85.5%	No	Makita	LS1013	W	150		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	Bench Grinder	1	Other	0.3	65.0%	No	Skil	HD3698	W	300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	Sanding Wheel	1	Other	0.3	65.0%	No	Hitachi	SB10Y	W	300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	Band Saw	1	Other	0.8	81.8%	No	Delta	28-276	W	150		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	Drill Press	1	Other	0.8	81.8%	No	Porter Cable	PCB660DP	W	150		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	Shop Vac	1	Other	6.5	88.5%	No	Rigid		W	500		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0
Shop - DPW Garage	Table Saw	1	Other	1.5	84.0%	No	Emerson	826187	W	500		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Shed - DPW Brine Shed	Air Compressor	1	Air Compressor	2.0	85.5%	No	Marathon Electric	YL160	W	3,000		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Shed - DPW Brine Shed	Brine Maker Pump	1	Other	5.0	88.5%	No	AMT	DS32	W	3,000		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Shed - DPW Brine Shed	Brine Maker Pump	1	Other	7.5	88.5%	No	AMT	DS25	W	3,000		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0

Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior Grounds - DPW Office	AC-1 - DPW Offices	1	Split-System Air-Source HP	2.00	22.00	16.00	9 HSPF	Johnson Controls	DHP24CSB21S	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior Grounds - DPW Office	AC-2 - DPW Offices	1	Split-System Air-Source HP	3.00	34.60	18.00	9.11 HSPF	Johnson Controls	DHP36CSB21S	W		No							0.0	0	0	$0	$0	$0	0.0
Roof - DPW Office	RTU-1 - DPW Offices	1	Package Unit	30.00		13.50		Johnson Controls	V3W222ABE3A3BCECB1	W		No							0.0	0	0	$0	$0	$0	0.0
Garage Office - DPW Garage	PTAC Unit	1	Packaged Terminal HP	0.80	8.20	11.00	10.5 HSPF	Friedrich		B		No							0.0	0	0	$0	$0	$0	0.0
Various Garage Spaces - DPW Garage	Small Unit Heater	6	Unit Heater		166.00		0.83 Et	Reznor	UDAP 200	B		No							0.0	0	0	$0	$0	$0	0.0
Various Garage Spaces - DPW Garage	Medium Unit Heater	2	Unit Heater		249.00		0.83 Et	Reznor	UDAP 300	B		No							0.0	0	0	$0	$0	$0	0.0
Shed - DPW Brine Shed	Shed Heating System	1	Electric Resistance Heat		15.09		1 COP	TPI Corporation	HF5848TC	B		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 - DPW Office	HHW System	2	Condensing Hot Water Boiler	850	Power Fin	PBN1002 MK13	W		No						0.0	0	0	$0	$0	$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
DPW Car Wash Mechanical Room - DPW Office	Car Wash	7	60	1.00	0.0	0	3	$31	$716	$120	19.2
DPW Car Wash Side Room - DPW Office	Car Wash	7	25	0.75	0.0	674	0	$77	$298	$50	3.2

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room - DPW Office	DHW - Office	1	Storage Tank Water Heater (> 50 Gal)	Bradford White	D80T1993N	W	8	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	UEF	0.0	0	3	$35	$8,538	$700	225.5
Car Wash Mechanical Room - DPW Office	Car Wash	1	Storage Tank Water Heater (> 50 Gal)	Rheem	ST120A	B	8	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	UEF	0.0	0	1	$9	$8,538	$700	901.9
Car Wash Side Room - DPW Office	Car Wash	1	Storage Tank Water Heater (≤ 50 Gal)	Bradford White		W		No						0.0	0	0	$0	$0	$0	0.0
Garage Mechanical Room - DPW Garage	DHW - Garage	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	E20A-6-G	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
Various Restrooms - DPW Office	9	6	Faucet Aerator (Lavatory)	2.00	0.50	0.0	0	5	$54	$43	$22	0.4
Various Break Rooms - DPW Office	9	3	Faucet Aerator (Kitchen)	2.00	1.50	0.0	0	0	$5	$22	$6	3.4
Garage Restroom - DPW Garage	9	1	Faucet Aerator (Lavatory)	2.00	0.50	0.0	123	0	$14	$7	$4	0.3

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Grounds Garage - DPW Garage	1	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Delfield	F5PC48N	No		No	0.0	0	0	$0	$0	$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Assembly Room - DPW Office	1	Ice Making Head (<450 lbs/day), Continuous	Hoshizaki	B-500PF	No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
DPW Office	4	Coffee Machine	900	No		
DPW Office	2	Graphics Printer	120	No		
DPW Office	45	Desktop	270	No		
DPW Office	1	Wide Format Printer	1,500	No		
DPW Office	5	Microwave	1,000	No		
DPW Office	7	Printer (Medium/Small)	200	No		
DPW Office	5	Printer/Copier (Large)	600	No		
DPW Office	1	Water Cooler	92	No		
DPW Office	2	Refrigerator (Mini)	150	No		
DPW Office	2	Refrigerator (Residential)	220	No		
DPW Office	3	Television	70	No		
DPW Office	1	Clothes Washer	900	No		
DPW Office	1	Clothes Dryer	5,000	No		
DPW Office	1	Paper Shredder	150	No		
DPW Office	1	Laminator	40	No		
DPW Office	1	Battery Charger	800	No		
DPW Office	2	Toaster Oven	1,200	No		
DPW Office	1	Wheel Balancer	2,000	No		
DPW Office	1	MIG Welder	10,000	No		
DPW Office	1	Tire Changer	1,380	No		
DPW Office	1	Server	1,500	No		
DPW Garage	1	Coffee Machine	900	No		
DPW Garage	3	Microwave	1,000	No		
DPW Garage	2	Refrigerator (Residential)	220	No		
DPW Garage	3	Tool Battery Charger	10	No		
DPW Garage	1	Fish Tank Air Pump	3	No		
DPW Brine Shed	1	Magnetic Flowmeter	12	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
Assembly Room - DPW Office	1	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0
Assembly Room - DPW Office	1	Refrigerated	10	Yes	0.2	1,612	0	$184	$230	$50	1.0

APPENDIX B: ENERGY STAR STATEMENT OF ENERGY PERFORMANCE

Energy use intensity (EUI) is presented in terms of *site energy* and *source energy*. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

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ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Piscataway Township DPW (Campus)

Primary Property Type: Office
Gross Floor Area (ft²): 43,953
Built: 1979

For Year Ending: February 28, 2022
Date Generated: June 02, 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
Piscataway Township DPW (Campus) 505 Sidney Road Piscataway, New Jersey 08854	Township of Piscataway 455 Hoes Lane Piscataway, NJ 08854 (732) 529-2528	Timothy Dacey 455 Hoes Lane Piscataway, NJ 08854 (732) 529-2528 tdacey@piscatawaynj.org

Property ID: 25326897

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
63.5 kBtu/ft²

Source EUI
102.6 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	1,546,542 (55%)
Electric - Grid (kBtu)	910,529 (33%)
Electric - Solar (kBtu)	335,359 (12%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	72.1
National Median Source EUI (kBtu/ft²)	116.4
% Diff from National Median Source EUI	-12%

Annual Emissions
Total (Location-Based) GHG Emissions (Metric Tons CO2e/year): 162

Signature & Stamp of Verifying Professional

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

LP Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

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

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

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