Local Government Energy Audit Report

Emerson Community School

January 13, 2023

Prepared for:
Plainfield Board of Education
305 Emerson Ave
Plainfield, New Jersey 07060

Prepared by:
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Disclaimer

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

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

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

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

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

Table of Contents

ENERGY EFFICIENCY INCENTIVE & REBATE TRANSITION

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

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

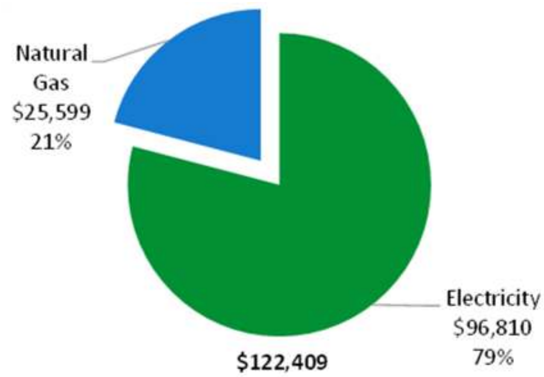
These next generation energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and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

New utility programs are under development. Keep up to date with developments by visiting the NJCEP website.

1 Executive Summary

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

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $122,409 Electricity: 883,279 kWh Natural Gas: 35,066 Therms	
ENERGY STAR® Benchmarking Score	32 *(1-100 scale)*	This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

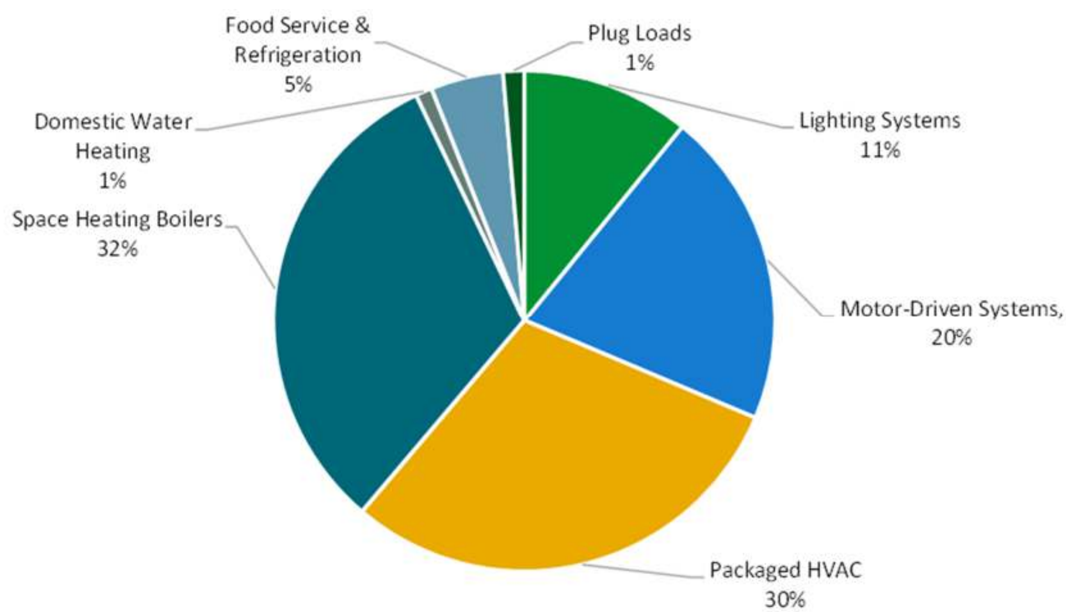


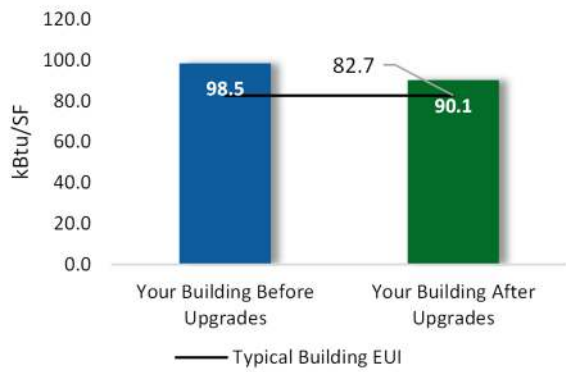
Figure 1 - Energy Use by System

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.

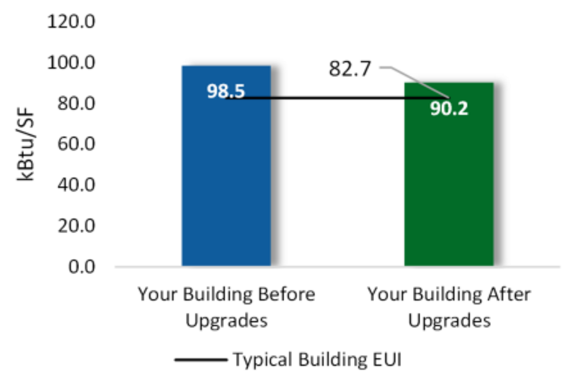
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$65,182
Potential Rebates & Incentives[1]	$13,862
Annual Cost Savings	$16,580
Annual Energy Savings	Electricity: 148,052 kWh Natural Gas: 483 Therms
Greenhouse Gas Emission Savings	77 Tons
Simple Payback	3.1 Years
Site Energy Savings (All Utilities)	8%



Scenario 2: Cost Effective Package[2]

Installation Cost	$63,943
Potential Rebates & Incentives	$13,862
Annual Cost Savings	$16,506
Annual Energy Savings	Electricity: 147,376 kWh Natural Gas: 483 Therms
Greenhouse Gas Emission Savings	77 Tons
Simple Payback	3.0 Years
Site Energy Savings (all utilities)	8%



On-site Generation Potential

Photovoltaic	Medium
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**118,135**	**24.7**	**-25**	**$12,768**	**$36,328**	**$9,695**	**$26,633**	**2.1**	**116,069**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	118,135	24.7	-25	$12,768	$36,328	$9,695	$26,633	2.1	116,069
Lighting Control Measures			**21,817**	**5.8**	**-5**	**$2,358**	**$18,952**	**$4,035**	**$14,917**	**6.3**	**21,435**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	19,949	5.3	-4	$2,156	$16,477	$2,000	$14,477	6.7	19,600
ECM 3	Install High/Low Lighting Controls	Yes	1,868	0.5	0	$202	$2,475	$2,035	$440	2.2	1,835
Motor Upgrades			**676**	**0.2**	**0**	**$74**	**$1,239**	**$0**	**$1,239**	**16.7**	**680**
ECM 4	Premium Efficiency Motors	No	676	0.2	0	$74	$1,239	$0	$1,239	16.7	680
Variable Frequency Drive (VFD) Measures			**1,166**	**0.1**	**29**	**$339**	**$2,756**	**$50**	**$2,706**	**8.0**	**4,559**
ECM 5	Install VFDs on Kitchen Hood Fan Motors	Yes	1,166	0.1	29	$339	$2,756	$50	$2,706	8.0	4,559
HVAC System Improvements			**4,646**	**0.0**	**44**	**$832**	**$5,438**	**$0**	**$5,438**	**6.5**	**9,854**
ECM 6	Implement Demand Control Ventilation (DCV)	Yes	4,646	0.0	44	$832	$5,438	$0	$5,438	6.5	9,854
Domestic Water Heating Upgrade			**0**	**0.0**	**4**	**$33**	**$239**	**$32**	**$207**	**6.3**	**524**
ECM 7	Install Low-Flow DHW Devices	Yes	0	0.0	4	$33	$239	$32	$207	6.3	524
Food Service & Refrigeration Measures			**1,612**	**0.2**	**0**	**$177**	**$230**	**$50**	**$180**	**1.0**	**1,623**
ECM 8	Vending Machine Control	Yes	1,612	0.2	0	$177	$230	$50	$180	1.0	1,623
TOTALS (COST EFFECTIVE MEASURES)			**147,376**	**30.8**	**48**	**$16,506**	**$63,943**	**$13,862**	**$50,081**	**3.0**	**154,065**
TOTALS (ALL MEASURES)			**148,052**	**31.0**	**48**	**$16,580**	**$65,182**	**$13,862**	**$51,320**	**3.1**	**154,745**

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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

Options from Around the State

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

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

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

The CHP program provides incentives for combined heat and power (i.e., 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.

Successor Solar Incentive Program (SuSI)

New Jersey is committed to supporting solar energy. Solar projects help the state reach the renewable goals outlined in the state's Energy Master Plan. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available, but certified solar projects are able to earn one SREC II (Solar Renewable Energy Certificates II) for each megawatt-hour of solar electricity produced from a qualifying solar facility.

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.

Large Energy User Program (LEUP)

LEUP designed to promote self-investment in energy efficiency and combined heat and power or fuel cell projects. It incentivizes owners/users of buildings to upgrade or install energy conserving measures in existing buildings to help offset the capital costs associated with the project. The efficiency upgrades are customized to meet the requirements of the customers' existing facilities, while advancing the State's energy efficiency, conservation, and greenhouse gas reduction goals.

2 EXISTING CONDITIONS

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

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

2.1 Site Overview

On June 10, 2022, TRC performed an energy audit at Emerson Community School located in Plainfield, New Jersey. TRC met with facility staff to review the facility operations and help focus our investigation on specific energy-using systems.

Emerson Community School is a two-story, 66,204 square foot building built in 2008. Spaces include classrooms, gymnasium, multipurpose room, offices, corridors, stairwells, ballrooms, kitchen, and mechanical space.

2.2 Building Occupancy

The facility is occupied from September through June. Typical weekday occupancy is 82 staff and 466 students.

Summer occupancy includes a summer day camp and continuing maintenance activities. There are no weekend activities.

Building Name	Weekday/Weekend	Operating Schedule
Emerson Community School	Weekday	8:00 AM - 5:00 PM
	Weekend	Closed

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick facade. The flat roof is supported with steel trusses and a metal deck and finished with an insulated layer and a covering of EPDM.

Steel trusses support a pitched roof with a metal deck covered with a standing seam metal roofing system. Roof encloses conditioned space.

Building Brick Façade

Pitched and Flat Roof System

Interior Truss System

Most of the windows are double glazed and have aluminum frames with a thermal break. The glass-to-frame seals are in good condition. The operable window weather seals are in good condition, showing little evidence of excessive wear. Exterior doors have aluminum frames and are in good condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.


Windows


Windows


Exterior Door

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. Additionally, there are some compact fluorescent plug-in lamps (CFL), incandescent PAR30, and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts.

Fixture types include 2-lamp or 3-lamp, 4-foot long recessed, surface mounted, and pendent mounted fixtures. Most exterior fixtures have been retrofitted with LED lamps.

Most fixtures are in good condition. Gymnasium fixtures mainly consist of manually controlled T5HO linear fluorescent lamps. The multipurpose room has a mix of linear T8 fluorescent and PAR incandescent fixtures, used for stage and accent lighting. The library uses both metal halide and CFL light sources. All exit signs are LED. Interior lighting levels were generally sufficient.


Pendent Mount High Bay


Recessed Troffer


Wall Mount Linear Fixtures

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


Cafetorium Dimming Controls


Wall Switch Occupancy Sensor

Exterior fixtures include wall packs and sign flood light with LED lamps. The pole mounted flood fixtures incorporate LED sources. Exterior fixtures are timer controlled.

Wall Pack

Sign Floodlight

Shoebox Pole Top Fixtures

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

Server rooms are conditioned by ductless mini split AC units. These vary in capacity between 0.5 tons and 0.75-tons and range in efficiency between 11.8 EER to 12 EER. The units are in poor condition and are not ENERGY STAR® labeled.

Outdoor Condensing Unit

Outdoor Condensing Unit

Evaporator

Unitary Heating Equipment

Stairwells and vestibules are heated by electric resistance heaters. The kitchen has an electric forced air furnace makeup unit, and the mechanical room has a gas-fired unit heater. These units have minimal use with capacities ranging from 5 kW (electric resistance heaters), 36 kW (kitchen reheat), and 62.3 MBh (mechanical unit heater). The units are in good condition.

Electric Resistance Heater

Electric Forced Air Furnace

Gas-fired Unit Heater

Packaged Units

The cafetorium, gymnasium, and offices are served with packaged roof top units (RTUs) controlled by the EMS. These units have gas-fired heating capacities ranging from 410 MBh to 697 MBh and cooling capacities from 30 tons to 40 tons. They are in fair condition. In addition, near the library a RTU with 5.25 tons of cooling and a 6-kW electric resistance heating unit conditions rooms near the library. A 10-ton RTU provides cooling only to the kitchen. The RTUs are equipped with supply and return fan motors of varying sizes, some of which are equipped with variable speed drives (VFD).

Refer to Appendix A for detailed information about each unit.

Cafetorium RTU

Gymnasium RTU

RTU on Roof Near Library

Air Handling Units (AHUs)

Classrooms, library, and office spaces are conditioned by air handling units. These units are each equipped with a supply fan, return fan, hot water heating coil, and chilled water coil for cooling. They are located on the roof above the areas they serve. Motors are constant speed, with most of them controlled by VFDs.

The heating coil is supplied by the hot water boiler and the cooling is supplied by a chiller, which are described in the sections that follow.

Air Handling Unit

Air Handling Unit

VFD Motor Control

2.6 Heating Hot Water Systems

Two Laars 2000 MBh hot water boilers serve most of the building heating load. The boilers are configured in a lead-lag control scheme. Both boilers are required under high load conditions. Installed in 2008, they are in fair condition. There is no service contract in place.

The boilers are configured in a constant flow primary distribution with two, 10 hp constant speed hot water pumps operating with an automated control scheme. The boilers provide hot water to the rooftop air handling unit.

Boilers

Heating Hot Water Pumps

Control Module

2.7 Chilled Water Systems

The chiller plant consists of a 170-ton, Trane, R-134A, air-cooled screw chiller. The chiller is configured in a primary distribution loop with two, 20 hp VFD controlled pumps. The chiller plant supplies chilled water to five rooftop air handler units. They supply conditioned air to classrooms, library, and office spaces.

Chiller

Chilled Water Pumps

Rooftop Air Handling Units

2.8 Domestic Hot Water

Hot water is produced by two, 100-gallon, 199 MBh gas-fired storage water heaters with an efficiency 80%.

At the time of the site visit, the domestic water heaters were set at 140°F. One 1/2 hp circulation pump distributes water to end uses. The circulation pump operates continuously. The domestic hot water pipes are insulated.

Storage Tank Water Heaters

Circulation Pump

Temperature Setting on Water Heater

2.9 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare breakfasts and lunches for students and staff. Most cooking is done using a conventional gas-fired oven. Bulk prepared foods are held in one electric holding cabinet. Equipment is not high efficiency and is in good condition.

The dishwasher is an ENERGY STAR® low temperature, rack type unit.

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

Double Rack Oven

Insulated Food Holding Cabinet

Dishwasher

2.10 Refrigeration

The kitchen has a stand-up refrigerator and a stand-up freezer, both with solid doors. There are several refrigerator chests. Equipment is a mix of standard and high efficiency, in good condition.

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

Stand-up Refrigerator

Chest Refrigerator

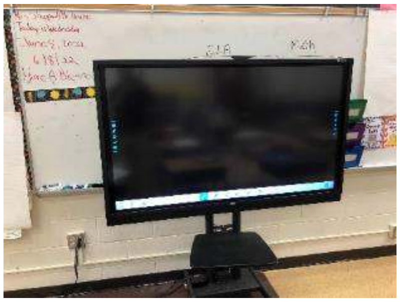
Chest Refrigerator

2.11 Plug Load and Vending Machines

The location is doing a great job managing their electrical plug loads. This report makes additional suggestions for ECMs in this area as well as energy efficient best practices.

There are 34 computers and 375 tablets throughout the facility. Plug loads include general cafe and office equipment. There are classroom typical loads such as smart boards, projectors, printers, and fans.

There are several mini-refrigerators, microwaves, coffee machines throughout the building. Most restrooms have electric hand dryers and corridors have water fountains.


Smartboard

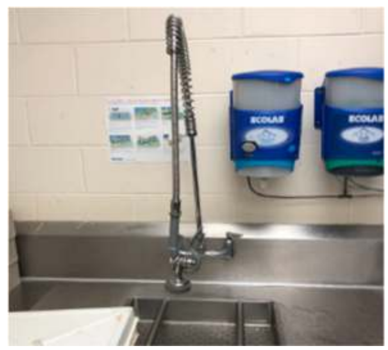

Water Fountains


Copier

2.12 Water-Using Systems

There are 13 restrooms with toilets and sinks. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher.


Restroom Sink


Kitchen Spray Value

2.13 On-Site Generation

Emerson Community School has a photovoltaic (PV) array that was installed in 2018 under a Power Purchase Agreement with Spano Partners Holdings, LLC. The system provides approximately 22% of the electricity used.

Emerson Community School has an emergency generator that, in the event of a power outage, serves critical services (lighting, elevator, heating - boiler and pumps). It is only used for emergency needs.


Solar Array on Lower Roof

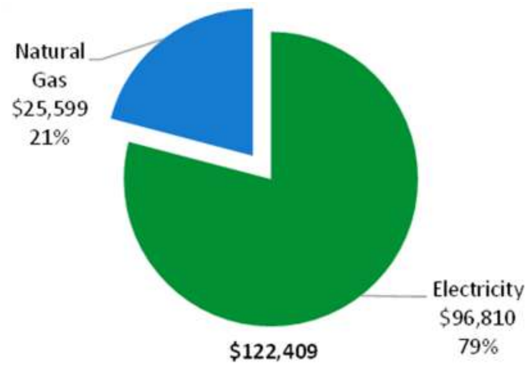

Solar Array on Upper Roof


Emergency Back-up Generator

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	883,279 kWh	$96,810
Natural Gas	35,066 Therms	$25,599
Total		**$122,409**



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

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

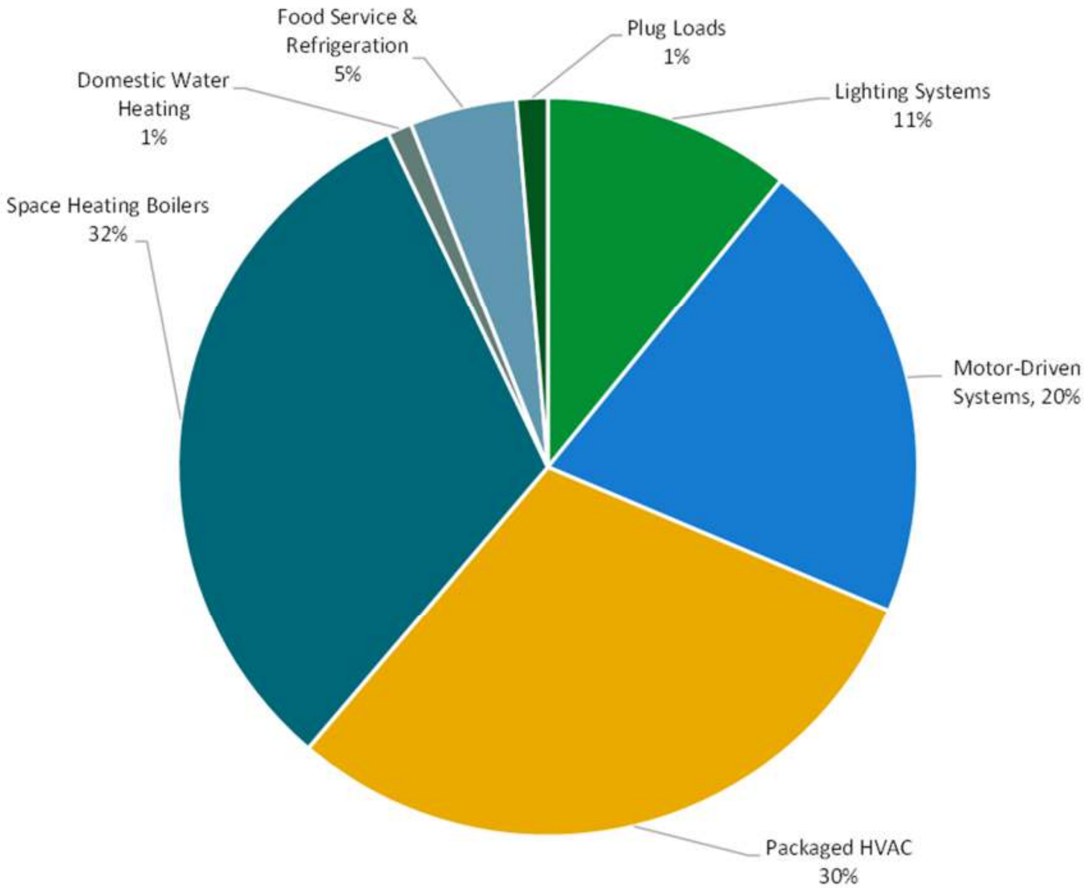
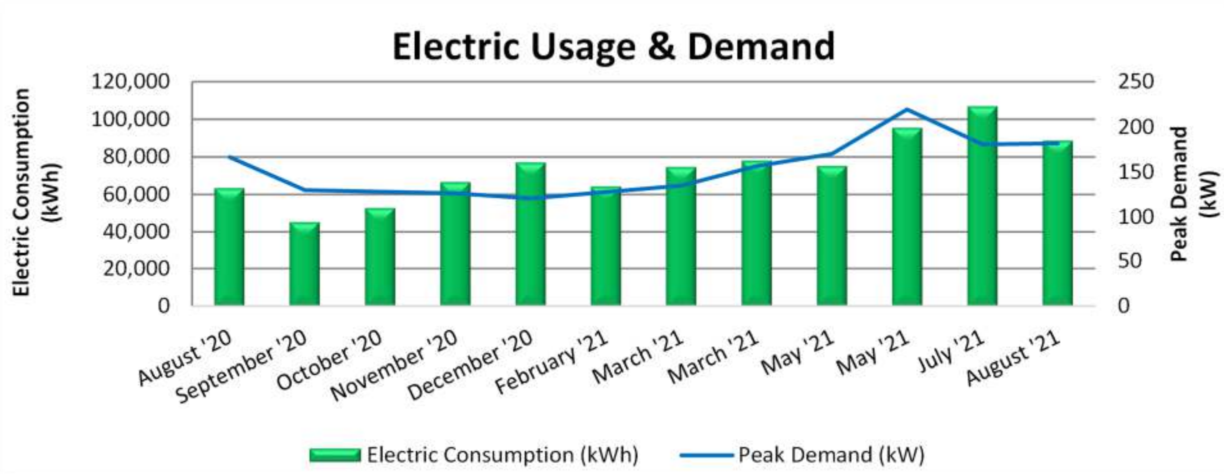


Figure 4 - Energy Balance

3.1 Electricity

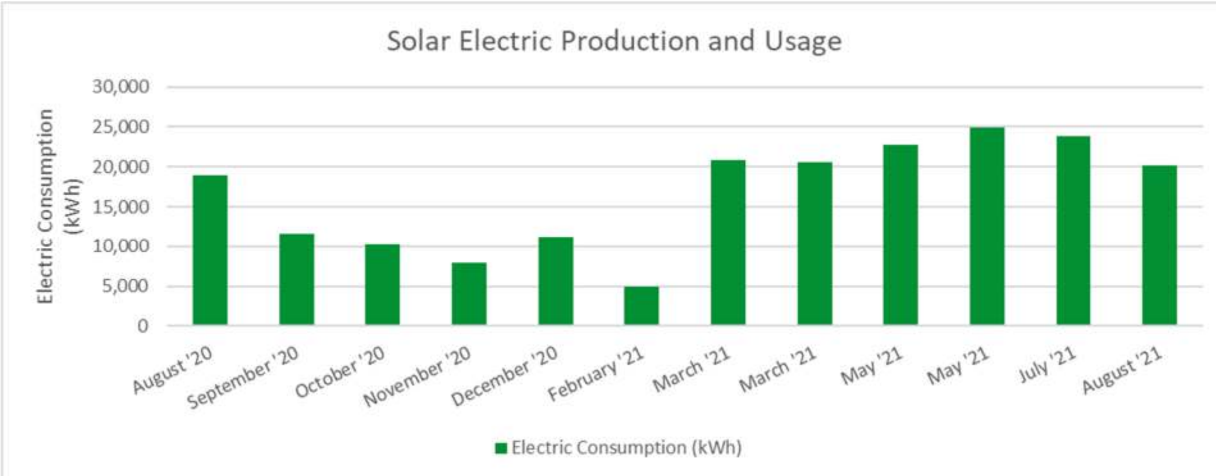
PSE&G delivers electricity under rate class Large Power & Lighting Secondary.



Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
9/14/20	31	63,460	167	2,116	8,527
10/13/20	29	45,351	130	488	5,824
11/11/20	29	52,773	128	481	5,980
12/15/20	34	66,631	126	475	7,422
1/15/21	31	77,088	121	453	8,119
2/16/21	32	64,203	128	480	6,722
3/17/21	29	74,725	135	507	7,345
4/15/21	29	78,053	157	589	7,866
5/17/21	32	75,082	170	642	7,501
6/15/21	29	95,377	219	2,804	10,869
7/16/21	31	106,816	181	2,309	11,223
8/16/21	31	88,560	182	2,323	9,942
Totals	**367**	**888,119**	**219**	**$13,666**	**$97,341**
Annual	**365**	**883,279**	**219**	**$13,592**	**$96,810**

Notes:

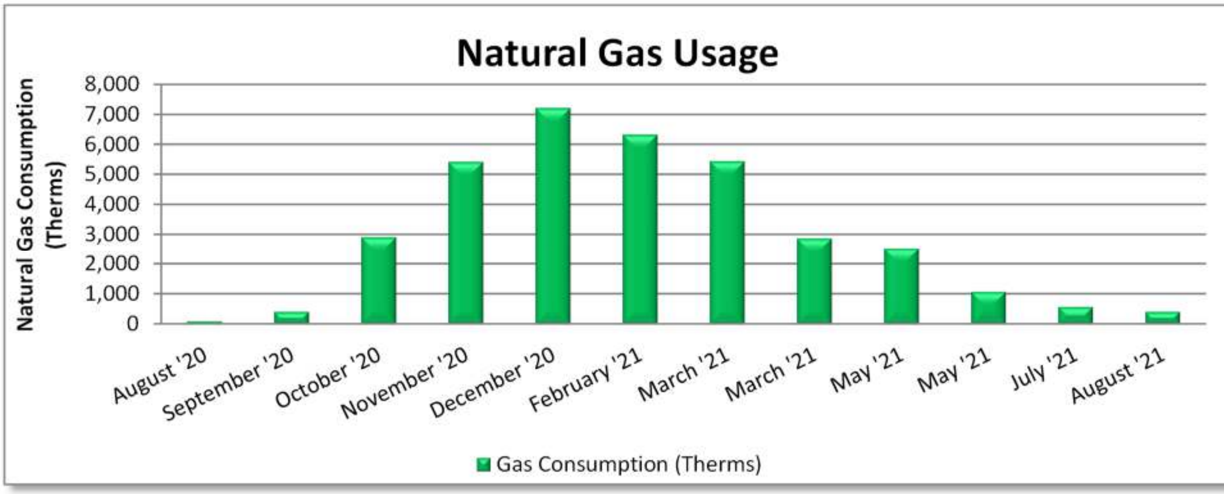
- Peak demand of 219 kW occurred in May 2021.
- Average demand over the past 12 months was 153 kW.
- Demand values are available for grid purchased electricity only.
- The average electric cost over the past 12 months was $0.110/kWh, which is the blended rate that includes energy supply, distribution, demand, solar fees, and other charges. This report uses this blended rate to estimate energy cost savings.
- On-site generation is through a PPA, and all of the electricity generated on-site is used on-site.



Solar Billing Data			
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Total Electric Cost**
9/14/20	31	18,994	$796
10/13/20	29	11,544	$548
11/11/20	29	10,249	$452
12/15/20	34	7,969	$321
1/15/21	31	11,192	$447
2/16/21	32	4,972	$207
3/17/21	29	20,785	$865
4/15/21	29	20,562	$886
5/17/21	32	22,802	$1,007
6/15/21	29	24,903	$993
7/16/21	31	23,775	$947
8/16/21	31	20,228	$811
Totals	**367**	**197,975**	**$8,278**
Annual	**365**	**196,896**	**$8,233**

3.2 Natural Gas

PSE&G delivers natural gas under rate class Large Volume Gas, with natural gas supply provided by UGI, a third-party supplier.



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
9/14/20	31	97	$196
10/13/20	29	413	$373
11/11/20	29	2,913	$2,156
12/15/20	34	5,413	$3,976
1/15/21	31	7,210	$5,010
2/16/21	32	6,325	$4,680
3/17/21	29	5,439	$4,418
4/15/21	29	2,864	$1,814
5/17/21	32	2,523	$1,613
6/15/21	29	1,078	$695
7/16/21	31	573	$444
8/16/21	31	411	$365
Totals	**367**	**35,258**	**$25,739**
Annual	**365**	**35,066**	**$25,599**

Notes:

- The average gas cost for the past 12 months is $0.730/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	**32**

This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

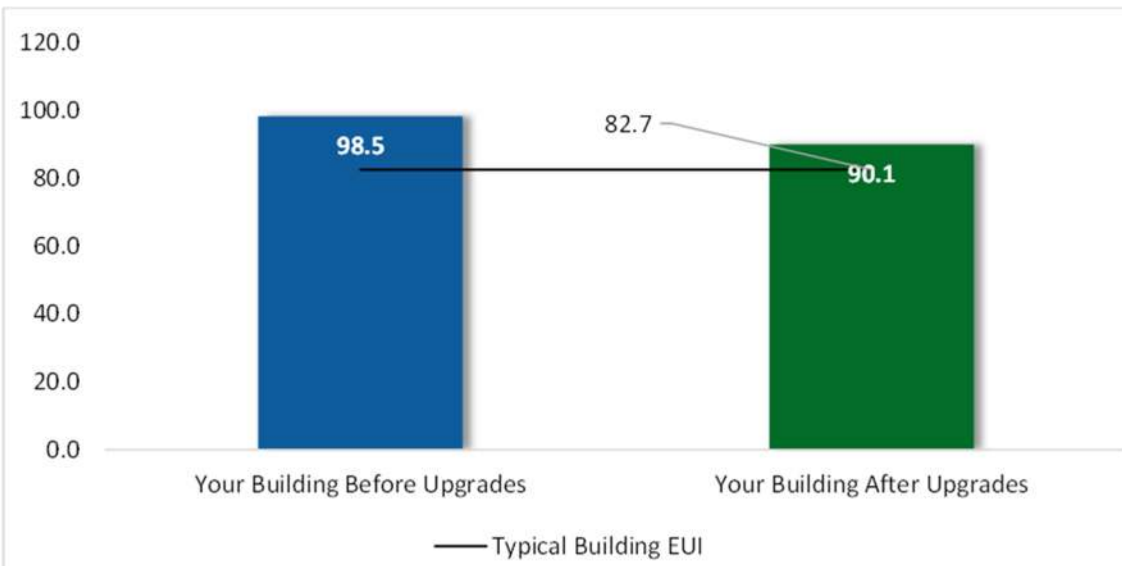


Figure 5 - Energy Use Intensity Comparison[3]

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

4 Energy Conservation Measures

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

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

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

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**118,135**	**24.7**	**-25**	**$12,768**	**$36,328**	**$9,695**	**$26,633**	**2.1**	**116,069**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	118,135	24.7	-25	$12,768	$36,328	$9,695	$26,633	2.1	116,069
Lighting Control Measures			**21,817**	**5.8**	**-5**	**$2,358**	**$18,952**	**$4,035**	**$14,917**	**6.3**	**21,435**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	19,949	5.3	-4	$2,156	$16,477	$2,000	$14,477	6.7	19,600
ECM 3	Install High/Low Lighting Controls	Yes	1,868	0.5	0	$202	$2,475	$2,035	$440	2.2	1,835
Motor Upgrades			**676**	**0.2**	**0**	**$74**	**$1,239**	**$0**	**$1,239**	**16.7**	**680**
ECM 4	Premium Efficiency Motors	No	676	0.2	0	$74	$1,239	$0	$1,239	16.7	680
Variable Frequency Drive (VFD) Measures			**1,166**	**0.1**	**29**	**$339**	**$2,756**	**$50**	**$2,706**	**8.0**	**4,559**
ECM 5	Install VFDs on Kitchen Hood Fan Motors	Yes	1,166	0.1	29	$339	$2,756	$50	$2,706	8.0	4,559
HVAC System Improvements			**4,646**	**0.0**	**44**	**$832**	**$5,438**	**$0**	**$5,438**	**6.5**	**9,854**
ECM 6	Implement Demand Control Ventilation (DCV)	Yes	4,646	0.0	44	$832	$5,438	$0	$5,438	6.5	9,854
Domestic Water Heating Upgrade			**0**	**0.0**	**4**	**$33**	**$239**	**$32**	**$207**	**6.3**	**524**
ECM 7	Install Low-Flow DHW Devices	Yes	0	0.0	4	$33	$239	$32	$207	6.3	524
Food Service & Refrigeration Measures			**1,612**	**0.2**	**0**	**$177**	**$230**	**$50**	**$180**	**1.0**	**1,623**
ECM 8	Vending Machine Control	Yes	1,612	0.2	0	$177	$230	$50	$180	1.0	1,623
TOTALS			**148,052**	**31.0**	**48**	**$16,580**	**$65,182**	**$13,862**	**$51,320**	**3.1**	**154,745**

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

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**118,135**	**24.7**	**-25**	**$12,768**	**$36,328**	**$9,695**	**$26,633**	**2.1**	**116,069**
ECM 1	Retrofit Fixtures with LED Lamps	118,135	24.7	-25	$12,768	$36,328	$9,695	$26,633	2.1	116,069
Lighting Control Measures		**21,817**	**5.8**	**-5**	**$2,358**	**$18,952**	**$4,035**	**$14,917**	**6.3**	**21,435**
ECM 2	Install Occupancy Sensor Lighting Controls	19,949	5.3	-4	$2,156	$16,477	$2,000	$14,477	6.7	19,600
ECM 3	Install High/Low Lighting Controls	1,868	0.5	0	$202	$2,475	$2,035	$440	2.2	1,835
Variable Frequency Drive (VFD) Measures		**1,166**	**0.1**	**29**	**$339**	**$2,756**	**$50**	**$2,706**	**8.0**	**4,559**
ECM 5	Install VFDs on Kitchen Hood Fan Motors	1,166	0.1	29	$339	$2,756	$50	$2,706	8.0	4,559
HVAC System Improvements		**4,646**	**0.0**	**44**	**$832**	**$5,438**	**$0**	**$5,438**	**6.5**	**9,854**
ECM 6	Implement Demand Control Ventilation (DCV)	4,646	0.0	44	$832	$5,438	$0	$5,438	6.5	9,854
Domestic Water Heating Upgrade		**0**	**0.0**	**4**	**$33**	**$239**	**$32**	**$207**	**6.3**	**524**
ECM 7	Install Low-Flow DHW Devices	0	0.0	4	$33	$239	$32	$207	6.3	524
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$177**	**$230**	**$50**	**$180**	**1.0**	**1,623**
ECM 8	Vending Machine Control	1,612	0.2	0	$177	$230	$50	$180	1.0	1,623
TOTALS		**147,376**	**30.8**	**48**	**$16,506**	**$63,943**	**$13,862**	**$50,081**	**3.0**	**154,065**

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

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

Figure 7 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**118,135**	**24.7**	**-25**	**$12,768**	**$36,328**	**$9,695**	**$26,633**	**2.1**	**116,069**
ECM 1	Retrofit Fixtures with LED Lamps	118,135	24.7	-25	$12,768	$36,328	$9,695	$26,633	2.1	116,069

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 of a specific lighting type (e.g., linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Retrofit Fixtures with LED Lamps

Replace fluorescent or CFL lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

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

Affected Building Areas: all areas with fluorescent fixtures with T8 tubes and CFLs.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**21,817**	**5.8**	**-5**	**$2,358**	**$18,952**	**$4,035**	**$14,917**	**6.3**	**21,435**
ECM 2	Install Occupancy Sensor Lighting Controls	19,949	5.3	-4	$2,156	$16,477	$2,000	$14,477	6.7	19,600
ECM 3	Install High/Low Lighting Controls	1,868	0.5	0	$202	$2,475	$2,035	$440	2.2	1,835

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 2: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected Building Areas: offices, conference rooms, classrooms, cafetorium, gymnasium, library, restrooms, and storage rooms.

ECM 3: Install High/Low Lighting Controls

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

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

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

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

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

Affected Building Areas: hallways and stairwells.

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**676**	**0.2**	**0**	**$74**	**$1,239**	**$0**	**$1,239**	**16.7**	**680**
ECM 4	Premium Efficiency Motors	676	0.2	0	$74	$1,239	$0	$1,239	16.7	680

ECM 4: Premium Efficiency Motors

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

Affected Motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Exterior 2 main roof B	Emerson Community School	2	Exhaust Fan	0.8	EF1,6
Exterior 3 lower roof c	Emerson Community School	1	Exhaust Fan	0.8	EF2

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

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**1,166**	**0.1**	**29**	**$339**	**$2,756**	**$50**	**$2,706**	**8.0**	**4,559**
ECM 5	Install VFDs on Kitchen Hood Fan Motors	1,166	0.1	29	$339	$2,756	$50	$2,706	8.0	4,559

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

ECM 5: Install VFDs on Kitchen Hood Fan Motors

Install VFDs and sensors to control the kitchen hood fan motors. The air flow of the hood is varied based on two key inputs: temperature and smoke/cooking fumes. The VFD controls the amount of exhaust (and kitchen make-up air) based on temperature—the lower the temperature the lower the flow. If the optic sensor is triggered by smoke or cooking fumes, the speed of the fan ramps up to 100%.

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

4.5 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**4,646**	**0.0**	**44**	**$832**	**$5,438**	**$0**	**$5,438**	**6.5**	**9,854**
ECM 6	Implement Demand Control Ventilation (DCV)	4,646	0.0	44	$832	$5,438	$0	$5,438	6.5	9,854

ECM 6: Implement Demand Control Ventilation (DCV)

DCV monitors the indoor air's carbon dioxide (CO_2) content to measure room occupancy. This data is used to regulate the amount of outdoor air provided to the space for ventilation.

Standard ventilation systems often provide outside air based on a space's estimated maximum occupancy but not actual occupancy. During low occupancy periods, the space may then be over ventilated. This wastes energy through heating and cooling the excess outside air flow. DCV reduces unnecessary outdoor air intake by regulating ventilation based on actual occupancy levels. DCV is most suited for facilities where occupancy levels vary significantly from hour to hour and day to day.

Energy savings associated with DCV are based on hours of operation, space occupancy, outside air reduction, and other factors. Energy savings results from eliminating unnecessary ventilation and space conditioning.

Affected Building Areas: gymnasium and cafeteria.

4.6 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**4**	**$33**	**$239**	**$32**	**$207**	**6.3**	**524**
ECM 7	Install Low-Flow DHW Devices	0	0.0	4	$33	$239	$32	$207	6.3	524

ECM 7: Install Low-Flow DHW Devices

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

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

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. Pre-rinse spray valves (PRSVs), often used in commercial and institutional kitchens, remove food waste from dishes prior to dishwashing.

Additional cost savings may result from reduced water usage.

4.7 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$177**	**$230**	**$50**	**$180**	**1.0**	**1,623**
ECM 8	Vending Machine Control	1,612	0.2	0	$177	$230	$50	$180	1.0	1,623

ECM 8: Vending Machine Control

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

4.8 Measures for Future Consideration

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

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

- Evaluate these measures further.
- Develop firm costs.
- Determine measure savings.
- Prepare detailed implementation plans.

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

VRF Systems

Variable refrigerant flow (VRF) systems use direct expansion (DX) heat pumps to transport heat between an outdoor condensing unit and a network of indoor evaporators, located near or within the conditioned space, through refrigerant piping installed in the building. Attributes that distinguish VRF from other DX system types are:

- Multiple indoor units connected to a common outdoor unit
- Scalability
- Variable capacity
- Distributed control
- Simultaneous heating and cooling capability

VRF provides flexibility by allowing for many different indoor units (with different capacities and configurations), individual zone control, the unique ability to offer simultaneous heating and cooling in separate zones on a common refrigerant circuit, and heat recovery from one zone to another. VRF systems are equipped with at least one variable-speed and/or variable-capacity compressor.

To match the building's load profiles, energy is transferred from one indoor space to another through the refrigerant line, and only one energy source is necessary to provide both heating and cooling. VRF systems also operate efficiently at part load because of the compressor's variable capacity control. VRF systems are ideal for applications with varying loads or where zoning is required. Some other advantages of VRF systems include consistent comfort, quiet operation, energy efficiency, installation flexibility, zoned heating and cooling, state-of-the-art controls, and reliability.

VRF systems are more expensive than conventional heat pump systems; however, the higher initial cost can be offset by improved cooling efficiency during part load operation—a SEER (cooling) rating of 18.0 is not uncommon for small packaged VRF-equipped heat pumps.

When you are replacing packaged HVAC equipment, we recommend a comprehensive approach. Work with your contractor or design engineer to make sure your systems are sized and zoned according to current space configurations and occupancy. Select high efficiency equipment and controls that match your heating and cooling needs. Commission the system and controls to ensure proper operation, comfort, ventilation, and energy use.

Install High Efficiency Energy Recovery Units (ERUs)

HVAC energy consumption in typical commercial buildings may account for 40% – 60% of the facility's energy use. Areas with high outdoor air requirements are even more energy intensive. Some of the facility types that require a higher amount of outdoor air for ventilation, which then needs to be conditioned, include swimming pools, laboratories, commercial kitchens, hospitals, and wood/metal shops. These facilities have the potential for significant energy savings by installing energy recovery units (ERU). Other applications that may have significant potential include theaters, fitness centers, and gymnasiums.

An ERU is a type of air-to-air heat exchanger that recovers energy from the exhaust air. An ERU heat exchanger transfers both sensible and latent heat[4]. One common type is a rotary enthalpy wheel. An enthalpy wheel improves the heating and cooling efficiency of an air handler or package unit by transferring energy from the exhaust air to the incoming outside air to precondition the outdoor air before it reaches the heating/cooling coil. Additional benefits for installing ERUs include reduced summer peak electrical demand, enhanced humidity control, continued operating savings, and the potential to downsize the heating and cooling capacity in comparison to traditional HVAC units. ERUs are the most cost effective on systems that use 100% outside air.

[4] Sensible heat refers to the amount of energy needed to increase or decrease the temperature of a substance. like air, independent of phase changes, Latent heat is the heat that results from an increase or decrease in the amount of moisture held by the air. Specifically, it's the amount of energy needed to cause a phase change.

5 Energy Efficient Best Practices

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

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

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Lighting Maintenance

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

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

Lighting Controls

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

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

Motor Controls

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Whenever possible, use automatic devices such as twist timers or occupancy sensors to turn off motors when they are not needed.

Motor Short Cycling Reduction

Frequent stopping and starting of motors places substantial stress on rotors and other parts. This leads to wear and tear, lower efficiency, and higher maintenance costs. Adjust the load on the motor to limit the amount of unnecessary stopping and starting to improve motor performance.

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.

Fans to Reduce Cooling Load

Install ceiling fans to supplement your cooling system. Thermostat settings can typically be increased by 4°F with no change in overall occupant comfort due to the wind chill effect of moving air.

Destratification Fans

For areas with high ceilings, destratification fans balance the air temperature from floor to ceiling. They help reduce the recovery time needed to warm the space after nightly temperature setbacks, and they will increase occupants' the comfort level.

Areas with high ceilings require the heating system to heat a larger volume of space than that which is occupied. As the warm air rises, the warmest space is at the ceiling level, rather than floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, which requires additional energy consumption by the heating equipment to compensate for this accelerated heat transfer.

Thermostat Schedules and Temperature Resets

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

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 5% to 10% 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.

Ductwork Maintenance

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

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

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

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

Boiler Maintenance

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

Furnace Maintenance

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

Optimize HVAC Equipment Schedules

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

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

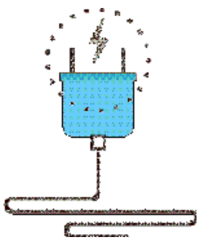
Water Heater Maintenance

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

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

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

Plug Load Controls



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

Water Conservation

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

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

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

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

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

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

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

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 On-site Generation

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

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

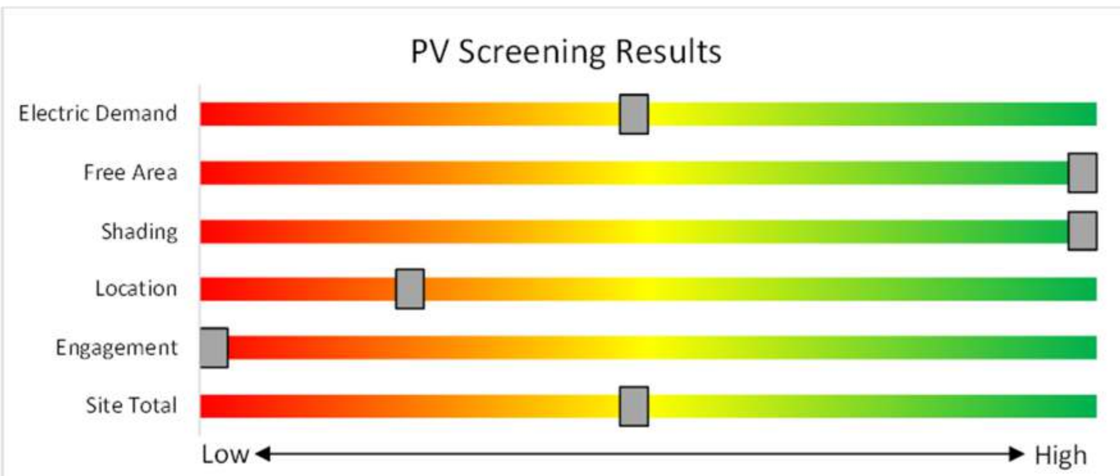
6.1 Solar Photovoltaic

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

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

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the medium potential. A PV array located 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	Medium	
System Potential	144	kW DC STC
Electric Generation	171,558	kWh/yr
Displaced Cost	$18,800	/yr
Installed Cost	$486,700	

Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects. Solar projects may qualify to earn SREC- IIs (Solar Renewable Energy Certificates-II), however, the project owners *must* register their solar projects prior to the start of construction to establish the project's eligibility.

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:

Successor Solar Incentive Program (SuSI): https://www.njcleanenergy.com/renewable-energy/programs/susi-program

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

6.2 Combined Heat and Power

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

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

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

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

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

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

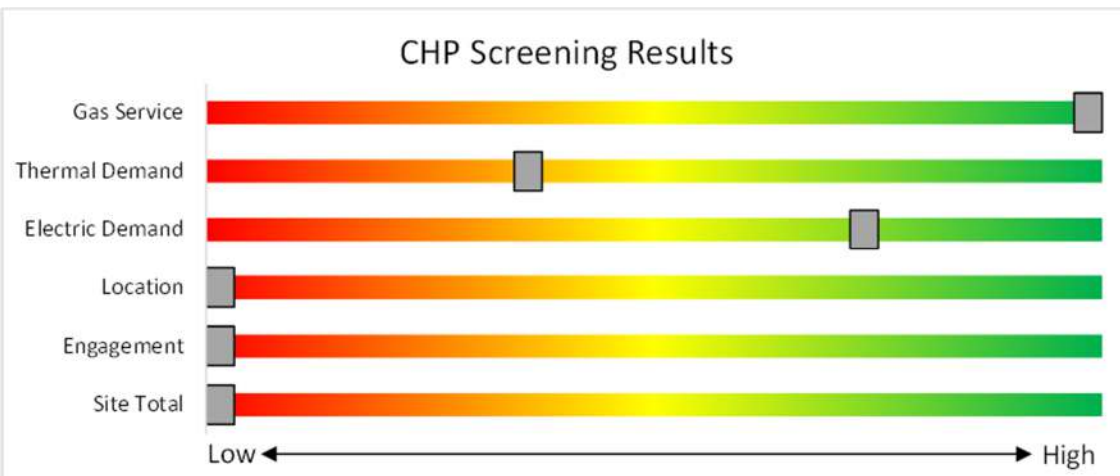


Figure 9 - Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

7 PROJECT FUNDING AND INCENTIVES

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

7.1 Utility Energy Efficiency Programs

The Clean Energy Act, signed into law by Governor Murphy in 2018, requires New Jersey's investor-owned gas and electric utilities to reduce their customers' use by set percentages over time. To help reach these targets the New Jersey Board of Public Utilities approved a comprehensive suite of energy efficiency programs to be run by the utility companies.

These new utility programs are rolling out in the spring and summer of 2021. Keep up to date with developments by visiting:

https://www.njcleanenergy.com/transition

8 NEW JERSEY'S CLEAN ENERGY PROGRAMS

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

8.1 Large Energy Users

The Large Energy Users Program (LEUP) is designed to foster self-directed investment in energy projects. This program is offered to New Jersey's largest energy customers that annually contribute at least $200,000 to the NJCEP aggregate of all buildings/sites. This equates to roughly $5 million in energy costs in the prior fiscal year.

Incentives

Incentives are based on the specifications below. The maximum incentive per entity is the lesser of:

- $4 million
- 75% of the total project(s) cost
- 90% of total NJCEP fund contribution in previous year
- $0.33 per projected kWh saved; $3.75 per projected Therm saved annually

How to Participate

To participate in LEUP, you will first need submit an enrollment application. This program requires all qualified and approved applicants to submit an energy plan that outlines the proposed energy efficiency work for review and approval. Applicants may submit a Draft Energy Efficiency Plan (DEEP), or a Final Energy Efficiency Plan (FEEP). Once the FEEP is approved, the proposed work can begin.

Detailed program descriptions, instructions for applying, and applications can be found at www.njcleanenergy.com/LEUP.

8.2 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

8.3 Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The program is used to register and certify 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 SREC-IIs (Solar Renewable Energy Certificates-II). SuSI consists of two sub-programs. The Administratively Determined Incentive (ADI) Program and the Competitive Solar Incentive (CSI) Program.

Administratively Determined Incentive (ADI) Program

The ADI Program provides administratively set incentives for net metered residential projects, net metered non-residential projects 5 MW or less, and all community solar projects.

After the registration is accepted, construction is complete, and a complete final as-built packet has been submitted, the project is issued a New Jersey certification number, which enables it to generate New Jersey SREC- IIs.

Market Segments	Size MW dc	Incentive Value ($/SREC II)	Public Entities Incentive Value - $20 Adder ($/SRECII)
Net Metered Residential	All types and sizes	$90	N/A
Small Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects smaller than 1 MW	$100	$120
Large Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects 1 MW to 5 MW	$90	$110
Small Net Metered Non-Residential Ground Mount	Projects smaller than 1 MW	$85	$105
Large Net Metered Non-Residential Ground Mount	Projects 1 MW to 5 MW	$80	$100
LMI Community Solar	Up to 5 MW	$90	N/A
Non-LMI Community Solar	Up to 5 MW	$70	N/A
Interim Subsection (t)	All types and sizes	$100	N/A

Eligible projects may generate SREC-IIs for 15 years following the commencement of commercial operations which is defined as permission to operate (PTO) from the Electric Distribution Company. After 15 years, projects may be eligible for a NJ Class I REC.

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

The ADI Program online portal is now open to new registrations effective August 28, 2021.

Competitive Solar Incentive Program

The Competitive Solar Incentive (CSI) Program will provide competitively set incentives for grid supply projects and net metered non-residential projects greater than 5MW. The program is currently under development with the goal of holding the first solicitation by early-to-mid 2022. For updates, please continue to check the Solar Proceedings page on the New Jersey's Clean Energy Program website.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan.

If you are considering installing solar photovoltaics on your building, visit the following link for more information: https://njcleanenergy.com/renewable-energy/programs/susi-program.

8.4 Energy Savings Improvement Program

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

9 PROJECT DEVELOPMENT

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

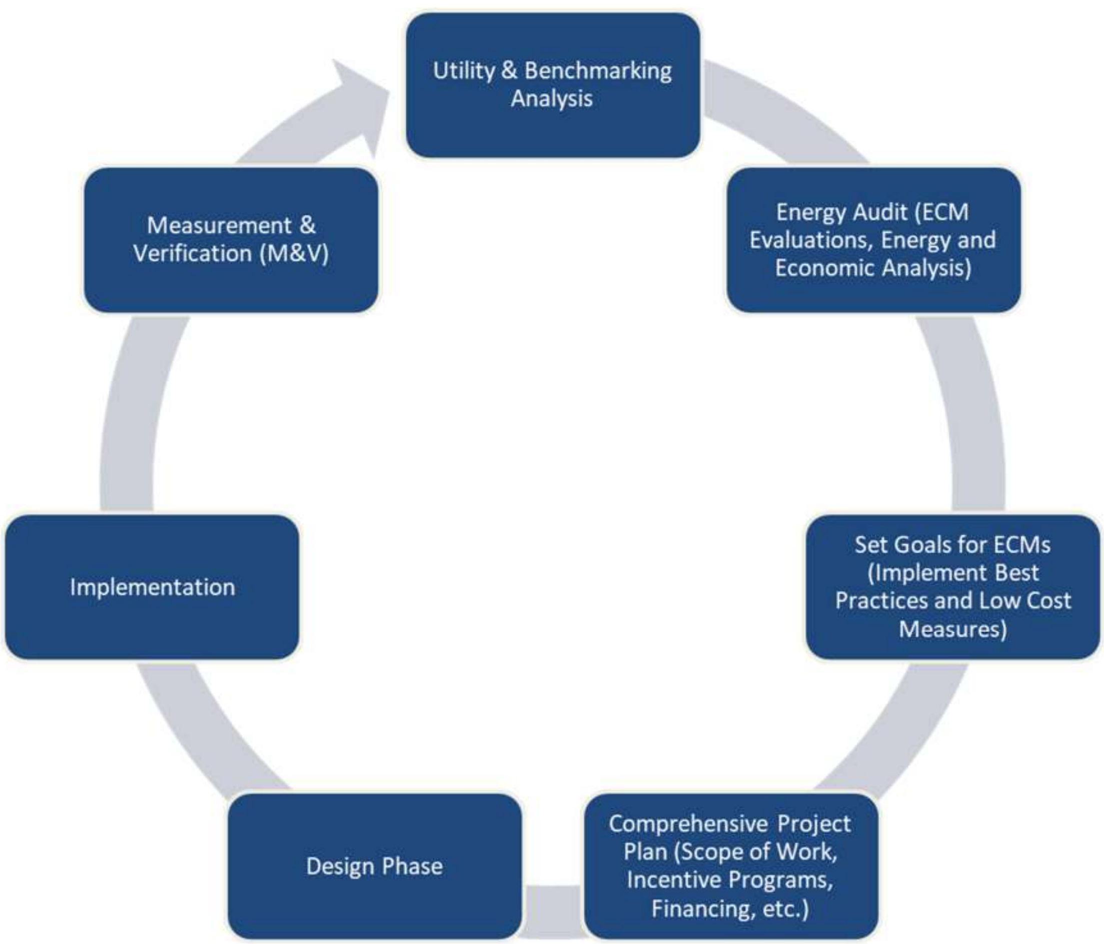


Figure 10 – Project Development Cycle

10 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

10.1 Retail Electric Supply Options

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

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

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

10.2 Retail Natural Gas Supply Options

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

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

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

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

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 102	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 102	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 103	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 103	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 104	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 104	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 105	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 105	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 106	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 106	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 107	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 107	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 117	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.7	2,432	-1	$263	$1,092	$260	3.2
Classroom 117	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 120	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 120	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 122	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 122	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 124	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.5	1,945	0	$210	$927	$215	3.4
Classroom 124	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 125	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 125	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 126	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.5	1,945	0	$210	$927	$215	3.4
Classroom 126	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 127	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3

	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 127	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 128	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 128	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 129	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.5	1,945	0	$210	$927	$215	3.4
Classroom 129	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 131	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,108	0	$228	$982	$230	3.3
Classroom 131	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	954	0	$103	$110	$30	0.8
Classroom 138	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	1,431	0	$155	$164	$45	0.8
Classroom 138	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	2,270	0	$245	$1,037	$245	3.2
Classroom 144	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
Classroom 144	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.1	1,908	0	$206	$219	$60	0.8
Classroom 144	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	1.0	3,405	-1	$368	$1,690	$385	3.5
Conference 139	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.3	973	0	$105	$599	$125	4.5
Corridor 2	8	Compact Fluorescent: (1) 26W Biaxial Plug-In Lamp	Wall Switch		26	2,340	1, 3	Relamp	Yes	8	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	19	1,615	0.1	265	0	$29	$550	$288	9.1
Corridor 2	7	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 2	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,615	0.2	648	0	$70	$444	$270	2.5
Dining Area 108	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.3	1,135	0	$123	$653	$140	4.2
Dining Area 108	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Electrical Room 1	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1, 2	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.2	2,428	-1	$262	$489	$95	1.5
Elevator 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$9	$37	$10	2.9
Exterior 5	3	LED Lamps: (1) 30W A19 Screw-In Lamp	Timeclock		30	4,380		None	No	3	LED Lamps: (1) 30W A19 Screw-In Lamp	Timeclock	30	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior 5	2	LED Lamps: (1) 100W Corn Bulb Screw-In Lamp	Timeclock		100	4,380		None	No	2	LED Lamps: (1) 100W Corn Bulb Screw-In Lamp	Timeclock	100	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior 5	5	LED Lamps: (1) 75W Corn Bulb Screw-In Lamp	Timeclock		75	4,380		None	No	5	LED Lamps: (1) 75W Corn Bulb Screw-In Lamp	Timeclock	75	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior 5	6	LED Lamps: (1) 10W Plug-In Lamps	Timeclock		10	4,380		None	No	6	LED Lamps: (1) 10W Plug-In Lamps	Timeclock	10	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior 5	2	LED Lamps: (2) 10W Plug-In Lamps	Timeclock		20	4,380		None	No	2	LED Lamps: (2) 10W Plug-In Lamps	Timeclock	20	4,380	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior 5	2	LED - Fixtures: Wall Pack	Timeclock		20	4,380		None	No	2	LED - Fixtures: Wall Pack	Timeclock	20	4,380	0.0	0	0	$0	$0	$0	0.0
Gymnasium 1	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
Gymnasium 1	18	Linear Fluorescent - T5HO: 4' T5HO (54W) - 6L	Wall Switch		358	2,340	1, 2	Relamp	Yes	18	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Occupancy Sensor	153	1,615	3.3	11,696	-2	$1,264	$2,775	$610	1.7
Gymnasium 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.1	324	0	$35	$226	$50	5.0
Kitchen 1	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch		10	2,340		None	No	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,340	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	1.0	3,405	-1	$368	$1,690	$385	3.5
Library 112	15	Compact Fluorescent: (4) 32W Double Biaxial Plug-In Lamps	Wall Switch		128	2,340	1, 2	Relamp	Yes	15	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	90	1,615	0.7	2,544	-1	$275	$1,020	$95	3.4
Library 112	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
Library 112	6	Metal Halide: (1) 70W Lamp	Wall Switch		95	0		None	No	6	Metal Halide: (1) 70W Lamp	Wall Switch	95	0	0.0	0	0	$0	$0	$0	0.0
Lobby 1 Multipurpose Exit	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lobby 1 Multipurpose Exit	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 3	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,615	0.2	811	0	$88	$499	$250	2.8
Main Corridor	2	Compact Fluorescent: (1) 26W Biaxial Plug-In Lamp	Wall Switch		26	2,340	1	Relamp	No	2	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	19	2,340	0.0	36	0	$4	$25	$2	5.9
Main Corridor	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
Main Corridor	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch		32	2,340	1, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,615	0.1	226	0	$24	$298	$160	5.6
Main Corridor	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Breaker Panel	29	8,760	0.2	2,544	-1	$275	$292	$80	0.8
Main Corridor	34	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 3	Relamp	Yes	34	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,615	1.0	3,675	-1	$397	$1,917	$1,015	2.3
Mechanical 1	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Mechanical 1	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1, 2	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.4	4,855	-1	$525	$708	$155	1.1
Multipurpose 1	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Multipurpose 1	26	Incandescent: (1) 65W PAR30 Screw-In Lamps	Other		26	100		None	No	26	Incandescent: (1) 65W PAR30 Screw-In Lamps	Other	26	100	0.0	0	0	$0	$0	$0	0.0
Multipurpose 1	26	Incandescent: (3) 50W R16 Screw-In Lamps	Other		150	100		None	No	26	Incandescent: (3) 50W R16 Screw-In Lamps	Other	150	100	0.0	0	0	$0	$0	$0	0.0
Multipurpose 1	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	648	0	$70	$489	$95	5.6
Multipurpose 1	27	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Other		93	4,380	1	Relamp	No	27	LED - Linear Tubes: (3) 4' Lamps	Other	44	4,380	1.0	6,439	-1	$696	$1,479	$405	1.5
Office - Enclosed 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	216	0	$23	$189	$40	6.4
Office - Enclosed 109	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	648	0	$70	$489	$95	5.6

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Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Office - Enclosed 110	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Office - Enclosed 110	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.3	1,135	0	$123	$653	$140	4.2
Office - Enclosed 112-A	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,340	0.0	127	0	$14	$55	$15	2.9
Office - Enclosed 112-A	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Office - Enclosed 114	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.3	1,135	0	$123	$653	$140	4.2
Office - Enclosed 115	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	648	0	$70	$489	$95	5.6
Office - Enclosed 123	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	811	0	$88	$544	$110	5.0
Office - Enclosed 133	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Office - Enclosed 133	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.1	486	0	$53	$434	$80	6.7
Office - Enclosed 133A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	648	0	$70	$489	$95	5.6
Office - Enclosed 137	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,340	0.0	127	0	$14	$55	$15	2.9
Office - Enclosed 137	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Office - Enclosed 137C	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Office - Enclosed 137C	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	811	0	$88	$544	$110	5.0
Office - Enclosed nurse	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.5	1,621	0	$175	$818	$185	3.6
Restroom - Female 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Breaker Panel	29	8,760	0.0	636	0	$69	$73	$20	0.8
Restroom - Female 1	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	540	0	$58	$453	$85	6.3
Restroom - Female 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Breaker Panel	29	8,760	0.0	636	0	$69	$73	$20	0.8
Restroom - Female 2	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	540	0	$58	$453	$85	6.3
Restroom - Male 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Breaker Panel	29	8,760	0.0	636	0	$69	$73	$20	0.8
Restroom - Male 1	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	540	0	$58	$453	$85	6.3
Restroom - Male 2	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	540	0	$58	$453	$85	6.3
Restroom - Male 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Breaker Panel	29	8,760	0.0	636	0	$69	$73	$20	0.8
Restroom - Unisex 1 Kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$9	$37	$10	2.9
Restroom - Unisex 129	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,340	0.0	127	0	$14	$55	$15	2.9

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Restroom - Unisex 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Restroom - Unisex 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$9	$37	$10	2.9
Restroom - Unisex 6	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$9	$37	$10	2.9
Restroom - Unisex 7	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$9	$37	$10	2.9
Restroom - Unisex nurse	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$9	$37	$10	2.9
Stairs 1	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,615	0.2	865	0	$93	$517	$305	2.3
Storage 117-A	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	1,000	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,000	0.0	54	0	$6	$55	$15	6.8
Storage 128SC	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	1,000	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,000	0.0	54	0	$6	$55	$15	6.8
Storage 136A	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	1,000	1, 2	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	690	0.1	139	0	$15	$335	$30	20.3
Storage 136B	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	1,000	1, 2	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	690	0.1	139	0	$15	$335	$30	20.3
Storage 137A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	1,000	1, 2	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	690	0.2	277	0	$30	$444	$60	12.8
Storage 138	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,000	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.0	36	0	$4	$37	$10	6.8
Storage 144SC	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch		32	1,000	1, 2	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	690	0.0	48	0	$5	$262	$10	48.1
Storage 148SC	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,000	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.0	36	0	$4	$37	$10	6.8
Storage/MDF	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor		62	350	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	350	0.0	13	0	$1	$37	$10	19.3
Storage/MDF	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	500	1, 2	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	345	0.1	69	0	$7	$335	$30	40.7
Classroom 220	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 220	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 221	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 221	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 222	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 222	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 223	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 223	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 224	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 224	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 225	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 225	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 226	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 226	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 227	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 227	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Classroom 228	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,297	0	$140	$708	$155	3.9
Classroom 228	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Breaker Panel		93	8,760	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Breaker Panel	44	8,760	0.0	477	0	$52	$55	$15	0.8
Corridor 3	5	Compact Fluorescent: (1) 26W Biaxial Plug-In Lamp	Wall Switch		26	2,340	1	Relamp	No	5	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	19	2,340	0.0	90	0	$10	$63	$5	5.9
Corridor 3	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
Corridor 3	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,615	0.1	324	0	$35	$335	$135	5.7
Janitorial JC218	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	500	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	18	0	$2	$37	$10	13.5
Office - Enclosed 219A	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	648	0	$70	$489	$95	5.6
Office - Enclosed 229	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	648	0	$70	$489	$95	5.6
Office - Enclosed 229A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch		93	2,340	1, 2	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	648	0	$70	$489	$95	5.6
Restroom - Female 3	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Breaker Panel	29	8,760	0.0	636	0	$69	$73	$20	0.8
Restroom - Female 3	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	540	0	$58	$453	$85	6.3
Restroom - Male 3	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1, 2	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	540	0	$58	$453	$85	6.3
Restroom - Male 3	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel		62	8,760	1	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Breaker Panel	29	8,760	0.0	636	0	$69	$73	$20	0.8
Restroom - Unisex 8	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	2,340	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$9	$37	$10	2.9
Stairs 2	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
Stairs 2	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	4,380	1, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,022	0.2	1,618	0	$175	$517	$305	1.2

Motor Inventory & Recommendations

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 1	Emerson Community School	1	Chilled Water Pump	20.0	93.0%	Yes	Baldor	EM2515T	W	2,000		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical 1	Emerson Community School	1	Chilled Water Pump	20.0	91.7%	Yes	Baldor	M2515T	W	2,000		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1 lower roof A	Emerson Community School	2	Exhaust Fan	0.3	65.0%	No	PennBarry	DX11B	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 2 main roof B	Emerson Community School	2	Exhaust Fan	0.8	70.0%	No	PennBarry	DX18B	B	2,745	4	Yes	81.1%	No		0.1	450	0	$49	$826	$0	16.7
Exterior 2 main roof B	Emerson Community School	1	Exhaust Fan	0.3	65.0%	No	PennBarry	DX08B	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof c	Emerson Community School	1	Exhaust Fan	0.3	65.0%	No	PennBarry	DX08B	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof c	Emerson Community School	1	Exhaust Fan	0.8	70.0%	No	PennBarry	Unknown	B	2,745	4	Yes	81.1%	No		0.1	225	0	$25	$413	$0	16.7
Mechanical 1	Emerson Community School	2	Heating Hot Water Pump	10.0	87.5%	No	Baldor	JMM3313T	W	2,000		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical 1	Emerson Community School	1	DHW Circulation Pump	0.5	70.0%	No	Grundfos	Unknown	W	8,760		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 4 kitchen roof	Kitchen 1	1	Kitchen Hood Exhaust Fan	0.8	70.0%	No	Captive-Aire	NCA14FA	B	1,000	5	No	81.1%	Yes	1	0.1	1,166	29	$339	$2,756	$50	8.0
Elevator 1	Emerson Community School	1	Other	10.0	91.0%	No	ThyssenKrupp Elevator	TAC20	W	100		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium 1	Gymnasium	6	Other	0.5	70.0%	No	Unknown	Unknown	W	20		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 2 main roof B	Exterior 2 main roof B, A	2	Supply Fan	20.0	93.0%	Yes	Baldor	EM2515T	W	3,391		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 2 main roof B	Exterior 2 main roof B, A	2	Return Fan	10.0	91.7%	Yes	AO Smith	E397	W	3,391		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof C	Gymnasium	1	Supply Fan	25.0	93.0%	No	AO Smith	S284T	B	3,391		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof C	Gymnasium	1	Return Fan	5.0	90.2%	No	AO Smith	S184T	B	3,391		No	90.2%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 2 main roof B	Exterior 2 main roof B	3	Return Fan	3.0	89.5%	Yes	AO Smith	E217V1	W	3,391		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 2 main roof B	Exterior 2 main roof B	3	Supply Fan	10.0	91.7%	Yes	AO Smith	E397	W	3,391		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof C	Cafeteria	1	Supply Fan	20.0	93.0%	No	Unknown	Unknown	B	3,391		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof C	Cafeteria	1	Return Fan	5.0	90.2%	No	Unknown	Unknown	B	3,391		No	90.2%	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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior 3 lower roof C	Exterior 3 lower roof C	1	Supply Fan	20.0	93.0%	Yes	AO Smith	S256T	B	3,391		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof C	Exterior 3 lower roof C	1	Return Fan	5.0	86.5%	Yes	AO Smith	S184T	B	3,391		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 4 kitchen roof	Kitchen 1	1	Makeup Air Fan	0.5	70.0%	No	Unknown	Unknown	W	500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged HVAC Inventory & Recommendations

Existing Conditions											Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior 2 Main Roof B	Emerson Community School	2	Ductless Mini-Split AC	0.75		11.80		EMI	S1CA8000D00	B		No							0.0	0	0	$0	$0	$0	0.0
Exterior 3 Lower Roof C	Emerson Community School	1	Ductless Mini-Split AC	0.50		12.00		EMI	S1CA5000D00	B		No							0.0	0	0	$0	$0	$0	0.0
Corridor 2	Corridor 2	1	Electric Resistance Heat		17.06		1 COP	Trane	UHWA051C5AT	W		No							0.0	0	0	$0	$0	$0	0.0
Main Corridor	Main Corridor	1	Electric Resistance Heat		17.06		1 COP	Trane	UHWA051C5AT	W		No							0.0	0	0	$0	$0	$0	0.0
Stairs 1	Stairs 1	1	Electric Resistance Heat		17.06		1 COP	Trane	UHWA051C5AT	W		No							0.0	0	0	$0	$0	$0	0.0
Stairs 2	Stairs 2	1	Electric Resistance Heat		17.06		1 COP	Trane	UHWA051C5AT	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 4 Kitchen Roof	Kitchen 1	1	Electric Forced Air Furnace		122.83		1 COP	Warren	CBK	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 1 Lower Roof A	Emerson Community School	1	Package Unit	5.25	20.50	11.00	1 COP	Trane	THC063A4RBAOUH08A0A	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof C	Cafeteria	1	Package Unit	40.00	697.00	10.00	0.82 AFUE	Trane	SFHFC404P946C6BD1C01A0#00G00L00BT07860##	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof C	Gymnasium	1	Package Unit	40.00	697.00	10.00	0.82 AFUE	Trane	SFHFC404P946C7BD1C01A0#00G00L00RT07860##	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 3 lower roof C	Emerson Community School	1	Package Unit	30.00	410.00	10.00	0.82 AFUE	Trane	SFHFC304P948C6DD7C01A0#00G00L00RT07860##	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 4 Kitchen Roof	Kitchen 1	1	Package Unit	10.00		11.00		Trane	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Mechanical 1	Mechanical 1	1	Unit Heater		62.30		0.83 AFUE	Reznor	UDAP75	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)	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior 3 Lower Roof C	Emerson Community School	1	Air-Cooled Screw Chiller	170.00	Trane	RTAC 1704 U00HUAFN N1TY 1CDL NN0E N10N NAEX N	B		No							0.0	0	0	$0	$0	$0	0.0

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 1	Emerson Community School	2	Non-Condensing Hot Water Boiler	1,700	Laars	RHCH2000NACF 2EXN	W		No						0.0	0	0	$0	$0	$0	0.0

Demand Control Ventilation Recommendations

		Recommendation Inputs					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior 3 lower roof C	Cafeteria	6	2.00	40.00		697.00	0.0	2,323	22	$416	$2,719	$0	6.5
Exterior 3 lower roof C	Gymnasium	6	2.00	40.00		697.00	0.0	2,323	22	$416	$2,719	$0	6.5

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 1	Emerson Community School	2	Storage Tank Water Heater (> 50 Gal)	Bradford White	EF100T199E3N2	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Emerson Community School	7	16	Faucet Aerator (Kitchen)	2.20	1.50	0.0	0	3	$23	$115	$32	3.6
Emerson Community School	7	1	Pre-Rinse Spray Valve	2.50	1.28	0.0	0	1	$10	$124	$0	12.6

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen 1	2	Refrigerator Chest	Powers	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	4	Refrigerator Chest	Vollrath	37001-00001-NNA	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	Traulsen	G30001	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Traulsen	G22000	Yes		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	Manufacturer	Model	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen 1	1	Gas Rack Oven (Single)	Unknown	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Gas Rack Oven (Double)	Hobart	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Insulated Food Holding Cabinet (Full Size)	Metro 65	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Electric Combination Oven/Steam Cooker (<15 Pans)	Vollrath	37040-00001-CAN	No		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

	Existing Conditions							Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Manufacturer	Model	Water Heater Fuel Type	Booster Heater Fuel 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	Estimated M&L Cost ($)	Total Incentives	Payback w/ Incentives in Years
Kitchen 1	1	Single Tank Conveyor (Low Temp)	Hobart	AM15	Natural Gas	N/A	Yes		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

Location	Existing Conditions					
	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Emerson Community School	3	Coffee Machine	800	No	Varied	Varied
Emerson Community School	21	Desktop	270	No	Varied	Varied
Emerson Community School	2	Fan	200	No	Varied	Varied
Emerson Community School	375	Tablet	75	No	Apple	Unknown
Emerson Community School	13	Laptop	75	No	Varied	Varied
Emerson Community School	7	Microwave	800	No	Varied	Varied
Classroom 138	1	Laminator	1,440	No	Ledco	The Educator
Lobby 1 Multipurpose Exit	1	Chairlift	1,500	No	Unknown	Unknown
Emerson Community School	12	Hand Dryer	100	No	Jetair	U1525EA
Emerson Community School	5	Paper Shredder	50	No	Unknown	Unknown
Emerson Community School	40	Printer	200	No	Unknown	Unknown
Emerson Community School	4	Copier	1,500	No	Xerox	Varied
Emerson Community School	10	Projector	100	No	Varied	Varied
Emerson Community School	4	Mini Refrigerator	126	No	Varied	Varied
Dining Area 108	1	Refrigerator	383	No	Unknown	Unknown
Emerson Community School	31	Smart Board	100	No	Varied	Varied
Emerson Community School	3	Television	130	No	Unknown	Unknown
Storage 138	1	Toaster Oven	1,000	No	Unknown	Unknown
Emerson Community School	6	Water Fountain	200	No	Elkay	Unknown

Vending Machine Inventory & Recommendations

Location	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Dining Area 108	1	Refrigerated	8	Yes	0.2	1,612	0	$177	$230	$50	1.0

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

Energy use intensity (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

32

ENERGY STAR® Score[1]

Emerson Community School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 66,204
Built: 2008

For Year Ending: July 31, 2021
Date Generated: July 03, 2022

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
Emerson Community School
305 Emerson Avenue
Plainfield, New Jersey 07060

Property Owner
PlainfieldBOE
920 Park Avenue
Plainfield, NJ 07060
(908) 731-4356

Primary Contact
Kenneth Welch, Jr.
920 Park Avenue
Plainfield, NJ 07060
(908) 731-4356
kwelch@plainfield.k12.nj.us

Property ID: 4721150

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
98.5 kBtu/ft²

Source EUI
164.2 kBtu/ft²

Annual Energy by Fuel

Electric - Solar (kBtu)	686,358 (10%)
Natural Gas (kBtu)	3,510,779 (54%)
Electric - Grid (kBtu)	2,321,027 (36%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	82.7
National Median Source EUI (kBtu/ft²)	137.9
% Diff from National Median Source EUI	19%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	466

Signature & Stamp of Verifying Professional

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

LP Signature: ______________________Date: ___________

Licensed Professional

____ ________
,
(___)____-_____
____

Professional Engineer or Registered Architect Stamp (if applicable)

Appendix C: Glossary

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

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

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