Local Government Energy Audit Report

Middletown TWP - Public Library Main Branch

March 1, 2019

Prepared for:

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Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information about financial incentives that may be available. 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 Energy Services (TRC) reviewed the energy conservation measures and estimates of energy savings were reviewed 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 installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

The New Jersey Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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

Table of Contents

1 Executive Summary 5

1.1 Planning Your Project 8

Pick Your Installation Approach 8
More Options from Around the State 10

2 Existing Conditions 12

2.1 Site Overview 12
2.2 Building Occupancy 13
2.3 Building Envelope 13
2.4 Lighting Systems 14
2.5 Air Handling Systems 16

Packaged Units & Air Conditioners 16

2.6 Heating Hot Water Systems 16
2.7 Domestic Hot Water 17
2.8 Plug Load & Vending Machines 17
2.9 Water-Using Systems 17

3 Energy Use and Costs 18

3.1 Electricity 20
3.2 Natural Gas 21
3.3 Benchmarking 22

Tracking Your Energy Performance 23

4 Energy Conservation Measures 24

4.1 Lighting 27

ECM 1: Install LED Fixtures 27
ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers 27
ECM 3: Retrofit Fixtures with LED Lamps 28

4.2 Lighting Controls 29

ECM 4: Install Occupancy Sensor Lighting Controls 29
ECM 5: Install High/Low Lighting Controls 29

4.3 Electric Unitary HVAC 30

Install High Efficiency Air Conditioning Units 30

4.4 Gas-Fired Heating 30

Install High Efficiency Furnaces 30

4.5 Food Service & Refrigeration Measures 31

ECM 6: Vending Machine Control 31

5 Energy Efficient Best Practices 32

Energy Tracking with ENERGY STAR® Portfolio Manager® 32
Doors and Windows 32

Thermostat Schedules and Temperature Resets 32
Economizer Maintenance 32
AC System Evaporator/Condenser Coil Cleaning 33
HVAC Filter Cleaning and Replacement 33
Boiler Maintenance 33
Furnace Maintenance 33
Water Heater Maintenance 33
Plug Load Controls 34
Computer Power Management Software 34
Water Conservation 34
Procurement Strategies 35

6 On-site Generation 36

6.1 Solar Photovoltaic 37
6.2 Combined Heat and Power 38

7 Project Funding and Incentives 39

7.1 SmartStart 40
7.2 Direct Install 41
7.3 Energy Savings Improvement Program 42
7.4 SREC Registration Program 43

8 Energy Purchasing and Procurement Strategies 44

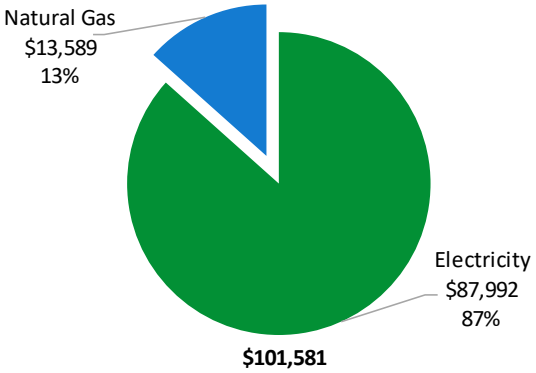
8.1 Retail Electric Supply Options 44
8.2 Retail Natural Gas Supply Options 44

Appendix A: Equipment Inventory & Recommendations 1
Appendix B: ENERGY STAR® Statement of Energy Performance 1
Appendix C: Glossary 2

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for the Public Library - Main Branch. 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 Energy Services (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 help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $101,581 Electricity: 636,925 kWh Natural Gas: 12,647 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

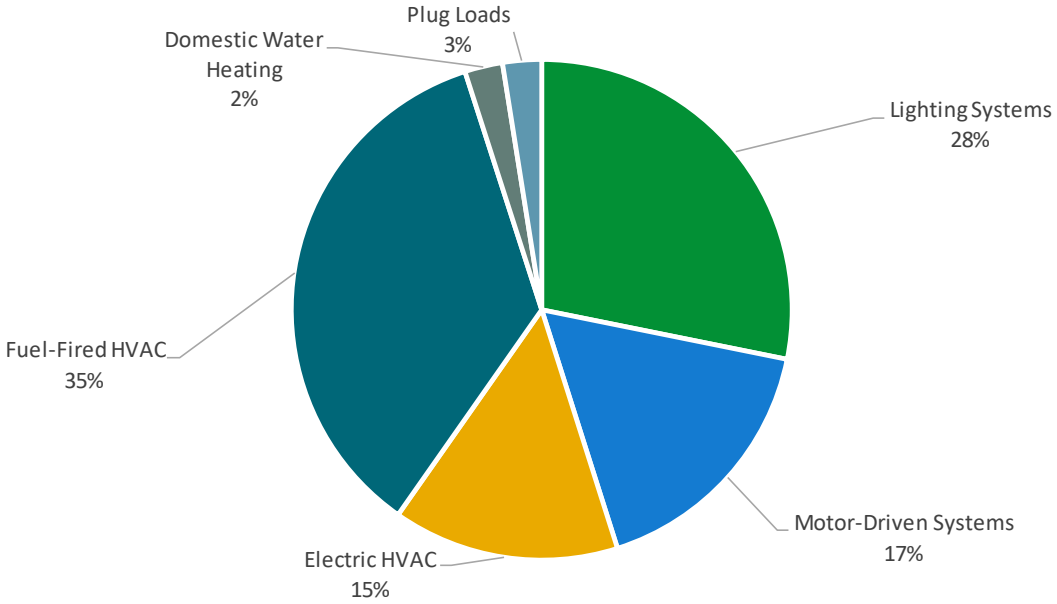


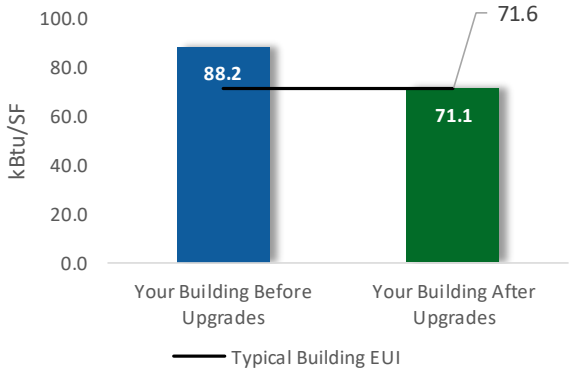
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

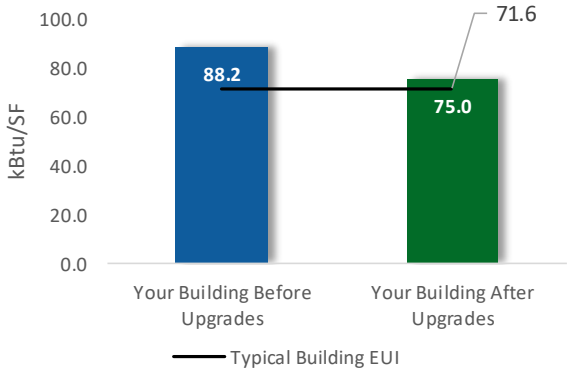
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$475,553
Potential Rebates & Incentives[1]	$9,773
Annual Cost Savings	$24,324
Annual Energy Savings	Electricity: 169,317 kWh Natural Gas: 868 Therms
Greenhouse Gas Emission Savings	90 Tons
Simple Payback	19.1 Years
Site Energy Savings (all utilities)	19%



Scenario 2: Cost Effective Package[2]

Installation Cost	$69,773
Potential Rebates & Incentives	$6,495
Annual Cost Savings	$21,561
Annual Energy Savings	Electricity: 158,294 kWh
Greenhouse Gas Emission Savings	78 Tons
Simple Payback	2.9 Years
Site Energy Savings (all utilities)	15%



On-site Generation Potential

Photovoltaic	Medium
Combined Heat and Power	None

[1] Incentives are based on current SmartStart Prescriptive incentives. Other program incentives 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	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Lifetime Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**127,674**	**27.3**	**-22**	**$17,398**	**$260,965**	**$60,597**	**$5,480**	**$55,117**	**3.2**	**125,945**
ECM 1	Install LED Fixtures	22,281	3.4	0	$3,078	$46,171	$14,828	$1,445	$13,383	4.3	22,436
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	730	0.2	0	$99	$1,489	$679	$42	$637	6.4	717
ECM 3	Retrofit Fixtures with LED Lamps	104,663	23.8	-22	$14,220	$213,306	$45,090	$3,993	$41,097	2.9	102,791
Lighting Control Measures		**29,008**	**5.6**	**-6**	**$3,941**	**$31,529**	**$8,946**	**$1,015**	**$7,931**	**2.0**	**28,487**
ECM 4	Install Occupancy Sensor Lighting Controls	27,651	5.3	-6	$3,757	$30,054	$7,946	$1,015	$6,931	1.8	27,155
ECM 5	Install High/Low Lighting Controls	1,356	0.3	0	$184	$1,474	$1,000	$0	$1,000	5.4	1,332
Electric Unitary HVAC Measures		**11,023**	**8.7**	**0**	**$1,523**	**$22,843**	**$363,583**	**$1,278**	**$362,305**	**237.9**	**11,100**
	Install High Efficiency Air Conditioning Units	11,023	8.7	0	$1,523	$22,843	$363,583	$1,278	$362,305	237.9	11,100
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**115**	**$1,240**	**$24,799**	**$42,197**	**$2,000**	**$40,197**	**32.4**	**13,512**
	Install High Efficiency Furnaces	0	0.0	115	$1,240	$24,799	$42,197	$2,000	$40,197	32.4	13,512
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$223**	**$1,113**	**$230**	**$0**	**$230**	**1.0**	**1,623**
ECM 6	Vending Machine Control	1,612	0.2	0	$223	$1,113	$230	$0	$230	1.0	1,623
TOTALS		**169,317**	**41.9**	**87**	**$24,324**	**$341,250**	**$475,553**	**$9,773**	**$465,780**	**19.1**	**180,668**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

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

Figure 2 – Evaluated Energy Improvements

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

New Jersey 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.

The potential ECMs identified for this building likely qualify for multiple incentive and funding programs. Based on current program rules and requirements, your measures are likely to qualify for the following programs:

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	Install LED Fixtures	x	x	
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x	x	
ECM 3	Retrofit Fixtures with LED Lamps	x	x	
ECM 4	Install Occupancy Sensor Lighting Controls	x	x	
ECM 5	Install High/Low Lighting Controls		x	
ECM 6	Vending Machine Control		x	

Figure 3 – Funding Options

New Jersey Clean Energy Programs At-A-Glance

	SmartStart Flexibility to install at your own pace	**Direct Install** Turnkey installation	**Pay for Performance** Whole building upgrades
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your energy reduction plan and set your energy savings targets.

Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.

Individual Measures with SmartStart

For facilities wishing to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation.

Turnkey Installation with Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized network of participating contractors. This program can provide substantially higher incentives than SmartStart, up to 70% of the cost of selected measures. Direct Install contractors will assess and verify individual measure eligibility and, in most cases, they perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Whole Building Approach with Pay for Performance

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also use this program. Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings.

More 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 their electric demand during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Public Library - Main Branch. 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. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing 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.

Please note that the information obtained at the site visit was supplemented, where necessary, with facility and equipment information noted in previous energy audit reports.

2.1 Site Overview

On July 18, 2018, TRC performed an energy audit at the Public Library - Main Branch located in Middletown, NJ. TRC met with Anthony Mercantante to review the facility operations and help focus our investigation on specific energy-using systems.

The Public Library - Main Branch is a one-story, 39,000 square foot building built in 1971. Spaces include: lounges, offices, library area with book shelves, study rooms, computer labs, meeting rooms, lobby, circulation work area, storage rooms and mechanical rooms.

Image 1. Aerial Screenshot of Library

2.2 Building Occupancy

The facility is occupied year-round. The number of staff in the library are around 42.

The library operating hours for weekdays Monday through Thursday are 9:00 AM to 9:00 PM and Friday and Saturday hours are 9:00 AM to 5:00 PM. The library is closed on Sundays.

Building Name	Weekday/Weekend	Operating Schedule
Public Library - Main Branch	Weekday	9:00 AM - 9:00 PM
	Weekend	9:00 AM - 5:00 PM

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick veneer. The majority of the building's roof is covered with black roofing membrane. Some sections like the entry canopy, circular section and lower front section have standing seam metal roofs.

The walls and roof are in fair condition.

Most of the windows are double pane and have aluminum frames. The glass-to-frame seals are in fair condition. Exterior doors are primarily glass and have aluminum frames and are in fair condition with slightly worn door seals. Degraded window and door seals increase drafts and outside air infiltration.

Image 2. Exterior Window

Image 3. Exterior Doors

Image 4. Building Exterior Walls

2.4 Lighting Systems

The primary interior lighting systems use either compact fluorescent (CFL) 4-pin "long" lamps or linear fluorescent T8 lamps. There are also a few linear T12 fixtures, linear T5 fixtures and a few U-bend T8 fixtures. Additionally, there are some short length compact fluorescent lamps (CFL), halogen incandescent and incandescent lamps. Typically, T5 and T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Fixtures include 1, 2, 3 and 4-lamp troffers, recessed, and surface mounted fixtures with U-bend or linear tube lamps. The CFL long lamps are generally located in 2x2 troffer type fixtures. Other lamp types are located in surface mounted, hanging or wall mounted interior fixtures.

Most of the exit signs are LED.

Most fixtures are in fair condition.

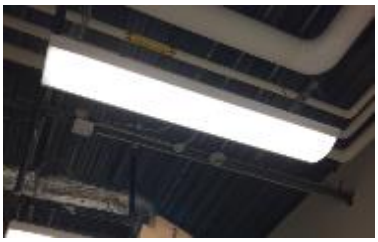


Image 5. Linear Fluorescent Fixture

Image 6. Linear Fluorescent Troffer Fixtures

Image 7. Recessed Can Fixtures

Image 8. Troffer Fixtures with CFL Long Lamps

Image 9. Hanging Decorative Fixtures

Image 10. LED Exit Sign

Most lighting fixtures are controlled by occupancy sensors and the remainder by wall switches.

Exterior fixtures include wall packs, canopy lights and parking lot pole lights with HID and CFL lamps.

The wallpacks have high pressure sodium (HPS) lamps, pole mounted fixtures have metal halide (MH) lamps, and canopy fixtures include CFL lamps.

Exterior fixtures are timer controlled.

Image 11. Pole Mounted Fixtures

Image 12. Wallpack Fixture

Image 13. Canopy Fixtures

Image 14. Exterior Lighting Control Timer

2.5 Air Handling Systems

Packaged Units & Air Conditioners

The building is primarily served by five packaged rooftop units that are controlled by zone thermostats. These units have capacities ranging from 7.5 tons to 60 tons. All these units are equipped with natural gas fired furnaces that provide heating for the units.

There is also one split system air source heat pump which serves the network room.

All units are controlled by individual zone level thermostats.

Refer to Appendix A for detailed information about each unit.

Image 15. Picture of Rooftop Package Units and Heat Pump Condenser Unit

2.6 Heating Hot Water Systems

Heating in the building is done by a combination of natural gas furnaces in the rooftop package units and one Aerco 930 MBh natural gas hot water boiler that circulates hot water to reheat boxes at the zone level. Hot water is circulated by two 1.5 hp hot water pumps.

Image 16. Condensing Hot Water Boiler

2.7 Domestic Hot Water

Hot water is produced with a Rheem 75 gallon 75.1 MBh gas-fired storage water heater(s) with an 80% efficiency (estimated).

One 0.5 hp circulation pumps distribute water to end uses. The circulation pumps operate continuously.

Image 17. DHW Heater

2.8 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 2.5% of total building energy use. This is lower than a typical building.

You seem to already be doing a great job managing your electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 59 computer work stations throughout the facility. Plug loads throughout the building include general café and office equipment. Some general plug load equipment in the building include small kitchen area appliances like electric stove, coffee maker and microwave.

There are a few residential style refrigerators throughout the building. These vary in condition and efficiency. There is one refrigerated beverage vending machine which is not equipped with occupancy-based controls.

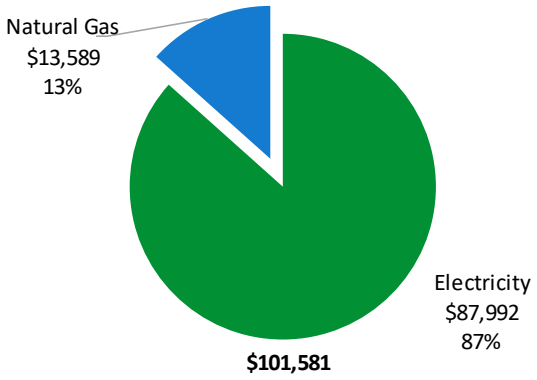
2.9 Water-Using Systems

There are six restrooms with toilets, urinals, and sinks, all of which are low flow units.

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	636,925 kWh	$87,992
Natural Gas	12,647 Therms	$13,589
Total		**$101,581**



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.

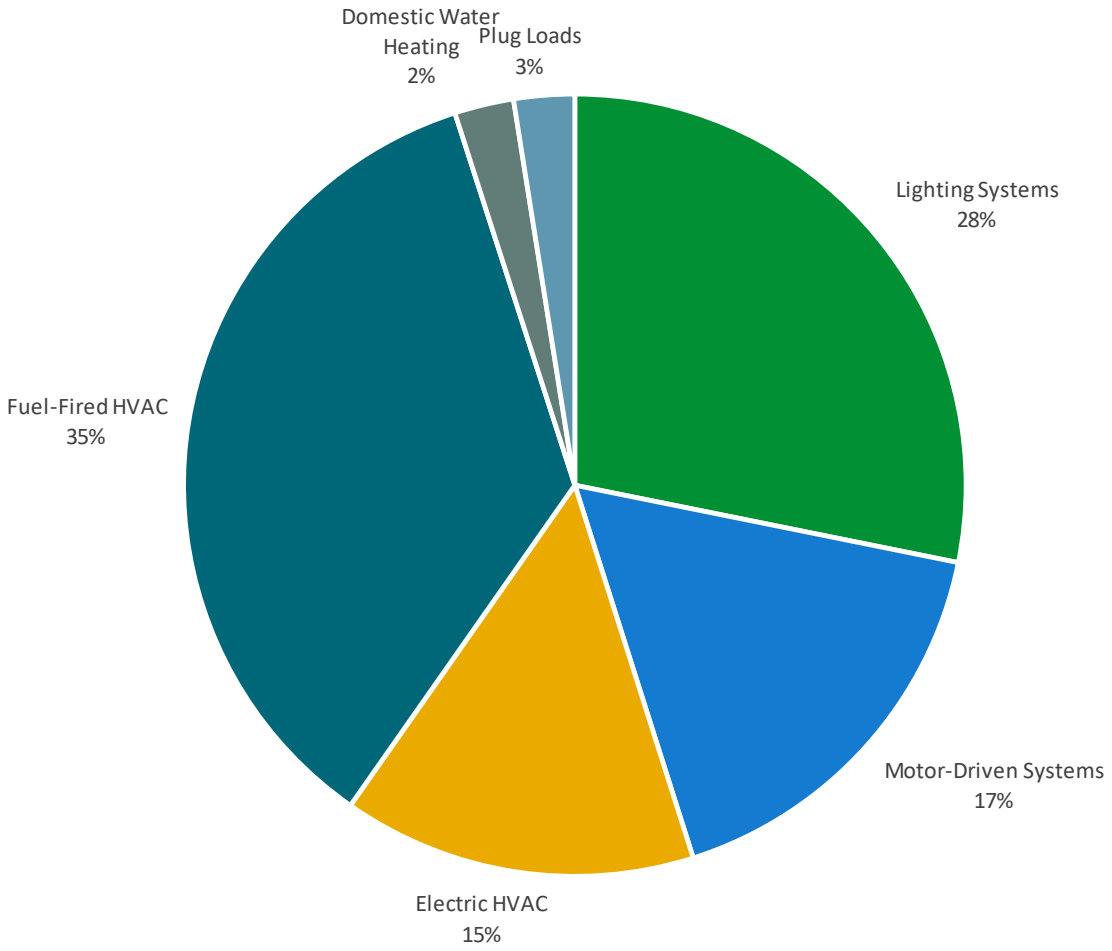
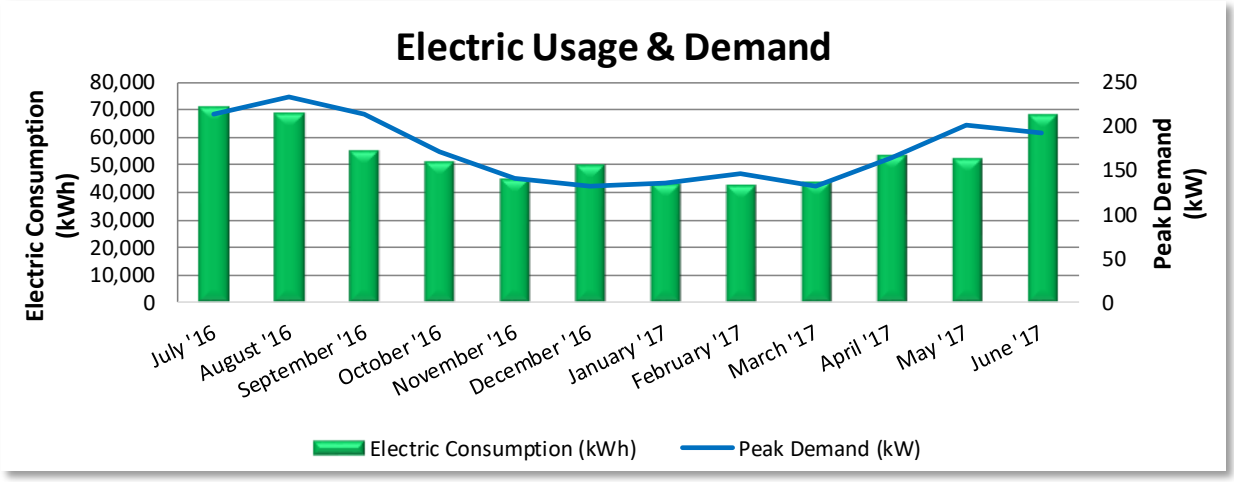


Figure 5 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary 3 Phase.



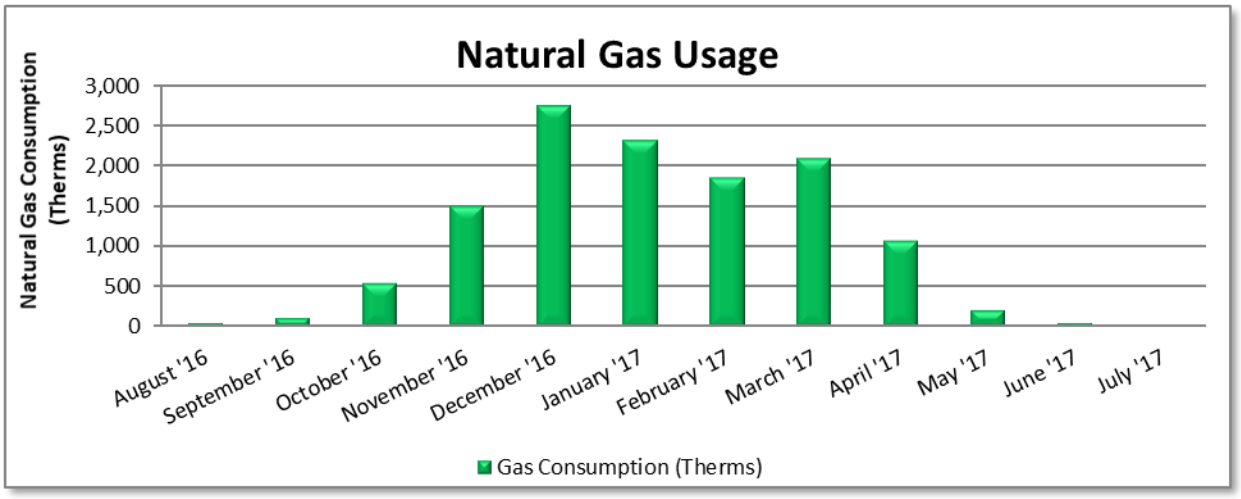
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
8/8/16	31	70,800	215		$9,550
9/7/16	30	68,560	233		$9,473
10/6/16	29	54,800	214		$7,697
11/7/16	32	50,800	171		$6,974
12/7/16	30	44,800	141		$6,137
1/10/17	34	49,760	132		$6,880
2/8/17	29	42,960	135		$6,190
3/8/17	28	42,320	147		$6,128
4/6/17	29	43,600	133		$5,983
5/8/17	32	53,520	164		$7,354
6/8/17	31	52,240	202		$7,552
7/11/17	33	68,000	193		$8,797
Totals	**368**	**642,160**	**233**	**$0**	**$88,715**
Annual	**365**	**636,925**	**233**	**$0**	**$87,992**

Notes:

- Peak demand of 233 kW occurred in September 2016.
- The average electric cost over the past 12 months was $0.138/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

NJ Natural Gas delivers natural gas under rate class BGSS.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
9/1/16	31	56	$216
10/1/16	30	110	$258
11/1/16	31	551	$703
12/1/16	30	1,504	$1,536
1/3/17	33	2,768	$2,648
2/1/17	29	2,324	$2,257
3/2/17	29	1,867	$1,855
4/1/17	30	2,097	$2,057
5/2/17	31	1,078	$1,161
6/2/17	31	215	$403
7/5/17	33	46	$253
8/1/17	27	31	$241
Totals	**365**	**12,647**	**$13,589**
Annual	**365**	**12,647**	**$13,589**

Notes:

- The average gas cost for the past 12 months is $1.074/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.

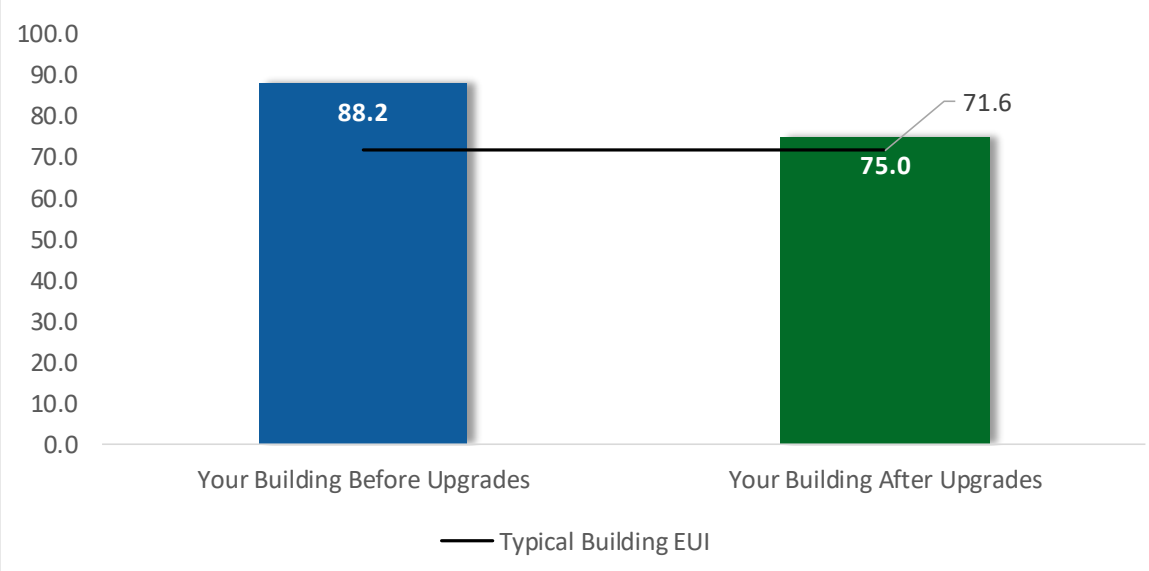


Figure 6 - Energy Use Intensity Comparison

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 as 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.

Tracking Your Energy Performance

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

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

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

For more information on ENERGY STAR® and Portfolio Manager®, visit their website.[3]

[3] 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, provide information about the cost effectiveness of those improvements, and recognize potential financial incentives from NJBPU. Most energy conservation measures have received preliminary analysis of feasibility which identifies expected ranges of savings and costs. 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 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 the current NJCEP prescriptive SmartStart program. A higher level of investigation may be necessary to support any SmartStart Custom, Pay for Performance, or Direct Install incentive applications. Some measures and proposed upgrades may be eligible for higher incentives than those shown below through other NJCEP programs described in a following section of this report.

Appendix A: Equipment Inventory & Recommendations provides a detailed list of the locations and recommended upgrades for each energy conservation measure.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**127,674**	**27.3**	**-22**	**$17,398**	**$60,597**	**$5,480**	**$55,117**	**3.2**	**125,945**
ECM 1	Install LED Fixtures	22,281	3.4	0	$3,078	$14,828	$1,445	$13,383	4.3	22,436
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	730	0.2	0	$99	$679	$42	$637	6.4	717
ECM 3	Retrofit Fixtures with LED Lamps	104,663	23.8	-22	$14,220	$45,090	$3,993	$41,097	2.9	102,791
Lighting Control Measures		**29,008**	**5.6**	**-6**	**$3,941**	**$8,946**	**$1,015**	**$7,931**	**2.0**	**28,487**
ECM 4	Install Occupancy Sensor Lighting Controls	27,651	5.3	-6	$3,757	$7,946	$1,015	$6,931	1.8	27,155
ECM 5	Install High/Low Lighting Controls	1,356	0.3	0	$184	$1,000	$0	$1,000	5.4	1,332
Electric Unitary HVAC Measures		**11,023**	**8.7**	**0**	**$1,523**	**$363,583**	**$1,278**	**$362,305**	**237.9**	**11,100**
	Install High Efficiency Air Conditioning Units	11,023	8.7	0	$1,523	$363,583	$1,278	$362,305	237.9	11,100
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**115**	**$1,240**	**$42,197**	**$2,000**	**$40,197**	**32.4**	**13,512**
	Install High Efficiency Furnaces	0	0.0	115	$1,240	$42,197	$2,000	$40,197	32.4	13,512
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$223**	**$230**	**$0**	**$230**	**1.0**	**1,623**
ECM 6	Vending Machine Control	1,612	0.2	0	$223	$230	$0	$230	1.0	1,623
TOTALS		**169,317**	**41.9**	**87**	**$24,324**	**$475,553**	**$9,773**	**$465,780**	**19.1**	**180,668**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria for that program.
** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Figure 7 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**127,674**	**27.3**	**-22**	**$17,398**	**$60,597**	**$5,480**	**$55,117**	**3.2**	**125,945**
ECM 1	Install LED Fixtures	22,281	3.4	0	$3,078	$14,828	$1,445	$13,383	4.3	22,436
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	730	0.2	0	$99	$679	$42	$637	6.4	717
ECM 3	Retrofit Fixtures with LED Lamps	104,663	23.8	-22	$14,220	$45,090	$3,993	$41,097	2.9	102,791
Lighting Control Measures		**29,008**	**5.6**	**-6**	**$3,941**	**$8,946**	**$1,015**	**$7,931**	**2.0**	**28,487**
ECM 4	Install Occupancy Sensor Lighting Controls	27,651	5.3	-6	$3,757	$7,946	$1,015	$6,931	1.8	27,155
ECM 5	Install High/Low Lighting Controls	1,356	0.3	0	$184	$1,000	$0	$1,000	5.4	1,332
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$223**	**$230**	**$0**	**$230**	**1.0**	**1,623**
ECM 6	Vending Machine Control	1,612	0.2	0	$223	$230	$0	$230	1.0	1,623
TOTALS		**158,294**	**33.1**	**-29**	**$21,561**	**$69,773**	**$6,495**	**$63,278**	**2.9**	**156,055**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria for that program.
** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Figure 8 – 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 ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**127,674**	**27.3**	**-22**	**$17,398**	**$60,597**	**$5,480**	**$55,117**	**3.2**	**125,945**
ECM 1	Install LED Fixtures	22,281	3.4	0	$3,078	$14,828	$1,445	$13,383	4.3	22,436
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	730	0.2	0	$99	$679	$42	$637	6.4	717
ECM 3	Retrofit Fixtures with LED Lamps	104,663	23.8	-22	$14,220	$45,090	$3,993	$41,097	2.9	102,791

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: Install LED Fixtures

Replace existing fixtures containing high intensity discharge (HID) lamps with new LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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

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

Affected building areas: exterior canopy and pole fixtures

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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

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

Affected building areas: fluorescent fixtures with T12 tubes in children's section

ECM 3: Retrofit Fixtures with LED Lamps

Replace linear fluorescent T5 & T8 lamps, U-bent fluorescent T8 lamps, compact fluorescent (CFL), incandescent and halogen 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 linear T5 and T8 tubes, U-Bend T8 lamps, CFL lamps (including long lamps), incandescent lamps and halogen incandescent lamps

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**29,008**	**5.6**	**-6**	**$3,941**	**$8,946**	**$1,015**	**$7,931**	**2.0**	**28,487**
ECM 4	Install Occupancy Sensor Lighting Controls	27,651	5.3	-6	$3,757	$7,946	$1,015	$6,931	1.8	27,155
ECM 5	Install High/Low Lighting Controls	1,356	0.3	0	$184	$1,000	$0	$1,000	5.4	1,332

Lighting controls reduce energy use by turning off or lowering, lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 4: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend 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, general rooms, sections of the library, storage shed, reading areas and seating areas

ECM 5: Install High/Low Lighting Controls

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

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety requirements. 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.

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

Affected building areas: entryway and front desk area

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 Electric Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**11,023**	**8.7**	**0**	**$1,523**	**$363,583**	**$1,278**	**$362,305**	**237.9**	**11,100**
	Install High Efficiency Air Conditioning Units	11,023	8.7	0	$1,523	$363,583	$1,278	$362,305	237.9	11,100

Install High Efficiency Air Conditioning Units

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 air conditioning equipment is eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

4.4 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**115**	**$1,240**	**$42,197**	**$2,000**	**$40,197**	**32.4**	**13,512**
	Install High Efficiency Furnaces	0	0.0	115	$1,240	$42,197	$2,000	$40,197	32.4	13,512

Install High Efficiency Furnaces

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

Although replacing the furnace section units would result in improved overall fuel efficiency, it is not recommended due to high payback.

Note: This measure is part of a measure to replace package units at this site and as such must be considered in combination with that measure.

4.5 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$223**	**$230**	**$0**	**$230**	**1.0**	**1,623**
ECM 6	Vending Machine Control	1,612	0.2	0	$223	$230	$0	$230	1.0	1,623

ECM 6: Vending Machine Control

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

Affected building areas: break room vending machine

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before - you can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions.[4] Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

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.

Thermostat Schedules and Temperature Resets

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

Economizer Maintenance

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

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

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

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. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the water side or fire side of the boiler.

Furnace Maintenance

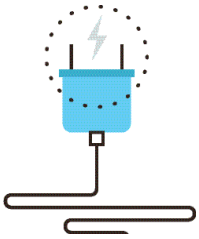
Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include the following: check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks,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

Water Heater Maintenance

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

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

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips.[5] Your local utility may offer incentives or rebates for this equipment.

Computer Power Management Software

Many computers consume power during nights, weekends, and holidays. Screen savers are commonly confused as a power management strategy. This contributes to avoidable, excessive electrical energy consumption. There are innovative power management software packages available that are designed to deliver significant energy saving and provide ongoing tracking measurements. A central power management platform helps enforce energy savings policies as well as identify and eliminate underutilized devices

Water Conservation

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

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

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

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

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.

[5] For additional information refer "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

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

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

Procurement Strategies

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

6 On-site Generation

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

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

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

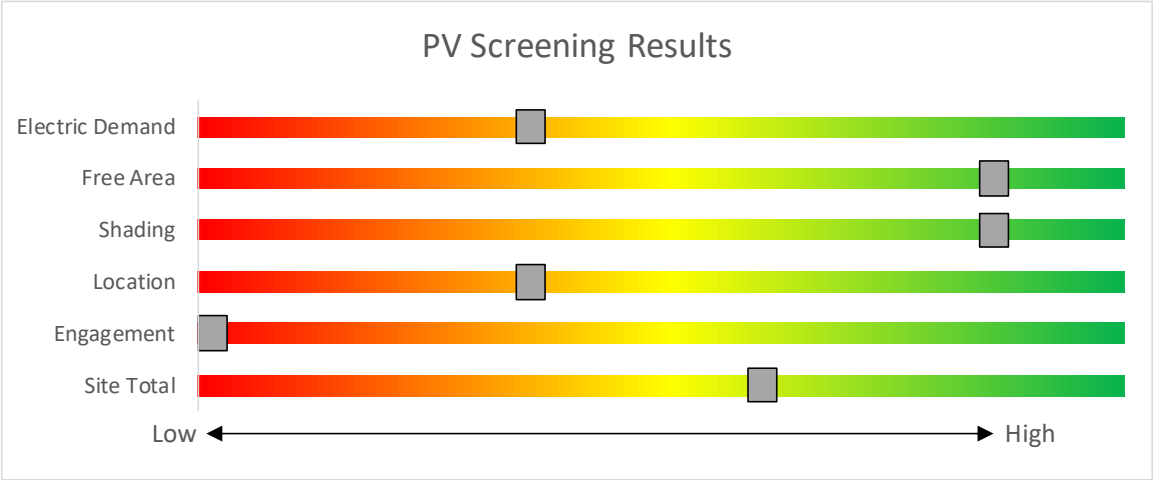


Figure 9 - Photovoltaic Screening

Solar Renewable Energy Certificate (SREC) Registration Program (SRP)

Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program before starting construction. Once your PV system is up and running, you periodically earn credits, which can then be sold on the open market for up to 15 years.

If you are considering installing solar photovoltaics on your building, visit www.njcleanenergy.com/srec for more information about the SREC Registration Program.

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:

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

6.2 Combined Heat and Power

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

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

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

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

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

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

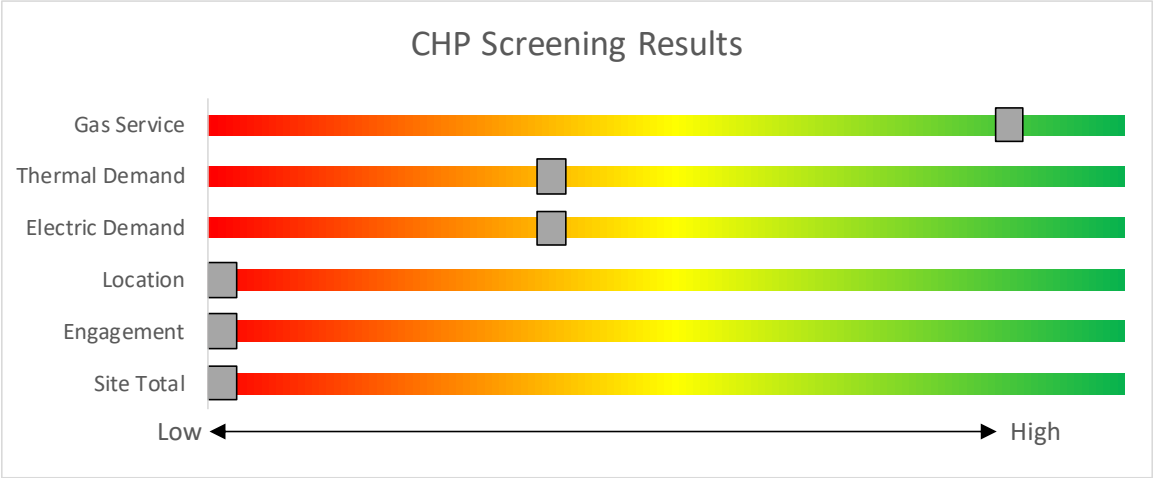


Figure 10 - Combined Heat and Power Screening

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? New Jersey Clean Energy Programs can help. Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available New Jersey Clean Energy Programs.

	SmartStart *Flexibility to install at your own pace*	**Direct Install** *Turnkey installation*	**Pay for Performance** *Whole building upgrades*
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Average peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.
Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.			

7.1 SmartStart

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

SmartStart routinely adds, removes, or modifies incentives from year-to-year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Incentives

The SmartStart Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type.

SmartStart Custom provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives. Custom incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings. Incentives are capped at 50% of the total installed incremental project cost, or a project cost buy down to a one-year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

Submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. You can work with your preferred contractor or use internal staff to install measures.

Visit www.njcleanenergy.com/SSB for a detailed program description, instructions for applying, and applications.

7.2 Direct Install

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

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Each entity is limited to incentives up to $250,000 per fiscal year.

How to Participate

To participate in Direct Install, you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI.

7.3 Energy Savings Improvement Program

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

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

How to Participate

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

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

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

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

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

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

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

7.4 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) 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 SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

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 SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar Renewable Portfolio Standard. Purchasing SRECs can help them meet those requirements. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period fluctuates depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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

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

A list of licensed third-party electric suppliers is available at the NJBPU website.[8]

8.2 Retail Natural Gas Supply Options

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

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

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

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

[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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	8	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch		60	4,243	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,243	0.2	1,136	0	$154	$292	$80	1.4
Boiler Room Electrical Room	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch		60	4,243	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,243	0.1	284	0	$39	$73	$20	1.4
Book Room	3	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor		60	2,928	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,928	0.1	294	0	$40	$110	$30	2.0
Book Room	4	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor		60	2,928	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,928	0.1	392	0	$53	$146	$40	2.0
Book Room	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
Utility Closet	1	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3	Relamp	No	1	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Wall Switch	70	4,243	0.0	137	0	$19	$54	$0	2.9
Admin Corridor	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.4	1,252	0	$170	$438	$120	1.9
Admin Corridor	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Room 140 Maintenance	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.1	313	0	$43	$110	$30	1.9
Room 138 Network	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.2	626	0	$85	$219	$60	1.9
Mens Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.1	313	0	$43	$110	$30	1.9
Womens Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.1	313	0	$43	$110	$30	1.9
Room 129 Tech Services	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.7	2,348	0	$319	$822	$225	1.9
Room 132 Public Info	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.1	313	0	$43	$110	$30	1.9
Room 127 Lounge	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.3	939	0	$128	$329	$90	1.9
Room 124 Admin	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.3	939	0	$128	$329	$90	1.9
Director Secretary Office	4	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3, 4	Relamp	Yes	4	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.2	948	0	$129	$487	$35	3.5
Directors Office	5	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	5	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.1	474	0	$64	$272	$0	4.2
Room 137	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.4	1,252	0	$170	$438	$120	1.9
Room 151	2	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	2	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.1	190	0	$26	$109	$0	4.2
Board Room	6	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	6	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.2	569	0	$77	$326	$0	4.2
Back Circulation Room	3	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	3	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.1	285	0	$39	$163	$0	4.2
Childrens Section	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Childrens Section	76	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	76	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	2.0	7,209	-2	$979	$4,131	$0	4.2
Childrens Section	20	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Occupancy Sensor		36	2,928	3	Relamp	No	20	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	Occupancy Sensor	25	2,928	0.2	683	0	$93	$689	$0	7.4

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Childrens Section	14	Linear Fluorescent - T12: 2' T12 (20W) - 1L	Occupancy Sensor		25	2,928	2	Relamp & Reballast	No	14	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,928	0.2	730	0	$99	$679	$42	6.4
Childrens Section	17	Halogen Incandescent: 1L - 50W Halogen Incandescent Lamps	Occupancy Sensor		100	2,928	3	Relamp	No	17	LED Screw-In Lamps: 1L- 15W LED Screw-In	Occupancy Sensor	15	2,928	1.3	4,569	-1	$621	$293	$17	0.4
Room 146 Childrens Services	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.2	626	0	$85	$219	$60	1.9
Room 145	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.1	313	0	$43	$110	$30	1.9
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 3L	Occupancy Sensor		92	2,928	3	Relamp	No	1	LED - Linear Tubes: (3) U-Lamp	Occupancy Sensor	50	2,928	0.0	134	0	$18	$109	$15	5.1
Room 148	8	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	8	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.2	759	0	$103	$435	$0	4.2
Room 148 Storage	2	Linear Fluorescent - T5: 2' T5 (14W) - 2L	Occupancy Sensor		34	2,928	3	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,928	0.0	108	0	$15	$65	$12	3.6
Front Desk	14	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Occupancy Sensor		36	2,928	3	Relamp	No	14	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	Occupancy Sensor	25	2,928	0.1	478	0	$65	$482	$0	7.4
Small Hanging	14	Incandescent: 1L - 35W Decorative Incandescent (Hanging Lapm Fixture)	Wall Switch		35	4,243	3, 4	Relamp	Yes	14	LED Screw-In Lamps: 1L- 5W LED Screw-In	Occupancy Sensor	5	2,928	0.4	2,013	0	$274	$511	$49	1.7
Entry Foyer	7	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Occupancy Sensor		36	2,928	3	Relamp	No	7	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	Occupancy Sensor	25	2,928	0.1	239	0	$32	$241	$0	7.4
Entry Foyer	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
Restroom/Meeting Rooms Lobby	11	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	11	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.3	1,043	0	$142	$598	$0	4.2
Room 109	1	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor		60	2,928	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,928	0.0	98	0	$13	$37	$10	2.0
Front Display Cabinet	1	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Occupancy Sensor		36	2,928	3	Relamp	No	1	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	Occupancy Sensor	25	2,928	0.0	34	0	$5	$34	$0	7.4
Front Display Cabinet	3	Halogen Incandescent: 1L - 50W Halogen Incandescent Lamps	Wall Switch		50	4,243	3	Relamp	No	3	LED Screw-In Lamps: 1L- 15W LED Screw-In	Wall Switch	8	4,243	0.1	584	0	$79	$52	$3	0.6
Room 106	4	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	4	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.1	379	0	$52	$217	$0	4.2
Room 111A	32	U-Bend Fluorescent - T8: U T8 (32W) - 3L	Wall Switch		92	4,243	3, 4	Relamp	Yes	32	LED - Linear Tubes: (3) U-Lamp	Occupancy Sensor	50	2,928	1.6	8,483	-2	$1,152	$4,018	$550	3.0
Room 111A	36	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Wall Switch		36	4,243	3, 4	Relamp	Yes	36	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	Occupancy Sensor	25	2,928	0.6	3,071	-1	$417	$2,497	$70	5.8
Room 111A	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Room 111A	5	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3, 4	Relamp	Yes	5	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.2	1,185	0	$161	$542	$35	3.1
Room 105 Kitchen	2	U-Bend Fluorescent - T8: U T8 (32W) - 3L	Occupancy Sensor		92	2,928	3	Relamp	No	2	LED - Linear Tubes: (3) U-Lamp	Occupancy Sensor	50	2,928	0.1	269	0	$37	$217	$30	5.1
Room 104 Storage	2	U-Bend Fluorescent - T8: U T8 (32W) - 3L	Occupancy Sensor		92	2,928	3	Relamp	No	2	LED - Linear Tubes: (3) U-Lamp	Occupancy Sensor	50	2,928	0.1	269	0	$37	$217	$30	5.1
Room 112 Electrical	1	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3	Relamp	No	1	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Wall Switch	70	4,243	0.0	137	0	$19	$54	$0	2.9
Mens Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.1	470	0	$64	$164	$45	1.9
Womens Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.1	470	0	$64	$164	$45	1.9

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main Entry Area	18	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Wall Switch		36	4,243	3, 5	Relamp	Yes	18	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	High/Low Control	25	2,928	0.3	1,535	0	$209	$1,578	$0	7.6
Main Entry Area	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Main Entry Front Desk	5	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3, 5	Relamp	Yes	5	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	High/Low Control	70	2,928	0.2	1,185	0	$161	$472	$0	2.9
Main Entry Front Desk	6	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Wall Switch		36	4,243	3, 5	Relamp	Yes	6	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	High/Low Control	25	2,928	0.1	512	0	$70	$526	$0	7.6
Friends Bookstore	2	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3, 4	Relamp	Yes	2	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.1	474	0	$64	$379	$35	5.3
Main Area Section 1	56	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3, 4	Relamp	Yes	56	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	2.6	13,268	-3	$1,803	$3,854	$105	2.1
Main Area Section 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
Fireplace Reading Area	17	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3, 4	Relamp	Yes	17	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.8	4,028	-1	$547	$1,194	$35	2.1
Fireplace Reading Area	22	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Wall Switch		36	4,243	3, 4	Relamp	Yes	22	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	Occupancy Sensor	25	2,928	0.4	1,876	0	$255	$1,736	$70	6.5
Fireplace Reading Area	11	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	11	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Right Side: Fiction/Non-Fiction	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	4,243	3, 4	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	1.4	7,505	-2	$1,020	$1,964	$460	1.5
Right Side: Fiction/Non-Fiction	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
Back: Non-Fiction	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	4,243	3, 4	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.8	4,041	-1	$549	$1,037	$245	1.4
Back: Non-Fiction	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
Back Corner: Non-Fiction	43	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	4,243	3, 4	Relamp	Yes	43	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	2.4	12,411	-3	$1,686	$3,165	$750	1.4
Seating Area	62	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Wall Switch		100	4,243	3, 4	Relamp	Yes	62	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	2.8	14,689	-3	$1,996	$4,450	$140	2.2
Seating Area	16	Compact Fluorescent: 2L - 9W CFL 4-Pin (Recessed Can)	Wall Switch		18	4,243	3, 4	Relamp	Yes	16	LED Screw-In Lamps: 2L- 6W LED 4-Pin	Occupancy Sensor	13	2,928	0.1	682	0	$93	$821	$35	8.5
Center Area	22	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Wall Switch		36	4,243	3, 4	Relamp	Yes	22	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	Occupancy Sensor	25	2,928	0.4	1,876	0	$255	$1,466	$35	5.6
Center Area	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Center Area	4	Compact Fluorescent: 4L - 50W Long Lamp CFL 4-Pin (Large Hanging Fixture)	Wall Switch		200	4,243	3, 4	Relamp	Yes	4	LED Screw-In Lamps: 4L-35W LED 4-Pin	Occupancy Sensor	140	2,928	0.4	1,895	0	$258	$705	$35	2.6
Center Area	38	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	4,243	3, 4	Relamp	Yes	38	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,928	1.4	7,312	-2	$993	$1,928	$450	1.5
Room 118	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.4	1,252	0	$170	$438	$120	1.9
Reference/IT	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor		93	2,928	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,928	0.1	313	0	$43	$110	$30	1.9
Quiet Reading Area	17	Incandescent: 1L - 35W Incandescent Lamp	Occupancy Sensor		35	2,928	3	Relamp	No	17	LED Screw-In Lamps: 1L- 5W LED Screw-In	Occupancy Sensor	5	2,928	0.4	1,599	0	$217	$293	$17	1.3
Quiet Reading Area	12	Compact Fluorescent: 2L - 18W CFL 4-Pin (Recessed Can)	Occupancy Sensor		36	2,928	3	Relamp	No	12	LED Screw-In Lamps: 2L-12.5W LED 4-Pin	Occupancy Sensor	25	2,928	0.1	410	0	$56	$413	$0	7.4

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Quiet Reading Area	2	Compact Fluorescent: 2L - 9W CFL 4-Pin (Recessed Can)	Wall Switch		18	4,243	3	Relamp	No	2	LED Screw-In Lamps: 2L- 6W LED 4-Pin	Wall Switch	13	4,243	0.0	49	0	$7	$69	$0	10.2
Room 116	2	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (Hanging Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	2	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.1	190	0	$26	$109	$0	4.2
Room 115	6	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	6	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.2	569	0	$77	$326	$0	4.2
Teen Room Walking Area	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Teen Room Walking Area	24	U-Bend Fluorescent - T8: U T8 (32W) - 3L	Occupancy Sensor		92	2,928	3	Relamp	No	24	LED - Linear Tubes: (3) U-Lamp	Occupancy Sensor	50	2,928	0.9	3,225	-1	$438	$2,609	$360	5.1
Teen Area	40	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	40	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	1.1	3,794	-1	$516	$2,174	$0	4.2
Room 113	10	Compact Fluorescent: 2L - 50W Long Lamp CFL 4-Pin (2x2 Fixture)	Occupancy Sensor		100	2,928	3	Relamp	No	10	LED Screw-In Lamps: 2L-35W Long Lamp LED 4-Pin	Occupancy Sensor	70	2,928	0.3	949	0	$129	$544	$0	4.2
Room 152	1	U-Bend Fluorescent - T8: U T8 (32W) - 3L	Wall Switch		92	4,243	3	Relamp	No	1	LED - Linear Tubes: (3) U-Lamp	Wall Switch	50	4,243	0.0	195	0	$26	$109	$15	3.5
Canopy	9	High-Pressure Sodium: (1) 70W Lamp	Timeclock		95	4,380	1	Fixture Replacement	No	9	LED - Fixtures: Downlight Surface Mount	Timeclock	29	4,380	0.4	2,621	0	$362	$1,800	$45	4.8
Storage Shed	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	3,536	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,440	0.1	641	0	$87	$262	$40	2.5
Parking Lot	14	Metal Halide: (1) 400W Lamp	Timeclock		458	4,380	1	Fixture Replacement	No	14	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	137	4,380	3.0	19,659	0	$2,716	$13,028	$1,400	4.3
Patio Wallpack	3	Compact Fluorescent: 2L - 32W CFL 4-Pin (Wallpack)	Timeclock		64	4,380	3	Relamp	No	3	LED Screw-In Lamps: 2L- 44W LED 4-Pin	Timeclock	45	4,380	0.0	252	0	$35	$163	$0	4.7

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?	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Hot Water Loop	2	Heating Hot Water Pump	1.5	84.0%	No	W	3,536		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	DHW Circulation	1	Water Supply Pump	0.5	76.2%	No	W	8,760		No	76.2%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Main Library Area (AHU-1)	1	Supply Fan	25.0	93.6%	Yes	B	4,067		No	93.6%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Circulation and Popular Materials (AHU-2)	1	Supply Fan	20.0	93.0%	Yes	B	3,730		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Children's Room (AHU 3)	1	Supply Fan	15.0	93.0%	Yes	B	3,730		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Network Room (AC-2)	1	Supply Fan	10.0	91.7%	No	B	3,730		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Popular Materials (AC-1)	1	Supply Fan	5.0	89.5%	No	B	3,569		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0

Electric 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)	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/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Main Library Area (AHU-1)	1	Packaged AC	60.00		B	NR	Yes	1	Packaged AC	60.00		9.50		3.0	3,728	0	$515	$132,958	$0	258.1
Roof	Circulation and Popular Materials (AHU-2)	1	Packaged AC	50.00		B	NR	Yes	1	Packaged AC	50.00		9.50		2.5	3,107	0	$429	$110,799	$0	258.1
Roof	Children's Room (AHU 3)	1	Packaged AC	40.00		B	NR	Yes	1	Packaged AC	40.00		9.50		2.0	2,486	0	$343	$88,639	$0	258.1
Roof	Network Room (AC-2)	1	Packaged AC	7.50		B	NR	Yes	1	Packaged AC	7.50		11.50		0.6	730	0	$101	$13,366	$548	127.2
Roof	Popular Materials (AC 1)	1	Packaged AC	10.00		B	NR	Yes	1	Packaged AC	10.00		11.50		0.8	973	0	$134	$17,821	$730	127.2
Roof	Newtork Room	1	Split-System Air-Source HP	1.50	1.80			No							0.0	0	0	$0	$0	$0	0.0

Fuel Heating 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)	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Hot Water Loop	1	Condensing Hot Water Boiler	930.00	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	Main Library Area (AHU-1)	1	Furnace	964.30	B	NR	Yes	1	Furnace	964.30	95.00%	AFUE	0.0	0	58	$622	$21,848	$400	34.5
Roof	Circulation and Popular Materials (AHU-2)	1	Furnace	324.00	B	NR	Yes	1	Furnace	324.00	95.00%	AFUE	0.0	0	21	$228	$7,341	$400	30.4
Roof	Children's Room (AHU 3)	1	Furnace	324.00	B	NR	Yes	1	Furnace	324.00	95.00%	AFUE	0.0	0	21	$228	$7,341	$400	30.4
Roof	Network Room (AC-2)	1	Furnace	102.50	B	NR	Yes	1	Furnace	102.50	95.00%	AFUE	0.0	0	6	$66	$2,322	$400	29.1
Roof	Popular Materials (AC-1)	1	Furnace	147.60	B	NR	Yes	1	Furnace	147.60	95.00%	AFUE	0.0	0	9	$95	$3,344	$400	30.9

DHW Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Throughout Building	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Throughout Building	59	Desktop Computer	150.0	Yes
Throughout Building	9	Desk Printer	20.0	Yes
Throughout Building	2	Refrigerator	172.0	Yes
Throughout Building	1	Electric Stove	5,000.0	Yes
Throughout Building	2	Coffee Maker	900.0	Yes
Throughout Building	1	Microwave	1,000.0	Yes
Throughout Building	1	Water Cooler	92.0	Yes
Throughout Building	1	Shredder	150.0	Yes
Throughout Building	3	Photocopier	600.0	Yes
Throughout Building	1	Mini Fridge	153.0	Yes
Throughout Building	1	Large Projector	300.0	Yes
Throughout Building	17	Laptops	45.0	Yes
Throughout Building	1	Smartboard	200.0	Yes
Throughout Building	1	Projector	200.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Break	1	Refrigerated	6	Yes	0.2	1,612	0	$223	$230	$0	1.0

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

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Middletown Township Public Library (Main Branch)

Primary Property Type: Library
Gross Floor Area (ft²): 39,000
Built: 1971

For Year Ending: June 30, 2017
Date Generated: November 13, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Middletown Township Public Library (Main Branch) 55 New Monmouth Road Middletown, New Jersey 07748	Middletown Township 1 King's Highway Middletown, NJ 07748 732-615-2000	Anthony Mercantante 1 King's Highway Middletown, NJ 07748 732-615-2000 x 2013 amercant@middletownnj.org

Property ID: 6414807

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
88.1 kBtu/ft²

Source EUI
189.9 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	2,170,555 (63%)
Natural Gas (kBtu)	1,265,378 (37%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	66.6
National Median Source EUI (kBtu/ft²)	143.6
% Diff from National Median Source EUI	32%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	287

Signature & Stamp of Verifying Professional

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

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate financial savings. 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	A British thermal unit is the amount of heat required to increase the temperature of one pound water by one-degree Fahrenheit. Commonly used to measure natural gas consumption.
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.
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 energy management systems.
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
HVAC	Heating, ventilation, and air conditioning.
kW	Kilowatt. Equal to 1,000 Watts.
Load	The total amount of power used by a building system 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.
MMBtu	One million British thermal units.
psig	Pounds per square inch.
Plug Load	Refers to the amount of energy used in a space by products that are powered by means of an ordinary AC plug.
Simple Payback	The amount of time needed to recoup the funds expended in an investment, or to reach the break-even point.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
Turnkey	Provision of a complete product or service that is ready for immediate use
Watt (W)	Unit of power commonly used to measure electricity use.