Local Government Energy Audit Report

Valley Street Park and Metcalf Playground

November 9, 2021

Prepared for:

City of Orange Township

717 Valley St

Orange, New Jersey 07050

Prepared by:

TRC

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

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

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ENERGY EFFICIENCY INCENTIVE & REBATE TRANSITION

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

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

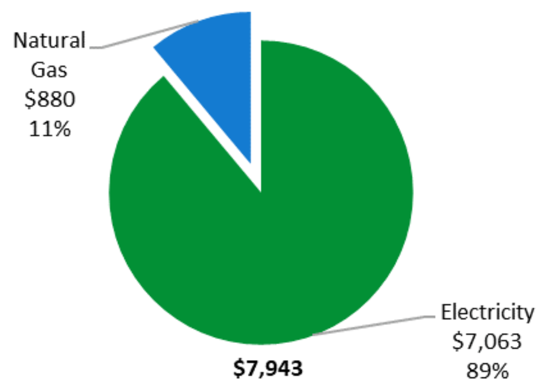
These "next generation" energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and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

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

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Valley St Park and Metcalf Playground. 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: $7,943 Electricity: 21,696 kWh Natural Gas: 814 Therms	
ENERGY STAR® Benchmarking Score	N/A	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.

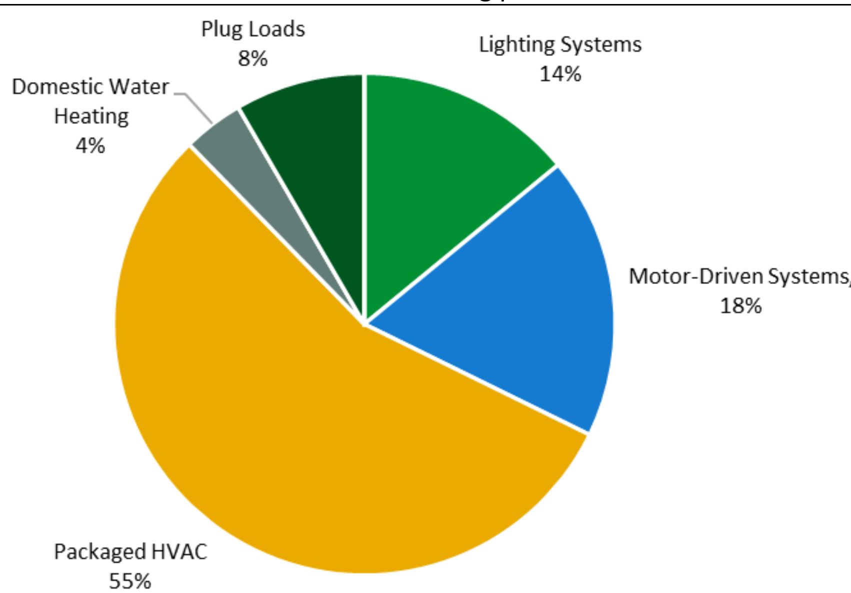


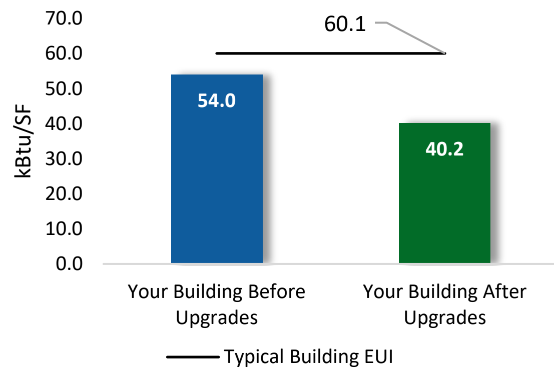
Figure 1 - Energy Use by System

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.

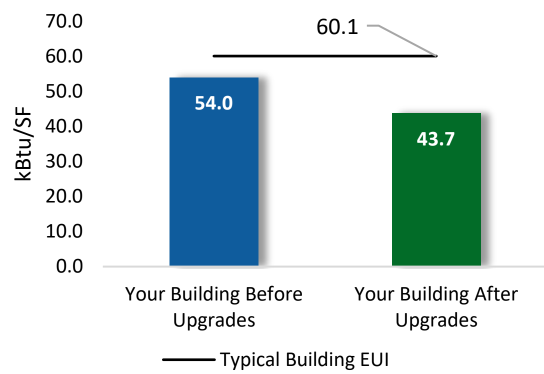
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$30,340
Potential Rebates & Incentives[1]	$4,176
Annual Cost Savings	$3,093
Annual Energy Savings	Electricity: 9,227 kWh Natural Gas: 82 Therms
Greenhouse Gas Emission Savings	5 Tons
Simple Payback	8.5 Years
Site Energy Savings (all utilities)	26%



Scenario 2: Cost Effective Package[2]

Installation Cost	$21,567
Potential Rebates & Incentives	$2,526
Annual Cost Savings	$2,698
Annual Energy Savings	Electricity: 8,243 kWh Natural Gas: 13 Therms
Greenhouse Gas Emission Savings	4 Tons
Simple Payback	7.1 Years
Site Energy Savings (all utilities)	19%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**4,041**	**1.2**	**0**	**$1,312**	**$15,036**	**$438**	**$14,598**	**11.1**	**4,031**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	4,003	1.2	0	$1,300	$14,963	$438	$14,525	11.2	3,994
ECM 2	Install LED Exit Signs	Yes	38	0.0	0	$12	$72	$0	$72	5.9	37
Lighting Control Measures			**480**	**0.4**	**0**	**$155**	**$2,084**	**$210**	**$1,874**	**12.1**	**472**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	480	0.4	0	$155	$2,084	$210	$1,874	12.1	472
Motor Upgrades			**115**	**0.0**	**0**	**$37**	**$352**	**$0**	**$352**	**9.4**	**116**
ECM 4	Premium Efficiency Motors	Yes	115	0.0	0	$37	$352	$0	$352	9.4	116
Variable Frequency Drive (VFD) Measures			**3,607**	**0.5**	**0**	**$1,174**	**$3,987**	**$1,800**	**$2,187**	**1.9**	**3,632**
ECM 5	Install VFDs on Process Pumps	Yes	3,607	0.5	0	$1,174	$3,987	$1,800	$2,187	1.9	3,632
Unitary HVAC Measures			**984**	**0.8**	**5**	**$371**	**$6,521**	**$1,050**	**$5,471**	**14.7**	**1,540**
ECM 6	Install High Efficiency Air Conditioning Units	No	984	0.8	5	$371	$6,521	$1,050	$5,471	14.7	1,540
HVAC System Improvements			**0**	**0.0**	**1**	**$7**	**$87**	**$60**	**$27**	**4.1**	**71**
ECM 7	Install Pipe Insulation	Yes	0	0.0	1	$7	$87	$60	$27	4.1	71
Domestic Water Heating Upgrade			**0**	**0.0**	**3**	**$36**	**$2,274**	**$618**	**$1,655**	**45.4**	**395**
ECM 8	Install Tankless Water Heater	No	0	0.0	2	$24	$2,252	$600	$1,652	68.6	261
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	1	$12	$22	$18	$3	0.3	134
TOTALS (COST EFFECTIVE MEASURES)			**8,243**	**2.1**	**1**	**$2,698**	**$21,567**	**$2,526**	**$19,041**	**7.1**	**8,456**
TOTALS (ALL MEASURES)			**9,227**	**3.0**	**8**	**$3,093**	**$30,340**	**$4,176**	**$26,163**	**8.5**	**10,257**

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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

Options from Around the State

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

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

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

The CHP program provides incentives for combined heat and power (aka 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.

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.

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Valley St Park and Metcalf Playground. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

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

2.1 Site Overview

On May 5, 2021, TRC performed an energy audit at Valley St Park and Metcalf Playground located in Orange, New Jersey. TRC met with Carnell Townes to review the facility operations and help focus our investigation on specific energy-using systems.

Valley St Park and Metcalf Playground is a one-story, 2,880 square foot building built in 1952. Spaces include an office, bathrooms, a kitchen, mechanical spaces, and storage closets. The park includes multiple recreational fields and a playground.

We were not made aware of any recent improvements to the building or the park itself, and there were no specific facility concerns.

2.2 Building Occupancy

The facility is occupied year-round. The facility is primarily used for events and gatherings, so the operating hours depend on these scheduled events. The pool is in operation from Memorial Day to Labor Day.

Building Name	Weekday/Weekend	Operating Schedule
Valley Street Park Building	Weekday	Dependent on Events
	Weekend	Dependent on Events
Ball Fields	Weekday	Dependent on Events
	Weekend	Dependent on Events
Outdoor Pool	Weekday	11:00 AM- 5:00 PM
	Weekend	11:00 AM- 5:00 PM

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block with a painted finish. The roof is a pitched roof with asphalt shingles that appear to be in fair condition. There is fiberglass insulation installed above the ceiling throughout the building. Site staff did not report any known issues with the building envelope.

The windows are double paned with bars on the exterior. The weather seals appear to be in fair condition, showing little evidence of infiltration. Exterior doors have aluminum frames and are in and are in good condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Side of Building

Building Front and Roof

Fixed Window (Bars Outside)

Fiberglass Insulation

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps and U-bend T8 lamps. There are also several 60-watt incandescent fixtures, and fluorescent exit signs. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Fixture types include 1-, 2-, or 4-lamp, 4-foot long recessed fixtures and 2-lamp 2-foot recessed with U-bend tube lamps. All exit signs have compact fluorescent lamps (CFL). The fixtures are in good condition.

Interior lighting levels were generally sufficient.

Lighting fixtures in the facility are controlled by wall switches. The exit signs are always on.

Exit Sign (CFL)

Community Room Recessed Fixtures

T8 2'x4' 4-Lamp Fixtures

U Bend T8 2'x2' 2-Lamp Fixture

The only exterior lighting is around the baseball fields. The baseball fields are illuminated with flood lights with manually controlled high intensity discharge (HID) lamps.

Baseball Field Area Lights-
One bulb not working

Baseball Field Area Lights

2.5 Air Handling Systems

Air Handling Units (AHUs)

The building is conditioned by an AHU. This AHU does not have a fresh air component, it just recirculates and conditions the indoor air. This unit is equipped with a supply fan motor, a refrigerant coil for cooling, and a natural gas furnace for heating. It is physically located in the utility room. The supply fan motor is a ½ hp constant speed motor at standard efficiency.

This system includes an outdoor condensing unit that has a cooling capacity of 5 tons. It is estimated to have been installed in 2004 and had an original energy efficiency ratio of 12 EER. It is in fair condition. This is a split air-conditioning (AC) system configuration.

The heating is provided by a Goodman natural gas furnace integrated into the AHU. The furnace has an original output capacity of 92 MBH and an original combustion efficiency of 80%.

At the time of the audit, the programmable thermostat was set at 62°F. It should be noted that reducing temperature setpoints to 68°F during the heating season and increasing this setpoint to 72°F during the cooling season will provide energy savings at no cost.

Goodman Air Handling Unit

Furnace Nameplate

Condensing Unit

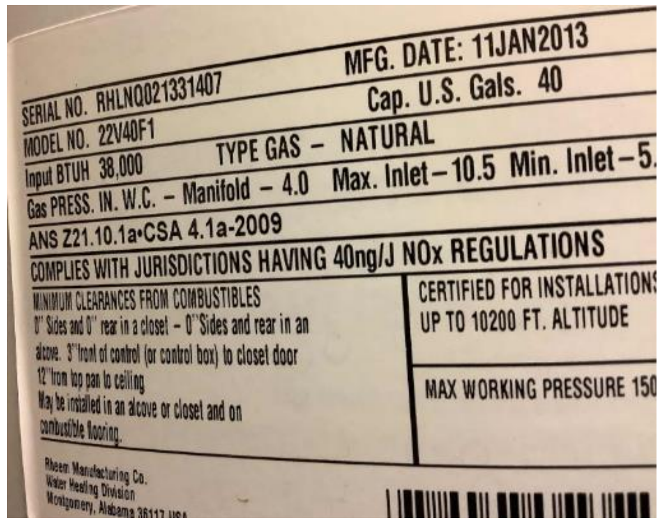
Programmable Thermostat (Community Room)

2.6 Domestic Hot Water

Hot water is produced by a 40 gallon, 38 MBH gas-fired storage water heater with an estimated 60% efficiency. This unit was manufactured in 2013. There was no gauge to determine the temperature set point of the hot water heater.

The domestic hot water pipes visible in the utility room were not insulated. The DHW supply piping is located in the attic and may not be insulated.

DHW Water Heater



DHW Water Heater Nameplate

2.7 Plug Load & Vending Machines

You may wish to consider paying particular attention to minimizing your plug load usage. This report makes suggestions for energy efficient best practices.

There is one computer workstation in the facility. Plug loads throughout the building include televisions and the refrigerator in the kitchen. We considered the restroom hand dryers as part of the plug loads.

Refrigerator

Computer Workstation

Bathroom Hand Dryer

2.8 Water-Using Systems

There are 2 restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm). Toilets are rated at 1.6 gallons per flush (gpf) and urinals are rated at 1 gpf.

Bathroom Sink

Bathroom Faucet

Toilet

Kitchen Faucet

2.9 Pool Equipment

The facility has an in-ground pool that is open to the public generally from Memorial Day to Labor Day from 11:00 AM to 5:00 PM. The pool has a cover but is not heated. There is a 5 HP constant speed circulating pump that operates continuously during the summer. The pump is housed in an unconditioned mechanical room accessed from the pool enclosure. This room also stores the filter and chemicals required for the pool.

Pool with Cover Installed

Pool Pump

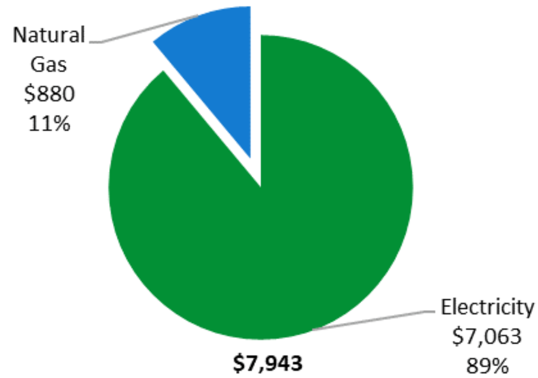
Pool Pump Motor Nameplate

Pool Filters and Piping

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	21,696 kWh	$7,063
Natural Gas	814 Therms	$880
Total		**$7,943**



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.

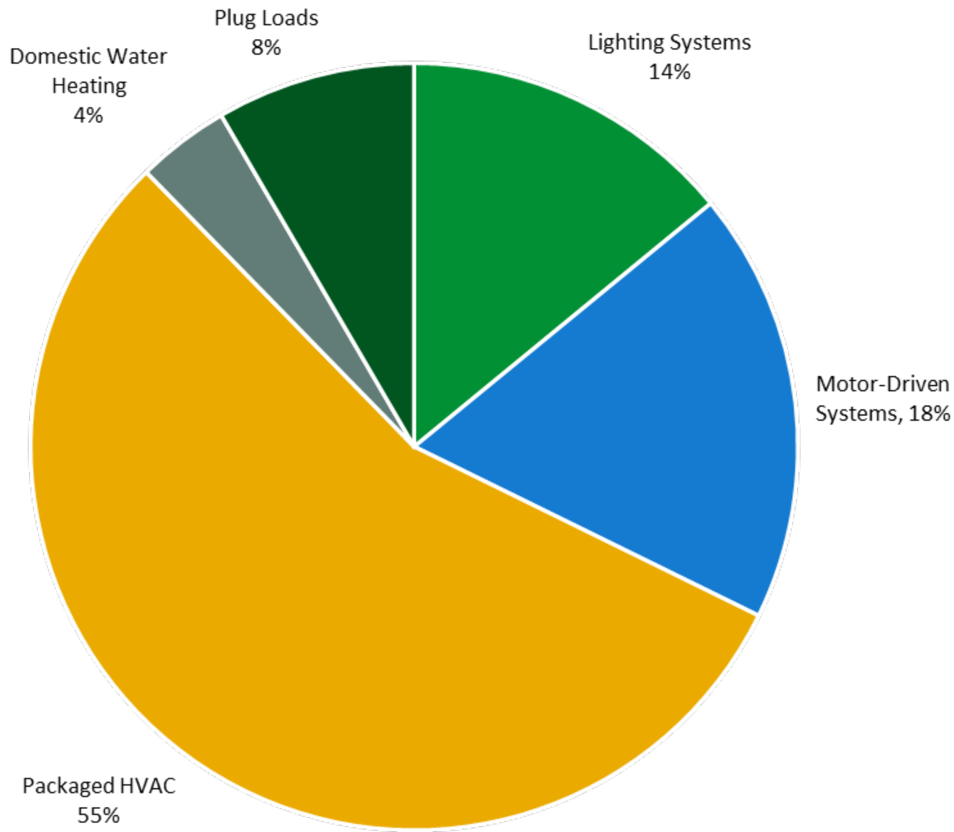
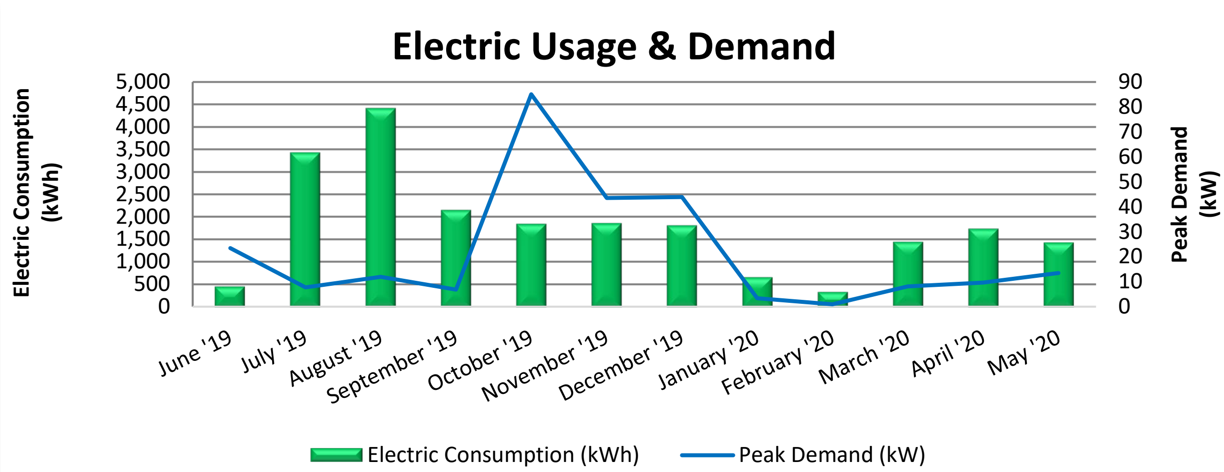


Figure 3 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class GLP.



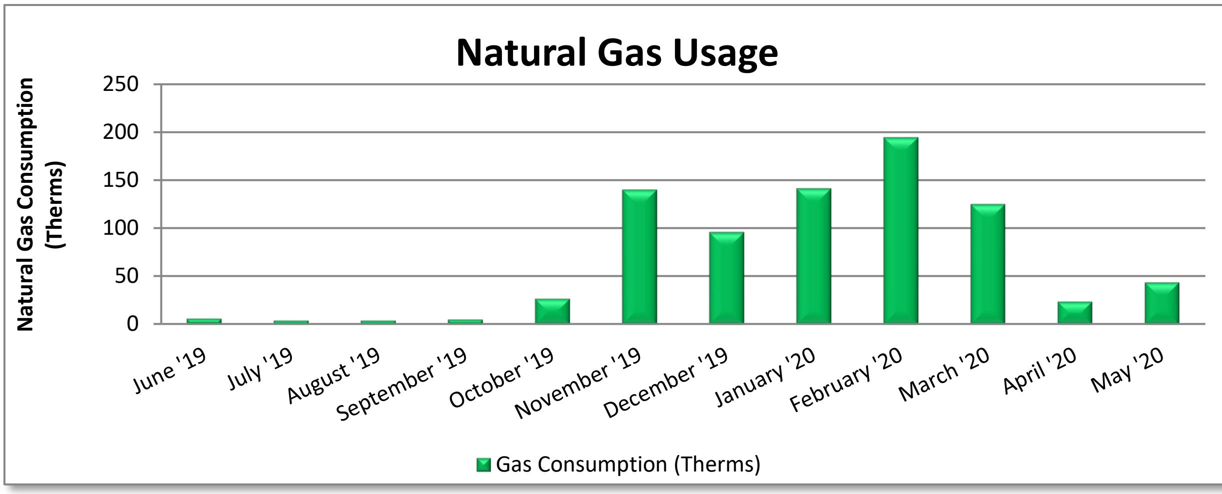
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/20/19	30	470	24	$683	$723
7/22/19	32	3,440	8	$452	$701
8/20/19	29	4,420	12	$501	$793
9/19/19	30	2,158	7	$430	$571
10/18/19	29	1,854	85	$167	$785
11/19/19	32	1,865	44	$171	$802
12/20/19	31	1,820	44	$341	$931
1/23/20	34	673	3	$16	$210
2/20/20	28	350	1	$4	$140
3/20/20	29	1,456	8	$32	$442
4/21/20	32	1,745	10	$38	$481
5/20/20	29	1,445	14	$53	$485
Totals	**365**	**21,696**	**85**	**$2,888**	**$7,063**
Annual	**365**	**21,696**	**85**	**$2,888**	**$7,063**

Notes:

- Peak demand of 85 kW occurred in October '19, but this single high reading seems to be an anomaly for this facility.
- Average demand over the past 12 months was 22 kW.
- The average electric cost over the past 12 months was $0.326/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers natural gas under rate class GSG-HTG.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
6/20/19	29	6	$21
7/23/19	33	4	$19
8/20/19	28	4	$19
9/20/19	31	5	$19
10/21/19	31	27	$39
11/20/19	30	140	$141
12/20/19	30	96	$117
1/23/20	34	141	$120
2/20/20	28	194	$178
3/20/20	29	125	$119
4/21/20	32	24	$35
5/20/20	29	44	$51
Totals	**364**	**812**	**$878**
Annual	**365**	**814**	**$880**

Notes:

- The average gas cost for the past 12 months is $1.081/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

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

Benchmarking Score	N/A

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

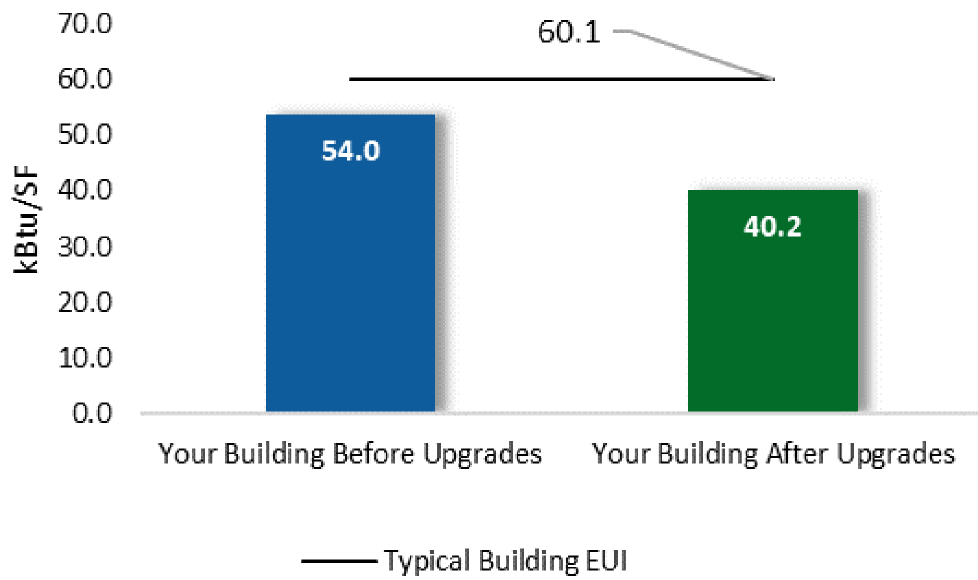


Figure 5 - Energy Use Intensity Comparison[3]

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

For more information on ENERGY STAR® and Portfolio Manager®, visit their website[4].

[4] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

4 ENERGY CONSERVATION MEASURES

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

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

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

Financial incentives are based on previously run state rebate programs. New utility programs are expected to start rolling out in the spring and summer of 2021. Keep up to date with developments by visiting the NJCEP website. Some measures and proposed upgrades may be eligible for higher incentives than those shown below.

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
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ECM 5	Install VFDs on Process Pumps	Yes	3,607	0.5	0	$1,174	$3,987	$1,800	$2,187	1.9	3,632
Unitary HVAC Measures			**984**	**0.8**	**5**	**$371**	**$6,521**	**$1,050**	**$5,471**	**14.7**	**1,540**
ECM 6	Install High Efficiency Air Conditioning Units	No	984	0.8	5	$371	$6,521	$1,050	$5,471	14.7	1,540
HVAC System Improvements			**0**	**0.0**	**1**	**$7**	**$87**	**$60**	**$27**	**4.1**	**71**
ECM 7	Install Pipe Insulation	Yes	0	0.0	1	$7	$87	$60	$27	4.1	71
Domestic Water Heating Upgrade			**0**	**0.0**	**3**	**$36**	**$2,274**	**$618**	**$1,655**	**45.4**	**395**
ECM 8	Install Tankless Water Heater	No	0	0.0	2	$24	$2,252	$600	$1,652	68.6	261
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	1	$12	$22	$18	$3	0.3	134
TOTALS			**9,227**	**3.0**	**8**	**$3,093**	**$30,340**	**$4,176**	**$26,163**	**8.5**	**10,257**

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

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**4,041**	**1.2**	**0**	**$1,312**	**$15,036**	**$438**	**$14,598**	**11.1**	**4,031**
ECM 1	Retrofit Fixtures with LED Lamps	4,003	1.2	0	$1,300	$14,963	$438	$14,525	11.2	3,994
ECM 2	Install LED Exit Signs	38	0.0	0	$12	$72	$0	$72	5.9	37
Lighting Control Measures		**480**	**0.4**	**0**	**$155**	**$2,084**	**$210**	**$1,874**	**12.1**	**472**
ECM 3	Install Occupancy Sensor Lighting Controls	480	0.4	0	$155	$2,084	$210	$1,874	12.1	472
Motor Upgrades		**115**	**0.0**	**0**	**$37**	**$352**	**$0**	**$352**	**9.4**	**116**
ECM 4	Premium Efficiency Motors	115	0.0	0	$37	$352	$0	$352	9.4	116
Variable Frequency Drive (VFD) Measures		**3,607**	**0.5**	**0**	**$1,174**	**$3,987**	**$1,800**	**$2,187**	**1.9**	**3,632**
ECM 5	Install VFDs on Process Pumps	3,607	0.5	0	$1,174	$3,987	$1,800	$2,187	1.9	3,632
Unitary HVAC Measures		**0**	**0.0**	**0**	**$0**	**$0**	**$0**	**$0**	**0.0**	**0**
ECM 6	Install High Efficiency Air Conditioning Units	0	0.0	0	$0	$0	$0	$0	0.0	0
HVAC System Improvements		**0**	**0.0**	**1**	**$7**	**$87**	**$60**	**$27**	**4.1**	**71**
ECM 7	Install Pipe Insulation	0	0.0	1	$7	$87	$60	$27	4.1	71
Domestic Water Heating Upgrade		**0**	**0.0**	**1**	**$12**	**$22**	**$18**	**$3**	**0.3**	**134**
ECM 8	Install Tankless Water Heater	0	0.0	0	$0	$0	$0	$0	0.0	0
ECM 9	Install Low-Flow DHW Devices	0	0.0	1	$12	$22	$18	$3	0.3	134
	TOTALS	**8,243**	**2.1**	**1**	**$2,698**	**$21,567**	**$2,526**	**$19,041**	**7.1**	**8,456**

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

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

Figure 7 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**4,041**	**1.2**	**0**	**$1,312**	**$15,036**	**$438**	**$14,598**	**11.1**	**4,031**
ECM 1	Retrofit Fixtures with LED Lamps	4,003	1.2	0	$1,300	$14,963	$438	$14,525	11.2	3,994
ECM 2	Install LED Exit Signs	38	0.0	0	$12	$72	$0	$72	5.9	37

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

ECM 1: Retrofit Fixtures with LED Lamps

Replace fluorescent, HID, and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies.

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.

For the baseball field area lights, staff should test out a sample of the replacement bulb first to confirm it meets the lighting requirements for the field before replacing all bulbs.

Affected building areas: all interior areas, and the majority of the exterior pole mounted area lights. Note that the projected cost and savings do not include replacing the lamps on the two fixture towers that are completely non-operational.

ECM 2: Install LED Exit Signs

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

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**480**	**0.4**	**0**	**$155**	**$2,084**	**$210**	**$1,874**	**12.1**	**472**
ECM 3	Install Occupancy Sensor Lighting Controls	480	0.4	0	$155	$2,084	$210	$1,874	12.1	472

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 3: 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: all interior spaces apart from the pool mechanical room and breaker room.

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**115**	**0.0**	**0**	**$37**	**$352**	**$0**	**$352**	**9.4**	**116**
ECM 4	Premium Efficiency Motors	115	0.0	0	$37	$352	$0	$352	9.4	116

ECM 4: Premium Efficiency Motors

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

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Utility Room	Entire Building	1	Supply Fan	0.5	Supply Fan in AHU- Provides Heating and Cooling

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

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**3,607**	**0.5**	**0**	**$1,174**	**$3,987**	**$1,800**	**$2,187**	**1.9**	**3,632**
ECM 5	Install VFDs on Process Pumps	3,607	0.5	0	$1,174	$3,987	$1,800	$2,187	1.9	3,632

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

ECM 5: Install VFDs on Process Pumps

Consider installing a VFD to control the pool filtration pump. Regulations require that pool water be circulated through filtering systems so that that pool water is regularly replaced by filtered water, measured by “turnover”. The turnover rate of a swimming pool is the amount of time it takes for the pumping and filtration systems to cycle all of the water in the pool one time, meaning all of the water in the pool has been filtered and cleaned. In cases where the turnover is higher than required by state laws or local ordinance, variable speed drives can often be used to control the speed of the circulation pumps, saving energy. In some jurisdictions the turnover rate can be reduced when the pool is not occupied for a significant period of time.

A pool expert can measure the turnover and evaluate whether the filtration system can accommodate reduced flow. Typically, a simple timeclock and VFD can be used to operate the pool filter pump at low speed when the pool is not in use for an extended period and then return the filter pump to full speed while the pool is in use. Energy savings accrue from the hours the pump can be operated at reduced speed.

4.5 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**984**	**0.8**	**5**	**$371**	**$6,521**	**$1,050**	**$5,471**	**14.7**	**1,540**
ECM 6	Install High Efficiency Air Conditioning Units	984	0.8	5	$371	$6,521	$1,050	$5,471	14.7	1,540

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

ECM 6: Install High Efficiency Air Conditioning Units

We evaluated replacing the standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. Some replacement units will incorporate efficient gas furnaces. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling and heating load and the estimated annual operating hours.

Affected units: the split unit located in the utility room.

4.6 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**$7**	**$87**	**$60**	**$27**	**4.1**	**71**
ECM 7	Install Pipe Insulation	0	0.0	$7	$87	$60	$27	4.1	71

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: domestic hot water piping.

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**3**	**$36**	**$2,274**	**$618**	**$1,655**	**45.4**	**395**
ECM 8	Install Tankless Water Heater	0	0.0	2	$24	$2,252	$600	$1,652	68.6	261
ECM 9	Install Low-Flow DHW Devices	0	0.0	1	$12	$22	$18	$3	0.3	134

ECM 8: Install Tankless Water Heater

We evaluated replacing the existing tank water heater with a high efficiency condensing tankless water heating system. Tankless water heaters (a.k.a. “on-demand water heaters”) only heat water when hot water is needed. Water is heated as it flows through the pipe to the hot water tap. Energy savings from a tankless water heater are based on eliminating heat losses associated with maintaining unnecessary standby hot water capacity.

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

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

Additional cost savings may result from reduced water usage.

4.8 Measures for Future Consideration

There are additional opportunities for improvement that City of Orange Township may wish to consider. These potential upgrades typically require further analysis, involve substantial capital investment and/or include significant system reconfiguration. These measure(s) are therefore beyond the scope of this energy audit. These measure(s) are described here to support a whole building approach to energy efficiency and sustainability.

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

- evaluate these measures further
- develop firm costs
- determine measure savings
- prepare detailed implementation plans.

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

Upgrade to a Heat Pump System

Your existing space conditioning system heating system is approaching or has reached the end of useful life. The current configuration consists of electric DX cooling in conjunction with a gas fired heating section.

Many entities, concerned with GHG production, are looking for ways to move to electrical heating sources since electricity can be produced with little to no carbon emissions. Consider replacing your space conditioning system with an electric air source heat pump. Electric heat pumps have high coefficient of performance (COP) ratings and are substantially more efficient than traditional electric resistance heating systems. Further investigation is required to determine whether installing a heat pump system is a cost-effective solution for replacing your heating system.

5 Energy Efficient Best Practices

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

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

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Weatherization

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

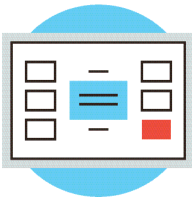
Lighting Maintenance

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.

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

Thermostat Schedules and Temperature Resets



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

HVAC Filter Cleaning and Replacement

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

Ductwork Maintenance

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

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

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

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

Furnace Maintenance

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

Optimize HVAC Equipment Schedules

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

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

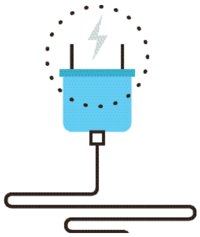
Water Heater Maintenance

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

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

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

Plug Load Controls



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

Water Conservation

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

For more information regarding water conservation go to the EPA's WaterSense® website[7] or download a copy of EPA's "WaterSense® at Work: Best Management Practices for Commercial and Institutional Facilities"[8] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

Procurement Strategies

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

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

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

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

6 ON-SITE GENERATION

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

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

6.1 Solar Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has no potential for installing a PV array. To be cost-effective, a solar PV array needs certain minimum criteria, such as sufficient and sustained electric demand and sufficient flat or south-facing rooftop or other unshaded space on which to place the PV panels.

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

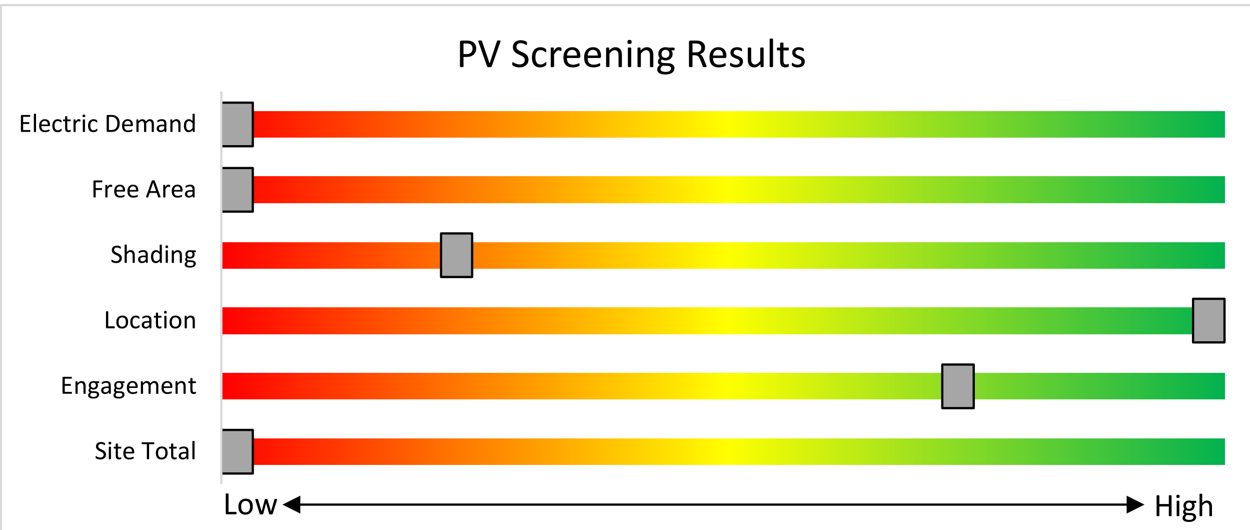

Figure 8 - Photovoltaic Screening

Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program is used to register the intent to install 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 TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installation.

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:

- **Transition Incentive (TI) Program:** https://www.njcleanenergy.com/renewable-energy/programs/transition-incentive-program
- **Basic Info on Solar PV in New Jersey**: www.njcleanenergy.com/whysolar.
- **New Jersey Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs.
- **Approved Solar Installers in the New Jersey 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. 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.

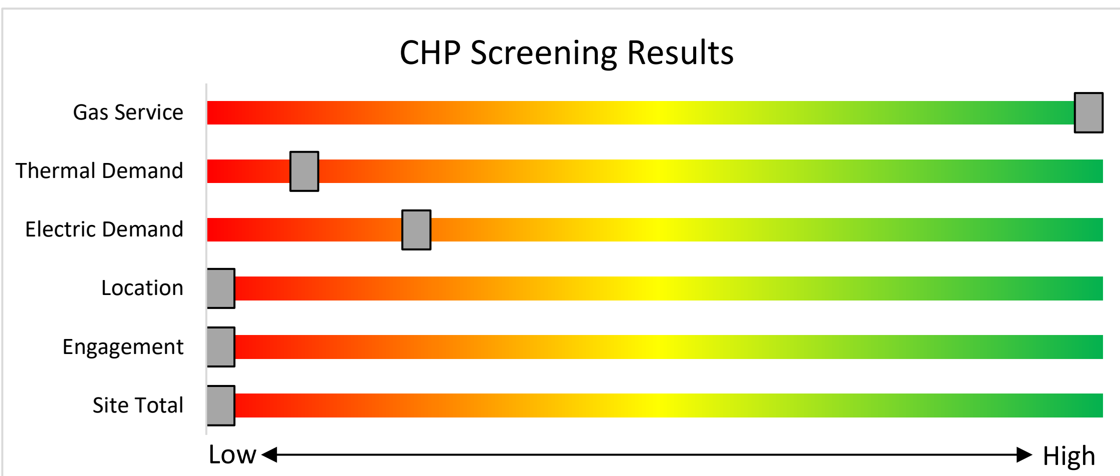

Figure 9 - Combined Heat and Power Screening

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 Project Funding and Incentives

Ready to improve your building's performance? Your utility provider may be able to help.

7.1 Utility Energy Efficiency Programs

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

8 New Jersey's Clean Energy Programs

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

8.1 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

8.2 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 in to contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

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

How to Participate

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

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

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

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

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

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program 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.

8.3 Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program is used to register the intent to install 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 TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installations. NJBPU calculates the value of a Transition Renewable Energy Certificate (TREC) by multiplying the base compensation rate ($152/MWh) by the project's assigned factor (i.e., $152 x 0.85 = $129.20/MWh). The TREC factors are defined based on the chart below:

Project Type	Factor
Subsection (t): landfill, brownfield, areas of historic fill	1.00
Grid supply (Subsection (r)) rooftop	1.00
Net metered non-residential rooftop and carport	1.00
Community solar	0.85
Grid supply (Subsection (r)) ground mount	0.60
Net metered residential ground mount	0.60
Net metered residential rooftop and carport	0.60
Net metered non-residential ground mount	0.60

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number, which enables it to generate New Jersey TRECs.

Eligible projects may generate TRECs for 15 years following the commencement of commercial operations (also referred to as the "Transition Incentive Qualification Life"). After 15 years, projects may be eligible for a New Jersey Class I REC.

TRECs will be used by the identified compliance entities to satisfy a compliance obligation tied to a new Transition Incentive Renewable Portfolio Standard ("Tl-RPS"), which will exist in parallel with, and completely separate from, the existing Solar RPS for Legacy SRECs. The Tl-RPS is a carve-out of the current Class I RPS requirement. The creation of TRECs is based upon metered generation supplied to PJM-EIS General Attribute Tracking System ("GATS") by the owners of eligible facilities or their agents. GATS would create one TREC for each MWh of energy produced from a qualified facility.

TRECs will be purchased monthly by a TREC Administrator who will allocate the TRECs 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.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan. The Transition Incentive Program online portal is now open to new applications effective May 1, 2020. There are instructions on "How and When to Transfer my SRP Registration to the Transition Incentive Program". If you are considering installing solar photovoltaics on your building, visit the following link for more information:

https://www.njcleanenergy.com/renewable-energy/programs/transition-incentive-program

9 Project Development

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

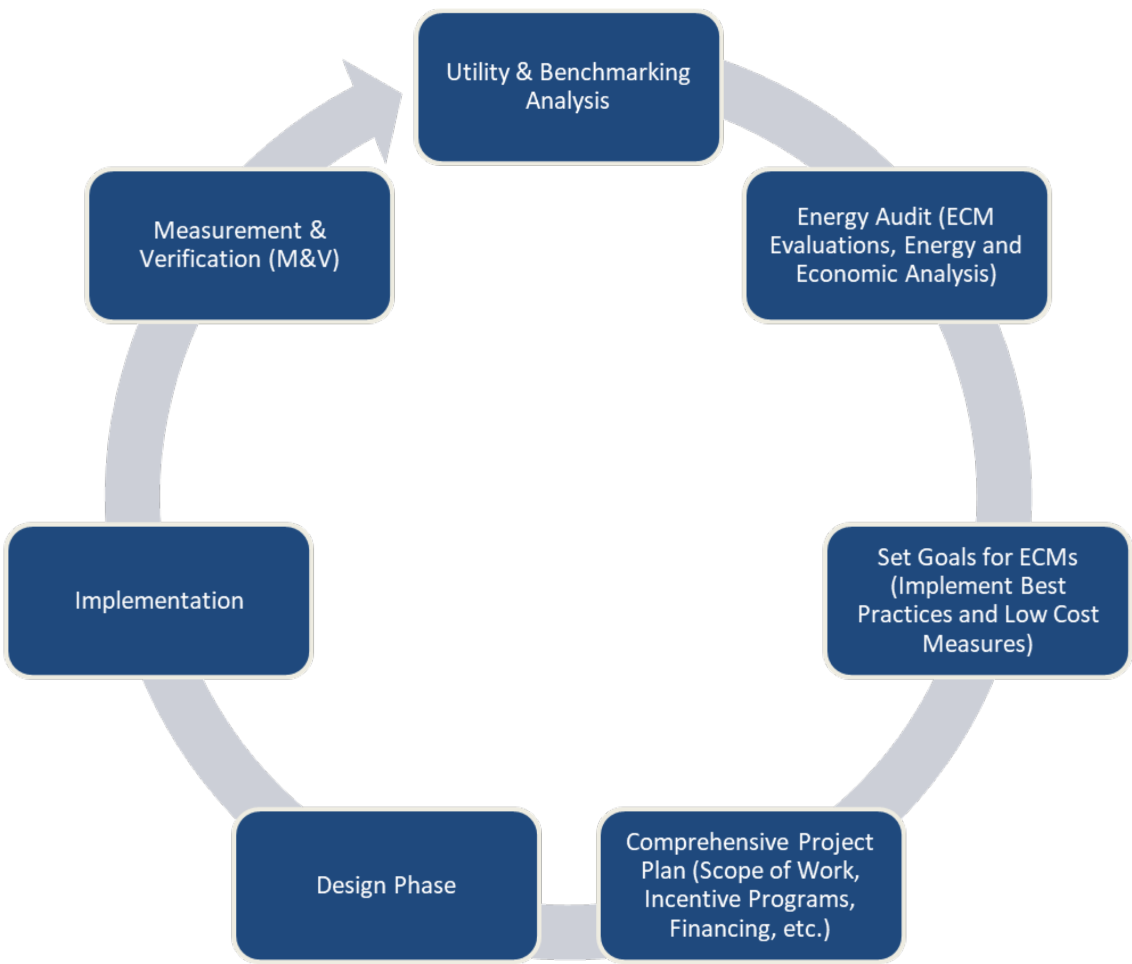

Figure 10 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 Retail Electric Supply Options

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

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

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

10.2 Retail Natural Gas Supply Options

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

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

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Baseball away from building	5	Metal Halide: (3) 1500W Lamp	Wall Switch		4,830	80	1	LED Retrofit	No	5	LED Lamps: Corn Cob Bulb Replecement (1500W Eq)	Wall Switch	1,050	80	0.0	1,512	0	$492	$5,950	$0	12.1
Baseball away from building	1	Metal Halide: (3) 1500W Lamp	Wall Switch		3,220	80	1	LED Retrofit	No	1	LED Lamps: Corn Cob Bulb Replecement (1500W Eq)	Wall Switch	1,050	80	0.0	174	0	$57	$1,190	$0	21.1
Baseball away from building	1	Metal Halide: (5) 1500W Lamp	Wall Switch		8,050	80	1	LED Retrofit	No	1	LED Lamps: Corn Cob Bulb Replecement (1500W Eq)	Wall Switch	1,750	80	0.0	504	0	$164	$1,650	$0	10.1
Baseball away from building	1	Metal Halide: (6) 1500W Lamp	Wall Switch		0	80		None	No	1	Metal Halide: (6) 1500W Lamp	Wall Switch	0	80	0.0	0	0	$0	$0	$0	0.0
Baseball close to building	1	Metal Halide: (3) 1500W Lamp	Wall Switch		3,220	80	1	LED Retrofit	No	1	LED Lamps: Corn Cob Bulb Replecement (1500W Eq)	Wall Switch	1,050	80	0.0	174	0	$57	$1,190	$0	21.1
Baseball close to building	1	Metal Halide: (3) 1500W Lamp	Wall Switch		0	80		None	No	1	Metal Halide: (3) 1500W Lamp	Wall Switch	0	80	0.0	0	0	$0	$0	$0	0.0
Baseball close to building	1	Metal Halide: (4) 1500W Lamp	Wall Switch		3,220	80	1	LED Retrofit	No	1	LED Lamps: Corn Cob Bulb Replecement (1500W Eq)	Wall Switch	1,400	80	0.0	146	0	$47	$1,420	$0	30.0
Baseball close to building	1	Metal Halide: (4) 1500W Lamp	Wall Switch		1,610	80	1	LED Retrofit	No	1	LED Lamps: Corn Cob Bulb Replecement (1500W Eq)	Wall Switch	1,400	80	0.0	17	0	$5	$1,420	$0	259.6
Breaker room	1	Incandescent: 60W A19 Bulb	Wall Switch	S	60	500	1	Relamp	No	1	LED Lamps: 9W LED A19	Wall Switch	9	500	0.0	28	0	$9	$17	$1	1.8
Community room	1	Exit Signs: Fluorescent	None		10	8,760	2	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	38	0	$12	$72	$0	5.9
Community room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	36	114	1,460	1, 3	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,007	0.3	467	0	$151	$562	$115	3.0
Community room	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,460	1, 3	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,007	0.2	350	0	$113	$489	$95	3.5
Community room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	0	1, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	0	0.1	0	0	$0	$73	$20	0.0
Entry	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	35	114	1,460	1, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,007	0.1	117	0	$38	$343	$55	7.6
Entry	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,460	1, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,007	0.0	62	0	$20	$72	$10	3.1
Equipment room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	500	1, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	345	0.1	40	0	$13	$189	$20	13.1
Janitorial closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	500	1, 3	Relamp	Yes	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	345	0.0	12	0	$4	$134	$5	33.7
Kitchen 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,460	1, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,007	0.1	117	0	$38	$189	$20	4.5
Office	5	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,460	1, 3	Relamp	Yes	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,007	0.2	309	0	$100	$632	$85	5.5
Office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	0	1, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	0	0.0	0	0	$0	$72	$10	0.0
Pool room	2	Incandescent: 60W A19 Bulb	Wall Switch	S	60	0	1	Relamp	No	2	LED Lamps: 9W LED A19	Wall Switch	9	0	0.1	0	0	$0	$34	$2	0.0
Restroom - Female	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,000	1, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	690	0.0	45	0	$15	$307	$45	17.8
Restroom - Female	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	0	1, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	0	0.1	0	0	$0	$73	$20	0.0
Restroom - Female	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,000	1, 3	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	690	0.1	169	0	$55	$290	$40	4.6
Restroom - Male	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,000	1, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	690	0.1	91	0	$29	$343	$55	9.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Restroom - Male	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,000	1, 3	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	690	0.1	127	0	$41	$217	$30	4.6
Utility room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	86	500	1, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	345	0.0	25	0	$8	$189	$20	21.3

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
Utility Room	Entire Building	1	Supply Fan	0.5	70.0%	No	Goodman	CAPF061C2A	B	2,745	4	Yes	78.2%	No		0.0	115	0	$37	$352	$0	9.4
Restroom - Female	Bathroom	1	Exhaust Fan	0.1	65.0%	No	Unknown	Unknown	B	1,000		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Restroom - Male	Bathroom	1	Exhaust Fan	0.1	65.0%	No	Unknown	Unknown	B	0		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Pool Room	Pool	1	Water Supply Pump	5.0	85.5%	No	Emerson	BW85	B	2,160	5	No	86.5%	Yes	1	0.5	3,607	0	$1,174	$3,987	$1,800	1.9

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
Utility Room	Entire Building	1	Split-System	5.00	92.00	11.08	0.768593056535309 AFUE	Goodman	Gm5p1155cna	B	6	Yes	1	Split-System	5.00	92.00	16.00	0.82 AFUE	0.8	984	5	$371	$6,521	$1,050	14.7

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Utility Room	DHW Piping	7	15	1.00	0.0	0	1	$7	$87	$60	4.1

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
Utility Room	Bathrooms and Kitchen	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	22V40F1	W	8	Yes	1	Tankless Water Heater	Natural Gas	95.00%	Et	0.0	0	2	$24	$2,252	$600	68.6

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
Restroom - Female	9	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$5	$7	$7	0.0
Restroom - Male	9	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$5	$7	$7	0.0
Kitchen	9	1	Faucet Aerator (Kitchen)	2.20	1.50	0.0	0	0	$2	$7	$4	1.5

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Office	1	Desktop	270	No	Unknown	Unknown
Office	1	Television	130	No	Unknown	Unknown
Community Room	1	Television	130	No	Unknown	Unknown
Bathrooms	2	Hand Dryer	2,200	No	ASI Hand Dryer	0195-00
Kitchen	1	Refrigerator	780	No	GE	GTS18EBMFRWW

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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

LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Valley Street Park & Metcalf Playground

Primary Property Type: Other - Recreation
Gross Floor Area (ft²): 2,880
Built: 1952

For Year Ending: April 30, 2020
Date Generated: May 28, 2021

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Valley Street Park & Metcalf Playground Valley Street City of Orange Township, New Jersey 07050	Orange Township City Municipality 29 North Day Street Orange Township, City of, NJ 07050 862-438-0647	Kathrina Nease 29 North Day Street Orange Township, City of, NJ 07050 862-438-0647 knease@orangenj.gov

Property ID: 15936032

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
53.9 kBtu/ft²

Source EUI
100.5 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	72,256 (47%)
Natural Gas (kBtu)	82,906 (53%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	60.1
National Median Source EUI (kBtu/ft²)	112
% Diff from National Median Source EUI	-10%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	11

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

___ _______
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(___)___-_____
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Professional Engineer or Registered Architect Stamp
(if applicable)

APPENDIX C: GLOSSARY

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

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

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