Local Government Energy Audit Report

City Hall

April 12, 2021

Prepared for:

City of Paterson

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Paterson, NJ 07505-1414

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

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

New Jersey's 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.

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Table of Contents

1 Executive Summary 1

1.1 Planning Your Project 4

Pick Your Installation Approach 4
More Options from Around the State 6

2 Existing Conditions 7

2.1 Site Overview 7
2.2 Building Occupancy 7
2.3 Building Envelope 8
2.4 Lighting Systems 8
2.5 Air Handling Systems 9

Packaged Units 9
Unitary Electric HVAC Equipment 9
Unitary Heating Equipment 10

2.6 Heating Steam Systems 10
2.7 Domestic Hot Water 11
2.8 Plug Load & Vending Machines 11
2.9 Water-Using Systems 11

3 Energy Use and Costs 12

3.1 Electricity 14
3.2 Natural Gas 15
3.3 Benchmarking 16

Tracking Your Energy Performance 17

4 Energy Conservation Measures 18

4.1 Lighting 21

ECM 1: Install LED Fixtures 21
ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers 21
ECM 3: Retrofit Fixtures with LED Lamps 22

4.2 Lighting Controls 22

ECM 4: Install Occupancy Sensor Lighting Controls 22
ECM 5: Install High/Low Lighting Controls 22

4.3 Variable Frequency Drives (VFD) 23

ECM 6: Install VFDs on Constant Volume (CV) Fans 23

4.4 Unitary HVAC 24

ECM 7: Install High Efficiency Air Conditioning Units 24
ECM 8: Install High Efficiency Heat Pumps 24

4.5 Gas-Fired Heating 25

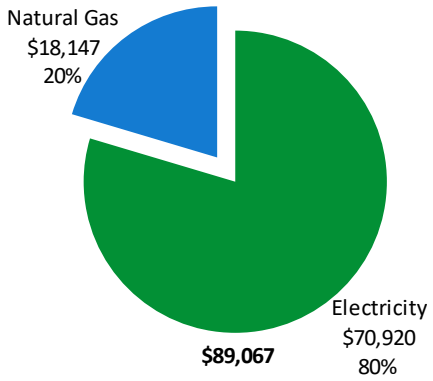
ECM 9: Install High Efficiency Steam Boilers 25

4.6 HVAC Improvements 25
ECM 10: Install Pipe Insulation 25
4.7 Domestic Water Heating 26
ECM 11: Install Low-Flow DHW Devices 26
4.8 Food Service & Refrigeration Measures 26
ECM 12: Vending Machine Control 26
5 Energy Efficient Best Practices 27
Energy Tracking with ENERGY STAR® Portfolio Manager® 27
Lighting Maintenance 27
Motor Maintenance 27
Thermostat Schedules and Temperature Resets 28
AC System Evaporator/Condenser Coil Cleaning 28
HVAC Filter Cleaning and Replacement 28
Steam Trap Repair and Replacement 28
Boiler Maintenance 28
Water Heater Maintenance 28
Water Conservation 29
Procurement Strategies 29
6 On-site Generation 30
6.1 Solar Photovoltaic 31
6.2 Combined Heat and Power 32
7 Project Funding and Incentives 33
7.1 SmartStart 34
7.2 Direct Install 35
7.3 Pay for Performance - Existing Buildings 36
7.4 Combined Heat and Power 37
7.5 Energy Savings Improvement Program 38
7.6 Transition Incentive (TI) Program 39
8 Project Development 40
9 Energy Purchasing and Procurement Strategies 41
9.1 Retail Electric Supply Options 41
9.2 Retail Natural Gas Supply Options 41
Appendix A: Equipment Inventory & Recommendations A-1
Appendix B: ENERGY STAR® Statement of Energy Performance B-1
Appendix C: Glossary C-1

1 EXECUTIVE SUMMARY

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

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $89,067 Electricity: 450,333 kWh Natural Gas: 19,774 Therms	
ENERGY STAR® Benchmarking Score	75 *(1-100 scale)*	Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.

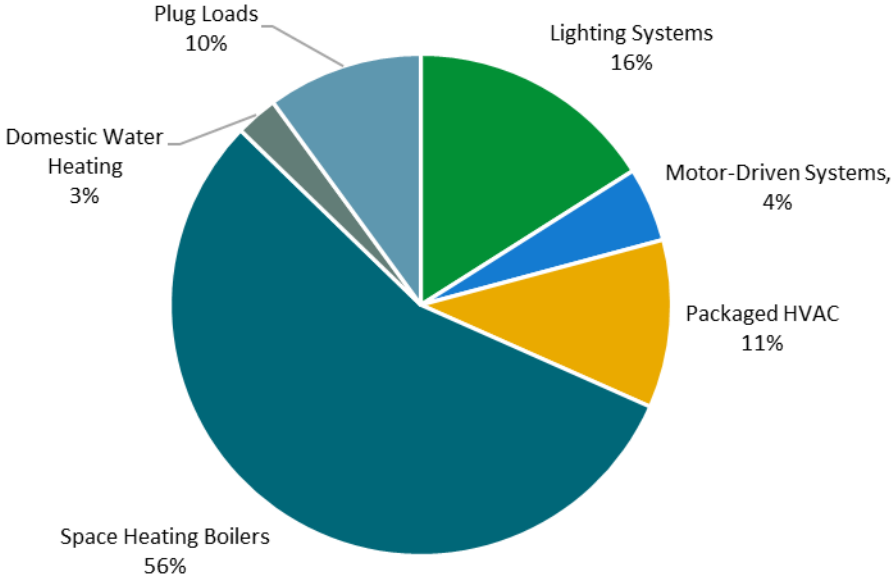


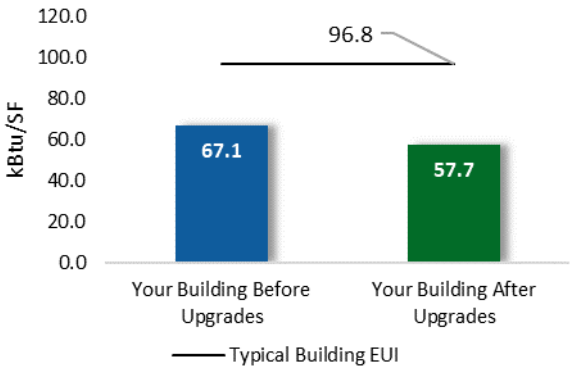
Figure 1 - Energy Use by System

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.

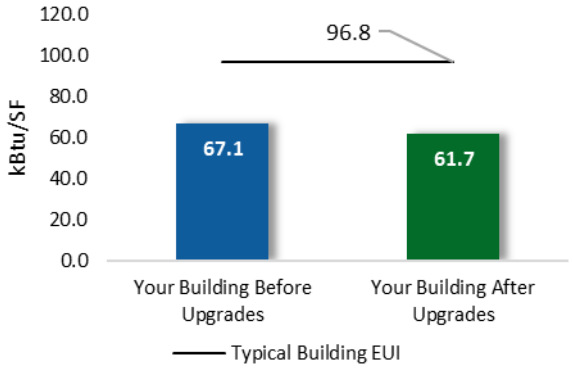
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$156,013
Potential Rebates & Incentives[1]	$32,088
Annual Cost Savings	$22,739
Annual Energy Savings	Electricity: 132,535 kWh Natural Gas: 2,035 Therms
Greenhouse Gas Emission Savings	79 Tons
Simple Payback	5.4 Years
Site Energy Savings (all utilities)	19%



Scenario 2: Cost Effective Package[2]

Installation Cost	$60,023
Potential Rebates & Incentives	$20,999
Annual Cost Savings	$19,704
Annual Energy Savings	Electricity: 122,994 kWh Natural Gas: 364 Therms
Greenhouse Gas Emission Savings	64 Tons
Simple Payback	2.0 Years
Site Energy Savings (all utilities)	13%



On-site Generation Potential

Photovoltaic	None
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	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**83,588**	**20.2**	**-17**	**$13,004**	**$34,484**	**$13,588**	**$20,896**	**1.6**	**82,142**
ECM 1	Install LED Fixtures	Yes	10,419	1.9	-2	$1,622	$3,739	$800	$2,939	1.8	10,253
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	2,563	0.5	-1	$399	$1,040	$200	$840	2.1	2,518
ECM 3	Retrofit Fixtures with LED Lamps	Yes	70,605	17.8	-15	$10,984	$29,705	$12,588	$17,117	1.6	69,371
Lighting Control Measures			**26,932**	**6.6**	**-6**	**$4,190**	**$17,237**	**$4,920**	**$12,317**	**2.9**	**26,461**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	21,726	5.6	-5	$3,380	$14,312	$3,530	$10,782	3.2	21,346
ECM 5	Install High/Low Lighting Controls	Yes	5,206	1.0	-1	$810	$2,925	$1,390	$1,535	1.9	5,115
Variable Frequency Drive (VFD) Measures			**10,863**	**2.4**	**0**	**$1,711**	**$7,495**	**$2,100**	**$5,395**	**3.2**	**10,939**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	10,863	2.4	0	$1,711	$7,495	$2,100	$5,395	3.2	10,939
Unitary HVAC Measures			**9,540**	**5.5**	**0**	**$1,502**	**$48,649**	**$5,465**	**$43,184**	**28.7**	**9,607**
ECM 7	Install High Efficiency Air Conditioning Units	No	3,494	2.0	0	$550	$27,645	$1,365	$26,280	47.8	3,519
ECM 8	Install High Efficiency Heat Pumps	No	6,046	3.5	0	$952	$21,003	$4,100	$16,903	17.8	6,089
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**167**	**$1,533**	**$47,341**	**$5,624**	**$41,717**	**27.2**	**19,556**
ECM 9	Install High Efficiency Steam Boilers	No	0	0.0	167	$1,533	$47,341	$5,624	$41,717	27.2	19,556
HVAC System Improvements			**0**	**0.0**	**54**	**$496**	**$492**	**$208**	**$284**	**0.6**	**6,323**
ECM 10	Install Pipe Insulation	Yes	0	0.0	54	$496	$492	$208	$284	0.6	6,323
Domestic Water Heating Upgrade			**0**	**0.0**	**5**	**$50**	**$86**	**$83**	**$3**	**0.1**	**634**
ECM 11	Install Low-Flow DHW Devices	Yes	0	0.0	5	$50	$86	$83	$3	0.1	634
Food Service & Refrigeration Measures			**1,612**	**0.2**	**0**	**$254**	**$230**	**$100**	**$130**	**0.5**	**1,623**
ECM 12	Vending Machine Control	Yes	1,612	0.2	0	$254	$230	$100	$130	0.5	1,623
TOTALS (COST EFFECTIVE MEASURES)			**122,994**	**29.5**	**36**	**$19,704**	**$60,023**	**$20,999**	**$39,024**	**2.0**	**128,122**
TOTALS (ALL MEASURES)			**132,535**	**35.0**	**203**	**$22,739**	**$156,013**	**$32,088**	**$123,925**	**5.4**	**157,285**

* - 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

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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	x	
ECM 6	Install VFDs on Constant Volume (CV) Fans	x	x	
ECM 7	Install High Efficiency Air Conditioning Units	x	x	
ECM 8	Install High Efficiency Heat Pumps	x	x	
ECM 9	Install High Efficiency Steam Boilers	x	x	
ECM 10	Install Pipe Insulation	x	x	
ECM 11	Install Low-Flow DHW Devices	x	x	
ECM 12	Vending Machine Control	x	x	

Figure 3 – Funding Options

New Jersey's 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. 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.	Incentives are paid out in three installments. The first installment is meant to help offset the costs of the initial engineering study. The subsequent incentives are paid based on the level of energy savings up to 50% of the total project cost. See Section 7.3 for all incentive details.
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 percent 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 percent 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 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 City Hall. 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.

2.1 Site Overview

On November 17, 2020, TRC performed an energy audit at City Hall located in Paterson, New Jersey. TRC met with Pascual Nieves to review the facility operations and help focus our investigation on specific energy-using systems.

City Hall is a four-story, 49,528 square foot building built in 1895. Spaces include hallways, offices, restrooms, storage and janitor closets, elevator rooms, and mechanical space.

The building is heated using a steam boiler serving the radiators. Cooling is provided using window AC units and a packaged AC unit. There have been no recent improvements or major concerns in the building.

2.2 Building Occupancy

The facility is occupied year-round. Typically, weekday occupancy is 200 staff and moving public population. It should be noted that the energy and economic analysis for this building is based on the use of the building during the utility billing period, and that results will vary based on changes to building use patterns.

Building Name	Weekday/Weekend	Operating Schedule
City Hall	Weekday	7:00 AM - 5:00 PM
	Weekend	No Operation

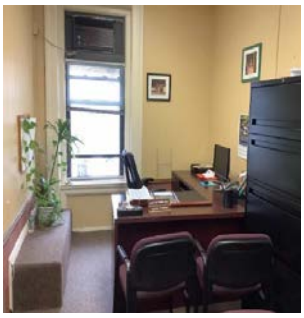
Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are formed from concrete masonry blocks. The building has a flat roof with a white membrane and no insulation. The roof is in fair condition.

The windows are double pane and in fair condition. Exterior doors are aluminum framed glass doors. The exterior doors are in good condition.

Exterior door



Windows

Exterior façade

Roof

2.4 Lighting Systems

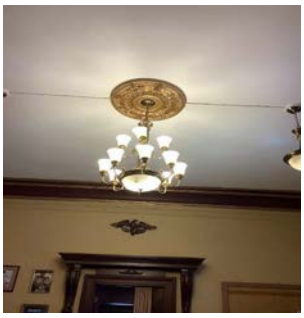
The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several 44-Watt U-bend T12 fixtures. Additionally, there are some 13-Watt compact fluorescent lamps (CFL), incandescent, and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Fixture types include 2-lamp, 3-lamp, or 4-lamp, 2-foot or 4-foot long troffer fixtures and 2-foot fixtures with U-bend tube lamps. Most fixtures are in good condition. All exit signs are 2-Watt LED units. Interior lighting levels were generally sufficient. Lighting fixtures in spaces are controlled by wall switches.

Most lighting fixtures are controlled manually by wall switches.

Exterior fixtures include wall packs with (44-Watt and 75-Watt) LED fixtures, fixtures with 70-Watt metal halide lamps and 12-Watt LED lamps. The exterior fixtures are controlled using photocells.

U-bend T8



6-lamp CFL fixtures

Exterior LED fixture

Exit signs

2.5 Air Handling Systems

Packaged Units

The Council Chambers are conditioned by one Lennox rooftop packaged air source heat pump unit which is controlled by an electric thermostat. The cooling capacity is 25 tons and the heating capacity is 200 MBh. The unit has an EER of 9.38. It is over 15 years old and past its useful life.

Refer to Appendix A for detailed information about each unit.

Thermostat

Lennox – Air Source HP

Unitary Electric HVAC Equipment

Various offices in the building are cooled using window AC units with an average cooling capacity of 1 ton. There are 42 such units with an average EER of 11.5.

The facility has four split AC units serving different spaces with capacities ranging from 1 ton to 5 tons. The 5-ton York unit is within its useful life. Other split AC units are all beyond their useful life and have been evaluated for replacement. The average EER of these units is 11.25. The split AC units are controlled using thermostats in the respective zones.

Split AC units

Condensing unit

Unitary Heating Equipment

Offices in the Purchasing Department are heated using two electric resistance heaters, each with a heating capacity of 8.3 MBh. Equipment is controlled by a manual dial thermostat.

Electric resistance heater

2.6 Heating Steam Systems

Heating in the building is provided by Rockmills Steel Corp steam boiler with an output capacity of 2343.30 MBh, serving the steam radiators located under the windows.

The setpoint in the building is set to 72°F. The boiler was installed in 1996, is well beyond its useful life, and has been evaluated for replacement.

The steam pipes were found to be uninsulated. Pipe insulation for the steam and condensate pipes have been evaluated.

Steam boiler

Radiators

Condensate pumps

Uninsulated pipes

2.7 Domestic Hot Water

Hot water is produced by a 50 gallon, 40 MBh gas-fired storage water heater rated at a 79% efficiency. The water heater was installed in 2015, is in good condition, and well maintained.

The pipes circulating hot water to the restrooms were observed to be uninsulated. An evaluation of 1.5" thickness pipe insulation for 30 feet of pipe has been made.

DHW

Uninsulated pipes

2.8 Plug Load & Vending Machines

You may wish to consider paying particular attention to minimizing your plug load usage. This report makes suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are 105 computer workstations throughout the facility. Plug loads throughout the building include general café and office equipment. There are several residential-style refrigerators throughout the building that are used to store food. These vary in condition and efficiency.

There is one refrigerated beverage vending machine not equipped with occupancy-based controls.

Copier

Space heater

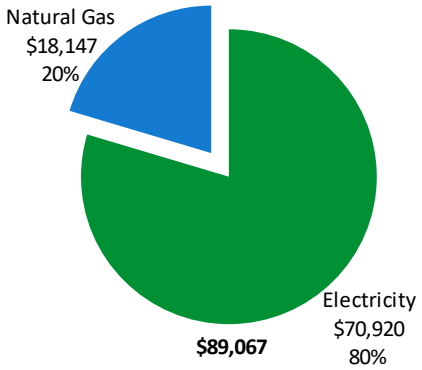
2.9 Water-Using Systems

The faucet flow rates are at 2.2 gallons per minute (gpm) or lower. Toilets are rated at 1.6 gallons per flush (gpf) and urinals are rated at 1.0 gpf.

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	450,333 kWh	$70,920
Natural Gas	19,774 Therms	$18,147
Total		**$89,067**



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.

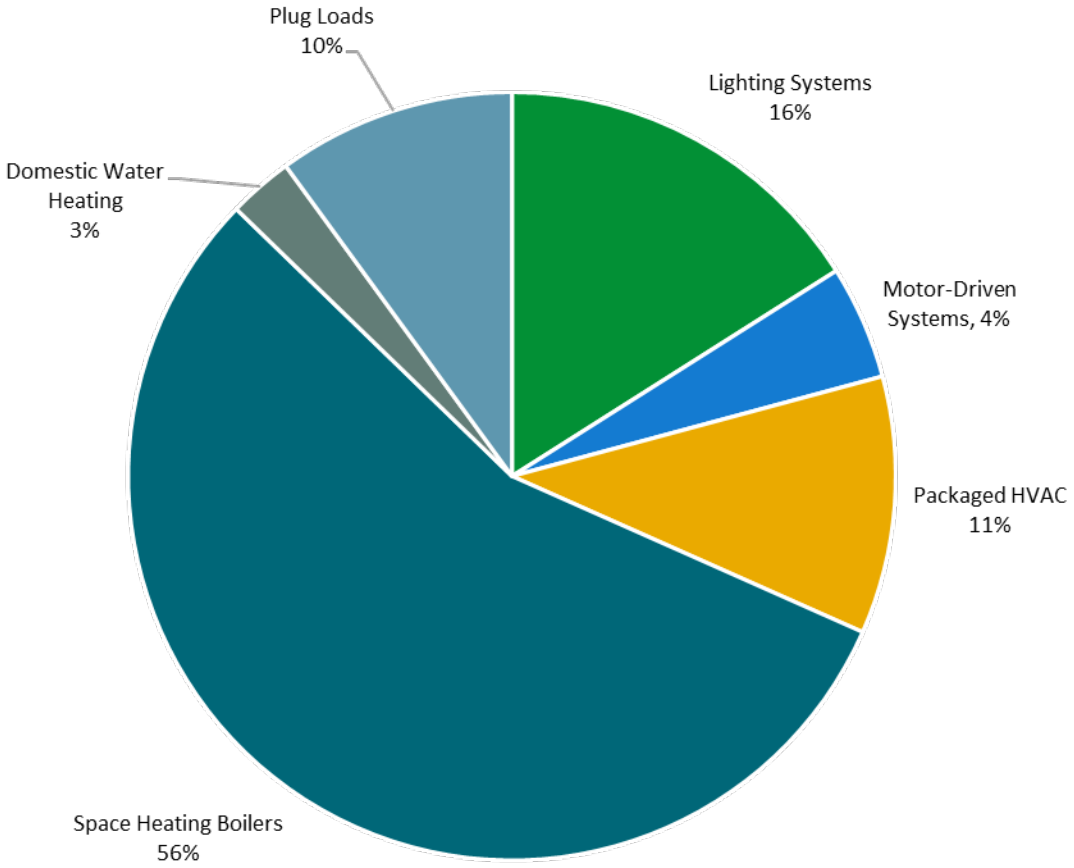
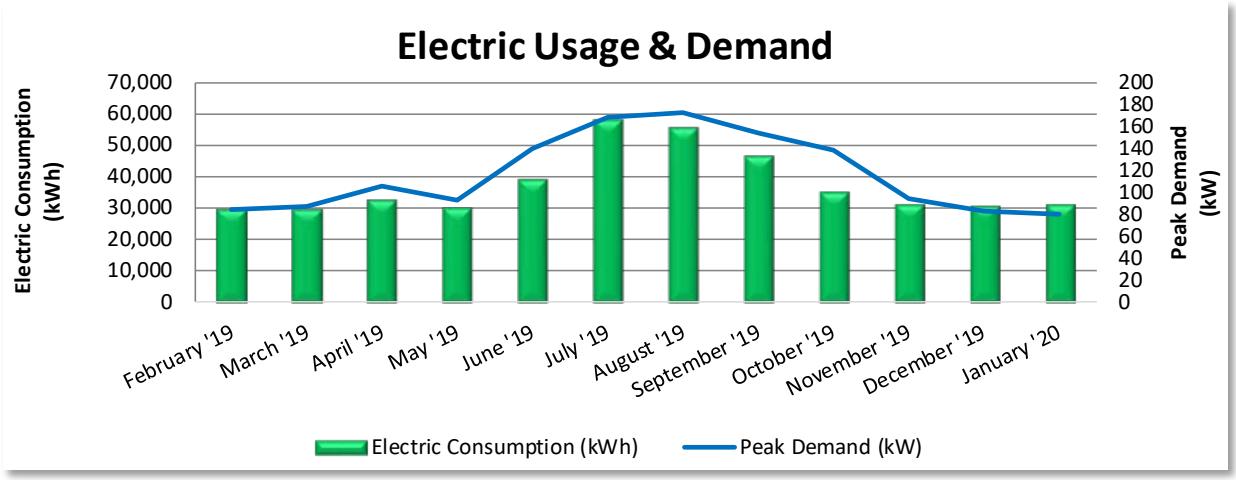


Figure 5 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class LPLS.



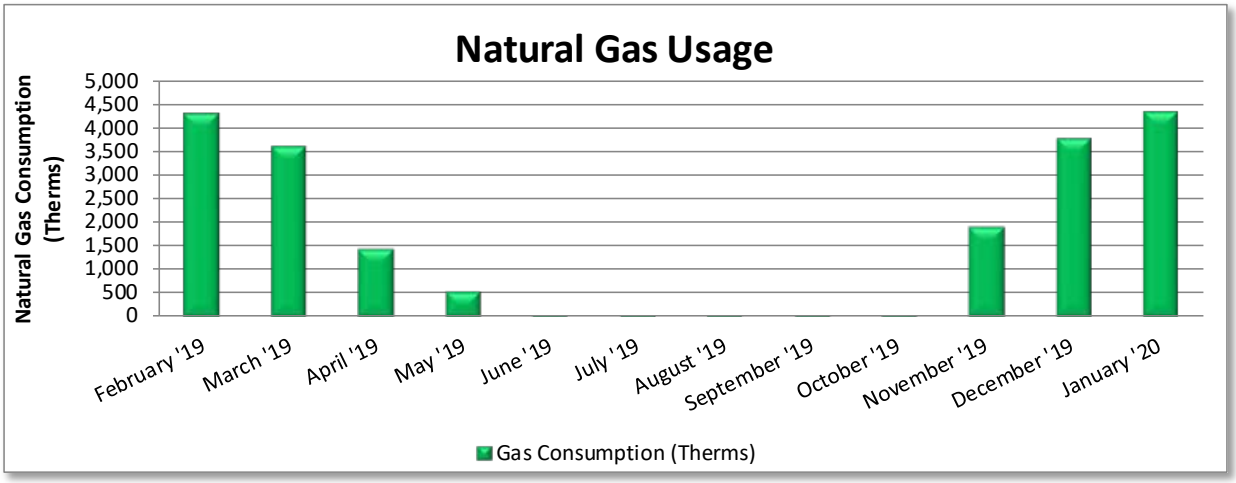
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
2/20/19	30	29,902	85	$318	$5,366
3/21/19	29	29,807	87	$325	$5,357
4/22/19	32	32,724	106	$398	$5,905
5/21/19	29	30,309	93	$348	$5,589
6/20/19	30	39,192	140	$526	$6,462
7/22/19	32	58,038	168	$2,129	$8,896
8/20/19	29	55,784	173	$2,189	$8,721
9/19/19	30	46,613	154	$1,946	$7,449
10/18/19	29	35,400	138	$518	$4,772
11/18/19	31	31,470	94	$354	$4,161
12/19/19	31	30,979	83	$314	$4,066
1/22/20	34	31,349	80	$301	$4,370
Totals	**366**	**451,567**	**173**	**$9,666**	**$71,114**
Annual	**365**	**450,333**	**173**	**$9,640**	**$70,920**

Notes:

- Peak demand of 173 kW occurred in August 2019.
- Average demand over the past 12 months was 117 kW.
- The average electric cost over the past 12 months was $0.157/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers natural gas under rate class LVG.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
2/20/19	30	4,281	$3,979
3/21/19	29	3,580	$3,312
4/22/19	32	1,421	$979
5/21/19	29	527	$441
6/20/19	30	18	$148
7/22/19	32	19	$148
8/21/19	30	17	$146
9/19/19	29	17	$146
10/18/19	29	20	$150
11/18/19	31	1,873	$2,007
12/19/19	31	3,744	$3,250
1/22/20	34	4,310	$3,491
Totals	**366**	**19,828**	**$18,197**
Annual	**365**	**19,774**	**$18,147**

Notes:

- The average gas cost for the past 12 months is $0.918/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	75

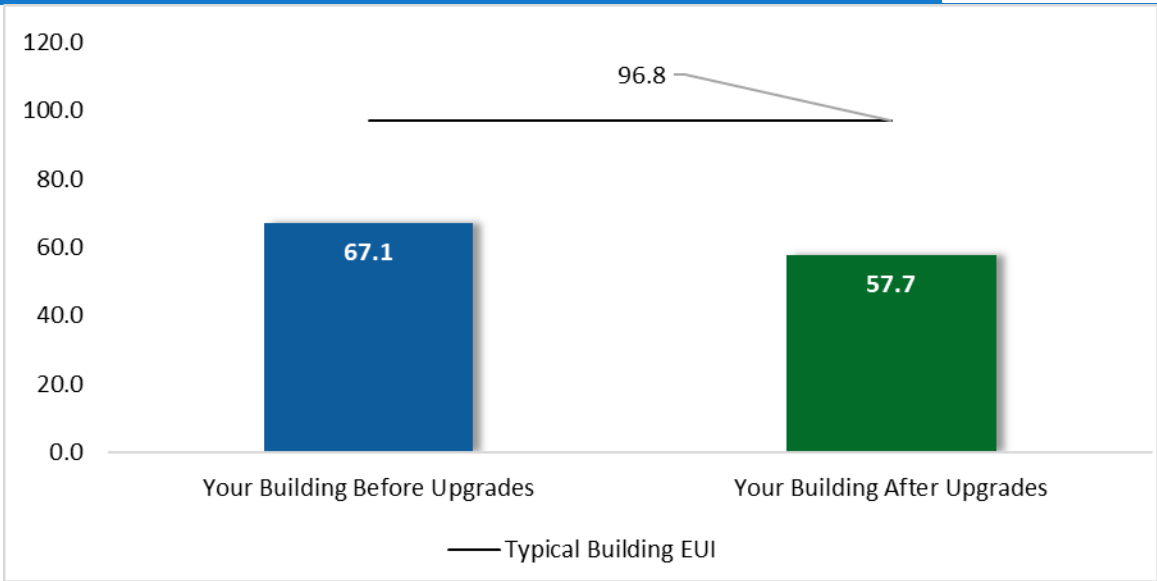


Figure 6 - Energy Use Intensity Comparison[3]

Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

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

4 Energy Conservation Measures

The goal of this audit report is to identify and evaluate potential energy efficiency improvements, 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's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

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

Financial incentives are based on 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.

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**83,588**	**20.2**	**-17**	**$13,004**	**$34,484**	**$13,588**	**$20,896**	**1.6**	**82,142**
ECM 1	Install LED Fixtures	Yes	10,419	1.9	-2	$1,622	$3,739	$800	$2,939	1.8	10,253
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	2,563	0.5	-1	$399	$1,040	$200	$840	2.1	2,518
ECM 3	Retrofit Fixtures with LED Lamps	Yes	70,605	17.8	-15	$10,984	$29,705	$12,588	$17,117	1.6	69,371
Lighting Control Measures			**26,932**	**6.6**	**-6**	**$4,190**	**$17,237**	**$4,920**	**$12,317**	**2.9**	**26,461**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	21,726	5.6	-5	$3,380	$14,312	$3,530	$10,782	3.2	21,346
ECM 5	Install High/Low Lighting Controls	Yes	5,206	1.0	-1	$810	$2,925	$1,390	$1,535	1.9	5,115
Variable Frequency Drive (VFD) Measures			**10,863**	**2.4**	**0**	**$1,711**	**$7,495**	**$2,100**	**$5,395**	**3.2**	**10,939**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	10,863	2.4	0	$1,711	$7,495	$2,100	$5,395	3.2	10,939
Unitary HVAC Measures			**9,540**	**5.5**	**0**	**$1,502**	**$48,649**	**$5,465**	**$43,184**	**28.7**	**9,607**
ECM 7	Install High Efficiency Air Conditioning Units	No	3,494	2.0	0	$550	$27,645	$1,365	$26,280	47.8	3,519
ECM 8	Install High Efficiency Heat Pumps	No	6,046	3.5	0	$952	$21,003	$4,100	$16,903	17.8	6,089
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**167**	**$1,533**	**$47,341**	**$5,624**	**$41,717**	**27.2**	**19,556**
ECM 9	Install High Efficiency Steam Boilers	No	0	0.0	167	$1,533	$47,341	$5,624	$41,717	27.2	19,556
HVAC System Improvements			**0**	**0.0**	**54**	**$496**	**$492**	**$208**	**$284**	**0.6**	**6,323**
ECM 10	Install Pipe Insulation	Yes	0	0.0	54	$496	$492	$208	$284	0.6	6,323
Domestic Water Heating Upgrade			**0**	**0.0**	**5**	**$50**	**$86**	**$83**	**$3**	**0.1**	**634**
ECM 11	Install Low-Flow DHW Devices	Yes	0	0.0	5	$50	$86	$83	$3	0.1	634
Food Service & Refrigeration Measures			**1,612**	**0.2**	**0**	**$254**	**$230**	**$100**	**$130**	**0.5**	**1,623**
ECM 12	Vending Machine Control	Yes	1,612	0.2	0	$254	$230	$100	$130	0.5	1,623
TOTALS			**132,535**	**35.0**	**203**	**$22,739**	**$156,013**	**$32,088**	**$123,925**	**5.4**	**157,285**

* - 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**83,588**	**20.2**	**-17**	**$13,004**	**$34,484**	**$13,588**	**$20,896**	**1.6**	**82,142**
ECM 1	Install LED Fixtures	10,419	1.9	-2	$1,622	$3,739	$800	$2,939	1.8	10,253
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,563	0.5	-1	$399	$1,040	$200	$840	2.1	2,518
ECM 3	Retrofit Fixtures with LED Lamps	70,605	17.8	-15	$10,984	$29,705	$12,588	$17,117	1.6	69,371
Lighting Control Measures		**26,932**	**6.6**	**-6**	**$4,190**	**$17,237**	**$4,920**	**$12,317**	**2.9**	**26,461**
ECM 4	Install Occupancy Sensor Lighting Controls	21,726	5.6	-5	$3,380	$14,312	$3,530	$10,782	3.2	21,346
ECM 5	Install High/Low Lighting Controls	5,206	1.0	-1	$810	$2,925	$1,390	$1,535	1.9	5,115
Variable Frequency Drive (VFD) Measures		**10,863**	**2.4**	**0**	**$1,711**	**$7,495**	**$2,100**	**$5,395**	**3.2**	**10,939**
ECM 6	Install VFDs on Constant Volume (CV) Fans	10,863	2.4	0	$1,711	$7,495	$2,100	$5,395	3.2	10,939
HVAC System Improvements		**0**	**0.0**	**54**	**$496**	**$492**	**$208**	**$284**	**0.6**	**6,323**
ECM 10	Install Pipe Insulation	0	0.0	54	$496	$492	$208	$284	0.6	6,323
Domestic Water Heating Upgrade		**0**	**0.0**	**5**	**$50**	**$86**	**$83**	**$3**	**0.1**	**634**
ECM 11	Install Low-Flow DHW Devices	0	0.0	5	$50	$86	$83	$3	0.1	634
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$254**	**$230**	**$100**	**$130**	**0.5**	**1,623**
ECM 12	Vending Machine Control	1,612	0.2	0	$254	$230	$100	$130	0.5	1,623
TOTALS		**122,994**	**29.5**	**36**	**$19,704**	**$60,023**	**$20,999**	**$39,024**	**2.0**	**128,122**

* - 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**83,588**	**20.2**	**-17**	**$13,004**	**$34,484**	**$13,588**	**$20,896**	**1.6**	**82,142**
ECM 1	Install LED Fixtures	10,419	1.9	-2	$1,622	$3,739	$800	$2,939	1.8	10,253
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,563	0.5	-1	$399	$1,040	$200	$840	2.1	2,518
ECM 3	Retrofit Fixtures with LED Lamps	70,605	17.8	-15	$10,984	$29,705	$12,588	$17,117	1.6	69,371

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 HID lamps with new LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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

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

Affected building areas: exterior and roof area metal halide 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: U-shape and straight tube T12 fluorescent fixtures.

ECM 3: Retrofit Fixtures with LED Lamps

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

This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected building areas: all areas with fluorescent fixtures with T8 tubes, incandescent lamps, and CFLs.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**26,932**	**6.6**	**-6**	**$4,190**	**$17,237**	**$4,920**	**$12,317**	**2.9**	**26,461**
ECM 4	Install Occupancy Sensor Lighting Controls	21,726	5.6	-5	$3,380	$14,312	$3,530	$10,782	3.2	21,346
ECM 5	Install High/Low Lighting Controls	5,206	1.0	-1	$810	$2,925	$1,390	$1,535	1.9	5,115

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

ECM 4: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend that lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

Affected building areas: offices

ECM 5: Install High/Low Lighting Controls

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

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety code requirements for egress. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full

lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. In parking lots and parking garages with significant ambient lighting, this control can sometimes be combined with photocell controls to turn the lights off when there is sufficient daylight.

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

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

Affected building areas: hallways.

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

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**10,863**	**2.4**	**0**	**$1,711**	**$7,495**	**$2,100**	**$5,395**	**3.2**	**10,939**
ECM 6	Install VFDs on Constant Volume (CV) Fans	10,863	2.4	0	$1,711	$7,495	$2,100	$5,395	3.2	10,939

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

ECM 6: Install VFDs on Constant Volume (CV) Fans

Install VFDs to control constant volume fan motor speeds. This converts a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one.

Zone thermostats signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature.

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

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

Affected air handlers: 25-ton Lennox rooftop air source heat pump. *Note*: This measure is recommended, however, the equipment is judged to be beyond useful life. Before implementing this measure, the facility should assess the equipment condition and may want to consider ECM 8 as an alternative.

4.4 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**9,540**	**5.5**	**0**	**$1,502**	**$48,649**	**$5,465**	**$43,184**	**28.7**	**9,607**
ECM 7	Install High Efficiency Air Conditioning Units	3,494	2.0	0	$550	$27,645	$1,365	$26,280	47.8	3,519
ECM 8	Install High Efficiency Heat Pumps	6,046	3.5	0	$952	$21,003	$4,100	$16,903	17.8	6,089

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 window ACs and split AC units is eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 7: Install High Efficiency Air Conditioning Units

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

Affected units: window ACs and Split AC units.

ECM 8: Install High Efficiency Heat Pumps

We evaluated replacing standard efficiency heat pumps with high efficiency heat pumps. A higher EER or SEER rating indicates a more efficient cooling system and a higher HSPF rating indicates more efficient heating mode. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average heating and cooling loads, and the estimated annual operating hours.

Affected units: 25-ton Lennox rooftop air source heat pump.

4.5 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**167**	**$1,533**	**$47,341**	**$5,624**	**$41,717**	**27.2**	**19,556**
ECM 9	Install High Efficiency Steam Boilers	0	0.0	167	$1,533	$47,341	$5,624	$41,717	27.2	19,556

ECM 9: Install High Efficiency Steam Boilers

Replace older inefficient steam boilers with high efficiency steam boilers. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

For the purposes of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load at this facility. In many cases installing multiple modular boilers rather than one or two large boilers will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boiler has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, the boiler has reached the end of its normal useful life. Typically, the marginal cost of purchasing high efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes.

4.6 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**54**	**$496**	**$492**	**$208**	**$284**	**0.6**	**6,323**
ECM 10	Install Pipe Insulation	0	0.0	54	$496	$492	$208	$284	0.6	6,323

ECM 10: Install Pipe Insulation

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

Affected Systems: DHW pipe, steam pipe and condensate pipe.

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**5**	**$50**	**$86**	**$83**	**$3**	**0.1**	**634**
ECM 11	Install Low-Flow DHW Devices	0	0.0	5	$50	$86	$83	$3	0.1	634

ECM 11: Install Low-Flow DHW Devices

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

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

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. Additional cost savings may result from reduced water usage.

4.8 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$254**	**$230**	**$100**	**$130**	**0.5**	**1,623**
ECM 12	Vending Machine Control	1,612	0.2	0	$254	$230	$100	$130	0.5	1,623

ECM 12: Vending Machine Control

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

5 Energy Efficient Best Practices

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

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

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Lighting Maintenance

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

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

Motor Maintenance

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

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

Thermostat Schedules and Temperature Resets

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Steam Trap Repair and Replacement

Steam traps are a crucial part of delivering heat from the boiler to the space heating units. Steam traps are automatic valves that remove condensate from the system. If the traps fail closed, condensate can build up in the steam supply side of the trap which reduces the flow in the steam lines and thermal capacity of the radiators. Or they may fail open, allowing steam into the condensate return lines resulting in wasted energy, water and hammering. Losses can be significantly reduced by testing and replacing equipment as they start to fail. Repair or replace traps that are blocked or allowing steam to pass. Inspect steam traps as part of a regular steam system maintenance plan.

Boiler Maintenance

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

Water Heater Maintenance

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

Also, preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to drain a few gallons out of the

water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Annual checks should include checks for:

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

Water Conservation

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

For more information regarding water conservation go to the EPA's WaterSense® 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.

Procurement Strategies

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

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

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

6 On-site Generation

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

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

6.1 Solar Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has no potential for installing a PV array.

This facility does not appear to meet the minimum criteria for a cost-effective solar PV installation. To be cost-effective, a solar PV array needs certain minimum criteria, such as sufficient and sustained electric demand and sufficient flat or south-facing rooftop or other unshaded space on which to place the PV panels.

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

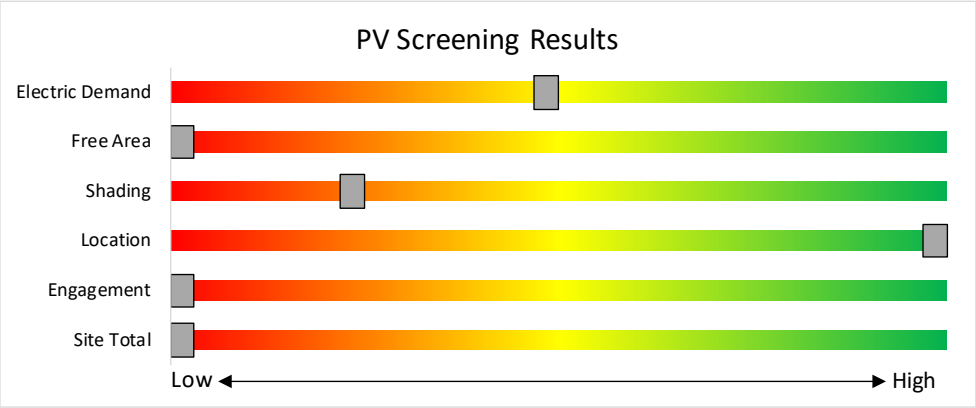


Figure 9 - Photovoltaic Screening

Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects prior to the start of construction to establish the project's eligibility to earn TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installation.

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

Transition Incentive (TI) Program: https://www.njcleanenergy.com/renewable-energy/programs/transition-incentive-program

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

6.2 Combined Heat and Power

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

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

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

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

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.

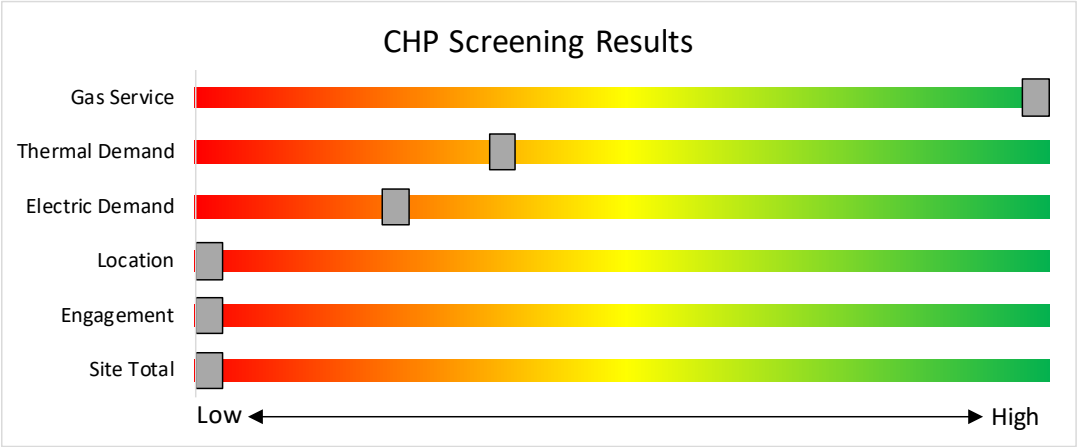


Figure 10 - Combined Heat and Power Screening

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's 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.	Incentives are paid out in three installments. The first installment is meant to help offset the costs of the initial engineering study. The subsequent incentives are paid based on the level of energy savings up to 50% of the total project cost. See Section 7.3 for all incentive details.
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-efficient 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 percent 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 percent of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30 percent 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 Pay for Performance - Existing Buildings

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 that results in at least 15 percent source energy savings, and lighting cannot make up the majority of the savings.

P4P is a generally a good option for medium-to-large sized facilities looking to implement as many measures as possible under a single project to achieve deep energy savings. This program has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program.

Based on the site building and utility data provided, the facility does not meet the requirements of the current P4P program.

Incentives

Incentives are based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

Contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, they will help further evaluate the measures identified in this report through development of the energy reduction plan), assist you in implementing selected measures, and verify actual savings one year after the installation. Your Partner will also help you apply for incentives.

Approval of the final scope of work is required by the program prior to installation. Installation can be done by the contractor of your choice (some P4P Partners are also contractors) or by internal staff, but the Partner remains involved throughout construction to ensure compliance with the program requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at www.njcleanenergy.com/P4P.

7.4 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

7.5 Energy Savings Improvement Program

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

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

How to Participate

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

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

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

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

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

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

7.6 Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects prior to the start of construction to establish the project's eligibility to earn TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installations. NJBPU calculates the value of a Transition Renewable Energy Certificate (TREC) by multiplying the base compensation rate ($152/MWh) by the project's assigned factor (i.e. $152 x 0.85 = $129.20/MWh). The TREC factors are defined based on the chart below:

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

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

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

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

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

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

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

8 Project Development

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

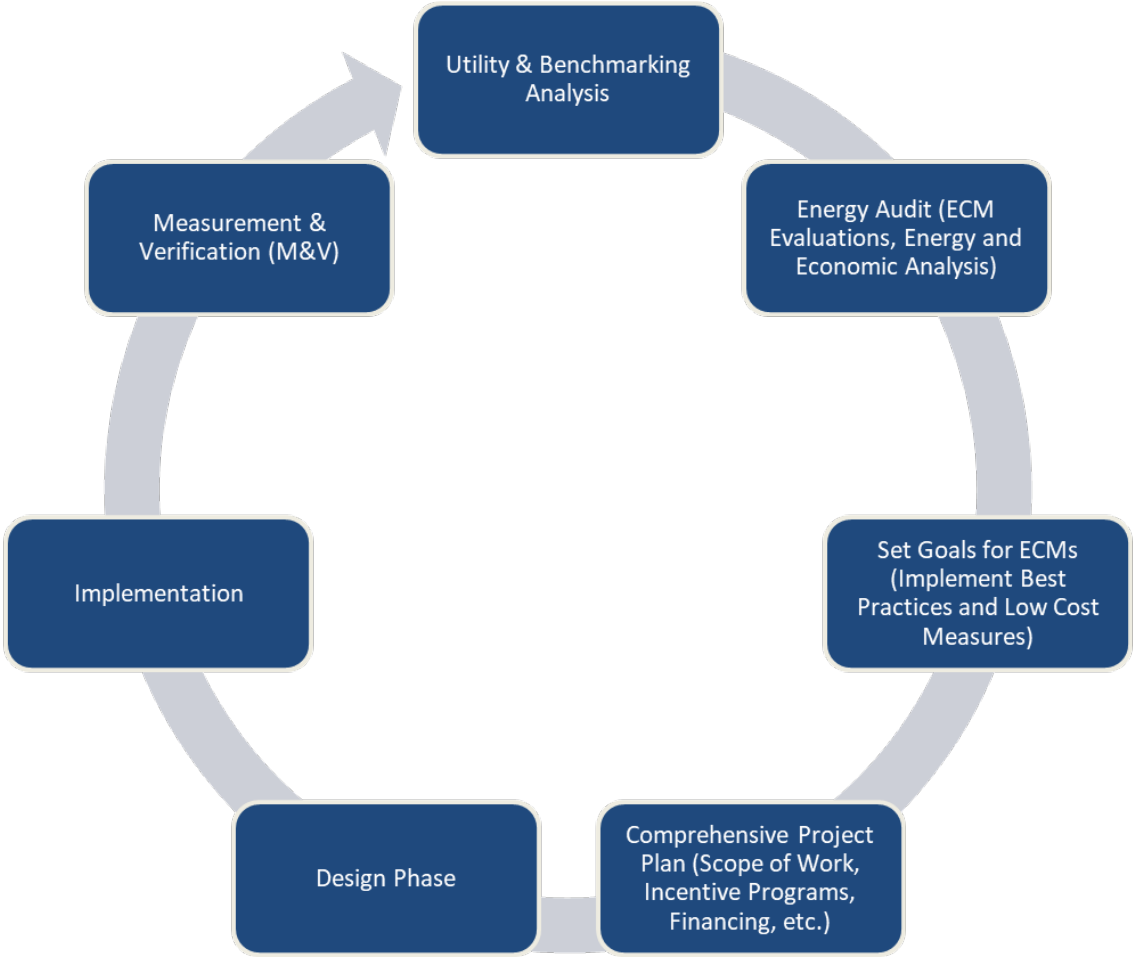


Figure 11 – Project Development Cycle

9 Energy Purchasing and Procurement Strategies

9.1 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].

9.2 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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
1st Fl Hallway	5	Compact Fluorescent: (6) 13W Spiral Plug-In Lamps	Wall Switch	S	78	4,420	3, 5	Relamp	Yes	5	LED Lamps: (6) 13W Spiral Plug-In Lamps	High/Low Control	55	3,050	0.2	974	0	$151	$742	$285	3.0
1st Fl Hallway	1	Compact Fluorescent: (8) 13W Spiral Plug-In Lamps	None	S	104	4,420	3, 5	Relamp	Yes	1	LED Lamps: (8) 13W Spiral Plug-In Lamps	High/Low Control	73	3,050	0.1	261	0	$41	$363	$86	6.8
1st Fl Hallway	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
1st Fl Hallway	4	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Wall Switch	S	88	4,420	2, 5	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	3,050	0.2	1,269	0	$197	$419	$80	1.7
1st Fl Lobby	1	Compact Fluorescent: (12) 13W Spiral Plug-In Lamps	None	S	156	4,420	3	Relamp	No	1	LED Lamps: (12) 13W Spiral Plug-In Lamps	None	110	4,420	0.0	224	0	$35	$207	$24	5.3
1st Fl Lobby	6	Compact Fluorescent: (6) 13W Spiral Plug-In Lamps	Wall Switch	S	78	4,420	3, 5	Relamp	Yes	6	LED Lamps: (6) 13W Spiral Plug-In Lamps	High/Low Control	55	3,050	0.2	1,168	0	$182	$845	$72	4.3
1st Fl Lobby	1	Compact Fluorescent: (4) 18W Spiral Plug-In Lamps	Wall Switch	S	72	4,420	3, 5	Relamp	Yes	1	LED Lamps: (4) 18W Spiral Plug-In Lamps	High/Low Control	51	3,050	0.0	179	0	$28	$69	$8	2.2
1st Fl Lobby	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
Accounts and Control Offices	1	Compact Fluorescent: (2) 13W Spiral Plug-In Lamps	Wall Switch	S	26	3,380	3	Relamp	No	1	LED Lamps: (2) 13W Spiral Plug-In Lamps	Wall Switch	19	3,380	0.0	26	0	$4	$34	$4	7.5
Accounts and Control Offices	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.4	1,717	0	$267	$672	$290	1.4
Accounts and Control Offices	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	S	93	3,380	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,332	0.2	703	0	$109	$434	$160	2.5
Accounts and Control Offices	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None	S	114	3,380	3, 4	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	0.3	1,375	0	$214	$635	$270	1.7
Billable Offices	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
Billable Offices	26	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	26	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	1.8	7,151	-1	$1,113	$2,439	$1,180	1.1
Exterior	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		44	4,380		None	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	44	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None		75	8,760		None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	75	8,760	0.0	0	0	$0	$0	$0	0.0
Exterior	1	LED Lamps: (1) 12W Plug-In Lamps	Wall Switch		12	2,600		None	No	1	LED Lamps: (1) 12W Plug-In Lamps	Wall Switch	12	2,600	0.0	0	0	$0	$0	$0	0.0
Exterior	2	Metal Halide: (1) 70W Lamp	Photocell		95	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	21	4,380	0.0	648	0	$102	$412	$200	2.1
Finance Directors Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	0.4	1,650	0	$257	$708	$310	1.6
Insurance Manager Offices	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.5	1,873	0	$291	$708	$310	1.4
Men Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,420	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,050	0.1	719	0	$112	$416	$150	2.4
Tax Assessors Office	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
Tax Assessors Office	33	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	33	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	2.3	9,077	-2	$1,412	$3,220	$1,530	1.2
2nd Fl Hallway	1	Compact Fluorescent: (1) 42W Plug-in Lamps	Wall Switch	S	42	4,420	3, 5	Relamp	Yes	1	LED Lamps: (1) 42W Plug-in Lamps	High/Low Control	30	3,050	0.0	104	0	$16	$242	$72	10.6
2nd Fl Hallway	5	Compact Fluorescent: (6) 13W Spiral Plug-In Lamps	Wall Switch	S	78	4,420	3, 5	Relamp	Yes	5	LED Lamps: (6) 13W Spiral Plug-In Lamps	High/Low Control	55	3,050	0.2	974	0	$151	$742	$285	3.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
2nd Fl Hallway	1	Compact Fluorescent: (8) 13W Spiral Plug-In Lamps	None	S	104	4,420	3, 5	Relamp	Yes	1	LED Lamps: (8) 13W Spiral Plug-In Lamps	High/Low Control	73	3,050	0.1	261	0	$41	$363	$86	6.8
2nd Fl Hallway	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
2nd Fl Hallway	2	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Wall Switch	S	88	4,420	2, 5	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	3,050	0.1	634	0	$99	$209	$40	1.7
2nd Fl Lobby	1	Compact Fluorescent: (12) 13W Spiral Plug-In Lamps	None	S	156	4,420	3	Relamp	No	1	LED Lamps: (12) 13W Spiral Plug-In Lamps	None	110	4,420	0.0	224	0	$35	$207	$24	5.3
2nd Fl Lobby	6	Compact Fluorescent: (6) 13W Spiral Plug-In Lamps	Wall Switch	S	78	4,420	3, 5	Relamp	Yes	6	LED Lamps: (6) 13W Spiral Plug-In Lamps	High/Low Control	55	3,050	0.2	1,168	0	$182	$845	$72	4.3
2nd Fl Lobby	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
3rd Fl Hallway	5	Compact Fluorescent: (6) 13W Spiral Plug-In Lamps	Wall Switch	S	78	4,420	3, 5	Relamp	Yes	5	LED Lamps: (6) 13W Spiral Plug-In Lamps	High/Low Control	55	3,050	0.2	974	0	$151	$742	$285	3.0
3rd Fl Hallway	1	Compact Fluorescent: (8) 13W Spiral Plug-In Lamps	None	S	104	4,420	3, 5	Relamp	Yes	1	LED Lamps: (8) 13W Spiral Plug-In Lamps	High/Low Control	73	3,050	0.1	261	0	$41	$363	$86	6.8
3rd Fl Hallway	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
3rd Fl Hallway	2	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Wall Switch	S	88	4,420	2, 5	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	3,050	0.1	634	0	$99	$209	$40	1.7
3rd Fl Lobby	1	Compact Fluorescent: (12) 13W Spiral Plug-In Lamps	None	S	156	4,420	3	Relamp	No	1	LED Lamps: (12) 13W Spiral Plug-In Lamps	None	110	4,420	0.0	224	0	$35	$207	$24	5.3
3rd Fl Lobby	6	Compact Fluorescent: (6) 13W Spiral Plug-In Lamps	Wall Switch	S	78	4,420	3, 5	Relamp	Yes	6	LED Lamps: (6) 13W Spiral Plug-In Lamps	High/Low Control	55	3,050	0.2	1,168	0	$182	$845	$72	4.3
3rd Fl Lobby	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
Business Admin Office	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
Business Admin Office	14	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	40	3,380	4	None	Yes	14	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	40	2,332	0.2	645	0	$100	$270	$70	2.0
City Clerk's Offices	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
City Clerk's Offices	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.2	624	0	$97	$416	$150	2.7
City Clerk's Offices	38	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,380	3, 4	Relamp	Yes	38	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,332	2.3	8,899	-2	$1,384	$2,891	$1,350	1.1
City Clerk's Offices	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None	S	114	3,380	3, 4	Relamp	Yes	13	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	0.9	3,576	-1	$556	$1,219	$590	1.1
City Council Chambers	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
City Council Chambers	7	Incandescent: (1) 60W Screw-in Lamps	Wall Switch	S	60	3,380	3, 4	Relamp	Yes	7	LED Lamps: (1) 60W Screw-in Lamps	Occupancy Sensor	9	2,332	0.4	1,400	0	$218	$391	$84	1.4
City Council Chambers	28	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	28	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	2.0	7,702	-2	$1,198	$2,585	$1,260	1.1
City Council Conference Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	0.4	1,650	0	$257	$708	$310	1.6
City Council Main Office	8	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	40	3,380	4	None	Yes	8	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	40	2,332	0.1	369	0	$57	$270	$70	3.5
City Council Main Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	3,380	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.1	312	0	$49	$343	$110	4.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
City Council Main Office	19	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	19	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	1.3	5,226	-1	$813	$1,928	$900	1.3
City Council President Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	0.3	1,100	0	$171	$562	$230	1.9
City Council President Offices	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	0.3	1,375	0	$214	$635	$270	1.7
Department of Law	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
Department of Law	31	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	40	3,380	4	None	Yes	31	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	40	2,332	0.4	1,429	0	$222	$810	$210	2.7
Department of Law	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,380	4	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.0	134	0	$21	$270	$70	9.6
Mayor Office	3	Compact Fluorescent: (6) 13W Spiral Plug-In Lamps	Wall Switch	S	78	3,380	3, 4	Relamp	Yes	3	LED Lamps: (6) 13W Spiral Plug-In Lamps	Occupancy Sensor	55	2,332	0.1	447	0	$69	$580	$106	6.8
Mayor Office	20	LED Lamps: (1) 15W BR30 Screw-In Lamp	Wall Switch	S	15	3,380	4	None	Yes	20	LED Lamps: (1) 15W BR30 Screw-In Lamp	Occupancy Sensor	15	2,332	0.1	346	0	$54	$540	$140	7.4
Mayor Office	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	1.3	4,951	-1	$770	$1,855	$860	1.3
Men Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,420	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,420	0.0	141	0	$22	$72	$20	2.4
Men Restroom by Law Office	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,420	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,050	0.1	381	0	$59	$261	$40	3.7
Restroom by Law Office	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,420	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,050	0.1	381	0	$59	$261	$80	3.0
Stairs to 2nd Floor	2	Compact Fluorescent: (6) 13W Spiral Plug-In Lamps	Wall Switch	S	78	4,420	3	Relamp	No	2	LED Lamps: (6) 13W Spiral Plug-In Lamps	Wall Switch	55	4,420	0.0	224	0	$35	$207	$24	5.3
Stairs to 2nd Floor	1	Compact Fluorescent: (8) 13W Spiral Plug-In Lamps	None	S	104	4,420	3	Relamp	No	1	LED Lamps: (8) 13W Spiral Plug-In Lamps	None	73	4,420	0.0	151	0	$23	$138	$16	5.2
Women Restroom	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	40	4,420	4	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	40	3,050	0.0	121	0	$19	$270	$70	10.7
4th Fl Hallway	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
4th Fl Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,420	3, 5	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	3,050	0.2	1,079	0	$168	$444	$330	0.7
Balcony	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
Balcony	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,380	0.1	368	0	$57	$110	$60	0.9
Purchasing Department	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	1.1	4,401	-1	$685	$1,708	$780	1.4
Purchasing Director	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	0.2	825	0	$128	$489	$190	2.3
Purchasing Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,420	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,420	0.1	272	0	$42	$73	$40	0.8
Stairs to 3rd Floor	1	Compact Fluorescent: (2) 13W Spiral Plug-In Lamps	Wall Switch	S	26	4,420	3	Relamp	No	1	LED Lamps: (2) 13W Spiral Plug-In Lamps	Wall Switch	19	4,420	0.0	34	0	$5	$34	$4	5.8
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,000	3, 4	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	690	0.3	326	0	$51	$562	$160	7.9
Women Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,420	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,420	0.0	141	0	$22	$72	$20	2.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Women Restroom	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,420	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,050	0.1	381	0	$59	$415	$110	5.1
Basement Custodian Lounge	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
Basement Custodian Lounge	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	58	3,380		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	58	3,380	0.0	0	0	$0	$0	$0	0.0
Basement Hallway	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Basement Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	S	133	4,420	3, 5	Relamp	Yes	6	LED - Linear Tubes: (6) 4' Lamps	High/Low Control	87	3,050	0.4	2,138	0	$333	$882	$585	0.9
Basement Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,420	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,050	0.2	817	0	$127	$146	$80	0.5
Basement Lobby	3	Compact Fluorescent: (6) 18W Spiral Plug-In Lamps	Wall Switch	S	108	3,380	3, 5	Relamp	Yes	3	LED Lamps: (6) 18W Spiral Plug-In Lamps	High/Low Control	76	2,332	0.2	620	0	$96	$535	$36	5.2
Basement Lobby	1	Compact Fluorescent: (8) 18W Spiral Plug-In Lamps	None	S	144	3,380	3	Relamp	No	1	LED Lamps: (8) 18W Spiral Plug-In Lamps	None	101	3,380	0.0	160	0	$25	$138	$16	4.9
Basement Lobby	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
Basement Lobby	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	3,380	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	3,380	0.0	123	0	$19	$37	$20	0.9
Basement Lobby	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 5	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,332	0.1	550	0	$86	$146	$80	0.8
Boiler Room	1	Compact Fluorescent: (1) 13W Spiral Plug-In Lamp	Wall Switch	S	13	1,000	3	Relamp	No	1	LED Lamps: (1) 13W Spiral Plug-In Lamp	Wall Switch	10	1,000	0.0	3	0	$1	$17	$2	29.7
Boiler Room	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
Boiler Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,000	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	690	0.1	92	0	$14	$189	$80	7.6
Elevator	4	Linear Fluorescent - EST12: 4' T12 (34W) - 1L	Wall Switch	S	43	3,380	2	Relamp & Reballast	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,380	0.1	424	0	$66	$202	$40	2.5
IT Office	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
IT Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	3,380	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.1	312	0	$49	$189	$80	2.2
IT Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,380	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,332	0.1	550	0	$86	$262	$120	1.7
IT Office	46	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	46	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,332	1.7	6,709	-1	$1,044	$4,413	$1,200	3.1
Janitor Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,000	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	690	0.1	92	0	$14	$189	$80	7.6
Janitor Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,000	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,000	0.0	32	0	$5	$72	$20	10.6
Security Office	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,420	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,050	0.1	763	0	$119	$560	$150	3.5
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,000	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	690	0.2	185	0	$29	$416	$80	11.7
Storage 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,000	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	690	0.2	185	0	$29	$416	$80	11.7
Supply Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,000	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,000	0.1	62	0	$10	$73	$40	3.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Tax Assessors Office	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
Tax Assessors Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,380	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,332	0.5	1,873	0	$291	$708	$310	1.4
Elevator Room	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	1,000	4	None	Yes	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	690	0.0	7	0	$1	$116	$40	71.6
Roof	6	Metal Halide: (1) 400W Lamp	Timeclock	S	458	4,380	1	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	120	4,380	1.9	9,771	-2	$1,520	$3,327	$600	1.8

Motor Inventory & Recommendations

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Roof	1	Supply Fan	7.5	90.0%	No	Lennox	DSS1-C300-00-176-3R	B	4,015	6	No	91.0%	Yes	1	2.2	9,545	0	$1,503	$4,738	$2,000	1.8
Roof	Roof	1	Return Fan	0.8	74.0%	No	Lennox	DSS1-C300-00-176-3R	B	4,015	6	No	81.1%	Yes	1	0.3	1,318	0	$208	$2,756	$100	12.8
Roof	Various	3	Supply Fan	0.5	70.0%	No	Unknown	Unknown	B	4,015		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Elevator	2	Other	20.0	93.0%	No	Nidec		W	780		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room	Boiler	1	Combustion Air Fan	1.0	85.5%	No	Industrial combustion	FPG-28	W	2,745		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room	Boiler	1	Condensate Pump	0.3	60.0%	No	GE Motors	5KH37NN265HX	W	4,380		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Building	Building	39	Supply Fan	0.1	60.0%	No			W	1,000		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Accounts and Control Offices	Accounts and Control Offices	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Accounts and Control Offices	Accounts and Control Offices	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Accounts and Control Offices	Accounts and Control Offices	1	Window AC	0.67		12.10		Frigidaire	FFRE0833U10	W		No							0.0	0	0	$0	$0	$0	0.0
Billable Offices	Billable Offices	2	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Billable Offices	Billable Offices	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Finance Directors Office	Finance Directors Office	1	Window AC	1.25		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Finance Directors Office	Finance Directors Office	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Insurance Manager Offices	Insurance Manager Offices	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Tax Assessors Office	Tax Assessors Office	1	Window AC	2.33		12.00		Frigidaire	FFRA2822U20	W		No							0.0	0	0	$0	$0	$0	0.0
Tax Assessors Office	Tax Assessors Office	1	Window AC	2.33		12.00		Frigidaire	FFRA2822U20	W		No							0.0	0	0	$0	$0	$0	0.0
Business Admin Office	Business Admin Office	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Business Admin Office	Business Admin Office	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Business Admin Office	Business Admin Office	2	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
City Clerk's Offices	City Clerk's Offices	1	Window AC	1.00		10.80		Electrolux	FAC125P1A	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
City Clerk's Offices	City Clerk's Offices	2	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
City Clerk's Offices	City Clerk's Offices	1	Window AC	1.00		12.10		Frigidaire	FFRE123ZA11	W		No							0.0	0	0	$0	$0	$0	0.0
City Council Conference Room	City Council Conference Room	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
City Council Main Office	City Council Main Office	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
City Council Main Office	City Council Main Office	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
City Council Main Office	City Council Main Office	1	Window AC	1.00		12.10		Frigidaire	FFRE123ZA11	W		No							0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
City Council Main Office	City Council Main Office	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
City Council President Office	City Council President Office	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
City Council President Offices	City Council President Offices	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
Department of Law	Department of Law	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Department of Law	Department of Law	1	Window AC	0.67		12.10		Frigidaire	FFRE0833U10	W		No							0.0	0	0	$0	$0	$0	0.0
Department of Law	Department of Law	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
Mayor Office	Mayor Office	2	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Mayor Office	Mayor Office	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
Mayor Office	Mayor Office	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
Mayor Office	Mayor Office	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Purchasing Department	Purchasing Department	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
Purchasing Department	Purchasing Department	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
Purchasing Department	Purchasing Department	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
Purchasing Director	Purchasing Director	1	Window AC	1.00		10.80		Unknown	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	96	0	$15	$703	$0	46.5
Tax Assessors Office	Tax Assessors Office	1	Window AC	1.00		12.10		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior	General	1	Split-System	5.00		13.00		York	TCD60B31SA	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior	General	1	Split-System	1.00		11.00		Unknown	PA13NR03600	B	7	Yes	1	Split-System	1.00		16.00		0.2	295	0	$46	$5,392	$210	111.7
Exterior	General	1	Split-System	3.00		11.00		Carrier	Unknown	B	7	Yes	1	Split-System	3.00		16.00		0.5	884	0	$139	$6,286	$630	40.6
Roof	Roof	1	Split-System	2.50		10.00		Unknown	Unknown	B	7	Yes	1	Split-System	2.50		16.00		0.6	972	0	$153	$6,124	$525	36.6
Purchasing Department	Purchasing Department	1	Electric Resistance Heat		8.53		1 COP	None	None	W		No							0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Purchasing Director	Purchasing Director	1	Electric Resistance Heat		8.53		1 COP	None	None	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Roof	1	Packaged Air-Source HP	25.00	200.00	9.38	3.19659964758332 COP	Lennox	DSS1-C300-00-176-3R	B	8	Yes	1	Packaged Air-Source HP	25.00	200.00	12.00	3.2 COP	3.5	6,046	0	$952	$21,003	$4,100	17.8
IT room	IT room	1	Fan Coil	5.00		11.00		York/Guardian	RFCX60CP20MP23E	W		No							0.0	0	0	$0	$0	$0	0.0
City Clerk's office	City Clerk's Offices	1	Window AC	2.00		7.74		Movin Cool	Classic Plus 26	B		No							0.0	0	0	$0	$0	$0	0.0
IT office	IT office	1	Window AC	3.00		8.37		Movin Cool	Office Pro 36	B		No							0.0	0	0	$0	$0	$0	0.0

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	City hall	1	Forced Draft Steam Boiler	2,343	Rockmills Steel Corp	MP70	B	9	Yes	1	Forced Draft Steam Boiler	2,343	81.00%	Et	0.0	0	167	$1,533	$47,341	$5,624	27.2

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	DHW	10	30	0.75	0.0	0	10	$88	$216	$120	1.1
Boiler room	Steam pipe	10	14	6.00	0.0	0	36	$331	$176	$56	0.4
Boiler room	Condensate pipe	10	8	2.00	0.0	0	8	$77	$100	$32	0.9

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Floor B	1	Storage Tank Water Heater (≤ 50 Gal)	Bradford White	MI5036FBN	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
City Clerk's Offices	11	1	Faucet Aerator (Kitchen)	2.20	1.50	0.0	0	0	$2	$7	$4	1.8
Men Restroom	11	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$4	$7	$7	0.0
Mayor Office	11	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$4	$7	$7	0.0
Men Restroom	11	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$4	$7	$7	0.0
Men Restroom by Law Office	11	2	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	$9	$14	$14	0.0
Restroom by Law Office	11	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$4	$7	$7	0.0
Women Restroom	11	2	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	$9	$14	$14	0.0
Purchasing Resteoom	11	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$4	$7	$7	0.0
Women Restroom	11	2	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	$9	$14	$14	0.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
City hall various spaces	9	Coffee Machine	400			
City hall various spaces	5	Dehumidifier	1,300			
City hall various spaces	105	Desktop	145			
City hall various spaces	7	Electric space heater	1,500			
City hall various spaces	9	Fan	60			
City hall various spaces	3	Laptop	75			
City hall various spaces	14	Microwave	900			
City hall various spaces	1	Blower Unit	500			
City hall various spaces	1	Servers	2,000			
City hall various spaces	1	Communication Devices	800			
City hall various spaces	2	Blower Unit	500			
City hall various spaces	4	Servers	2,000			
City hall various spaces	8	Paper shredders	250			
City hall various spaces	74	Printer (Medium/Small)	60			
City hall various spaces	20	Printer/Copier (Large)	200			
City hall various spaces	1	Projector	200			
City hall various spaces	9	Refrigerator (Mini)	60			
City hall various spaces	6	Refrigerator (Residential)	80			
City hall various spaces	13	Television	100			
City hall various spaces	2	Toaster	900			
City hall various spaces	4	Toaster Oven	1,200			
City hall various spaces	11	Water cooler	520			

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
City Hall	1	Refrigerated	12	Yes	0.2	1,612	0	$254	$230	$100	0.5

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.

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ENERGY STAR® Statement of Energy Performance

75

ENERGY STAR® Score[1]

City of Paterson - City Hall

Primary Property Type: Office
Gross Floor Area (ft²): 49,528
Built: 1895

For Year Ending: March 31, 2020
Date Generated: December 28, 2020

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
City of Paterson - City Hall 155 Market Street Paterson, New Jersey 07505	City of Paterson 155 Market Street Paterson, NJ 07505 (973) 321-1600	Andre Sayegh 155 Market Street Paterson, NJ 07505 (973) 321-1600 asayegh@patersonnj.gov

Property ID: 3920468

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
67.1 kBtu/ft²

Source EUI
124.7 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	1,535,338 (46%)
Natural Gas (kBtu)	1,788,856 (54%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	96.8
National Median Source EUI (kBtu/ft²)	179.9
% Diff from National Median Source EUI	-31%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	242

Signature & Stamp of Verifying Professional

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

LP Signature: _____Date: _____

Licensed Professional

Andre Sayegh
155 Market Street
Paterson, NJ 07505
(973) 321-1600
asayegh@patersonnj.gov

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

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

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

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