



Local Government Energy Audit Report

South Ward Senior Center

November 17, 2021

Prepared for:

City of Trenton
870 South Broad Street
Trenton, NJ 08611

Prepared by:

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Disclaimer

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

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

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

Incentive values provided in this report are estimated based 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](#).



The graphic features logos for seven New Jersey utilities: Atlantic City Electric, Jersey Central Power & Light, PSEG, Rockland Electric Company, Elizabethtown Gas, South Jersey Gas, and New Jersey Natural Gas. Below the logos, the text "Program areas to be served by the Utilities:" is followed by a bulleted list. A separate box titled "Proposed New Programs & Features:" lists additional program details.

Program areas to be served by the Utilities:

- Existing Buildings (residential, commercial, industrial, government)
- Efficient Products
 - HVAC
 - Appliance Rebates
 - Appliance Recycling

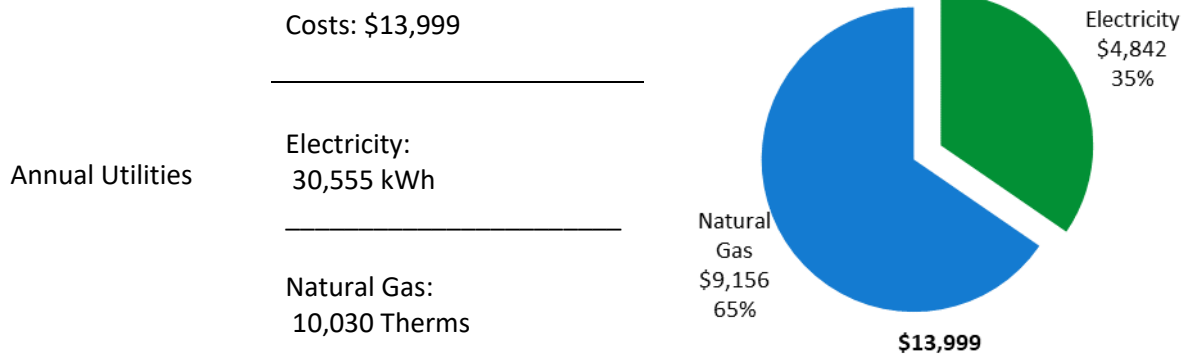
Proposed New Programs & Features:

- Dedicated multi-family program
- More financing options
- Quick home energy check-ups

1 EXECUTIVE SUMMARY

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

BUILDING PERFORMANCE REPORT



ENERGY STAR®
Benchmarking Score

N/A
(1-100 scale)

A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

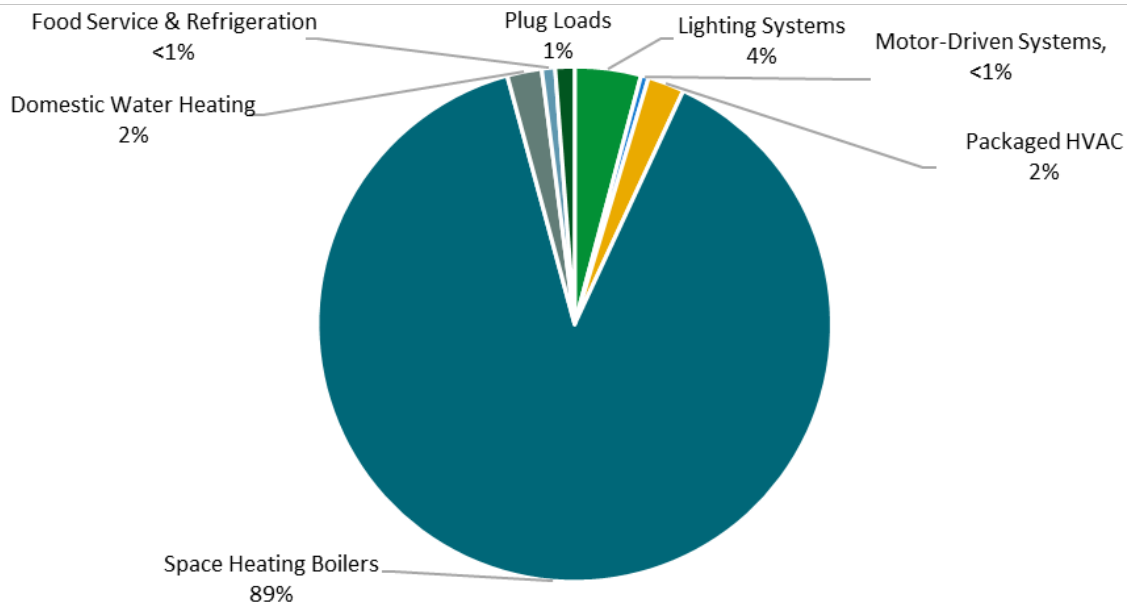


Figure 1 - Energy Use by System

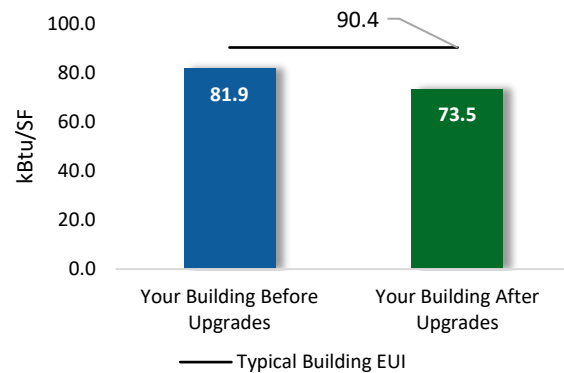
POTENTIAL IMPROVEMENTS



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.

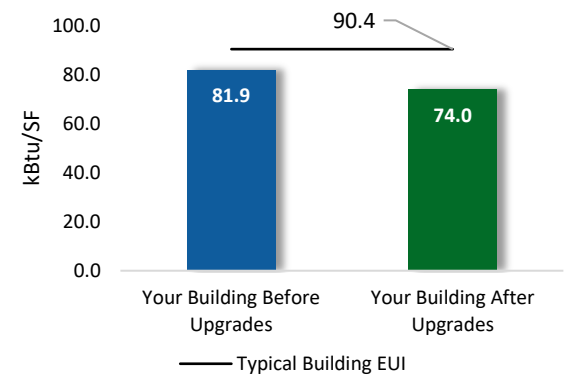
Scenario 1: Full Package (all evaluated measures)

Installation Cost	\$34,665
Potential Rebates & Incentives ¹	\$2,060
Annual Cost Savings	\$2,250
Annual Energy Savings	Electricity: 12,061 kWh Natural Gas: 371 Therms
Greenhouse Gas Emission Savings	8 Tons
Simple Payback	14.5 Years
Site Energy Savings (all utilities)	7%



Scenario 2: Cost Effective Package²

Installation Cost	\$11,430
Potential Rebates & Incentives	\$2,060
Annual Cost Savings	\$1,944
Annual Energy Savings	Electricity: 10,131 kWh Natural Gas: 371 Therms
Greenhouse Gas Emission Savings	7 Tons
Simple Payback	4.8 Years
Site Energy Savings (all utilities)	6%



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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades			7,638	4.5	-2	\$1,196	\$6,239	\$1,191	\$5,048	4.2	7,501
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	3,003	2.6	-1	\$470	\$3,932	\$600	\$3,332	7.1	2,949
ECM 2	Retrofit Fixtures with LED Lamps	Yes	4,635	1.9	-1	\$726	\$2,307	\$591	\$1,716	2.4	4,552
Lighting Control Measures			1,477	0.8	0	\$231	\$2,456	\$335	\$2,121	9.2	1,451
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	1,319	0.7	0	\$206	\$2,006	\$195	\$1,811	8.8	1,295
ECM 4	Install High/Low Lighting Controls	Yes	158	0.1	0	\$25	\$450	\$140	\$310	12.5	155
Unitary HVAC Measures			1,930	1.4	0	\$306	\$23,235	\$0	\$23,235	76.0	1,944
ECM 5	Install High Efficiency Air Conditioning Units	No	1,930	1.4	0	\$306	\$23,235	\$0	\$23,235	76.0	1,944
HVAC System Improvements			0	0.0	37	\$341	\$339	\$108	\$231	0.7	4,370
ECM 6	Install Pipe Insulation	Yes	0	0.0	37	\$341	\$339	\$108	\$231	0.7	4,370
Domestic Water Heating Upgrade			0	0.0	2	\$16	\$29	\$26	\$3	0.2	199
ECM 7	Install Low-Flow DHW Devices	Yes	0	0.0	2	\$16	\$29	\$26	\$3	0.2	199
Food Service & Refrigeration Measures			1,016	0.1	0	\$161	\$2,368	\$400	\$1,968	12.2	1,023
ECM 8	Replace Refrigeration Equipment	Yes	1,016	0.1	0	\$161	\$2,368	\$400	\$1,968	12.2	1,023
TOTALS (COST EFFECTIVE MEASURES)			10,131	5.4	37	\$1,944	\$11,430	\$2,060	\$9,371	4.8	14,544
TOTALS (ALL MEASURES)			12,061	6.8	37	\$2,250	\$34,665	\$2,060	\$32,606	14.5	16,487

* - 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 (NJBPB) has sponsored this Local Government Energy Audit (LGEA) Report for South Ward Senior Center. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

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

2.1 Site Overview

On March 23, 2021, TRC performed an energy audit at South Ward Senior Center located in Trenton, New Jersey. TRC met with Akil Muse to review the facility operations and help focus our investigation on specific energy-using systems.

The South Ward Senior Center is a four-story, 14,000 square foot building built in 1909. Originally designed to be a police station it was repurposed as a senior center for the local community. Spaces include offices, corridors, stairwells, senior center dining room kitchen, and basement mechanical space.

2.2 Building Occupancy

The facility is occupied year-round. Typical weekday occupancy is four staff and 20 visitors.

It should be noted that the energy and economic analysis for this building is based on the use of the building during the utility billing period, and that results will vary based on changes to building use patterns.

Building Name	Weekday/Weekend	Operating Schedule
South Ward Senior Center	Weekday	8:00 AM - 4:30 PM
	Weekend	closed

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

The lower roof is flat and covered with painted asphalt, and it is in good condition. The upper roof is pitched and appears to be asphalt shingles. The walls are made of a brick decorative exterior wall and plaster, gypsum drywall, painted CMU interior finish.

Most of the windows are single glazed and wood frames. The glass-to-frame seals are in poor condition. The operable window weather seals are in poor condition. Exterior doors have wood frames and are in poor condition with worn door seals. Degraded window and door seals increase drafts and outside air infiltration.



Building Walls



Lower Roof



Main Entrance Doors



Aluminum window



Signs of Interior Wall Damage



Wooden Window/Frames



Wooden Window/Frames



Metal door

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several 40-Watt and 75-Watt T12 fixtures. Additionally, there are some incandescent and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts. Fixture types include 2-lamp or 4-lamp, 4-foot or 8-foot-long troffer, recessed, surface mounted fixtures. Most fixtures are in fair condition. All exit signs are LED units. Interior lighting levels were generally sufficient except for in storage 4, which was underlit. There may be an opportunity to retrofit fixtures. All lighting fixtures are controlled manually. This facility does not have any exterior lighting.



*4-Foot Long Linear T8
Fixture*



*4-Foot Long Linear T12
Fixtures*



*8-Foot Long Linear T-12
Fixture*



LED Exit Sign

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

Various office areas throughout the senior center are conditioned by unitary electric HVAC equipment.

Cooling for the dining room and several office areas is provided by window and through-the wall air conditioning (AC) units, each with a capacity of 0.5 tons. The units are in poor condition and are not ENERGY STAR® labeled.



Window A/C Units



Window A/C Units

Split air conditioning (AC) systems provide cooling for offices and the craft room. These units are all beyond their useful life, in poor condition and are standard efficiency. Their cooling capacities range between 1.5 tons and 2 tons with energy efficiency ratings (EER) of approximately 11.5 EER. These systems are controlled by remote controls located within the spaces served.



A/C split systems



A/C split systems

Unitary Heating Equipment

The dining room is heated by electric resistance heaters. The units are in good condition. Equipment is controlled by a manual dial thermostat.



Electric resistance heater

2.6 Heating Hot Water Systems

One Burham 808 MBh steam boiler serves the building heating load. The burners are non-modulating with a nominal efficiency of 82.4% and appears to be in good condition. There is no service contract in place.

The boiler provides steam to cast iron radiators throughout the building. A one-pipe steam distribution system serves the building heating terminals. A 1/3 hp feed pump in the mechanical room serves the boiler. Approximately eight feet of 5-inch pipe and 19 feet of 2-inch pipe lack insulation; insulation should be repaired or replaced.



Boiler



Radiator

2.7 Domestic Hot Water

Hot water is produced by a 74 gallon, 75.1 MBh gas-fired storage water heater with a rated efficiency of 80%.



Boiler



Radiator

2.8 Refrigeration

The kitchen has one stand-up commercial refrigerator with a solid door, an electric stove top, and a residential-style refrigerator.

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



Commercial Refrigerator



Residential Refrigerator

2.9 Plug Load & Vending Machines

The location is doing a great job managing their electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are several residential-style refrigerators throughout the building that are used to store food. These vary in condition and efficiency.

2.10 Water-Using Systems

There are five restrooms with toilets and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher.

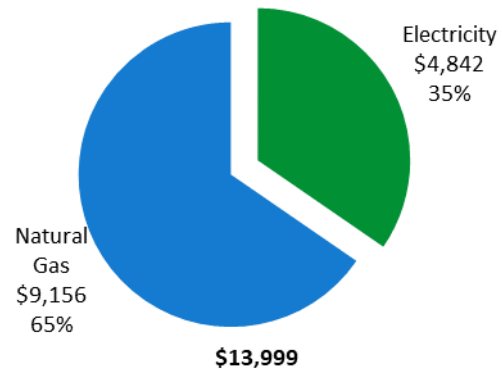


Restroom sinks

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	30,555 kWh	\$4,842
Natural Gas	10,030 Therms	\$9,156
Total		\$13,999



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

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

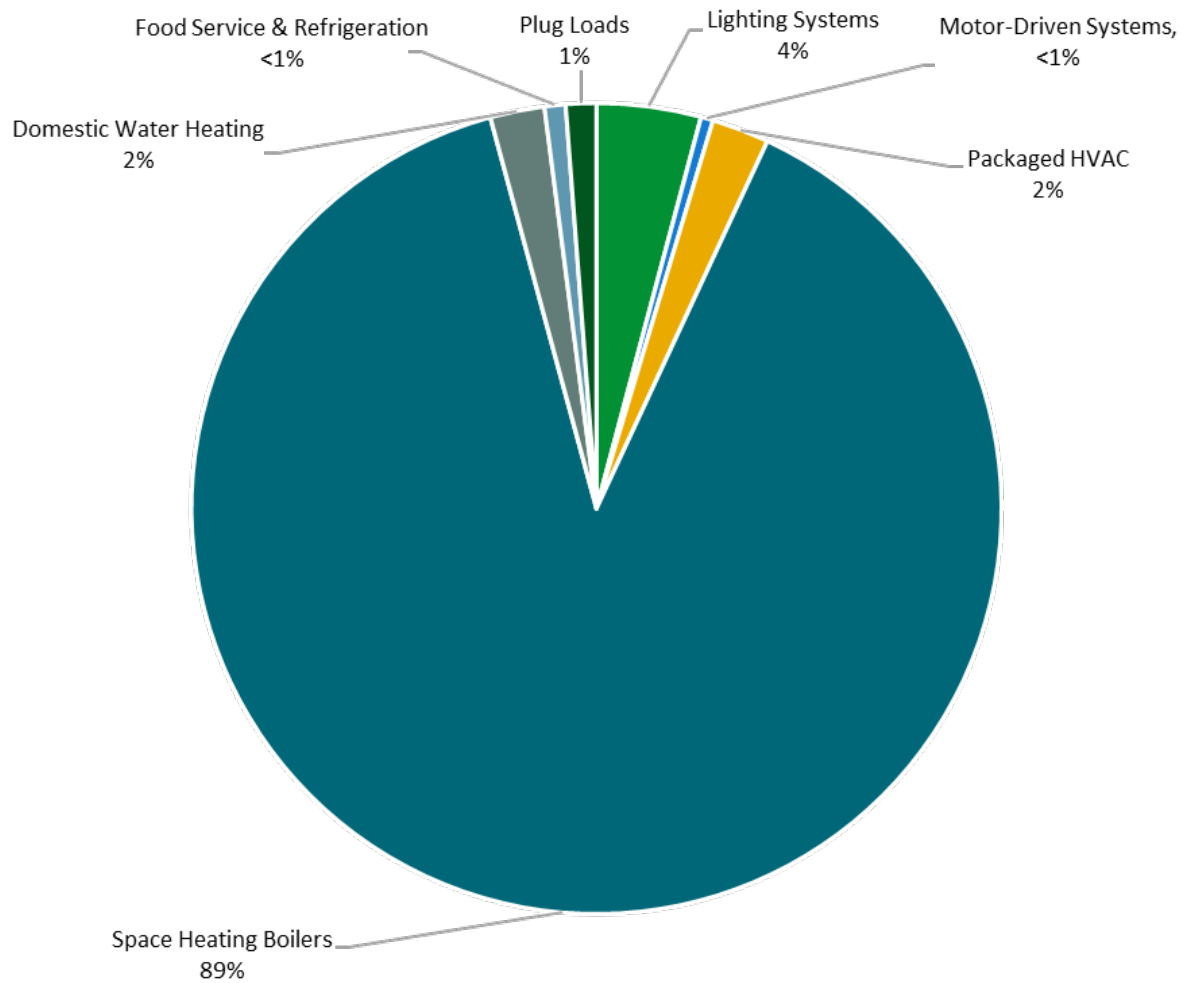
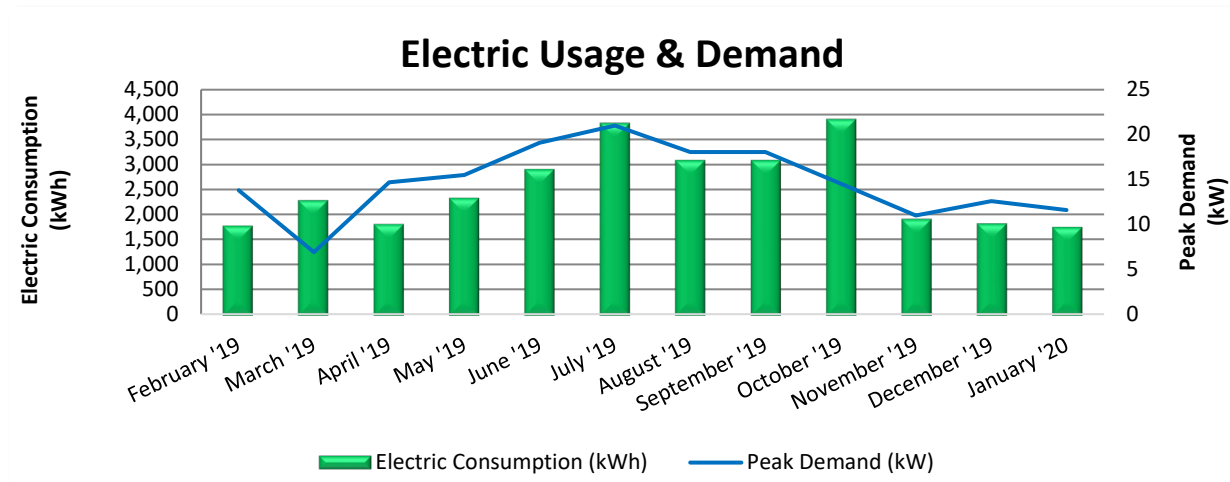


Figure 4 - Energy Balance

3.1 Electricity

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



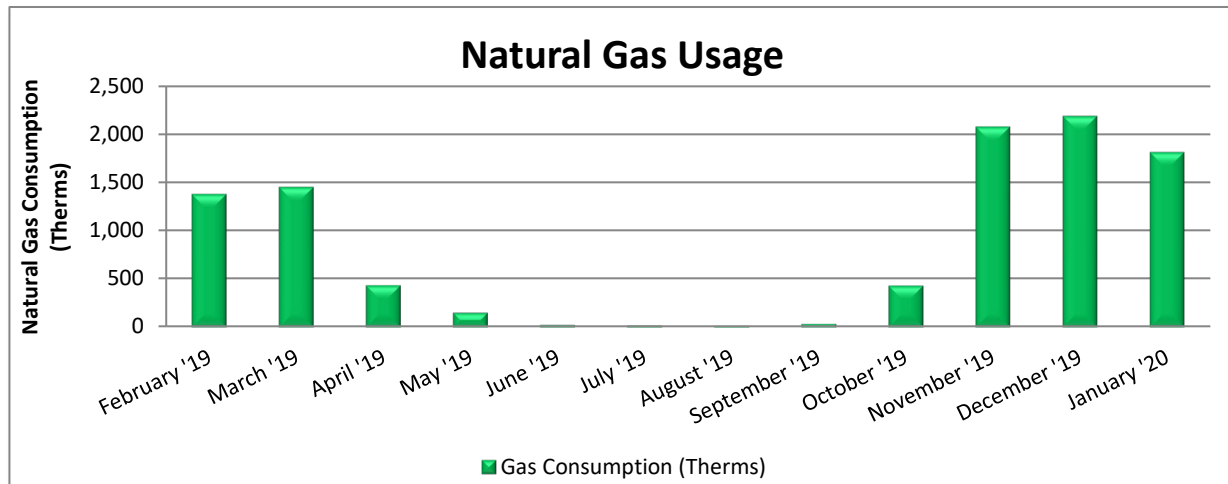
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
3/10/19	28	1,785	14	\$54	\$268
4/10/19	31	2,295	7	\$27	\$275
5/10/19	30	1,815	15	\$58	\$258
6/11/19	32	2,340	16	\$214	\$461
7/11/19	30	2,910	19	\$263	\$569
8/9/19	29	3,825	21	\$289	\$691
9/9/19	31	3,090	18	\$163	\$497
10/9/19	30	3,090	18	\$163	\$497
11/7/19	29	3,900	15	\$103	\$546
12/10/19	33	1,920	11	\$43	\$258
1/10/20	31	1,830	13	\$50	\$268
2/10/20	31	1,755	12	\$46	\$256
Totals	365	30,555	14	\$1,474	\$4,842
Annual	365	30,555	14	\$1,474	\$4,842

Notes:

- Peak demand of 14 kW occurred in July 2019.
- Average demand over the past 12 months was 15 kW.
- The average electric cost over the past 12 months was \$0.158/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers natural gas under rate class Large Volume Gas (LVG).



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
3/10/19	28	1,381	\$930
4/10/19	31	1,453	\$967
5/10/19	30	436	\$386
6/11/19	32	152	\$224
7/11/19	30	26	\$152
8/9/19	29	19	\$148
9/9/19	31	18	\$100
10/9/19	30	36	\$206
11/7/19	29	434	\$669
12/10/19	33	2,076	\$1,865
1/10/20	31	2,185	\$1,906
2/10/20	31	1,812	\$1,603
Totals	365	10,030	\$9,156
Annual	365	10,030	\$9,156

Notes:

- The average gas cost for the past 12 months is \$0.913/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.

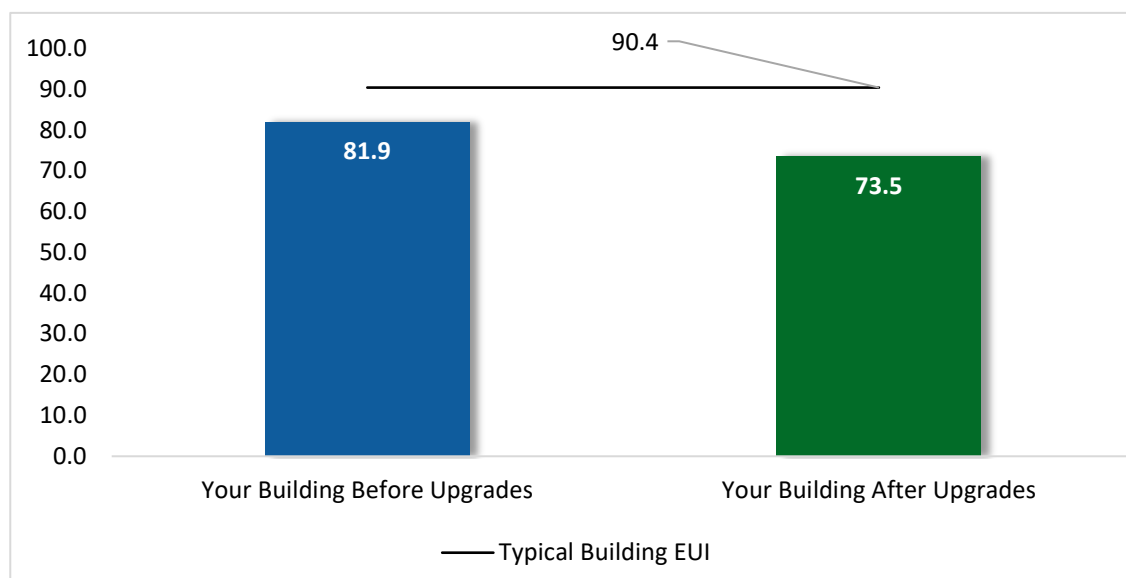


Figure 5 - Energy Use Intensity Comparison³

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 website⁴.

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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades			7,638	4.5	-2	\$1,196	\$6,239	\$1,191	\$5,048	4.2	7,501
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	3,003	2.6	-1	\$470	\$3,932	\$600	\$3,332	7.1	2,949
ECM 2	Retrofit Fixtures with LED Lamps	Yes	4,635	1.9	-1	\$726	\$2,307	\$591	\$1,716	2.4	4,552
Lighting Control Measures			1,477	0.8	0	\$231	\$2,456	\$335	\$2,121	9.2	1,451
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	1,319	0.7	0	\$206	\$2,006	\$195	\$1,811	8.8	1,295
ECM 4	Install High/Low Lighting Controls	Yes	158	0.1	0	\$25	\$450	\$140	\$310	12.5	155
Unitary HVAC Measures			1,930	1.4	0	\$306	\$23,235	\$0	\$23,235	76.0	1,944
ECM 5	Install High Efficiency Air Conditioning Units	No	1,930	1.4	0	\$306	\$23,235	\$0	\$23,235	76.0	1,944
HVAC System Improvements			0	0.0	37	\$341	\$339	\$108	\$231	0.7	4,370
ECM 6	Install Pipe Insulation	Yes	0	0.0	37	\$341	\$339	\$108	\$231	0.7	4,370
Domestic Water Heating Upgrade			0	0.0	2	\$16	\$29	\$26	\$3	0.2	199
ECM 7	Install Low-Flow DHW Devices	Yes	0	0.0	2	\$16	\$29	\$26	\$3	0.2	199
Food Service & Refrigeration Measures			1,016	0.1	0	\$161	\$2,368	\$400	\$1,968	12.2	1,023
ECM 8	Replace Refrigeration Equipment	Yes	1,016	0.1	0	\$161	\$2,368	\$400	\$1,968	12.2	1,023
TOTALS			12,061	6.8	37	\$2,250	\$34,665	\$2,060	\$32,606	14.5	16,487

* - 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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		7,638	4.5	-2	\$1,196	\$6,239	\$1,191	\$5,048	4.2	7,501
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	3,003	2.6	-1	\$470	\$3,932	\$600	\$3,332	7.1	2,949
ECM 2	Retrofit Fixtures with LED Lamps	4,635	1.9	-1	\$726	\$2,307	\$591	\$1,716	2.4	4,552
Lighting Control Measures		1,477	0.8	0	\$231	\$2,456	\$335	\$2,121	9.2	1,451
ECM 3	Install Occupancy Sensor Lighting Controls	1,319	0.7	0	\$206	\$2,006	\$195	\$1,811	8.8	1,295
ECM 4	Install High/Low Lighting Controls	158	0.1	0	\$25	\$450	\$140	\$310	12.5	155
HVAC System Improvements		0	0.0	37	\$341	\$339	\$108	\$231	0.7	4,370
ECM 6	Install Pipe Insulation	0	0.0	37	\$341	\$339	\$108	\$231	0.7	4,370
Domestic Water Heating Upgrade		0	0.0	2	\$16	\$29	\$26	\$3	0.2	199
ECM 7	Install Low-Flow DHW Devices	0	0.0	2	\$16	\$29	\$26	\$3	0.2	199
Food Service & Refrigeration Measures		1,016	0.1	0	\$161	\$2,368	\$400	\$1,968	12.2	1,023
ECM 8	Replace Refrigeration Equipment	1,016	0.1	0	\$161	\$2,368	\$400	\$1,968	12.2	1,023
TOTALS		10,131	5.4	37	\$1,944	\$11,430	\$2,060	\$9,371	4.8	14,544

* - 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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		7,638	4.5	-2	\$1,196	\$6,239	\$1,191	\$5,048	4.2	7,501
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	3,003	2.6	-1	\$470	\$3,932	\$600	\$3,332	7.1	2,949
ECM 2	Retrofit Fixtures with LED Lamps	4,635	1.9	-1	\$726	\$2,307	\$591	\$1,716	2.4	4,552

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 Fluorescent Fixtures with LED Lamps and Drivers

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

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

Affected building areas: all areas with fluorescent fixtures with T12 tubes.

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent, HID, or 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.

Affected building areas: all areas with fluorescent fixtures with T8 tubes.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$) *	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs) **	CO ₂ e Emissions Reduction (lbs)
Lighting Control Measures		1,477	0.8	0	\$231	\$2,456	\$335	\$2,121	9.2	1,451
ECM 3	Install Occupancy Sensor Lighting Controls	1,319	0.7	0	\$206	\$2,006	\$195	\$1,811	8.8	1,295
ECM 4	Install High/Low Lighting Controls	158	0.1	0	\$25	\$450	\$140	\$310	12.5	155

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: offices, restrooms, and storage rooms.

ECM 4: Install High/Low Lighting Controls

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

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

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

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

Affected building areas: hallways.

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

4.3 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Unitary HVAC Measures		1,930	1.4	0	\$306	\$23,235	\$0	\$23,235	76.0	1,944
ECM 5	Install High Efficiency Air Conditioning Units	1,930	1.4	0	\$306	\$23,235	\$0	\$23,235	76.0	1,944

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 at this facility 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 system/window AC units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 5: Install High Efficiency Air Conditioning Units

Replace standard efficiency air conditioning units with high efficiency packaged air conditioning units. 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.

4.4 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
HVAC System Improvements		0	0.0	37	\$341	\$339	\$108	\$231	0.7	4,370
ECM 6	Install Pipe Insulation	0	0.0	37	\$341	\$339	\$108	\$231	0.7	4,370

ECM 6: Install Pipe Insulation

Install insulation on steam 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: steam system piping.

4.5 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
	Domestic Water Heating Upgrade	0	0.0	2	\$16	\$29	\$26	\$3	0.2	199
ECM 7	Install Low-Flow DHW Devices	0	0.0	2	\$16	\$29	\$26	\$3	0.2	199

ECM 7: Install Low-Flow DHW Devices

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

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

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

Additional cost savings may result from reduced water usage.

4.6 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
	Food Service & Refrigeration Measures	1,016	0.1	0	\$161	\$2,368	\$400	\$1,968	12.2	1,023
ECM 8	Replace Refrigeration Equipment	1,016	0.1	0	\$161	\$2,368	\$400	\$1,968	12.2	1,023

ECM 8: Replace Refrigeration Equipment

Replace existing commercial refrigerators with new ENERGY STAR® rated equipment. The energy savings associated with this measure come from reduced energy usage, due to more efficient technology, and reduced run times.

4.7 Measures for Future Consideration

There are additional opportunities for improvement that City of Trenton 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 Trenton 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.

Window Replacements

Energy efficient windows are an important consideration when improving the building envelope. The heat transfer through the glass panes are responsible for a significant portion of the facility's heating and cooling energy consumption. We recommend replacing single pane windows with double pane windows and considering models that are gas-filled with low-e coatings to reduce heat loss. Windows should be selected with low- U-factors to maximize energy savings. The U-factor is the rate at which the window conducts non-solar heat flow and is a key indicator of performance. The lower the U-factor, the higher the efficiency of the window. Window frames and sashes should be efficient as well. If metal frames are specified or required by code, the frame extrusions should have a thermal break to reduce conduction through the frame. As part of the installation, the window frames should be properly sealed with caulk materials to ensure the mitigation of air infiltration. Building envelopes that limit air infiltration and that have adequate fenestrations play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Window system replacement is an expensive upgrade that generally involves architectural elements. We recommend this as a measure for further study.

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 emissions⁵. 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.

Doors and Windows

Close exterior doors and windows in heated and cooled areas. Leaving doors and windows open leads to a loss of heat during the winter and chilled air during the summer. Reducing air changes per hour (ACH) can lead to increased occupant comfort as well as heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

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

Window Treatments/Coverings

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

Lighting Maintenance

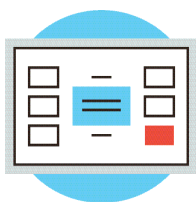


- Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.
-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

Lighting Controls

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

Thermostat Schedules and Temperature Resets



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

AC System Evaporator/Condenser Coil Cleaning

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

HVAC Filter Cleaning and Replacement

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

Boiler Maintenance

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

Water Heater Maintenance

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

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

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

Water Conservation



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

For more information regarding water conservation go to the EPA's WaterSense® website⁶ or download a copy of EPA's "WaterSense® at Work: Best Management Practices for Commercial and Institutional Facilities"⁷ to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

Procurement Strategies

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

⁶ <https://www.epa.gov/watersense>.

⁷ <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.

This facility does not appear to meet the minimum criteria for a cost-effective solar PV installation. 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.

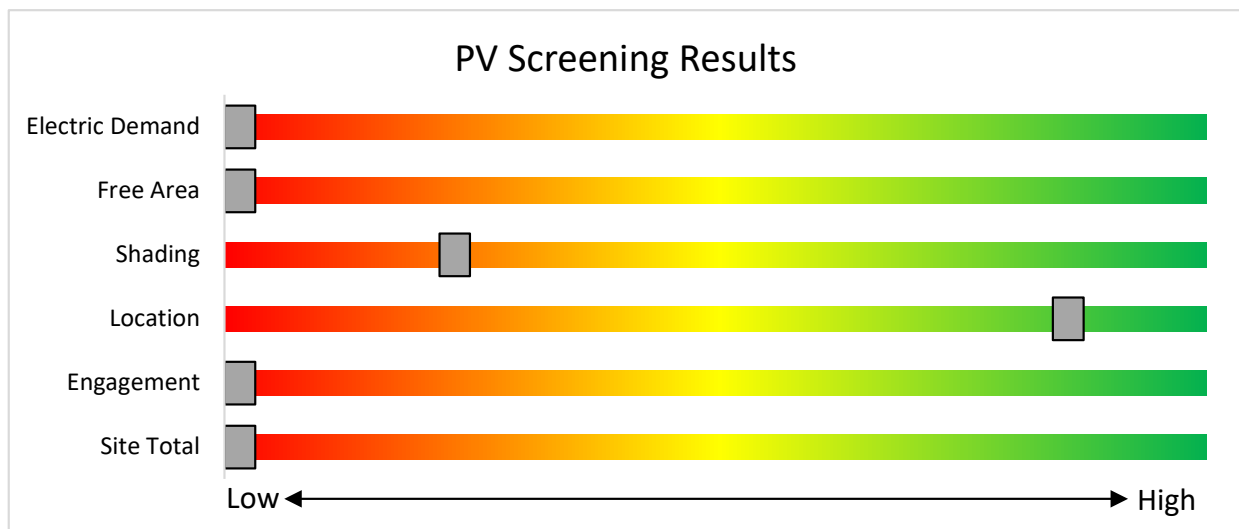


Figure 8 - Photovoltaic Screening

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

6.2 Combined Heat and Power

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

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

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

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

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

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

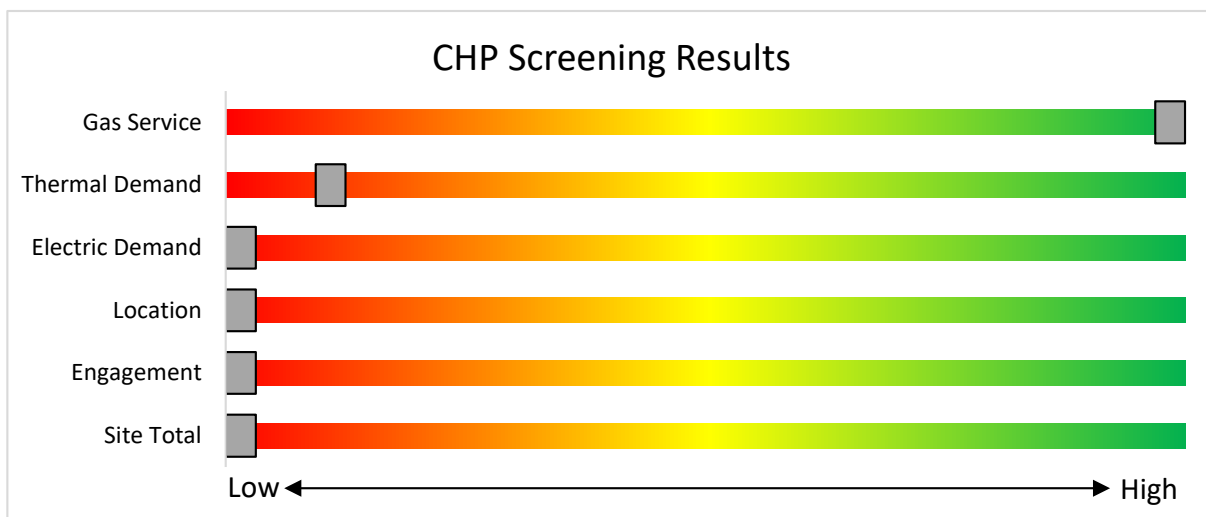


Figure 3 - Combined Heat and Power Screening

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



The infographic is titled "Program areas to be served by the Utilities:". At the top, it displays logos for six utilities: Atlantic City Electric, Jersey Central Power & Light, PSEG, Rockland Electric Company, ELIZABETHTOWN GAS, and SOUTH JERSEY GAS. Below the logos, the title "Program areas to be served by the Utilities:" is followed by a bulleted list of program areas. To the right of this list is a box titled "Proposed New Programs & Features:" containing three items.

Program areas to be served by the Utilities:

- Existing Buildings (residential, commercial, industrial, government)
- Efficient Products
 - HVAC
 - Appliance Rebates
 - Appliance Recycling

Proposed New Programs & Features:

- Dedicated multi-family program
- More financing options
- Quick home energy check-ups

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 into 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 description 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. $\$152 \times 0.85 = \$129.20/\text{MWh}$). 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 NJ 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 ("TI-RPS"), which will exist in parallel with, and completely separate from, the existing Solar RPS for Legacy SRECs. The TI-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.

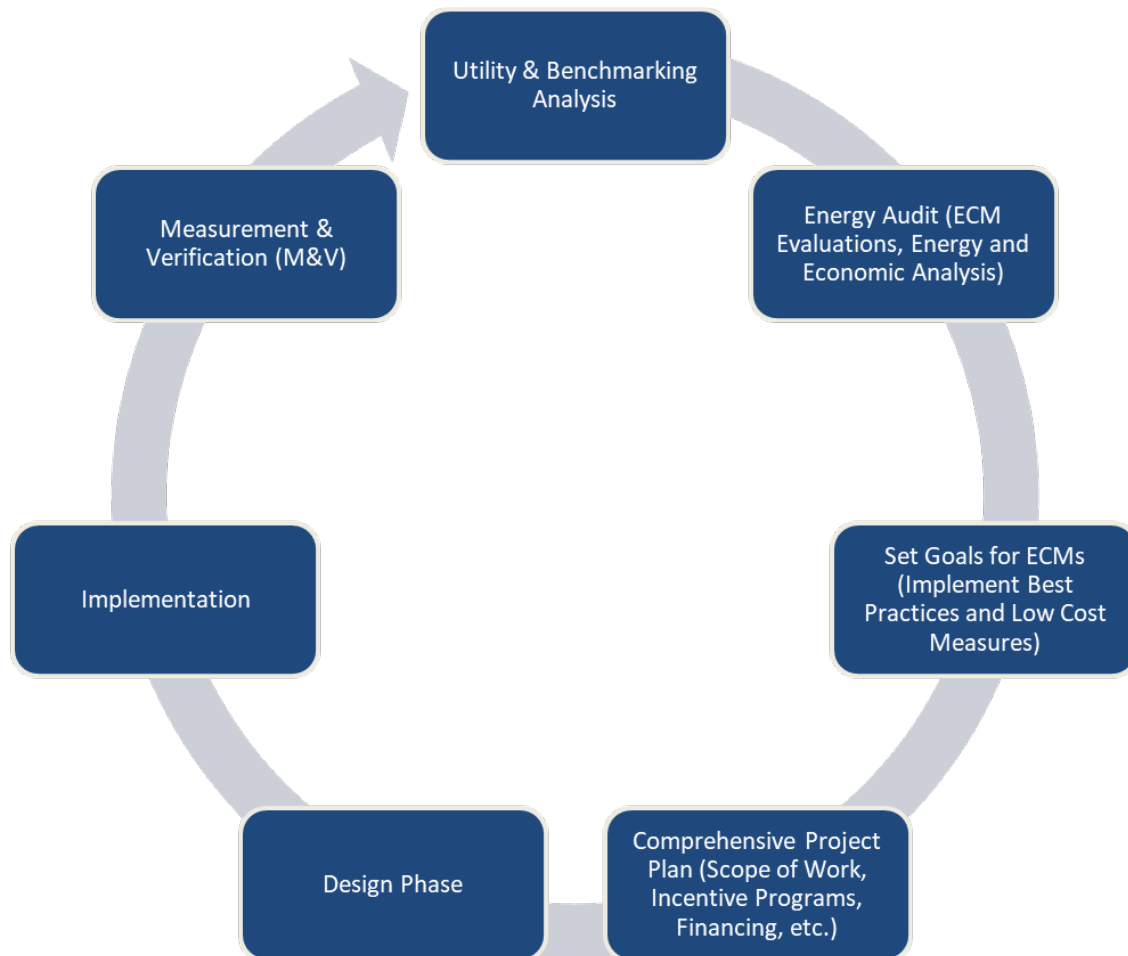


Figure 4 – Project Development Cycle

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 website⁸.

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 website⁹.

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

⁹ 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
Boiler room	2	LED Lamps: 10W-A lamp	Wall Switch	S	10	500		None	No	2	LED Lamps: 10W-A lamp	Wall Switch	10	500	0.0	0	0	\$0	\$0	\$0	0.0
Hallway	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	500	1	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	500	0.1	46	0	\$7	\$129	\$20	15.0
Stairs 1	2	LED Lamps: 10W-A lamp	Wall Switch		10	500		None	No	2	LED Lamps: 10W-A lamp	Wall Switch	10	500	0.0	0	0	\$0	\$0	\$0	0.0
Storage 1	2	Incandescent: 60W-A lamp	Wall Switch	S	60	500	2	Relamp	No	2	LED Lamps: 10W-A lamp	Wall Switch	9	500	0.1	55	0	\$9	\$34	\$2	3.8
Storage 2	1	Incandescent: 60W-A lamp	Wall Switch	S	60	500	2	Relamp	No	1	LED Lamps: 10W-A lamp	Wall Switch	9	500	0.0	28	0	\$4	\$17	\$1	3.8
Storage 3	1	Incandescent: 60W-A lamp	Wall Switch	S	60	500	2	Relamp	No	1	LED Lamps: 10W-A lamp	Wall Switch	9	500	0.0	28	0	\$4	\$17	\$1	3.8
Craft room	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,210	2, 3	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,525	0.6	1,589	0	\$249	\$927	\$215	2.9
Craft room restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,210	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,525	0.1	200	0	\$31	\$343	\$55	9.2
Dining Area 1	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Dining Area 1	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,210	2, 3	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,525	0.4	1,059	0	\$166	\$708	\$155	3.3
Front entrance	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Front entrance	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,210	2, 3	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,525	0.5	1,236	0	\$193	\$781	\$175	3.1
Hallway	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,210	2, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	1,525	0.1	353	0	\$55	\$371	\$110	4.7
Kitchen 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,210	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,525	0.1	353	0	\$55	\$262	\$60	3.7
Lobby 1	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Lobby 1	1	Incandescent: 60W-A lamp	Wall Switch	S	60	2,210	2	Relamp	No	1	LED Lamps: 10W-A lamp	Wall Switch	9	2,210	0.0	122	0	\$19	\$17	\$1	0.9
Office - 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,210	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,210	0.0	134	0	\$21	\$73	\$20	2.5
Office - 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,210	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,210	0.0	134	0	\$21	\$73	\$20	2.5
Reception restroom	1	Incandescent: 60W-A lamp	Wall Switch	S	60	2,210	2	Relamp	No	1	LED Lamps: 10W-A lamp	Wall Switch	9	2,210	0.0	122	0	\$19	\$17	\$1	0.9
Reception restroom	1	LED Lamps: 10W-A lamp	Wall Switch	S	10	2,210		None	No	1	LED Lamps: 10W-A lamp	Wall Switch	10	2,210	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Female 1	2	Incandescent: 60W-A lamp	Wall Switch	S	60	2,210	2	Relamp	No	2	LED Lamps: 10W-A lamp	Wall Switch	9	2,210	0.1	243	0	\$38	\$34	\$2	0.9
Storage 4	1	Linear Fluorescent - T12: 8' T12 (75W) - 4L	Wall Switch	U	316	2,210	1	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 8' Lamps	Wall Switch	144	2,210	0.2	411	0	\$64	\$257	\$40	3.4
Storage 4	6	LED Lamps: 10W-A lamp	Wall Switch	U	10	2,210		None	No	6	LED Lamps: 10W-A lamp	Wall Switch	10	2,210	0.0	0	0	\$0	\$0	\$0	0.0
Stairs 2	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch		158	2,210	1	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,210	0.1	205	0	\$32	\$129	\$20	3.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years	
Evidence room 1	1	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	S	92	1,000	1	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	1,000	0.0	60	0	\$9	\$84	\$10	7.9	
Evidence room 2	1	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	S	92	1,000	1	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	1,000	0.0	60	0	\$9	\$84	\$10	7.9	
Evidence room 3	1	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	S	92	1,000	1	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	1,000	0.0	60	0	\$9	\$84	\$10	7.9	
Evidence room 4	1	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	S	92	1,000	1	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	1,000	0.0	60	0	\$9	\$84	\$10	7.9	
Evidence room 5	1	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	S	92	1,000	1	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	1,000	0.0	60	0	\$9	\$84	\$10	7.9	
Hallway	2	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	1,500	1, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 8' Lamps	High/Low Control	72	1,035	0.2	351	0	\$55	\$482	\$110	6.8	
Large storage	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	1,500	1	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,500	0.1	96	0	\$15	\$69	\$10	3.9	
Large storage	2	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	1,500	1, 3	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,035	0.2	351	0	\$55	\$527	\$40	8.9	
Locker room	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	1,500	1	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,500	0.1	96	0	\$15	\$69	\$10	3.9	
Office 1	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	1,500	1	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,500	0.1	96	0	\$15	\$69	\$10	3.9	
Office 1 restroom	1	LED Lamps: 10W-A lamp	Wall Switch	S	10	1,500		None	No	1	LED Lamps: 10W-A lamp	Wall Switch	10	1,500	0.0	0	0	\$0	\$0	\$0	0.0	
Office 2	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	1,500	1	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,500	0.1	191	0	\$30	\$118	\$20	3.3	
Office 3	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	1,500	1	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,500	0.1	191	0	\$30	\$118	\$20	3.3	
Office 3	1	LED Lamps: 10W-A lamp	Wall Switch	S	10	1,500		None	No	1	LED Lamps: 10W-A lamp	Wall Switch	10	1,500	0.0	0	0	\$0	\$0	\$0	0.0	
Restroom - unisex 1	1	Incandescent: 60W-A lamp	Wall Switch	S	60	1,000	2	Relamp	No	1	LED Lamps: 10W-A lamp	Wall Switch	9	1,000	0.0	55	0	\$9	\$17	\$1	1.9	
Stairs 3	1	Incandescent: 60W-A lamp	Wall Switch		60	1,000	2	Relamp	No	1	LED Lamps: 10W-A lamp	Wall Switch	9	1,000	0.0	55	0	\$9	\$17	\$1	1.9	
Storage room 5	1	Incandescent: 60W-A lamp	Wall Switch	S	60	500	2	Relamp	No	1	LED Lamps: 10W-A lamp	Wall Switch	9	500	0.0	28	0	\$4	\$17	\$1	3.8	
Storage room 6	3	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	500	1, 3	Relamp & Reballast	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	345	0.4	220	0	\$34	\$625	\$60	16.4	
Restroom - male 1	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	500	1	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.1	32	0	\$5	\$69	\$10	11.8	
Storage room 7	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	500	1	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.1	32	0	\$5	\$69	\$10	11.8	
open office	6	Linear Fluorescent - T12: 8' T12 (75W) - 4L	Wall Switch	S	316	500	1, 3	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 8' Lamps	Occupancy Sensor	144	345	1.1	702	0	\$110	\$1,814	\$275	14.0	

Motor Inventory & Recommendations

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Boiler - Heating System	1	Boiler Feed Water Pump	0.3	65.0%	No	Marathon	T QB 56C34D1200L	W	2,745		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Boiler Room	Boiler - Heating System	1	Combustion Air Fan	0.3	65.0%	No	Marathon	HPC 56C34D2109F	W	2,745		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0

Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Dining room	Dining room	3	Electric Resistance Heat		2.56		1 COP	TPI		W		No							0.0	0	0	\$0	\$0	\$0	0.0
Craft room	Craft room	1	Ductless Mini-Split AC	2.00		11.50		Fujitsu		B	5	Yes	1	Ductless Mini-Split AC	2.00		18.00		0.4	504	0	\$80	\$5,642	\$0	70.6
Front entrance	Front entrance, reception area	1	Ductless Mini-Split AC	2.00		11.50		Fujitsu		B	5	Yes	1	Ductless Mini-Split AC	2.00		18.00		0.4	504	0	\$80	\$5,642	\$0	70.6
Office 1	Office 1	1	Ductless Mini-Split AC	1.50		11.50		Fujitsu		B	5	Yes	1	Ductless Mini-Split AC	1.50		18.00		0.3	378	0	\$60	\$5,193	\$0	86.6
Office 2	Office 2	1	Ductless Mini-Split AC	1.50		11.50		Fujitsu		B	5	Yes	1	Ductless Mini-Split AC	1.50		18.00		0.3	378	0	\$60	\$5,193	\$0	86.6
Dining room	Dining room	2	Window AC	0.50		10.30		Frigidair		B	5	Yes	2	Window AC	0.50		12.00		0.1	110	0	\$17	\$1,044	\$0	59.6
Office 1	Office 1	1	Window AC	0.50		10.30		Unknown		B	5	Yes	1	Window AC	0.50		12.00		0.0	55	0	\$9	\$522	\$0	59.6

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	South Ward Senior Center	1	Forced Draft Steam Boiler	808	Burnham	V906	W		No						0.0	0	0	\$0	\$0	\$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Steam Heating System	6	8	5.00	0.0	0	17	\$159	\$100	\$32	0.4
Boiler Room	Steam Heating System	6	19	2.00	0.0	0	20	\$182	\$238	\$76	0.9

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	South Ward Senior Center	1	Storage Tank Water Heater (> 50 Gal)	AO Smith	BT-80 400	W		No						0.0	0	0	\$0	\$0	\$0	0.0

Low-Flow Device Recommendations

		Recommendation Inputs				Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	7	1	Faucet Aerator (Kitchen)	2.50	1.50	0.0	0	0	\$3	\$7	\$4	1.2
1-South Ward Senior Center	7	3	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	\$13	\$22	\$22	0.0

Commercial Refrigerator/Freezer Inventory & Recommendations


	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Dining area 1	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	Traulsen	G10010	No	8	Yes	0.1	1,016	0	\$161	\$2,368	\$400	12.2

Plug Load Inventory


		Existing Conditions				
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified ?	Manufacturer	Model
Kitchen 1	1	electric stove top	2,400	No	Hotpoint	
Kitchen 1, Storage 6	2	Refrigerator	226	No	Frigidaire	

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.



ENERGY STAR® Statement of Energy Performance



**ENERGY STAR®
Score¹**

South Ward Senior Center

Primary Property Type: Social/Meeting Hall
 Gross Floor Area (ft²): 14,000
 Built: 1909

For Year Ending: February 29, 2020
 Date Generated: May 10, 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 South Ward Senior Center 870 S. Broad Street Trenton, New Jersey 08611	Property Owner City of Trenton 310 East State Street Trenton, NJ 08618 (609) 989-3615	Primary Contact Hoggarth Stephen 310 East State Street Trenton, NJ 08618 (609) 989-3615 shoggarth@trentonnj.org
Property ID: 15274645		

Energy Consumption and Energy Use Intensity (EUI)			
Site EUI	Annual Energy by Fuel	National Median Comparison	
81.9 kBtu/ft²	Natural Gas (kBtu) 1,040,109 (91%)	National Median Site EUI (kBtu/ft²)	90.4
	Electric - Grid (kBtu) 106,211 (9%)	National Median Source EUI (kBtu/ft²)	109.8
		% Diff from National Median Source EUI	-25%
Source EUI		Annual Emissions	
99.3 kBtu/ft²		Greenhouse Gas Emissions (Metric Tons CO₂e/year)	65

Signature & Stamp of Verifying Professional

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

LP Signature: _____ Date: _____

Licensed Professional

()

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

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

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

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