Local Government Energy Audit Report

Cherry Hill Public Library

September 19, 2019

Prepared for:

Cherry Hill Public Library
1100 Kings Highway N
Cherry Hill, New Jersey 08034

Prepared by:

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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.

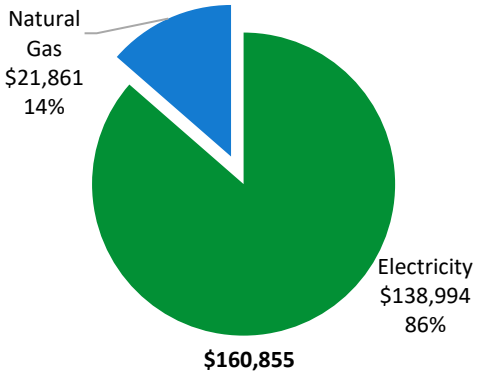
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

Table of Contents

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Cherry Hill Public Library. This report provides you with information about the Library's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in the Library. 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: $160,855 Electricity: 1,152,439 kWh Natural Gas: 27,768 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

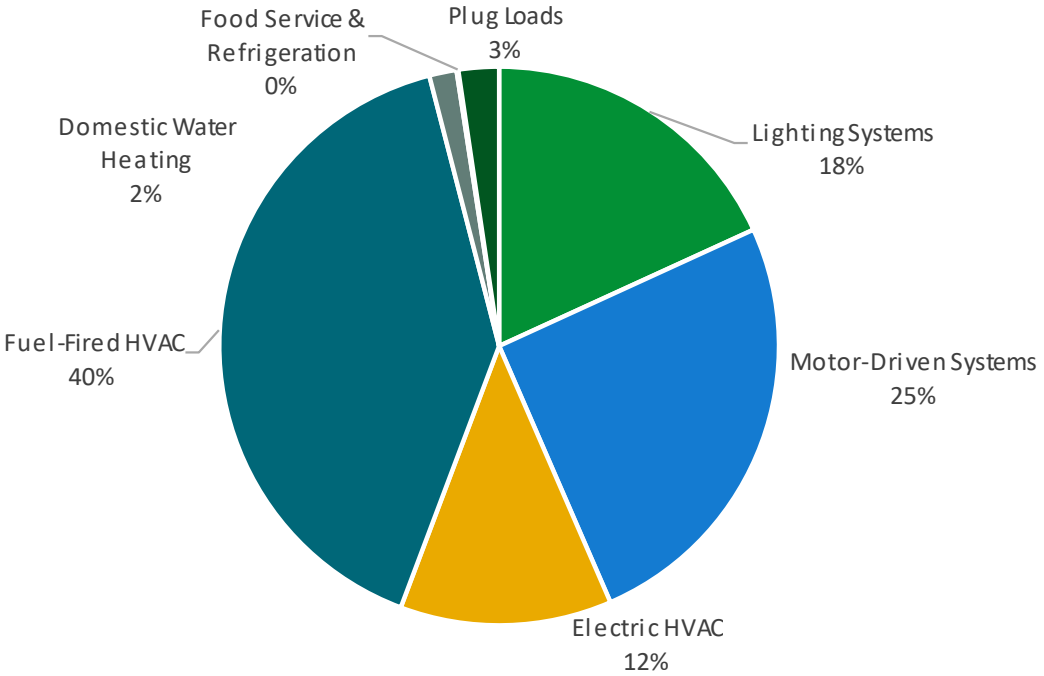


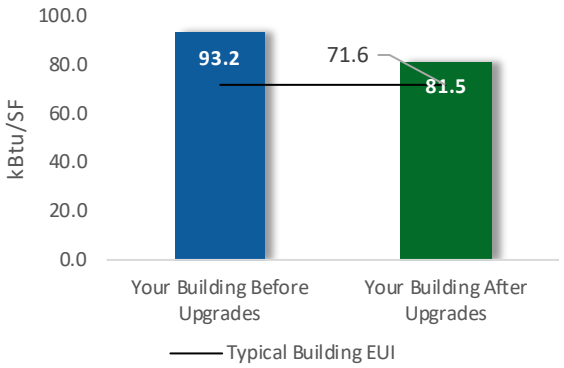
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

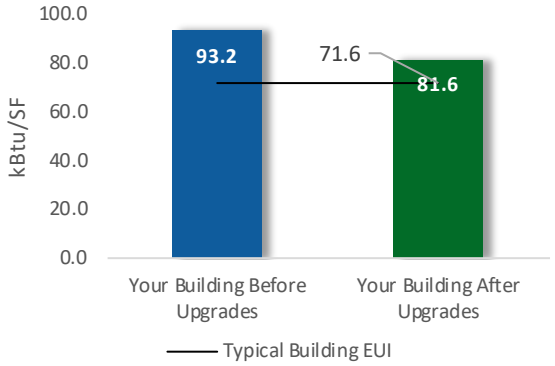
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$119,846
Potential Rebates & Incentives[1]	$13,850
Annual Cost Savings	$30,649
Annual Energy Savings	Electricity: 256,511 kWh
Greenhouse Gas Emission Savings	127 Tons
Simple Payback	3.5 Years
Site Energy Savings (all utilities)	13%



Scenario 2: Cost Effective Package[2]

Installation Cost	$118,157
Potential Rebates & Incentives	$13,845
Annual Cost Savings	$30,575
Annual Energy Savings	Electricity: 255,892 kWh
Greenhouse Gas Emission Savings	127 Tons
Simple Payback	3.4 Years
Site Energy Savings (all utilities)	12%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

[1] Incentives are based on current SmartStart Prescriptive incentives. Other program incentives may apply.

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

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Lifetime Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**171,868**	**42.3**	**-36**	**$20,445**	**$306,677**	**$63,104**	**$9,845**	**$53,259**	**2.6**	**168,851**
ECM 1	Install LED Fixtures	619	0.1	0	$74	$1,113	$1,688	$5	$1,683	22.7	616
ECM 2	Retrofit Fixtures with LED Lamps	171,249	42.2	-36	$20,371	$305,564	$61,416	$9,840	$51,576	2.5	168,235
Lighting Control Measures		**56,079**	**12.6**	**-12**	**$6,670**	**$53,357**	**$41,258**	**$4,005**	**$37,253**	**5.6**	**55,073**
ECM 3	Install Occupancy Sensor Lighting Controls	46,760	10.5	-10	$5,561	$44,490	$30,908	$4,005	$26,903	4.8	45,921
ECM 4	Install High/Low Lighting Controls	9,319	2.2	-2	$1,108	$8,867	$10,350	$0	$10,350	9.3	9,152
Variable Frequency Drive (VFD) Measures		**28,564**	**3.2**	**0**	**$3,445**	**$51,675**	**$15,455**	**$0**	**$15,455**	**4.5**	**28,763**
ECM 5	Install VFDs on Heating Water Pumps	28,564	3.2	0	$3,445	$51,675	$15,455	$0	$15,455	4.5	28,763
Domestic Water Heating Upgrade		**0**	**0.0**	**11**	**$90**	**$896**	**$29**	**$0**	**$29**	**0.3**	**1,333**
ECM 6	Install Low-Flow DHW Devices	0	0.0	11	$90	$896	$29	$0	$29	0.3	1,333
TOTALS (COST EFFECTIVE MEASURES)		**255,892**	**58.1**	**-37**	**$30,575**	**$411,492**	**$118,157**	**$13,845**	**$104,312**	**3.4**	**253,405**
TOTALS (ALL MEASURES)		**256,511**	**58.2**	**-37**	**$30,649**	**$412,605**	**$119,846**	**$13,850**	**$105,996**	**3.5**	**254,021**

* - 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 may 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		
ECM 2	Retrofit Fixtures with LED Lamps	X		
ECM 3	Install Occupancy Sensor Lighting Controls	X		
ECM 4	Install High/Low Lighting Controls			
ECM 5	Install VFDs on Hot Water Pumps			
ECM 6	Install Low-Flow Domestic Hot Water Devices			

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.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.

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

Individual Measures with SmartStart

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

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

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

More Options from Around the State

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

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

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

The CHP program provides incentives for combined heat and power (aka cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces electric loads at commercial facilities when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. By enabling commercial facilities to reduce 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 Cherry Hill Public Library. This report provides information on how the Library 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.

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

2.1 Site Overview

On June 25, 2019, TRC performed an energy audit at Cherry Hill Public Library located in Cherry Hill, New Jersey. TRC met with Jim Stamer to review the Library operations and help focus our investigation on specific energy-using systems.

Cherry Hill Public Library is a three-story, 72,000 square foot building built in 2004. Spaces include: a library open area, computer work rooms, conference rooms, offices, group study rooms, child services, a book storage area, a circular desk, corridors, stairwells, a staff lounge, and basement mechanical space.

Over the last several years, the Library has started replacing its existing fluorescent light fixtures with LED light fixtures. The site has an EMS to control the HVAC system. They recently installed two 130 tons chillers replacing one 250-ton chiller.

2.2 Building Occupancy

The Library is occupied year-round. Typical weekday occupancy is 63 staff people and approximately 1000 visitors.

The Library is open on weekends for public as per schedule on the following page. Maintenance activities goes all year around, as well.

Building Name	Weekday/Weekend	Operating Schedule
Cherry Hill Public Library	Weekday	Public (Mon-Thu: 9:30 AM - 9:00 PM, Fri: 9:30 AM - 5:00 PM) Staff (Mon-Thu: 7:00 AM - 10:00 PM, Fri: 7:00 AM - 6:00 PM)
	Weekend	Public (Sat: 9:30 AM - 5:00 PM, Sun: 11:00 AM - 5:00 PM) Staff (Sat: 8:30 AM - 6:00 PM, Sun: 11:00 AM - 6:00 PM)

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Exterior walls are made of brick and sheetrock interior finish.

The flat roof is supported with steel trusses and a metal deck and finished with an insulated layer and a covering of TPO. Steel trusses support a pitched roof with a metal deck covered with slate shingles. Roof encloses unconditioned space. The thermal barrier is between this space and the conditioned space below. The roof is in good condition.

Windows are double-glazed with low-e glass and have aluminum frames with a thermal break. The glass-to-frame seals are in good condition. The operable window weather seals are also in good condition, showing no evidence of excessive wear. Exterior doors have aluminum frames and are in good condition with undamaged door seals.

Flat Roof

Shingle Roof

Building Front

Windows

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps with electronic ballasts.

Fluorescent fixture types include 2- and 3-lamp, 2-, 3-, and 4-foot long troffer, recessed and surface-mounted fixtures and 2-foot fixtures with linear tube lamps.

The archway areas are served by manually controlled 28-Watt T5 linear fluorescent lamp up-light fixtures. The main level and lower level lobby fixtures have 50-, 75-, and 150-Watt halogen incandescent lamps and are manually controlled.

Conference center fixtures have 23-Watt LED Biax and 40-Watt compact fluorescent (CFL) Biax fixtures controlled by dimmer switches. Additionally, there are CFL, incandescent, and LED general purpose lamps. All exit signs are LED units.

Most fixtures are in good condition. Interior lighting levels were generally sufficient.

Most lighting fixtures are controlled manually, the remainder by occupancy sensors or dimmer switches.

Gallery Hall Lighting

Computer Room Lighting

Main Level Lighting

Cherry Little Room Lighting

Exterior fixtures include wall packs, canopy lights with 70-Watt high-pressure sodium and LED lamps. The pole-mounted parking lot fixtures have 54-Watt LED lamps.

Exterior light fixtures are controlled by a time clock or photocell, depending on the fixture.

Parking Lot

Pole-mounted Fixture

2.5 Air Handling Systems

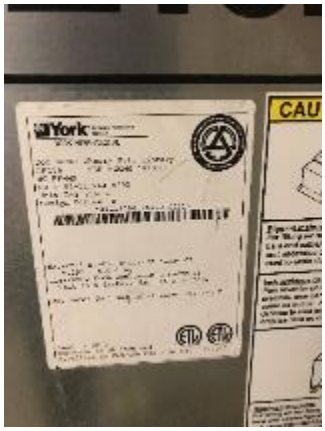
Packaged Units

Library areas are served with six air handling units. AHUs have heating and cooling coils, which received hot and chilled water from boilers and chillers, respectively. AHUs have supply fans ranging in size from 7.5 hp to 25 hp, return fans ranging in size from 3 hp to 10 hp.

Air Conditioners

The server room and computer work rooms use three split system air conditioning (AC) units to provide cooling. These vary in capacity between 2- and 4-tons. The units are in good condition. They range in efficiency between 9 EER to 9.7 EER. They are not ENERGY STAR® labeled.

Air Handler



AHU Nameplate

Split System AC

Data Room AC

2.6 Heating Hot Water Systems

Two Hydrotherm 1200 MBh hot water boilers with four modules each serve the building heating load needs. The burners are modulating with a nominal efficiency of 80%. The boilers are configured in an automated control scheme. Multiple boilers are required under high load conditions. Installed in 2003, they are in good condition. There is no service contract in place.

The boiler heating loop is configured in a constant flow primary distribution with three 10 hp constant speed hot water pumps operating with an automated lead/lag control scheme. The boilers provide hot water to air handling units throughout the building.

Hot water supply setpoint adjusts to 180°F as the outside air temperature drops to 55°F, and the setpoint is adjusted linearly to 120°F when the outside air is above 64°F.

Boilers

Hot Water Pumps

2.7 Chilled Water Systems

The chiller plant consists of a two 130-ton, Trane, R-22, water-cooled rotary chillers (CH1 and CH2). The chilled water loop is configured in a primary distribution loop with two 30-hp variable flow primary pumps (P- 1 and 2). Variable frequency drives (VFDs) control the primary distribution pumps.

The chilled water supply temperature is reset based on outside air temperature. Chilled water is distributed at 42°F when the outside air temperature is above 60°F, and the setpoint is reset to 50°F when the outside air is below 55°F. The chiller plant is locked out when the outside air temperature is below 45°F, and it is turned off from mid-December through February.

The chiller plant supplies chilled water to air handling units. Installed in 2019, the chiller plant is in great condition.

The condenser water system consists of one single-cell cooling tower (CT1) and associated pumping with one 30 hp cooling fan. Fan motor is staged based on maintaining basin water temperature. Condenser water is supplied to the chillers by two 15 hp, 300 gpm variable flow pumps (P-3 and 4). The condenser water temperature is reset with water supplied at 80°F when the outside air temperature is above 70°F, and the setpoint is reset to 65°F when the outside air is below 55°F.

Chillers

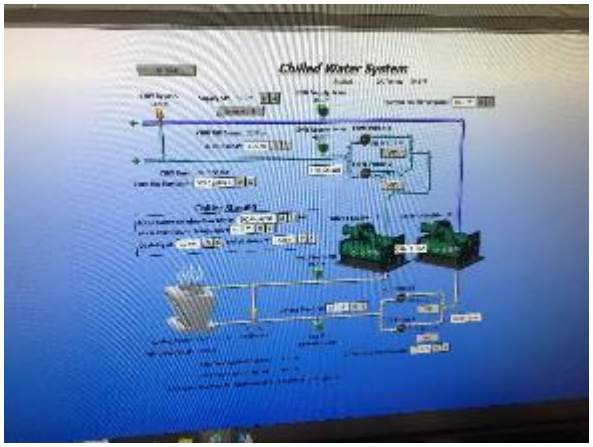
Condenser Water Pumps

Cooling Tower

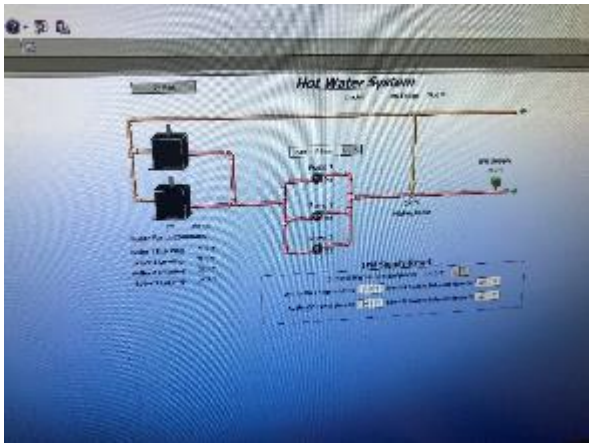
Chilled Water Pumps

2.8 Building Energy Management Systems (EMS)

A Peterson EMS controls the HVAC equipment, boilers, chillers, and air handlers. The EMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, heating water loop temperatures, and chilled water loop temperatures.

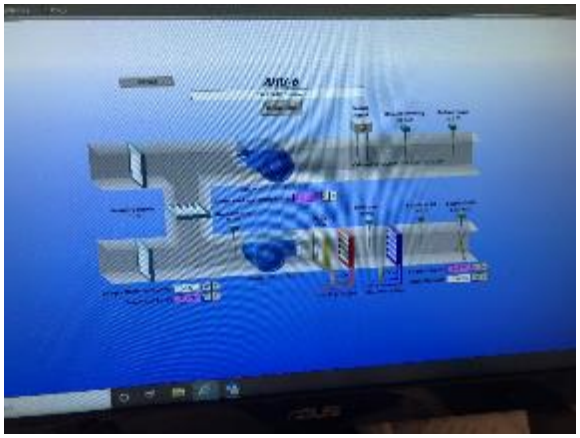


Chilled Water System



Hot Water System

Floor Plan



AHU Graphic

2.9 Domestic Hot Water

Hot water for the main library area is produced with an 81-gallon A.O. Smith 154 MBh gas-fired storage water heater with an 80% thermal efficiency. Hot water for the lower level restrooms is produced with a 30-gallon A.O. Smith 18 kW electric storage water heater.

At the time of the site visit, the domestic water heaters were set at 130°F.

Three 1/25 hp circulation pumps distribute water to end uses. The circulation pumps operate continuously. The domestic hot water pipes are insulated, and the insulation is in good condition.

Gas DHW Heater

Electric DHW Heater

DHW Circulation Pump

2.10 Refrigeration

The library coffee shop has two small size stand-up refrigerators with solid doors. All equipment is high-efficiency and in good condition.

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

Coffee Shop Refrigerator

2.11 Plug Load

The utility bill analysis indicates that plug loads consume approximately 3% percent of total building energy use. This is lower than a typical building.

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

There are approximately 183 computer work stations throughout the Library. Plug loads throughout the building include general library and office equipment. There are computer work rooms with typical loads such as projectors, fax machines, and printers.

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

Computers

Refrigerator

2.12 Water-Using Systems

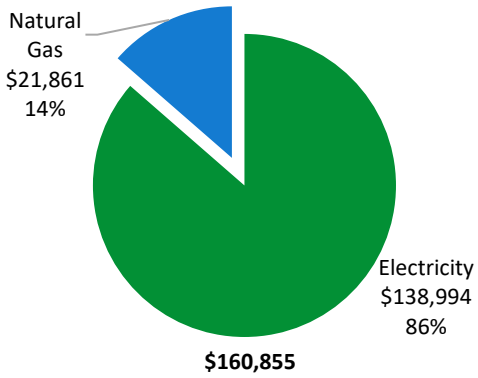
There are nine restrooms with toilets, urinals, and sinks. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher. Toilets are rated at 1.2 gallons per flush (gpf), and urinals are rated at 1 gpf.

Restroom

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	1,152,439 kWh	$138,994
Natural Gas	27,768 Therms	$21,861
Total		**$160,855**



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.

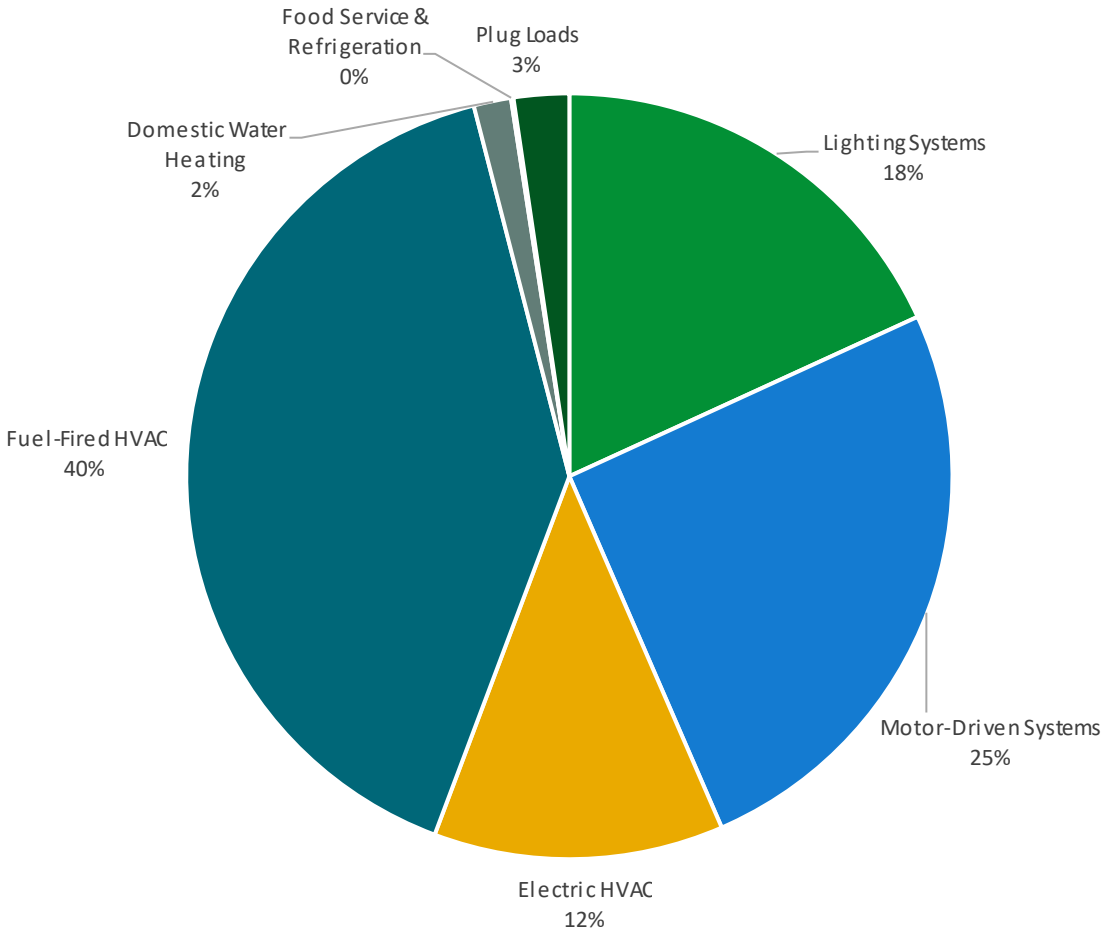
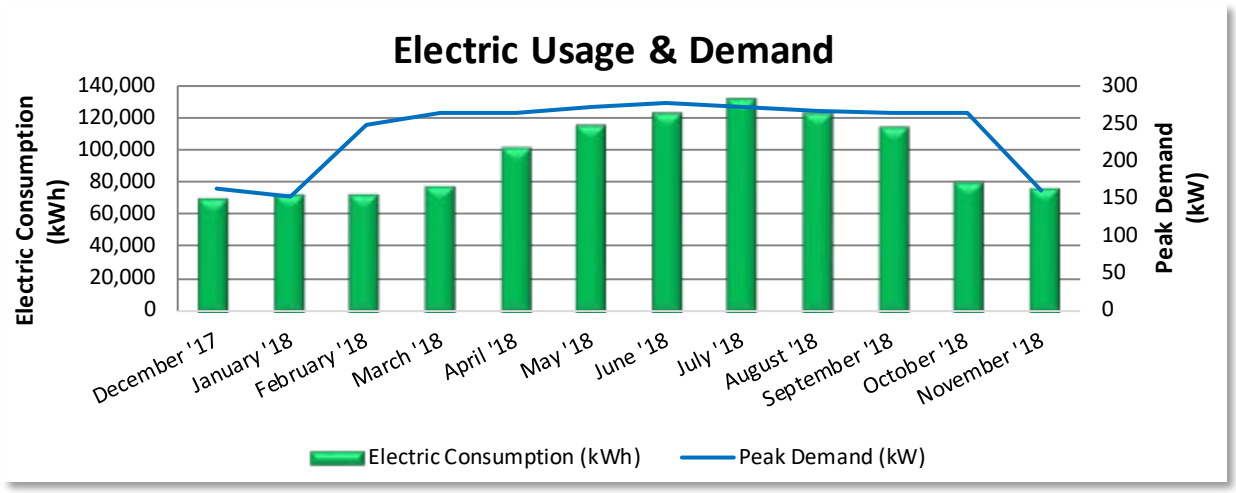


Figure 5 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class Large Power & Lighting Secondary (LPLS), with electric production provided by South Jersey Energy, a third-party supplier.



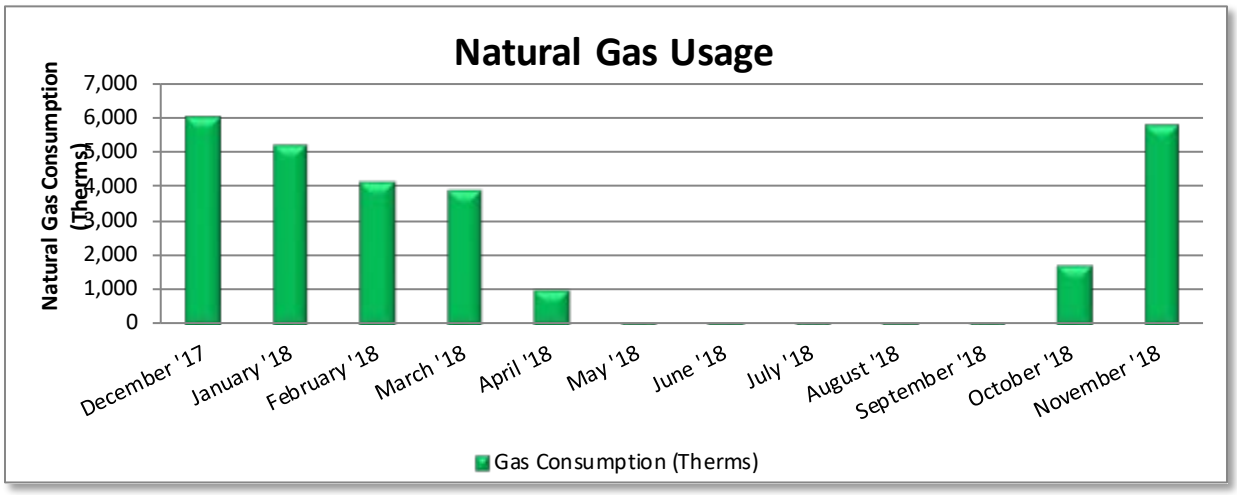
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
1/12/18	30	69,246	163	$622	$8,500
2/12/18	31	72,100	152	$579	$8,831
3/14/18	30	72,722	249	$954	$9,222
4/13/18	30	76,803	264	$983	$9,713
5/14/18	31	100,474	265	$947	$12,390
6/13/18	30	114,305	273	$976	$14,303
7/13/18	30	122,008	278	$994	$15,087
8/13/18	31	130,506	273	$975	$15,812
9/12/18	30	121,451	266	$952	$14,893
10/11/18	29	113,253	264	$944	$12,379
11/9/18	29	80,057	264	$957	$9,120
12/12/18	33	76,357	160	$600	$8,362
Totals	**364**	**1,149,282**	**278**	**$10,483**	**$138,613**
Annual	**365**	**1,152,439**	**278**	**$10,512**	**$138,994**

Notes:

- Peak demand of 278 kW occurred in June '18.
- The average electric cost over the past 12 months was $0.121/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers natural gas under rate class Large Volume Gas (LVG), with natural gas supply provided by Constellation New Energy- Gas Division, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
1/12/18	30	5,970	$4,537
2/12/18	31	5,138	$4,054
3/14/18	30	4,090	$3,543
4/13/18	30	3,869	$2,112
5/14/18	31	990	$619
6/13/18	30	30	$122
7/13/18	30	30	$122
8/13/18	31	31	$123
9/12/18	30	30	$122
10/11/18	29	33	$124
11/9/18	29	1,721	$1,967
12/12/18	33	5,757	$4,354
Totals	**364**	**27,692**	**$21,801**
Annual	**365**	**27,768**	**$21,861**

Notes:

- The average gas cost for the past 12 months is $0.787/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

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

Benchmarking Score	**N/A**

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

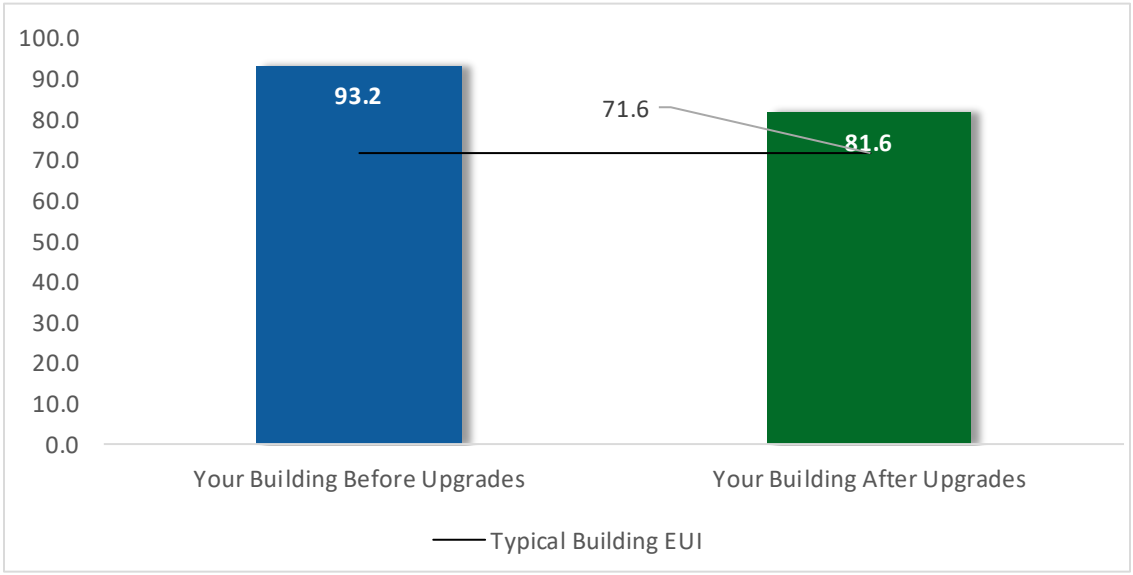


Figure 6 - Energy Use Intensity Comparison

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

Tracking Your Energy Performance

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

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

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

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

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

4 Energy Conservation Measures

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

Calculations of energy use and savings are based on the current version of the *New Jersey'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.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**171,868**	**42.3**	**-36**	**$20,445**	**$63,104**	**$9,845**	**$53,259**	**2.6**	**168,851**
ECM 1	Install LED Fixtures	619	0.1	0	$74	$1,688	$5	$1,683	22.7	616
ECM 2	Retrofit Fixtures with LED Lamps	171,249	42.2	-36	$20,371	$61,416	$9,840	$51,576	2.5	168,235
Lighting Control Measures		**56,079**	**12.6**	**-12**	**$6,670**	**$41,258**	**$4,005**	**$37,253**	**5.6**	**55,073**
ECM 3	Install Occupancy Sensor Lighting Controls	46,760	10.5	-10	$5,561	$30,908	$4,005	$26,903	4.8	45,921
ECM 4	Install High/Low Lighting Controls	9,319	2.2	-2	$1,108	$10,350	$0	$10,350	9.3	9,152
Variable Frequency Drive (VFD) Measures		**28,564**	**3.2**	**0**	**$3,445**	**$15,455**	**$0**	**$15,455**	**4.5**	**28,763**
ECM 5	Install VFDs on Heating Water Pumps	28,564	3.2	0	$3,445	$15,455	$0	$15,455	4.5	28,763
Domestic Water Heating Upgrade		**0**	**0.0**	**11**	**$90**	**$29**	**$0**	**$29**	**0.3**	**1,333**
ECM 6	Install Low-Flow DHW Devices	0	0.0	11	$90	$29	$0	$29	0.3	1,333
TOTALS		**256,511**	**58.2**	**-37**	**$30,649**	**$119,846**	**$13,850**	**$105,996**	**3.5**	**254,021**

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

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

Figure 7 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**171,249**	**42.2**	**-36**	**$20,371**	**$61,416**	**$9,840**	**$51,576**	**2.5**	**168,235**
ECM 2	Retrofit Fixtures with LED Lamps	171,249	42.2	-36	$20,371	$61,416	$9,840	$51,576	2.5	168,235
Lighting Control Measures		**56,079**	**12.6**	**-12**	**$6,670**	**$41,258**	**$4,005**	**$37,253**	**5.6**	**55,073**
ECM 3	Install Occupancy Sensor Lighting Controls	46,760	10.5	-10	$5,561	$30,908	$4,005	$26,903	4.8	45,921
ECM 4	Install High/Low Lighting Controls	9,319	2.2	-2	$1,108	$10,350	$0	$10,350	9.3	9,152
Variable Frequency Drive (VFD) Measures		**28,564**	**3.2**	**0**	**$3,445**	**$15,455**	**$0**	**$15,455**	**4.5**	**28,763**
ECM 5	Install VFDs on Heating Water Pumps	28,564	3.2	0	$3,445	$15,455	$0	$15,455	4.5	28,763
Domestic Water Heating Upgrade		**0**	**0.0**	**11**	**$90**	**$29**	**$0**	**$29**	**0.3**	**1,333**
ECM 6	Install Low-Flow DHW Devices	0	0.0	11	$90	$29	$0	$29	0.3	1,333
TOTALS		**255,892**	**58.1**	**-37**	**$30,575**	**$118,157**	**$13,845**	**$104,312**	**3.4**	**253,405**

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

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

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**171,868**	**42.3**	**-36**	**$20,445**	**$63,104**	**$9,845**	**$53,259**	**2.6**	**168,851**
ECM 1	Install LED Fixtures	619	0.1	0	$74	$1,688	$5	$1,683	22.7	616
ECM 2	Retrofit Fixtures with LED Lamps	171,249	42.2	-36	$20,371	$61,416	$9,840	$51,576	2.5	168,235

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

ECM 1: Install LED Fixtures

Replace existing fixtures containing high-pressure sodium 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.

Installing LED fixtures has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, existing HID fixtures are approaching the end of its normal useful life. Typically, the marginal cost of purchasing an energy efficient LED fixture can be justified by the marginal savings from the improved lighting conditions.

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

Affected building areas: roof and exterior fixtures.

ECM 2: Retrofit Fixtures with LED Lamps

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

This measure saves energy by installing LEDs, which use less power than other lighting technologies while providing 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 ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**56,079**	**12.6**	**-12**	**$6,670**	**$41,258**	**$4,005**	**$37,253**	**5.6**	**55,073**
ECM 3	Install Occupancy Sensor Lighting Controls	46,760	10.5	-10	$5,561	$30,908	$4,005	$26,903	4.8	45,921
ECM 4	Install High/Low Lighting Controls	9,319	2.2	-2	$1,108	$10,350	$0	$10,350	9.3	9,152

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

ECM 3: Install Occupancy Sensor Lighting Controls

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

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

Occupancy sensors can be mounted on the wall at existing switch locations, 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, conference center, multi-culture room, video and music section, and library open areas.

ECM 4: Install High/Low Lighting Controls

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

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low levels 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 control 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 taken into account 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 as an occupant approaches each area.

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 ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**28,564**	**3.2**	**0**	**$3,445**	**$15,455**	**$0**	**$15,455**	**4.5**	**28,763**
ECM 5	Install VFDs on Heating Water Pumps	28,564	3.2	0	$3,445	$15,455	$0	$15,455	4.5	28,763

Variable frequency drives (VFDs) 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 motor to conservatively account for the cost of an inverter duty rated motor.

Premium efficiency motors have been proposed to be installed only in conjunction with proposed VFDs motor measures. Non-inverter duty rated motors will need to be replaced when the VFD measure is implemented.

ECM 5: Install VFDs on Heating Water Pumps

Install VFDs to control heating water pumps. Two-way valves must serve the hot water coils, and the hot water loop must have a differential pressure sensor installed. If a bypass leg or three-way valves are used in the hot water distribution, they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases, and the VFD modulates the pump speed to maintain a differential pressure setpoint.

Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Affected pumps: HWP-1, -2, and -3.

4.4 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**11**	**$90**	**$29**	**$0**	**$29**	**0.3**	**1,333**
ECM 6	Install Low-Flow DHW Devices	0	0.0	11	$90	$29	$0	$29	0.3	1,333

ECM 6: 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.

5 ENERGY EFFICIENT BEST PRACTICES

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs. You may already be doing some of these things— see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Doors and Windows

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

Lighting Maintenance

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

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

Lighting Controls

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

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

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.

Thermostat Schedules and Temperature Resets

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

Economizer Maintenance

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

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

Chiller Maintenance

Service chillers regularly to keep them operating properly. Chillers are responsible for a substantial portion of a commercial building's overall energy usage and when they do not work well, there is usually a noticeable increase in energy bills and increased occupant complaints. Regular diagnostics and service can save five to ten percent of the cost of operating your chiller. If you already have a maintenance contract in place, your existing service company should be able to provide these services.

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Boiler Maintenance

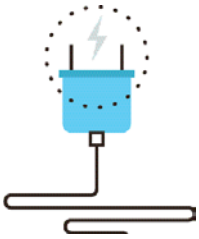
Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is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

Water Heater Maintenance

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

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

Plug Load Controls



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

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

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 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 Library 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 Library's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, which results in improved electric grid reliability through better use of transmission and distribution systems.

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

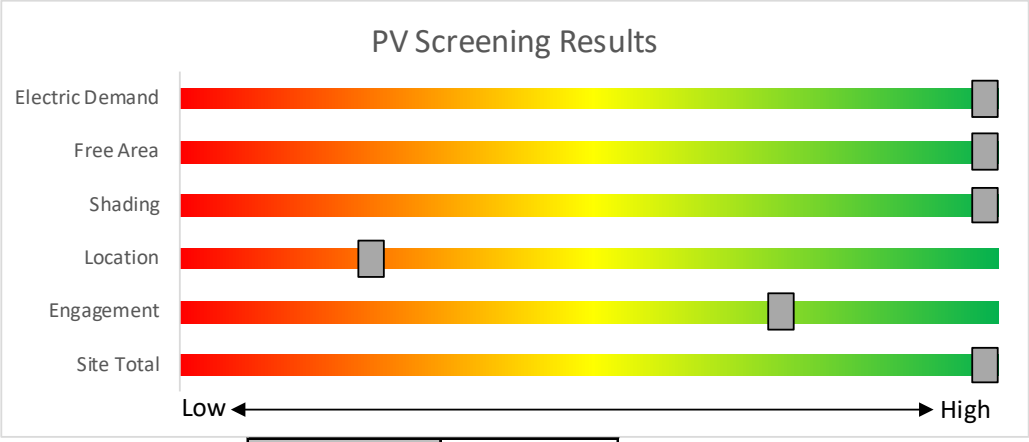
6.1 Solar Photovoltaic

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

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

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

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



Potential	High	
System Potential	239	kW DC STC
Electric Generation	284,738	kWh/yr
Displaced Cost	$34,340	/yr
Installed Cost	$807,800	

Figure 9 - Photovoltaic Screening

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

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

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

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

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

6.2 Combined Heat and Power

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

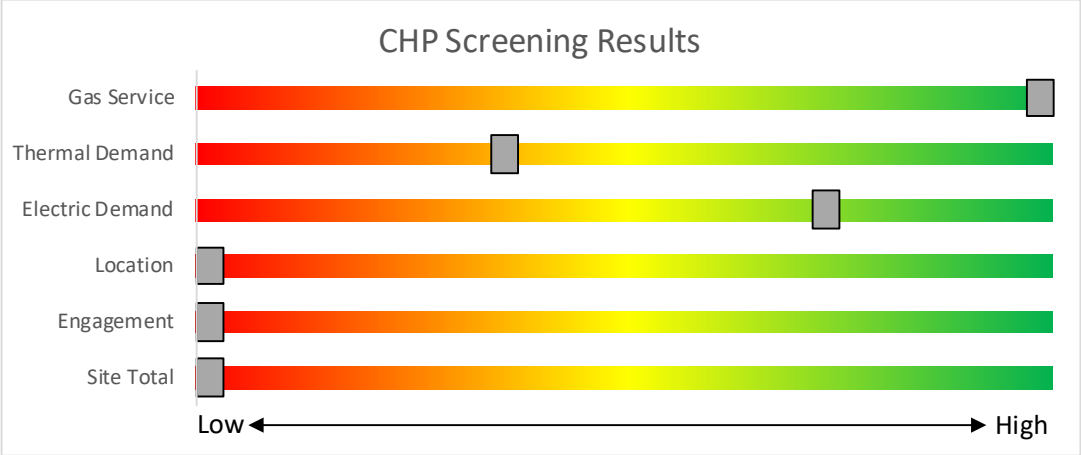
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be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

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

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

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

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



Potential	None	
System Type	None	
System Potential	130	kW
Electric Generation	281,126	kWh/yr
Thermal Generation	1,545,120	MBtu/yr
Displaced Cost	$22,000	/yr
Installed Cost	$453,000	

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

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

7.1 SmartStart

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

SmartStart routinely adds, removes, or modifies incentives from year-to-year for various energy 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 the Library, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives, and controls.

Incentives

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

How to Participate

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

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

7.3 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% 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.

The scope of work presented in this audit report does not quite meet the requirements of the current P4P program. However, due to the size of the facility and existing conditions, should additional measures be identified at a later point in time, for example through further evaluation or the Energy Savings Improvement Program process, this facility could potentially meet the requirements necessary to participate in the 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 in to contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

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

How to Participate

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

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

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

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

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

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

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

7.6 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects prior to the start of construction to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number, which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

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

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

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

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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

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

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

8.2 Retail Natural Gas Supply Options

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

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

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

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

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
105 Mech Room	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,692	2	Relamp	No	20	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,692	0.6	2,632	-1	$313	$730	$200	1.7
135 Mech Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.4	156	0	$19	$438	$120	17.1
Elevator 1	4	LED Lamps: RC20	None		7	3,692		None	No	4	LED Lamps: RC20	None	7	3,692	0.0	0	0	$0	$0	$0	0.0
Elevator 1	2	Incandescent: RC20	None		48	3,692	2	Relamp	No	2	LED Lamps: RC20	None	7	3,692	0.1	327	0	$39	$40	$2	1.0
Elevator Machine Room 3rd Fl	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	730	0.0	26	0	$3	$37	$10	8.6
314 Mech Room	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	730	0.5	442	0	$53	$621	$170	8.6
Roof	1	High-Pressure Sodium: (1) 70W Lamp	Wall Switch	S	95	3,692	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Porch Wall Mount	Wall Switch	21	3,692	0.1	295	0	$35	$494	$5	13.9
Elevator 2	2	LED Lamps: RC20	None		7	3,692		None	No	2	LED Lamps: RC20	None	7	3,692	0.0	0	0	$0	$0	$0	0.0
Elevator 2	4	Incandescent: RC20	None		48	3,692	2	Relamp	No	4	LED Lamps: RC20	None	7	3,692	0.1	654	0	$78	$80	$4	1.0
106A Sump Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.1	26	0	$3	$73	$20	17.1
106 Shop	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,547	2	Relamp	No	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.6	1,907	0	$227	$767	$210	2.5
106 Shop	6	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	3,692	3	None	Yes	6	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.1	341	0	$41	$270	$35	5.8
101 Electric Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	730	0.1	104	0	$12	$146	$40	8.6
South Side	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		22	4,380		None	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	22	4,380	0.0	0	0	$0	$0	$0	0.0
West Side	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		22	4,380		None	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	22	4,380	0.0	0	0	$0	$0	$0	0.0
Door Side	3	Compact Fluorescent: 4 Pin - 1L	Timeclock		42	4,380	2	Relamp	No	3	LED Lamps: 4 Pin - 1L	Timeclock	29	4,380	0.0	166	0	$20	$76	$3	3.6
Parking Lot	20	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		54	4,380		None	No	20	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	54	4,380	0.0	0	0	$0	$0	$0	0.0
Building Front	4	Compact Fluorescent: Canopy	Timeclock		32	4,380	2	Relamp	No	4	LED Lamps: Canopy	Timeclock	22	4,380	0.0	168	0	$20	$101	$4	4.8
Flag Pole	1	High-Pressure Sodium: (1) 70W Lamp	Timeclock		95	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	21	4,380	0.0	324	0	$39	$1,195	$0	30.6
Flag Pole	2	LED Lamps: A19	Timeclock		10	4,380		None	No	2	LED Lamps: A19	Timeclock	10	4,380	0.0	0	0	$0	$0	$0	0.0
Flag Pole	11	Incandescent: PAR30L	Timeclock		53	4,380	2	Relamp	No	11	LED Lamps: PAR30L	Timeclock	11	4,380	0.3	2,024	0	$244	$299	$11	1.2
102 Fire Sprinkler Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	730	0.1	52	0	$6	$73	$20	8.6
104C Storage	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.7	299	0	$36	$840	$230	17.1
104 File Storage	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.4	182	0	$22	$511	$140	17.1
104 File Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.1	26	0	$3	$73	$20	17.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
104 File Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.1	26	0	$3	$73	$20	17.1
Fire pump side hall	6	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	730	2, 4	Relamp	Yes	6	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	504	0.3	228	0	$27	$587	$12	21.2
Fire pump side hall	3	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	730	4	None	Yes	3	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	504	0.0	34	0	$4	$225	$0	56.1
Fire pump side hall	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	730	0.0	23	0	$3	$72	$10	23.0
Fire pump side hall	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
104A Storage	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.2	91	0	$11	$256	$70	17.1
107 Storage	8	Compact Fluorescent: (2) 40W Biax Lamps	Occupancy Sensor	S	80	365	2	Relamp	No	8	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	365	0.2	107	0	$13	$483	$16	36.6
108 Work Room	8	Compact Fluorescent: (2) 40W Biax Lamps	Occupancy Sensor	S	80	2,547	2	Relamp	No	8	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.2	748	0	$89	$483	$16	5.2
112 Facilities Office	6	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	3,692	3	None	Yes	6	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.1	341	0	$41	$270	$35	5.8
113 Closet	2	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	S	46	365		None	No	2	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	365	0.0	0	0	$0	$0	$0	0.0
111 Storage	1	Compact Fluorescent: (2) 40W Biax Lamps	Occupancy Sensor	S	80	365	2	Relamp	No	1	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	365	0.0	13	0	$2	$60	$2	36.6
139 IT Office	8	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	8	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.3	1,539	0	$183	$753	$51	3.8
139 Server Room	1	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2	Relamp	No	1	LED Lamps: (2) 23W Biax Lamps	Wall Switch	46	3,692	0.0	136	0	$16	$60	$2	3.6
139 Office	6	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	6	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.3	1,155	0	$137	$632	$47	4.3
140 Superitendant Office	2	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	2	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.1	385	0	$46	$237	$24	4.6
104B Storage	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	504	0.3	298	0	$35	$445	$90	10.0
Workroom Hall	4	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	3,692	4	None	Yes	4	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	2,547	0.1	227	0	$27	$225	$0	8.3
Workroom Hall	5	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 4	Relamp	Yes	5	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	2,547	0.2	962	0	$114	$527	$10	4.5
Workroom Hall	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
114 Family Restroom	1	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	S	46	2,547		None	No	1	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.0	0	0	$0	$0	$0	0.0
115 Men Restroom	5	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	S	60	2,547	2	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.1	426	0	$51	$183	$50	2.6
115 Men Restroom	6	LED - Fixtures: Ceiling Mount	Occupancy Sensor	S	12	2,547		None	No	6	LED - Fixtures: Ceiling Mount	Occupancy Sensor	12	2,547	0.0	0	0	$0	$0	$0	0.0
116 Women Restroom	6	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	S	60	2,547	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.2	512	0	$61	$219	$60	2.6
116 Women Restroom	3	LED - Fixtures: Ceiling Mount	Occupancy Sensor	S	12	2,547		None	No	3	LED - Fixtures: Ceiling Mount	Occupancy Sensor	12	2,547	0.0	0	0	$0	$0	$0	0.0
117 Multi Culture Room	16	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	26	3,692	2, 3	Relamp	Yes	16	LED Lamps: 4 Pin - 1L	Occupancy Sensor	18	2,547	0.2	858	0	$102	$674	$51	6.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
117 Multi Culture Room	10	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.4	1,595	0	$190	$635	$135	2.6
117 Multi Culture Room	8	LED Lamps: RC20	Wall Switch	S	7	3,692	3	None	Yes	8	LED Lamps: RC20	Occupancy Sensor	7	2,547	0.0	69	0	$8	$116	$20	11.7
117 Multi Culture Room	8	Incandescent: RC20	Wall Switch	S	48	3,692	2, 3	Relamp	Yes	8	LED Lamps: RC20	Occupancy Sensor	7	2,547	0.3	1,377	0	$164	$430	$43	2.4
117 Multi Culture Room	3	Incandescent: RC20	Wall Switch	S	48	3,692	2, 3	Relamp	Yes	3	LED Lamps: RC20	Occupancy Sensor	7	2,547	0.1	516	0	$61	$176	$23	2.5
119 History Room	6	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	6	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.3	1,155	0	$137	$632	$47	4.3
119 History Room	3	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.1	260	0	$31	$192	$23	5.5
120 Storage	2	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	730	2, 3	Relamp	Yes	2	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	504	0.1	76	0	$9	$237	$4	25.7
121 Storage	2	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	730	2, 3	Relamp	Yes	2	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	504	0.1	76	0	$9	$237	$4	25.7
121 Storage	3	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	730	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	504	0.1	51	0	$6	$192	$3	30.9
Display Case	2	Incandescent: PAR30L	Wall Switch	S	53	3,692	2	Relamp	No	2	LED Lamps: PAR30L	Wall Switch	11	3,692	0.1	335	0	$40	$54	$2	1.3
Custodial Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	730	0.0	26	0	$3	$37	$10	8.6
128A Electric Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	730	0.0	26	0	$3	$37	$10	8.6
122 Electric Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	730	0.0	26	0	$3	$37	$10	8.6
124A Conference Center	8	LED Lamps: (3) 23W Biax Lamps	Daylight Dimming		69	2,215		None	No	8	LED Lamps: (3) 23W Biax Lamps	Daylight Dimming	69	2,215	0.0	0	0	$0	$0	$0	0.0
124A Conference Center	9	Compact Fluorescent: (3) 40W Biax Lamps	Daylight Dimming		120	2,215	2	Relamp	No	9	LED Lamps: (3) 23W Biax Lamps	Daylight Dimming	69	2,215	0.4	1,098	0	$131	$815	$27	6.0
124A Conference Center	13	Compact Fluorescent: 4 Pin - 1L	Daylight Dimming		42	2,215	2	Relamp	No	13	LED Lamps: 4 Pin - 1L	Daylight Dimming	29	2,215	0.1	392	0	$47	$328	$13	6.8
124B Conference Center	8	LED Lamps: (3) 23W Biax Lamps	Daylight Dimming		69	2,215		None	No	8	LED Lamps: (3) 23W Biax Lamps	Daylight Dimming	69	2,215	0.0	0	0	$0	$0	$0	0.0
124B Conference Center	9	Compact Fluorescent: (3) 40W Biax Lamps	Daylight Dimming		120	2,215	2	Relamp	No	9	LED Lamps: (3) 23W Biax Lamps	Daylight Dimming	69	2,215	0.4	1,098	0	$131	$815	$27	6.0
124B Conference Center	13	Compact Fluorescent: 4 Pin - 1L	Daylight Dimming		42	2,215	2	Relamp	No	13	LED Lamps: 4 Pin - 1L	Daylight Dimming	29	2,215	0.1	392	0	$47	$328	$13	6.8
124A Conference Center	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
124B Conference Center	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
134 Mech Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.0	13	0	$2	$37	$10	17.1
124B Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	730	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	730	0.0	14	0	$2	$18	$5	8.1
128 Storage	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	365	2	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	365	0.3	143	0	$17	$402	$110	17.1
Gallary Hall	51	LED Lamps: PAR30	Wall Switch	S	53	3,692	4	None	Yes	51	LED Lamps: PAR30	High/Low Control	53	2,547	0.7	3,341	-1	$397	$2,025	$0	5.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
150 Tactical Services	16	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	16	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.7	3,079	-1	$366	$1,236	$67	3.2
151 TS Supervisor	4	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	4	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.2	770	0	$92	$511	$43	5.1
149 Staff Lounge	7	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	7	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.3	1,347	0	$160	$693	$49	4.0
Staff Restroom	1	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	3,692		None	No	1	LED Lamps: (2) 23W Biax Lamps	Wall Switch	46	3,692	0.0	0	0	$0	$0	$0	0.0
Staff Restroom 2	1	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2	Relamp	No	1	LED Lamps: (2) 23W Biax Lamps	Wall Switch	46	3,692	0.0	136	0	$16	$60	$2	3.6
Lower Level Staff Stair	6	Compact Fluorescent: 4 Pin - 3L	None		96	3,692	2	Relamp	No	6	LED Lamps: 4 Pin - 3L	None	67	3,692	0.2	689	0	$82	$454	$18	5.3
Lower Level Staff Stair	2	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	3,692		None	No	2	LED Lamps: (2) 23W Biax Lamps	Wall Switch	46	3,692	0.0	0	0	$0	$0	$0	0.0
227 Admin Office	11	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	11	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.5	2,117	0	$252	$934	$57	3.5
227 Admin 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
230 Board Room	12	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	12	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.2	1,039	0	$124	$573	$47	4.3
230 Board Room	6	Halogen Incandescent: Bulb - 1L	Wall Switch	S	75	3,692	2, 3	Relamp	Yes	6	LED Lamps: Bulb - 1L	Occupancy Sensor	11	2,547	0.4	1,609	0	$191	$433	$41	2.0
230 Board Room	2	Compact Fluorescent: Decorative Dome - 5L	Wall Switch	S	210	3,692	2, 3	Relamp	Yes	2	LED Lamps: 4 Pin - 1L	Occupancy Sensor	147	2,547	0.2	866	0	$103	$522	$45	4.6
232 Office	4	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.3	1,155	0	$137	$632	$47	4.3
233 Office	2	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.1	577	0	$69	$451	$41	6.0
231 Office	2	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.1	577	0	$69	$451	$41	6.0
229 Director's Office	4	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.3	1,155	0	$137	$632	$47	4.3
228 Office	4	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.3	1,155	0	$137	$632	$47	4.3
227 Bathroom	1	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	S	46	2,547		None	No	1	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.0	0	0	$0	$0	$0	0.0
Main Level Elevator Staff	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,692	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,692	0.0	70	0	$8	$18	$5	1.6
Main Level Elevator Staff	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,692	2, 3	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,547	0.0	129	0	$15	$149	$6	9.3
Main Level Elevator Staff	1	Compact Fluorescent: Bulb - 1L	Wall Switch	S	26	3,692	2	Relamp	No	1	LED Lamps: Bulb - 1L	Wall Switch	18	3,692	0.0	31	0	$4	$25	$1	6.6
Large Print Area	18	Linear Fluorescent - T5: 4' T5 (28W) - 3L	Wall Switch	S	90	3,692	2, 3	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	1.0	4,305	-1	$512	$1,256	$305	1.9
216 Office	3	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	26	3,692	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 1L	Occupancy Sensor	18	2,547	0.0	161	0	$19	$192	$23	8.8
Large Print Area	3	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.1	260	0	$31	$192	$23	5.5
Video Section	27	Linear Fluorescent - T5: 4' T5 (28W) - 3L	Wall Switch	S	90	3,692	2, 3	Relamp	Yes	27	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	1.4	6,458	-1	$768	$2,019	$475	2.0

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Video Section	3	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.1	260	0	$31	$192	$23	5.5
Video Section	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,692	2, 3	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,547	0.0	175	0	$21	$153	$30	5.9
Video Section	2	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	26	3,692	2, 3	Relamp	Yes	2	LED Lamps: 4 Pin - 1L	Occupancy Sensor	18	2,547	0.0	107	0	$13	$166	$22	11.3
Video Section	2	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	18	3,692	2, 3	Relamp	Yes	2	LED Lamps: 4 Pin - 1L	Occupancy Sensor	13	2,547	0.0	74	0	$9	$166	$22	16.4
Video Section	2	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	2	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.0	173	0	$21	$166	$22	7.0
Video Section	4	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	3,692	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	2,547	0.1	315	0	$37	$189	$40	4.0
Video Section	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,692	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.1	335	0	$40	$189	$40	3.7
Video Section	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,692	2, 3	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,547	0.0	193	0	$23	$165	$29	5.9
Music Section	12	Linear Fluorescent - T5: 4' T5 (28W) - 3L	Wall Switch	S	90	3,692	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	0.6	2,870	-1	$341	$927	$215	2.1
Music Section	1	LED Lamps: 4 Pin - 1L	Wall Switch	S	29	3,692		None	No	1	LED Lamps: 4 Pin - 1L	Wall Switch	29	3,692	0.0	0	0	$0	$0	$0	0.0
Music Section	7	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	7	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.1	606	0	$72	$447	$42	5.6
Periodical Section	14	Linear Fluorescent - T5: 4' T5 (28W) - 3L	Wall Switch	S	90	3,692	2, 3	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	0.7	3,349	-1	$398	$1,037	$245	2.0
Periodical Section	3	LED Lamps: (3) 23W Biax Lamps	Wall Switch	S	69	3,692	3	None	Yes	3	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.1	256	0	$30	$270	$35	7.7
Periodical Section	5	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	5	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.3	1,443	0	$172	$723	$50	3.9
Periodical Section	11	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	11	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.2	952	0	$113	$548	$46	4.4
Periodical Section	5	LED Lamps: 4 Pin - 1L	Wall Switch	S	29	3,692	3	None	Yes	5	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.0	182	0	$22	$116	$20	4.4
Periodical Section	7	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	26	3,692	2, 3	Relamp	Yes	7	LED Lamps: 4 Pin - 1L	Occupancy Sensor	18	2,547	0.1	375	0	$45	$447	$42	9.1
Circulation Desk	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,692	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,547	0.1	351	0	$42	$189	$40	3.6
Circulation Desk	4	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,692	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,547	0.1	257	0	$31	$181	$32	4.9
Circulation Desk	4	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	3,692	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	2,547	0.1	315	0	$37	$189	$40	4.0
Circulation Desk	7	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	7	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.1	606	0	$72	$447	$42	5.6
222 Circulation Office	9	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	9	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.4	1,732	0	$206	$813	$53	3.7
222 Circulation Office	4	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	3,692	3	None	Yes	4	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.1	227	0	$27	$270	$35	8.7
224 Office	3	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	3,692	3	None	Yes	3	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.0	171	0	$20	$116	$20	4.7
Main Level Lobby	6	LED Lamps: BR30	Wall Switch	S	9	3,692	4	None	Yes	6	LED Lamps: BR30	High/Low Control	9	2,547	0.0	67	0	$8	$225	$0	28.3

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main Level Lobby	36	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 4	Relamp	Yes	36	LED Lamps: 4 Pin - 1L	High/Low Control	29	2,547	0.7	3,117	-1	$371	$2,259	$36	6.0
Main Level Lobby	11	Halogen Incandescent: Bulb - 1L	Wall Switch	S	150	3,692	2, 4	Relamp	Yes	11	LED Lamps: Bulb - 1L	High/Low Control	23	2,547	1.3	5,898	-1	$701	$749	$11	1.1
Main Level Lobby	4	LED - Fixtures: Wall Sconces	Wall Switch	S	9	3,692	4	None	Yes	4	LED - Fixtures: Wall Sconces	High/Low Control	9	2,547	0.0	42	0	$5	$225	$0	45.0
Front Forrier	2	Compact Fluorescent: Wall Sconces	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	2	LED Lamps: Wall Sconces	Occupancy Sensor	29	2,547	0.0	173	0	$21	$166	$2	8.0
Front Entrance	4	LED Lamps: 4 Pin - 1L	Wall Switch	S	29	3,692	3	None	Yes	4	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.0	143	0	$17	$116	$20	5.6
220A Pop Up Store	3	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.1	260	0	$31	$192	$23	5.5
220A Pop Up Store	2	Compact Fluorescent: (1) 40W Biax Lamps	Wall Switch	S	40	3,692	2, 3	Relamp	Yes	2	LED Lamps: (1) 23W Biax Lamps	Occupancy Sensor	23	2,547	0.0	192	0	$23	$176	$22	6.7
220 Elec Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	730	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	730	0.0	26	0	$3	$37	$10	8.6
Main 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
Main Coffee Shop	14	Halogen Incandescent: Bulb - 1L	Wall Switch	S	50	3,692	2, 3	Relamp	Yes	14	LED Lamps: Bulb - 1L	Occupancy Sensor	8	2,547	0.6	2,502	-1	$298	$651	$49	2.0
Main Coffee Shop	7	Halogen Incandescent: Bulb - 1L	Wall Switch	S	75	3,692	2, 3	Relamp	Yes	7	LED Lamps: Bulb - 1L	Occupancy Sensor	11	2,547	0.4	1,877	0	$223	$460	$42	1.9
Coffee Shop	6	LED Lamps: BR30	Wall Switch	S	9	3,692	3	None	Yes	6	LED Lamps: BR30	Occupancy Sensor	9	2,547	0.0	63	0	$7	$116	$0	15.5
Coffee Shop	7	Incandescent: RC20	Wall Switch	S	45	3,692	2, 3	Relamp	Yes	7	LED Lamps: RC20	Occupancy Sensor	7	2,547	0.2	1,121	0	$133	$410	$42	2.8
Coffee Shop Storage	3	Compact Fluorescent: RC20	Wall Switch	S	26	3,692	2, 3	Relamp	Yes	3	LED Lamps: RC20	Occupancy Sensor	18	2,547	0.0	161	0	$19	$176	$3	9.0
Reading Center	12	Compact Fluorescent: Wall Sconces	Wall Switch	S	84	3,692	2, 3	Relamp	Yes	12	LED Lamps: Wall Sconces	Occupancy Sensor	59	2,547	0.5	2,078	0	$247	$876	$59	3.3
Reading Center	4	Halogen Incandescent: Bulb - 1L	Wall Switch	S	50	3,692	2, 3	Relamp	Yes	4	LED Lamps: Bulb - 1L	Occupancy Sensor	8	2,547	0.2	715	0	$85	$379	$39	4.0
Reading Center	36	LED Lamps: PAR30	Wall Switch	S	12	3,692	3	None	Yes	36	LED Lamps: PAR30	Occupancy Sensor	12	2,547	0.1	534	0	$64	$540	$70	7.4
Reading Center	4	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.1	638	0	$76	$416	$75	4.5
208 Study	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.1	319	0	$38	$189	$40	3.9
209 Study Room	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.1	319	0	$38	$189	$40	3.9
Reading Center	28	LED Lamps: Circleline	Wall Switch	S	12	3,692	3	None	Yes	28	LED Lamps: Circleline	Occupancy Sensor	12	2,547	0.1	415	0	$49	$540	$70	9.5
Room 203	10	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	10	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.6	2,886	-1	$343	$1,175	$65	3.2
202 Supervisor Office	2	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.1	577	0	$69	$451	$41	6.0
Left Arch	108	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	108	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	3.8	17,221	-4	$2,048	$5,834	$1,325	2.2
Left Arch	40	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,692	2, 3	Relamp	Yes	40	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	2.2	10,046	-2	$1,195	$2,731	$670	1.7

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Left Arch	10	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,692	2, 3	Relamp	Yes	10	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,547	0.2	877	0	$104	$453	$85	3.5
Left Arch	24	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	24	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.5	2,078	0	$247	$1,146	$94	4.3
Left Arch	36	Linear Fluorescent - T5: 4' T5 (28W) - 3L	Wall Switch	S	90	3,692	2, 3	Relamp	Yes	36	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	1.9	8,611	-2	$1,024	$2,782	$645	2.1
Cherry Little Room	12	LED Lamps: Circleline	Wall Switch	S	12	3,692	3	None	Yes	12	LED Lamps: Circleline	Occupancy Sensor	12	2,547	0.0	178	0	$21	$270	$35	11.1
Cherry Little Room	1	Compact Fluorescent: Decorative Dome - 1L	Wall Switch	S	42	3,692	2	Relamp	No	1	LED Lamps: Decorative Dome - 1L	Wall Switch	29	3,692	0.0	50	0	$6	$25	$1	4.1
Cherry Little Room	6	Linear Fluorescent - T5: 4' T5 (28W) - 3L	Wall Switch	S	90	3,692	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	0.3	1,435	0	$171	$599	$125	2.8
Right Arch	100	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	100	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	3.5	15,945	-3	$1,896	$5,542	$1,245	2.3
Right Arch	40	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,692	2, 3	Relamp	Yes	40	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	2.2	10,046	-2	$1,195	$2,731	$670	1.7
Right Arch	10	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,692	2, 3	Relamp	Yes	10	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,547	0.2	877	0	$104	$453	$85	3.5
Right Arch	24	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	24	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.5	2,078	0	$247	$1,146	$94	4.3
Right Arch	36	Linear Fluorescent - T5: 4' T5 (28W) - 3L	Wall Switch	S	90	3,692	2, 3	Relamp	Yes	36	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,547	1.9	8,611	-2	$1,024	$2,782	$645	2.1
Micro Film Section	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,692	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,547	0.1	351	0	$42	$189	$40	3.6
Reading Center	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
Reading Center Women	6	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.2	957	0	$114	$489	$95	3.5
Reading Center Women	2	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	2	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.0	173	0	$21	$166	$22	7.0
Reading Center Women	1	LED Lamps: 4 Pin - 1L	Wall Switch	S	29	3,692		None	No	1	LED Lamps: 4 Pin - 1L	Wall Switch	29	3,692	0.0	0	0	$0	$0	$0	0.0
Reading Center Men	3	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.1	260	0	$31	$192	$23	5.5
Reading Center Men	5	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.2	797	0	$95	$453	$85	3.9
RC Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,692	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,692	0.0	132	0	$16	$37	$10	1.7
Restroom Lobby	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,692	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	0.1	335	0	$40	$343	$20	8.1
Upper Level Elevator Stair	4	Compact Fluorescent: 4 Pin - 3L	Wall Switch	S	126	3,692	2	Relamp	No	4	LED Lamps: 4 Pin - 3L	Wall Switch	88	3,692	0.1	603	0	$72	$303	$12	4.1
Upper Level Elevator Stair	2	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2	Relamp	No	2	LED Lamps: (2) 23W Biax Lamps	Wall Switch	46	3,692	0.1	271	0	$32	$121	$4	3.6
Upper Level Lobby	18	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	26	3,692	2, 4	Relamp	Yes	18	LED Lamps: 4 Pin - 1L	High/Low Control	18	2,547	0.2	965	0	$115	$1,129	$18	9.7
Upper Level Lobby	4	LED Lamps: PAR30	Wall Switch	S	12	3,692	4	None	Yes	4	LED Lamps: PAR30	High/Low Control	12	2,547	0.0	59	0	$7	$225	$0	31.9
Upper Level 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

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Children's Area	36	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	1.3	5,740	-1	$683	$1,855	$430	2.1
Children's Area	1	LED Lamps: Circleline	Wall Switch	S	12	3,692		None	No	1	LED Lamps: Circleline	Wall Switch	12	3,692	0.0	0	0	$0	$0	$0	0.0
Youth Services Section	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,692	2, 3	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,547	0.1	439	0	$52	$207	$45	3.1
Youth Services Section	5	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	3,692	2, 3	Relamp	Yes	5	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	2,547	0.1	394	0	$47	$207	$45	3.5
Youth Services Section	5	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,692	2, 3	Relamp	Yes	5	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,547	0.1	322	0	$38	$197	$15	4.8
Youth Services Section	30	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	30	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	1.9	8,659	-2	$1,030	$3,256	$160	3.0
Youth Services Arch	34	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,692	2, 3	Relamp	Yes	34	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,547	1.2	5,421	-1	$645	$1,782	$410	2.1
Youth Services Arch	4	Halogen Incandescent: Bulb - 1L	Wall Switch	S	50	3,692	2, 3	Relamp	Yes	4	LED Lamps: Bulb - 1L	Occupancy Sensor	8	2,547	0.2	715	0	$85	$379	$39	4.0
Youth Services Arch	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
Youth Services Arch	60	LED - Fixtures: Inseparable SSL - Other	Wall Switch	S	5	3,692	3	None	Yes	60	LED - Fixtures: Inseparable SSL - Other	Occupancy Sensor	5	2,547	0.1	334	0	$40	$810	$105	17.8
Youth Services Arch	3	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2, 3	Relamp	Yes	3	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	2,547	0.1	577	0	$69	$451	$41	6.0
YS Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,692	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,692	0.0	132	0	$16	$37	$10	1.7
Elevator Hall	2	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 4	Relamp	Yes	2	LED Lamps: 4 Pin - 1L	High/Low Control	29	2,547	0.0	173	0	$21	$275	$2	13.3
Elevator Hall	2	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	26	3,692	2, 4	Relamp	Yes	2	LED Lamps: 4 Pin - 1L	High/Low Control	18	2,547	0.0	107	0	$13	$275	$2	21.5
Bathroom A	1	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2	Relamp	No	1	LED Lamps: (2) 23W Biax Lamps	Wall Switch	46	3,692	0.0	136	0	$16	$60	$2	3.6
Bathroom B	1	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	3,692	2	Relamp	No	1	LED Lamps: (2) 23W Biax Lamps	Wall Switch	46	3,692	0.0	136	0	$16	$60	$2	3.6
Room 308	9	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	9	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.6	2,598	-1	$309	$1,085	$62	3.3
308 Storage	2	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	365	2	Relamp	No	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	365	0.1	40	0	$5	$181	$6	36.6
308 Supervisor Office	3	LED Lamps: Bulb - 1L	Wall Switch	S	9	3,692	3	None	Yes	3	LED Lamps: Bulb - 1L	Occupancy Sensor	9	2,547	0.0	33	0	$4	$116	$20	24.2
Craft Room	10	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	3,692	2, 3	Relamp	Yes	10	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	2,547	0.6	2,886	-1	$343	$1,175	$65	3.2
Craft Room	3	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	42	3,692	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 1L	Occupancy Sensor	29	2,547	0.1	260	0	$31	$192	$23	5.5
Craft Room	12	Compact Fluorescent: 4 Pin - 1L	Wall Switch	S	32	3,692	2, 3	Relamp	Yes	12	LED Lamps: 4 Pin - 1L	Occupancy Sensor	22	2,547	0.2	792	0	$94	$573	$47	5.6
Craft Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,692	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,547	0.1	351	0	$42	$189	$40	3.6

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
MER 105	AHU-1	1	Supply Fan	20.0	93.0%	Yes	W	4,800		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
MER 105	AHU-2	1	Supply Fan	25.0	93.6%	Yes	W	4,800		No	93.6%	No		0.0	0	0	$0	$0	$0	0.0
MER 105	AHU-3	1	Supply Fan	7.5	91.0%	Yes	W	4,800		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
MER 135	AHU-4	1	Supply Fan	10.0	91.7%	Yes	W	4,800		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
MER 135	AHU-5	1	Supply Fan	15.0	93.0%	Yes	W	4,800		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
MER 314	AHU-6	1	Supply Fan	15.0	93.0%	Yes	W	4,800		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
MER 105	AHU-1	1	Return Fan	10.0	91.7%	Yes	W	4,800		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
MER 105	AHU-2	1	Return Fan	10.0	91.7%	Yes	W	4,800		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
MER 105	AHU-3	1	Return Fan	3.0	89.5%	Yes	W	4,800		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
MER 135	AHU-4	1	Return Fan	3.0	89.5%	Yes	W	4,800		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
MER 135	AHU-5	1	Return Fan	7.5	91.0%	Yes	W	4,800		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
MER 314	AHU-6	1	Return Fan	10.0	91.7%	Yes	W	4,800		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
MER 101	P-1 Chilled Water	1	Chilled Water Pump	30.0	94.1%	Yes	W	1,830		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
MER 101	P-2 Chilled Water	1	Chilled Water Pump	30.0	94.1%	Yes	W	1,830		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
MER 101	P-3 Condenser Water	1	Condenser Water Pump	15.0	93.0%	Yes	W	1,830		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
MER 101	P-4 Condenser Water	1	Condenser Water Pump	15.0	93.0%	Yes	W	1,830		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
MER 101	HWP-1	1	Heating Hot Water Pump	10.0	89.5%	No	W	2,920	5	No	91.7%	Yes	1	1.1	9,521	0	$1,148	$5,152	$0	4.5
MER 101	HWP-2	1	Heating Hot Water Pump	10.0	89.5%	No	W	2,920	5	No	91.7%	Yes	1	1.1	9,521	0	$1,148	$5,152	$0	4.5
MER 101	HWP-3	1	Heating Hot Water Pump	10.0	89.5%	No	W	2,920	5	No	91.7%	Yes	1	1.1	9,521	0	$1,148	$5,152	$0	4.5
MER 101	DHW Recirculation	3	Water Supply Pump	0.0	60.0%	No	W	8,760		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
MER 101	Sewerage Pumps	2	Process Pump	3.0	81.5%	No	W	730		No	81.5%	No		0.0	0	0	$0	$0	$0	0.0
Elevator Machine Room 1	Hydraulic Pump 1	1	Process Pump	20.0	72.0%	No	W	2,555		No	72.0%	No		0.0	0	0	$0	$0	$0	0.0
Sump Pump Room	Sump Pumps	2	Process Pump	0.8	77.0%	No	W	730		No	77.0%	No		0.0	0	0	$0	$0	$0	0.0
Elevator Machine Room 2	Hydraulic Pump 1	1	Process Pump	20.0	72.0%	No	W	2,555		No	72.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Restroom	1	Exhaust Fan	0.3	72.0%	No	W	4,800		No	72.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor	Cooling Tower	1	Cooling Tower Fan	30.0	94.1%	Yes	W	3,660		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Storage	Server Room	1	Packaged AC	5.00		W		No							0.0	0	0	$0	$0	$0	0.0
Server Room	AHU-8	1	Split-System AC	2.00		W		No							0.0	0	0	$0	$0	$0	0.0
Computer Work Room	AHU-9	1	Split-System AC	2.00		W		No							0.0	0	0	$0	$0	$0	0.0

Electric Chiller Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
MER 101	CH-1	1	Water-Cooled Screw Chiller	130.00	N		No							0.0	0	0	$0	$0	$0	0.0
MER 101	CH-2	1	Water-Cooled Screw Chiller	130.00	N		No							0.0	0	0	$0	$0	$0	0.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
MER 101	B-1	1	Non-Condensing Hot Water Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0
MER 101	B-2	1	Non-Condensing Hot Water Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0

DHW Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
MER 101	DHW Heater	1	Storage Tank Water Heater (> 50 Gal)	N		No						0.0	0	0	$0	$0	$0	0.0
2nd Fl Storage	DHW Heater	1	Storage Tank Water Heater (≤ 50 Gal)	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	6	4	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	11	$90	$29	$0	0.3

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Coffee Shop	2	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Break Room/Offices	7	Small Refrigerator	120.0	No
Break Room/Offices	7	Microwave	800.0	No
Library area	183	Computers	120.0	Yes
Library area	7	Medium Printer	55.0	Yes
Break Room/Offices	4	Toaster Oven	550.0	No
Break Room/Offices	1	Medium Refrigerator	145.0	Yes
Offices	16	Small Printer	46.0	Yes
Library area	3	Projectors	120.0	Yes
Library area	9	Copy Machines	600.0	Yes
Offices	4	Coffee Machines	1,500.0	No
Break Room/Offices	2	Big Refrigerator	255.0	Yes
Offices	2	Paper Shredder	46.0	Yes
Lobby/Library area	2	LCD Tv	120.0	Yes
Break Room	1	Toaster	550.0	No

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

N/A

ENERGY STAR® Score[1]

Cherry Hill Public Library

Primary Property Type: Library
Gross Floor Area (ft²): 72,000
Built: 2004

For Year Ending: November 30, 2018
Date Generated: June 27, 2019

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
Cherry Hill Public Library 1100 Kings Highway N Cherry Hill, New Jersey 08034	Cherry Hill Public Library 1100 Kings Highway N Cherry Hill, NJ 08034 (____)____-_____	Laverne Mann 1100 Kings Highway N Cherry Hill, NJ 08034 8569031201 lmann@chplnj.org

Property ID: 7061515

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
92 kBtu/ft²

Source EUI
192.2 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	3,932,222 (59%)
Natural Gas (kBtu)	2,694,075 (41%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	68.8
National Median Source EUI (kBtu/ft²)	143.6
% Diff from National Median Source EUI	34%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	542

Signature & Stamp of Verifying Professional

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

Signature: _____ Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate 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.
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.