Local Government Energy Audit Report

Cliffwood Avenue Elementary School

November 4, 2020

Prepared for:
Matawan Aberdeen Regional School District
422 Cliffwood Avenue
Cliffwood, NJ 07721

Prepared by:
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Disclaimer

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

TRC 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 installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. Cost estimates include material and labor pricing associated with installation of primary recommended equipment only. Cost estimates do not include demolition or removal of hazardous waste. We encourage the owner of the facility to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

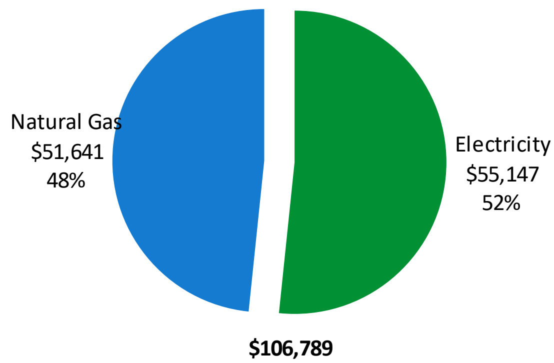
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

Table of Contents

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Cliffwood Avenue Elementary 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: $106,789 Electricity: 447,646 kWh Natural Gas: 47,395 Therms	
ENERGY STAR® Benchmarking Score	37 *(1-100 scale)*	This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

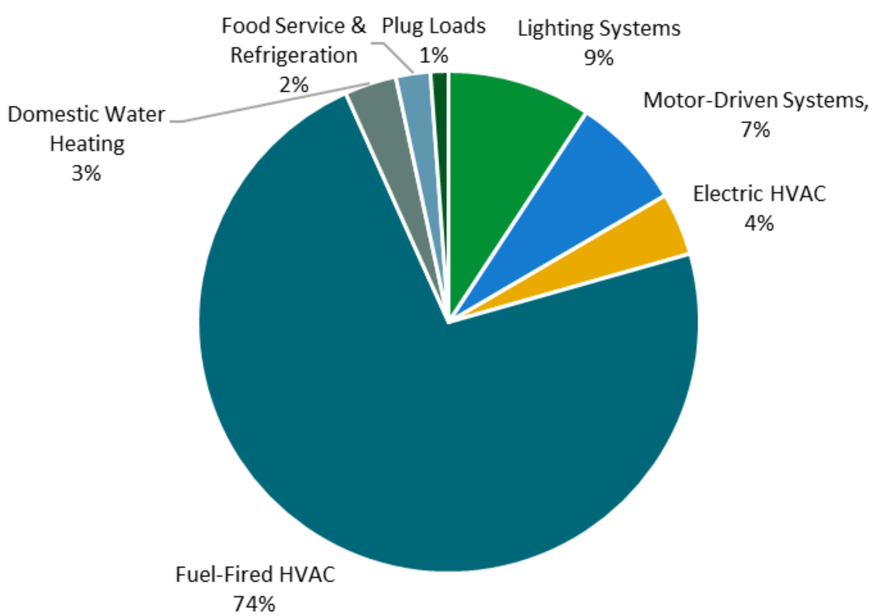


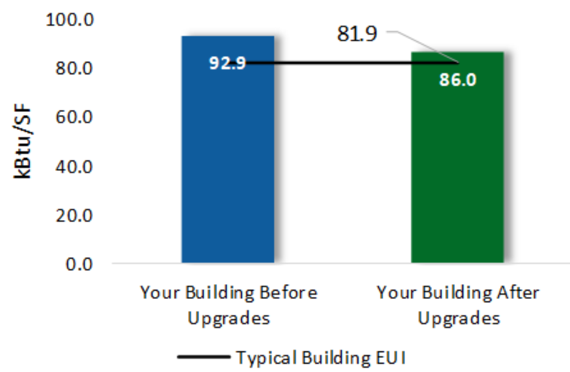
Figure 1 - Energy Use by System

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.

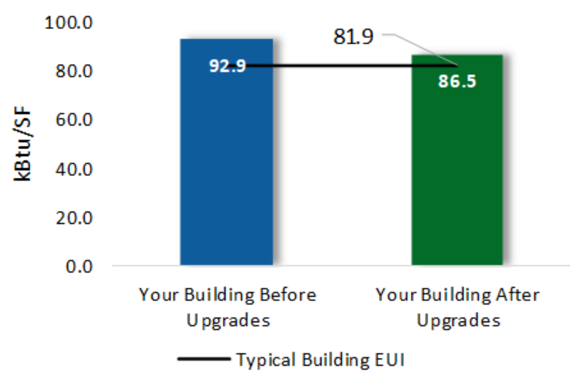
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$83,333
Potential Rebates & Incentives[1]	$20,574
Annual Cost Savings	$16,816
Annual Energy Savings	Electricity: 136,334 kWh
Greenhouse Gas Emission Savings	69 Tons
Simple Payback	3.7 Years
Site Energy Savings (all utilities)	7%



Scenario 2: Cost Effective Package[2]

Installation Cost	$67,292
Potential Rebates & Incentives	$19,474
Annual Cost Savings	$16,158
Annual Energy Savings	Electricity: 133,083 kWh
Greenhouse Gas Emission Savings	66 Tons
Simple Payback	3.0 Years
Site Energy Savings (all utilities)	7%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**82,148**	**17.4**	**-17**	**$9,933**	**$19,468**	**$9,196**	**$10,272**	**1.0**	**80,711**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	82,148	17.4	-17	$9,933	$19,468	$9,196	$10,272	1.0	80,711
Lighting Control Measures			**25,964**	**5.5**	**-5**	**$3,139**	**$21,353**	**$3,830**	**$17,523**	**5.6**	**25,510**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	21,421	4.5	-4	$2,590	$16,628	$3,620	$13,008	5.0	21,047
ECM 3	Install High/Low Lighting Controls	Yes	4,543	0.9	-1	$549	$4,725	$210	$4,515	8.2	4,463
Variable Frequency Drive (VFD) Measures			**25,997**	**5.8**	**0**	**$3,203**	**$33,246**	**$6,600**	**$26,646**	**8.3**	**26,178**
ECM 4	Install VFDs on Constant Volume (CV) Fans	Yes	13,985	3.8	0	$1,723	$18,002	$2,700	$15,302	8.9	14,083
ECM 5	Install VFDs on Heating Water Pumps	Yes	9,129	1.1	0	$1,125	$8,152	$3,600	$4,552	4.0	9,193
ECM 6	Install Boiler Draft Fan VFDs	No	2,882	0.9	0	$355	$7,091	$300	$6,791	19.1	2,902
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**17**	**$185**	**$6,231**	**$800**	**$5,431**	**29.3**	**1,990**
ECM 7	Install High Efficiency Furnaces	No	0	0.0	17	$185	$6,231	$800	$5,431	29.3	1,990
HVAC System Improvements			**369**	**0.0**	**7**	**$118**	**$2,719**	**$0**	**$2,719**	**23.0**	**1,153**
ECM 8	Implement Demand Control Ventilation (DCV)	No	369	0.0	7	$118	$2,719	$0	$2,719	23.0	1,153
Domestic Water Heating Upgrade			**245**	**0.0**	**1**	**$39**	**$86**	**$48**	**$38**	**1.0**	**345**
ECM 9	Install Low-Flow DHW Devices	Yes	245	0.0	1	$39	$86	$48	$38	1.0	345
Food Service & Refrigeration Measures			**1,612**	**0.2**	**0**	**$199**	**$230**	**$100**	**$130**	**0.7**	**1,623**
ECM 10	Vending Machine Control	Yes	1,612	0.2	0	$199	$230	$100	$130	0.7	1,623
TOTALS (COST EFFECTIVE MEASURES)			**133,083**	**27.9**	**-22**	**$16,158**	**$67,292**	**$19,474**	**$47,818**	**3.0**	**131,465**
TOTALS (ALL MEASURES)			**136,334**	**28.9**	**2**	**$16,816**	**$83,333**	**$20,574**	**$62,759**	**3.7**	**137,510**

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	Retrofit Fixtures with LED Lamps	X	X	
ECM 2	Install Occupancy Sensor Lighting Controls	X	X	
ECM 3	Install High/Low Lighting Controls	X	X	
ECM 4	Install VFDs on Constant Volume (CV) Fans	X	X	
ECM 5	Install VFDs on Heating Water Pumps	X	X	
ECM 6	Install Boiler Draft Fan VFDs	X	X	
ECM 7	Install High Efficiency Furnaces	X		
ECM 8	Implement Demand Control Ventilation (DCV)		X	
ECM 9	Install Low-Flow DHW Devices	X	X	
ECM 10	Vending Machine Control	X	X	

Figure 3 – Funding Options

New Jersey’s Clean Energy Programs At-A-Glance

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

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

Individual Measures with SmartStart

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

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

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

More Options from Around the State

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

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

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

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

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces electric loads at commercial facilities when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. By enabling commercial facilities to reduce electric demand during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

2 EXISTING CONDITIONS

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

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

2.1 Site Overview

On July 17, 2020, TRC performed an energy audit at Cliffwood Avenue Elementary School located in Cliffwood, New Jersey. TRC met with Joe Czimcharo to review the facility operations and help focus our investigation on specific energy-using systems.

Cliffwood Avenue Elementary School is a two-story, 67,450 square foot building built in 1958. Spaces include: classrooms, gymnasium, offices, cafeteria, corridors, stairwells, a kitchen and mechanical and spaces.

Over the last five years the facility has replaced some packaged roof top units.

2.2 Building Occupancy

The facility is occupied year-round. Typical weekday occupancy is 70 staff and 320 students.

Summer occupancy includes summer classes continuing maintenance activities. There are occasional sporting events on weekends.

Building Name	Weekday/Weekend	Operating Schedule
Custodial hours	Weekday	6:00 AM - 11:00 PM
	Weekend	Closed
Staff and Student Occupancy	Weekday	8:00 AM to 4:00 PM
	Weekend	Closed, occasionally partially open for sporting events

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building exterior walls are concrete block over structural steel with a brick facade. The roof is flat and covered with black and white membrane and in fair condition.

The interior walls are made of concrete masonry units (CMUs) with a decorative painted veneer finish.

Most of the windows are double pane and have aluminum frames. 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 fair condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Exterior walls

Exterior Doors

Roof

Windows

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several 40-Watt LED fixtures. Additionally, there are some compact fluorescent lamps (CFL), incandescent, and other LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts.

Fixture types include 2-lamp, 3-lampk, or 4-lamp, 2-foot or 4-foot long recessed or surface mounted fixtures and 2-foot fixtures with linear tube lamps. Most fixtures are in good condition. Interior lighting levels were generally sufficient.

Gymnasium fixtures have high bay, T5(HO) linear fluorescent lamps and are manually controlled.

All exit signs are LED units.


Library lighting


Cafetorium lighting


Hallway lighting


Classroom lighting

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


Remote occupancy sensor

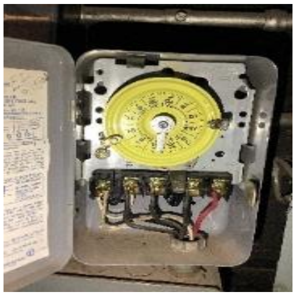
Exterior fixtures include wall packs, flood lights, and canopy lights with LED lamps.

Exterior light fixtures are controlled by a time clock.


Building flood lights


Wallpacks


Canopy lighting


Timeclock

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators (UV) provide heating and cooling to classroom areas. They are equipped with supply fan motors, outside air dampers cooling coils and heating coils. Each unit has a cooling capacity of between three and four tons, depending on the model. The units are relatively new and appear to be in good operating condition. They are controlled by the EMS.

Packaged and Split-system Units

The building is served by several split-system and packaged roof top units (RTUs). There are three gas-fired packaged units and two make-up air units with either 8- or 15-ton cooling capacity and 120 or 240 MBh heating capacity, respectively. There are also three split-system air-conditioners with either 6- or 10- ton cooling capacity and three ductless mini-split heat pumps with either ¾ or 1- ton cooling capacity and 10.9 or 22.2 MBh heating capacity, respectively. These packaged and split-system units are equipped with economizers that are in good condition.

Refer to Appendix A for detailed information about each unit.

Air Conditioners

The copy room is cooled by a 1- ton capacity window air conditioning (AC) unit. The unit efficiency is 9.4 EER and it is not ENERGY STAR® labeled. The unit is in fair condition.

Despite the new EMS, some of the HVAC equipment remains controlled by a pneumatic system. A 2 hp air compressor located in the boiler room serves the pneumatic system.

Air Handling Units

There are two air handling units (AHUs) in the school. One serves the media center and the other serves the classrooms 12 and 13. The supply fan motor hp for the media center is 1.5 hp and for the other AHU serving classrooms 12 and 13, the supply fan has a 3 hp motor. Both AHUs are in good condition.


Rooftop packaged AC unit


Ductless mini-split HP unit


Window AC unit


Indoor air-handling unit

2.6 Heating Hot Water Systems

Two Rockmills 3,347 MBh steam boilers and three Lochinvar 470 MBh condensing hot water boilers serve the building heating load. The burners are fully modulating with a nominal efficiency of 82% for the steam boilers and 94% for the hot water boilers. The boilers are configured in a lead-lag control scheme. Multiple boilers may be required under high load conditions. The steam boilers were installed in 2013 and serve the original building and older addition whereas the hot water boilers were installed in 2015 and heat the 1995 addition. Both boilers are in good condition.

The steam boilers generate hot water with a heat exchanger. There are two 1.5 hp variable speed, hot water pumps for hot water generated by the heat exchanger.

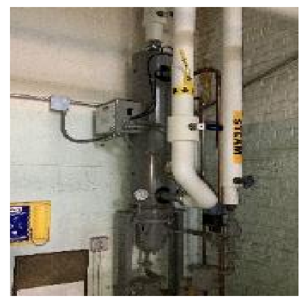
The hot water boilers are configured in a constant flow primary distribution with two 5 hp constant speed hot water pumps operating in a lead-lag control scheme.

The boilers provide hot water to unit ventilators, fin tube radiators, makeup air units, and air-handlers throughout the building. Hot water is generally supplied at 150°F-160°F during winter.

Steam boilers

Condensing hot water boilers

Hot water pump VFDs



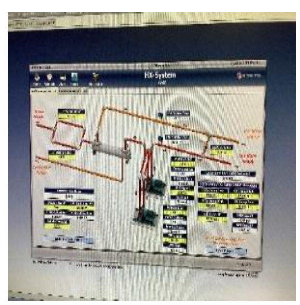
Steam to hot water heat exchanger

2.7 Building Energy Management Systems (EMS)

A Honeywell EMS controls the HVAC equipment, boilers, air handlers, and package units. The EMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, and heating water loop temperatures.

Temperature setpoints schedule

RTU dashboard



Steam to hot water heat exchange system dashboard

Exhaust fan dashboard

2.8 Domestic Hot Water

Hot water is produced with a 119-gallon, 18 kW electric storage water heater and a 74 gallon, 75.1 MBh gas-fired storage water heater, both with a nominal 80% efficiency rating. Three fractional horsepower circulation pumps distribute water to end uses. The circulation pumps operate continuously. The domestic hot water pipes are insulated, and the insulation is in good condition.

The facility is installing a steam-to-hot water heat exchanger to provide domestic hot water. The purpose of this new system will be so the site can avoid running the electric hot water heater during summer.

Electric storage water heater

Gas storage water heater

2.9 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students. Most cooking is done using convection gas-fired ovens. Bulk prepared foods are held in an electric holding cabinet. Equipment is not high efficiency and is in good condition.

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

Gas convection ovens

Insulated food cabinet

2.10 Refrigeration

The kitchen has several stand-up refrigerators with either solid or glass doors. There is also a freezer chest. All equipment is standard efficiency and in good condition.

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

Solid door refrigerator

Glass door refrigerator

Freezer chest

Large solid door refrigerator

2.11 Plug Load & Vending Machines

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

There are 61 computer work stations throughout the facility. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as projectors and fans.

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

There is a refrigerated beverage vending machine in the staff lounge. The vending machine is not equipped with occupancy-based controls.

Café Equipment

Vending Machine

Copier

2.12 Water-Using Systems

There are restrooms with toilets, urinals, and sinks. 26 lavatory faucets have flow rates of 0.5 gallons per minute (gpm) and considered low flow. There are 12 kitchen faucets which are rated at 2.0 gpm.

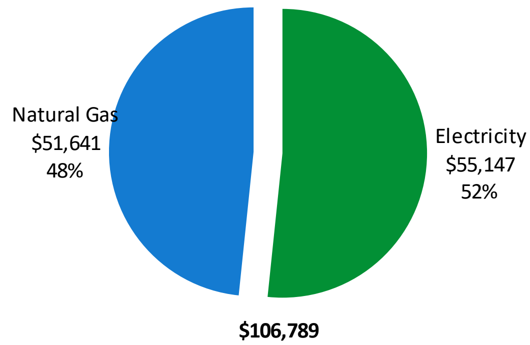
Lavatory fixtures

Toilet fixture

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	447,646 kWh	$55,147
Natural Gas	47,395 Therms	$51,641
Total		**$106,789**



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

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

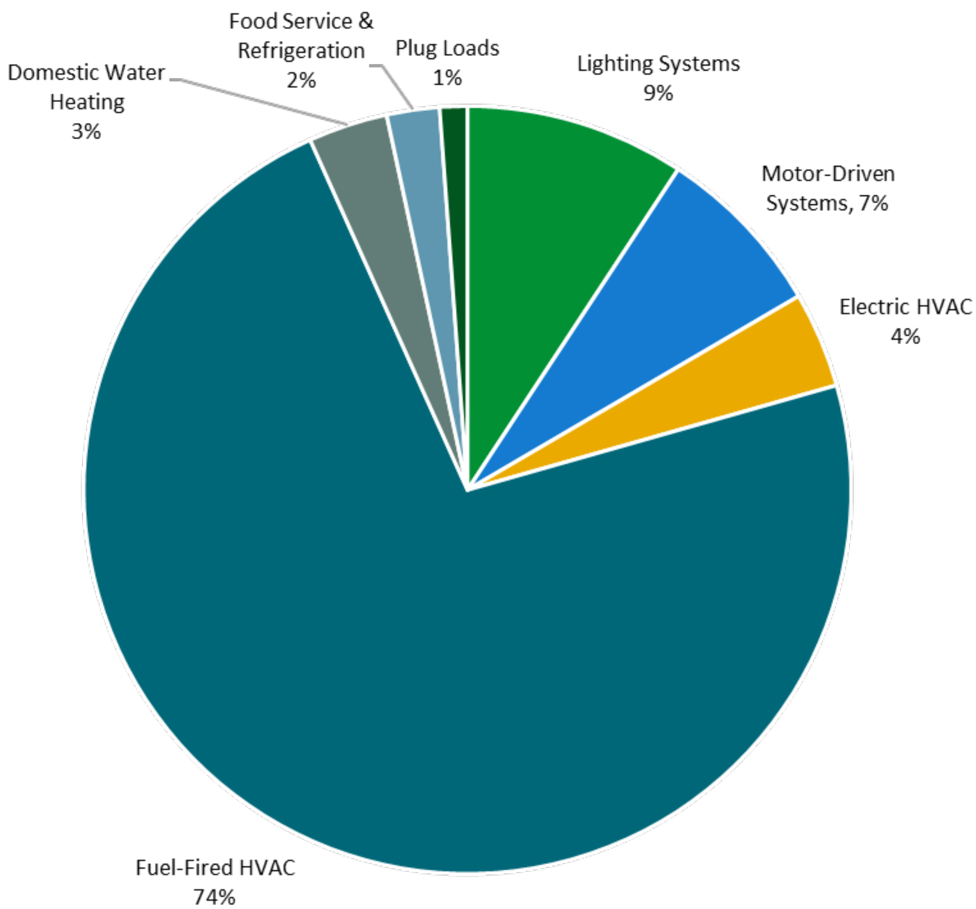
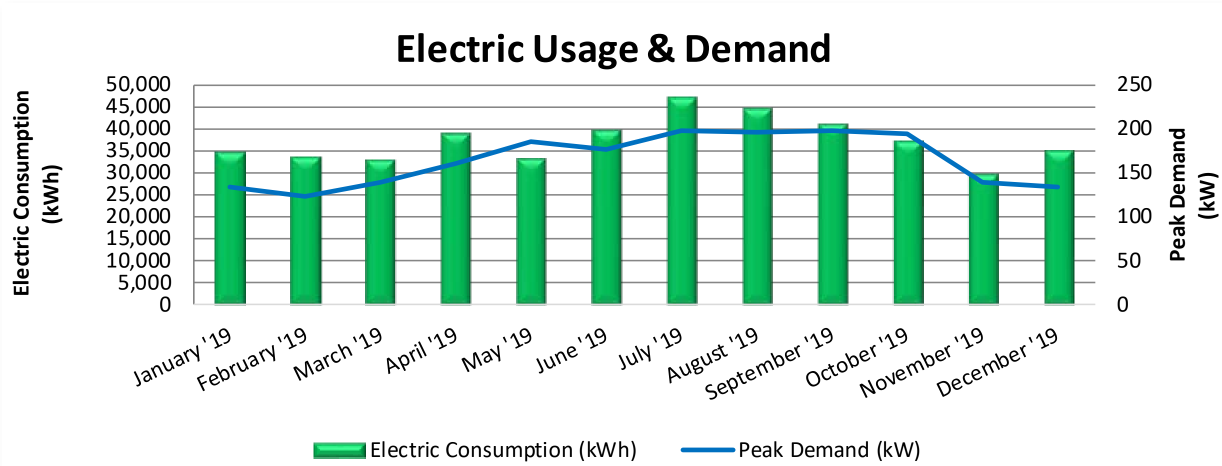


Figure 5 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary 3 Phase and Outdoor Lighting Service, with electric production provided by East Coast Power, a third-party supplier.



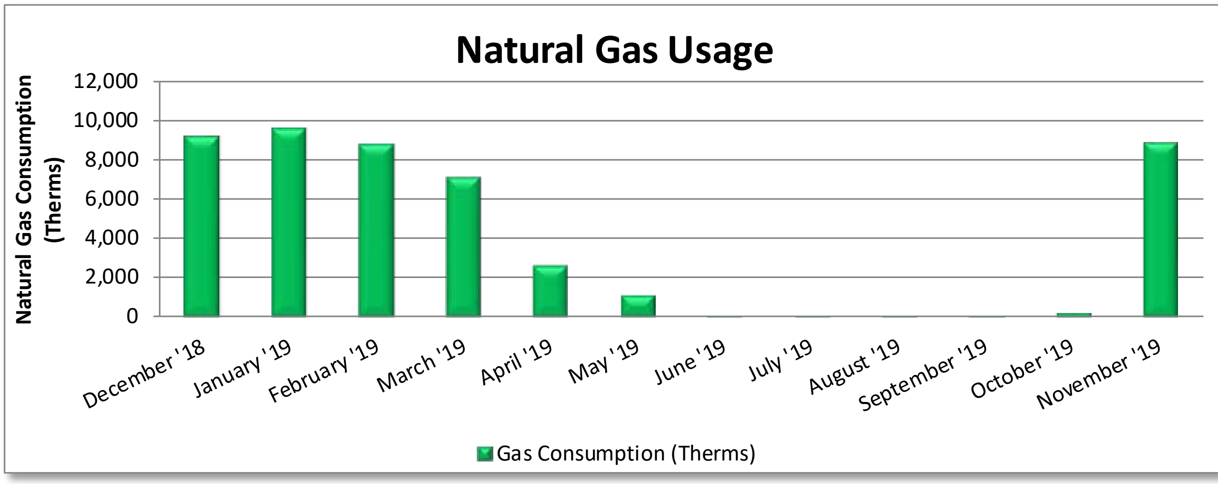
Electric Billing Data						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
1/22/19	35	34,606	134	$776	$4,059	No
2/20/19	29	33,806	123	$709	$3,984	No
3/20/19	28	33,006	140	$812	$3,938	No
4/19/19	30	38,926	161	$944	$4,626	No
5/22/19	33	33,326	185	$1,091	$4,345	No
6/20/19	29	39,566	177	$1,109	$4,841	No
7/22/19	32	47,246	198	$1,244	$5,868	No
8/21/19	30	44,846	196	$1,232	$5,626	No
9/19/19	29	41,006	198	$1,247	$5,273	No
10/21/19	32	37,326	194	$1,136	$4,804	No
11/18/19	28	29,966	140	$800	$3,767	No
12/19/19	31	35,246	134	$766	$4,167	Yes
Totals	**366**	**448,872**	**198**	**$11,864**	**$55,298**	
Annual	**365**	**447,646**	**198**	**$11,832**	**$55,147**	

Notes:

- Peak demand of 198 kW occurred in September 2019.
- Average demand over the past 12 months was 165 kW.
- The average electric cost over the past 12 months was $0.123/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.
- Electricity consumption increases during summer months from the increase in cooling demand met by electric HVAC equipment.

3.2 Natural Gas

NJ Natural Gas delivers natural gas under rate class Monthly 057CNN2G, with natural gas supply provided by UGI Energy Services, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
1/7/19	34	9,155	$10,313
2/4/19	28	9,591	$9,780
3/6/19	30	8,793	$8,460
4/5/19	30	7,065	$6,544
5/6/19	31	2,601	$2,836
6/5/19	30	1,074	$1,578
7/9/19	34	84	$790
8/6/19	28	43	$755
9/5/19	30	25	$741
10/3/19	28	35	$749
11/4/19	32	176	$869
12/5/19	31	8,883	$8,368
Totals	**366**	**47,525**	**$51,783**
Annual	**365**	**47,395**	**$51,641**

Notes:

- The average gas cost for the past 12 months is $1.090/therm, which is the blended rate used throughout the analysis.
- The majority of gas consumption occurs during the winter months due to the increased heating demand met by the gas boilers.

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	37

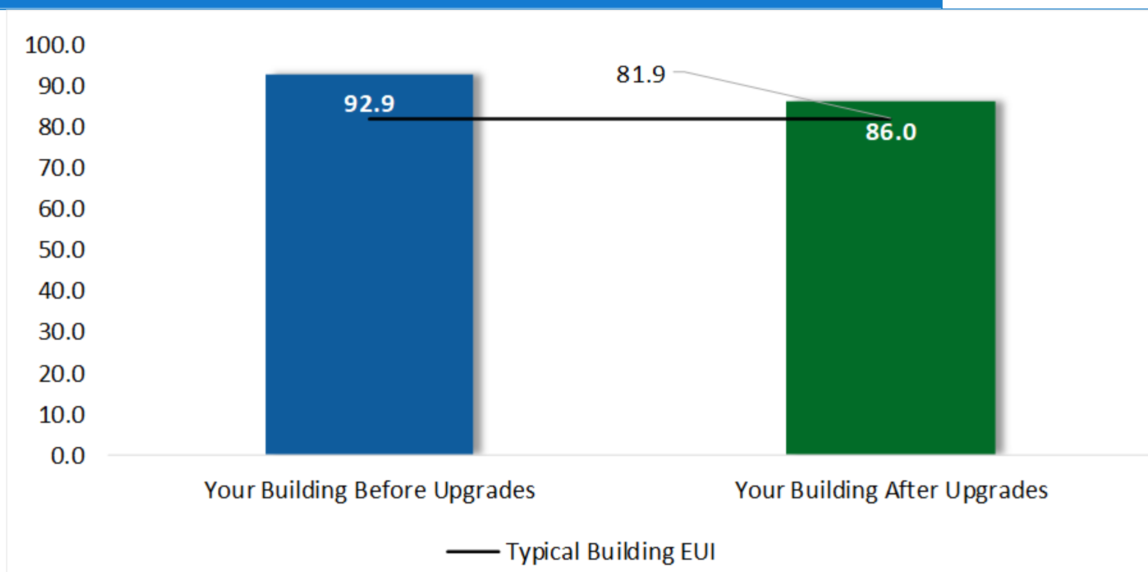


Figure 6 - Energy Use Intensity Comparison[3]

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

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

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

4 Energy Conservation Measures

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

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

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

Financial incentives are based on the current NJCEP prescriptive SmartStart program. A higher level of investigation may be necessary to support any SmartStart Custom, Pay for Performance, or Direct Install incentive applications. Some measures and proposed upgrades may be eligible for higher incentives than those shown below through other NJCEP programs described in a following section of this report.

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**82,148**	**17.4**	**-17**	**$9,933**	**$19,468**	**$9,196**	**$10,272**	**1.0**	**80,711**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	82,148	17.4	-17	$9,933	$19,468	$9,196	$10,272	1.0	80,711
Lighting Control Measures			**25,964**	**5.5**	**-5**	**$3,139**	**$21,353**	**$3,830**	**$17,523**	**5.6**	**25,510**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	21,421	4.5	-4	$2,590	$16,628	$3,620	$13,008	5.0	21,047
ECM 3	Install High/Low Lighting Controls	Yes	4,543	0.9	-1	$549	$4,725	$210	$4,515	8.2	4,463
Variable Frequency Drive (VFD) Measures			**25,997**	**5.8**	**0**	**$3,203**	**$33,246**	**$6,600**	**$26,646**	**8.3**	**26,178**
ECM 4	Install VFDs on Constant Volume (CV) Fans	Yes	13,985	3.8	0	$1,723	$18,002	$2,700	$15,302	8.9	14,083
ECM 5	Install VFDs on Heating Water Pumps	Yes	9,129	1.1	0	$1,125	$8,152	$3,600	$4,552	4.0	9,193
ECM 6	Install Boiler Draft Fan VFDs	No	2,882	0.9	0	$355	$7,091	$300	$6,791	19.1	2,902
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**17**	**$185**	**$6,231**	**$800**	**$5,431**	**29.3**	**1,990**
ECM 7	Install High Efficiency Furnaces	No	0	0.0	17	$185	$6,231	$800	$5,431	29.3	1,990
HVAC System Improvements			**369**	**0.0**	**7**	**$118**	**$2,719**	**$0**	**$2,719**	**23.0**	**1,153**
ECM 8	Implement Demand Control Ventilation (DCV)	No	369	0.0	7	$118	$2,719	$0	$2,719	23.0	1,153
Domestic Water Heating Upgrade			**245**	**0.0**	**1**	**$39**	**$86**	**$48**	**$38**	**1.0**	**345**
ECM 9	Install Low-Flow DHW Devices	Yes	245	0.0	1	$39	$86	$48	$38	1.0	345
Food Service & Refrigeration Measures			**1,612**	**0.2**	**0**	**$199**	**$230**	**$100**	**$130**	**0.7**	**1,623**
ECM 10	Vending Machine Control	Yes	1,612	0.2	0	$199	$230	$100	$130	0.7	1,623
TOTALS			**136,334**	**28.9**	**2**	**$16,816**	**$83,333**	**$20,574**	**$62,759**	**3.7**	**137,510**

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

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

Figure 7 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**82,148**	**17.4**	**-17**	**$9,933**	**$19,468**	**$9,196**	**$10,272**	**1.0**	**80,711**
ECM 1	Retrofit Fixtures with LED Lamps	82,148	17.4	-17	$9,933	$19,468	$9,196	$10,272	1.0	80,711
Lighting Control Measures		**25,964**	**5.5**	**-5**	**$3,139**	**$21,353**	**$3,830**	**$17,523**	**5.6**	**25,510**
ECM 2	Install Occupancy Sensor Lighting Controls	21,421	4.5	-4	$2,590	$16,628	$3,620	$13,008	5.0	21,047
ECM 3	Install High/Low Lighting Controls	4,543	0.9	-1	$549	$4,725	$210	$4,515	8.2	4,463
Variable Frequency Drive (VFD) Measures		**23,114**	**4.9**	**0**	**$2,848**	**$26,155**	**$6,300**	**$19,855**	**7.0**	**23,276**
ECM 4	Install VFDs on Constant Volume (CV) Fans	13,985	3.8	0	$1,723	$18,002	$2,700	$15,302	8.9	14,083
ECM 5	Install VFDs on Heating Water Pumps	9,129	1.1	0	$1,125	$8,152	$3,600	$4,552	4.0	9,193
Domestic Water Heating Upgrade		**245**	**0.0**	**1**	**$39**	**$86**	**$48**	**$38**	**1.0**	**345**
ECM 9	Install Low-Flow DHW Devices	245	0.0	1	$39	$86	$48	$38	1.0	345
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$199**	**$230**	**$100**	**$130**	**0.7**	**1,623**
ECM 10	Vending Machine Control	1,612	0.2	0	$199	$230	$100	$130	0.7	1,623
TOTALS		**133,083**	**27.9**	**-22**	**$16,158**	**$67,292**	**$19,474**	**$47,818**	**3.0**	**131,465**

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

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

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**82,148**	**17.4**	**-17**	**$9,933**	**$19,468**	**$9,196**	**$10,272**	**1.0**	**80,711**
ECM 1	Retrofit Fixtures with LED Lamps	82,148	17.4	-17	$9,933	$19,468	$9,196	$10,272	1.0	80,711

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

ECM 1: Retrofit Fixtures with LED Lamps

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

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

Affected building areas: all areas with fluorescent fixtures with T8 tubes; basement storage area, cafetorium, and elevator with incandescent lamps; lobby with compact fluorescent; and cafetorium and gymnasium with T5 tubes.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**25,964**	**5.5**	**-5**	**$3,139**	**$21,353**	**$3,830**	**$17,523**	**5.6**	**25,510**
ECM 2	Install Occupancy Sensor Lighting Controls	21,421	4.5	-4	$2,590	$16,628	$3,620	$13,008	5.0	21,047
ECM 3	Install High/Low Lighting Controls	4,543	0.9	-1	$549	$4,725	$210	$4,515	8.2	4,463

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: main office, classrooms, gymnasium, library, kitchen, 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.

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

Affected building areas: stairwells and lobbies.

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

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**25,997**	**5.8**	**0**	**$3,203**	**$33,246**	**$6,600**	**$26,646**	**8.3**	**26,178**
ECM 4	Install VFDs on Constant Volume (CV) Fans	13,985	3.8	0	$1,723	$18,002	$2,700	$15,302	8.9	14,083
ECM 5	Install VFDs on Heating Water Pumps	9,129	1.1	0	$1,125	$8,152	$3,600	$4,552	4.0	9,193
ECM 6	Install Boiler Draft Fan VFDs	2,882	0.9	0	$355	$7,091	$300	$6,791	19.1	2,902

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 4: Install VFDs on Constant Volume (CV) Fans

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

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

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

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

Affected air handlers: AHU for classrooms 12 and 13, Library, as well as the Century AHU. Trane dedicated outdoor air unit, and the Cafeteria RTU.

ECM 5: Install VFDs on Heating Water Pumps

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

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

Affected pumps: 5hp HHW pumps associated with Lochinvar boilers.

ECM 6: Install Boiler Draft Fan VFDs

We evaluated replacing existing volume control devices on boiler draft fans, such as inlet vanes or dampers, with VFDs. Inlet vanes or dampers are an inefficient means of controlling the air volume compared to VFDs. The existing volume control device will be removed or permanently disabled, and the control signal will be redirected to the VFD to determine proper fan motor speed.

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

Additional maintenance savings may result from this measure. VFDs are solid state electronic devices, which generally requires less maintenance than mechanical air volume control devices.

4.4 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**17**	**$185**	**$6,231**	**$800**	**$5,431**	**29.3**	**1,990**
ECM 7	Install High Efficiency Furnaces	0	0.0	17	$185	$6,231	$800	$5,431	29.3	1,990

ECM 7: Install High Efficiency Furnaces

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

Note: these units produce acidic condensate that requires proper drainage.

Affected units: Trane dedicated outdoor air unit.

4.5 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**369**	**0.0**	**7**	**$118**	**$2,719**	**$0**	**$2,719**	**23.0**	**1,153**
ECM 8	Implement Demand Control Ventilation (DCV)	369	0.0	7	$118	$2,719	$0	$2,719	23.0	1,153

ECM 8: Implement Demand Control Ventilation (DCV)

Demand control ventilation (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: 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 ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**245**	**0.0**	**1**	**$39**	**$86**	**$48**	**$38**	**1.0**	**345**
ECM 9	Install Low-Flow DHW Devices	245	0.0	1	$39	$86	$48	$38	1.0	345

ECM 9: 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 aerator (kitchen)	1.5 gpm

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

Additional cost savings may result from reduced water usage.

4.7 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$199**	**$230**	**$100**	**$130**	**0.7**	**1,623**
ECM 10	Vending Machine Control	1,612	0.2	0	$199	$230	$100	$130	0.7	1,623

ECM 10: 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 Matawan Aberdeen Regional School District may wish to consider. These potential upgrades typically require further analysis, involve substantial capital investment and/or include significant system reconfiguration. These measure(s) are therefore beyond the scope of this energy audit. These measure(s) are described here to support a whole building approach to energy efficiency and sustainability.

Matawan Aberdeen Regional School District may wish to consider the Energy Savings Improvement Program (ESIP) / a 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.

<u>Expansion of an Energy Management System</u>

Most of the facility is connected to an energy management system (EMS) which provides for centralized, remote control and monitoring of some of the building systems. An EMS utilizes a system of temperature and pressure sensors that obtain feedback about field conditions and provide signals to control systems that adjust HVAC system operation for optimal functioning. Thirty years ago, most control systems were pneumatic systems driven by compressed air, with pneumatic thermostats and air driven actuators for valves and dampers. Most of the pneumatics controls at this facility have largely been replaced by direct digital control (DDC) systems, but a small pneumatic system remains. Contemporary DDC systems afford tighter controls and enhanced monitoring and trending capabilities as compared to the older systems.

Based on our survey, it appears that the expansion of the EMS at your site to include the cafeteria UV units and fin tube heating units could increase the efficiency of your building HVAC system operation.

A controls upgrade would expand automated equipment “start” and “stop” times, temperature setpoints, lockouts and deadbands to be programmed remotely using the existing graphic interface. Controls can be configured to optimize ventilation and outside air intake by adjusting economizer position, damper function and fan speed. Coordinated control of HVAC systems is dependent on a network of sensors and status points. A comprehensive building control system provides monitoring and control for all HVAC systems so operators can adjust system programming for optimal comfort and energy savings.

It is recommended that an HVAC engineer or contractor who specializes in energy management systems be contacted for a detailed evaluation and implementation costs. For the purposes of this report, the potential energy savings and measure costs were estimated based on industry standards and previous project experience. Further analysis should be conducted for the feasibility of this measure. This is not an investment grade analysis nor should be used as a basis for design and construction.

Retro-Commissioning Study

Due to the complexity of today's HVAC systems and controls a thorough analysis and rebalance of heating, ventilation, and cooling systems should periodically be conducted. There are indications at this site that systems may be not be operating correctly or as efficiently as they could be. One important tool available to building operators to ensure proper system operation is retro-commissioning.

Retro-commissioning is a common practice recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) to be implemented every few years. We recommend that you contact a reputable engineering firm that specializes in energy control systems and retro-commissioning. Ask them to propose a scope of work and an outline of the procedures and processes to be implemented, including a schedule and the roles of all responsible parties.

Once goals and responsibilities are established, the objective of the investigation process is to understand how the building is currently operating, identify the issues, and determine the most cost-effective way to improve performance. The retro-commissioning agent will review building documentation, interview building occupants, and inspect and test the equipment. Information is then compiled into a report and shared with facility staff, who will select which recommendations to implement after reviewing the findings.

The implementation phase puts the selected processes into place. Typical measures may include sensor calibration, equipment schedule changes, damper linkage repair and similar relatively low-cost adjustments--although more expensive sophisticated programming and building control system upgrades may be warranted. Approved measures may be implemented by the agent, the building staff, or by subcontractors. Typically, a combination of these individuals makes up the retro-commissioning team.

After the approved measures are implemented, the team will verify that the changes are working as expected. Baseline and post-case measurements will allow building staff to monitor equipment and ensure that the benefits are maintained.

In your case, a good time for retro-commissioning might be in combination with expansion of the EMS, providing an opportunity for fully integrating and balancing operation of your heating, ventilating, and cooling equipment.

5 Energy Efficient Best Practices

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

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

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Lighting Maintenance

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

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

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 Maintenance

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

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. Thermostats should be programmed for a setback of 5°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.

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Boiler Maintenance

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

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.

Water Heater Maintenance

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

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

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

Water Conservation

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

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

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

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

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

Procurement Strategies

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

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

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

6 On-site Generation

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

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

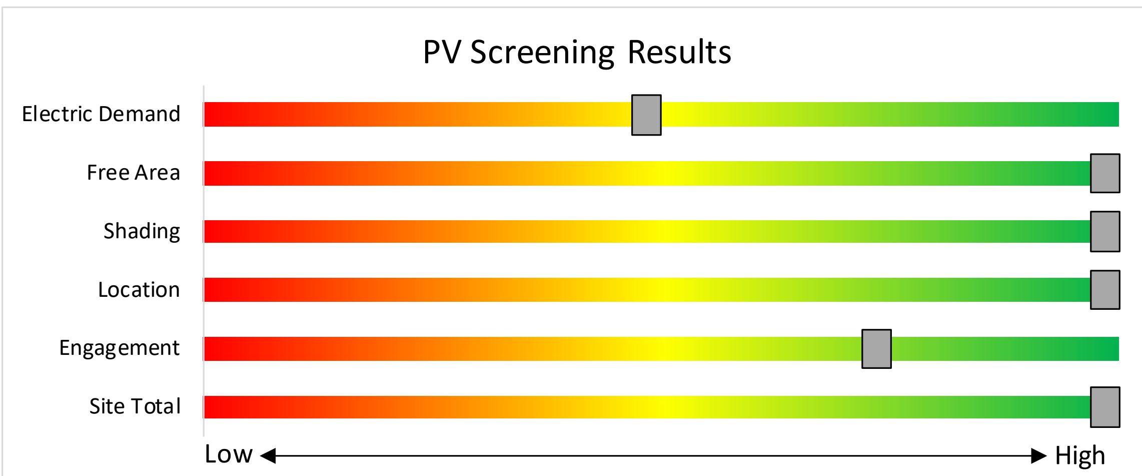
6.1 Solar Photovoltaic

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

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

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

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



Potential	High	
System Potential	165	kW DC STC
Electric Generation	196,576	kWh/yr
Displaced Cost	$24,220	/yr
Installed Cost	$429,000	

Figure 9 - Photovoltaic Screening

Transition Incentive (TI) Program

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

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

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

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

6.2 Combined Heat and Power

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

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

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

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

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

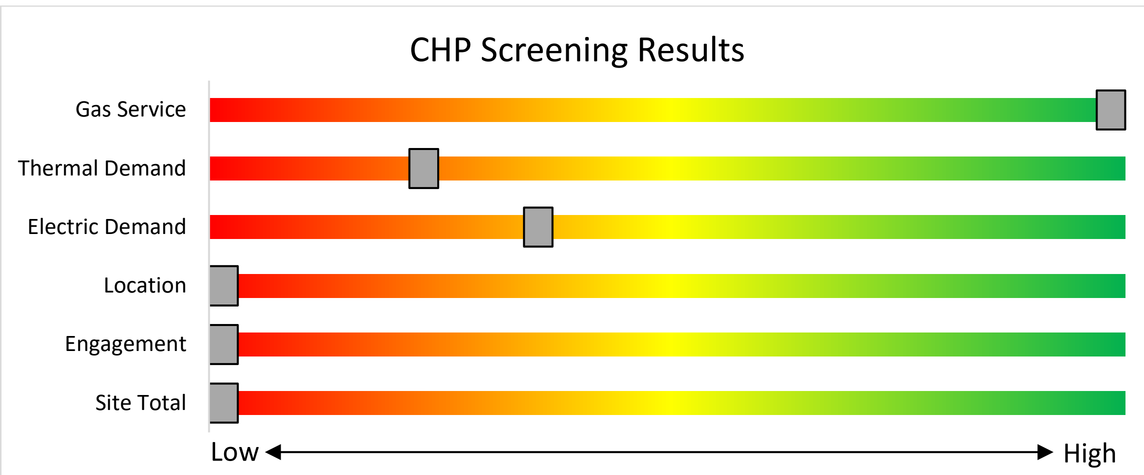


Figure 10 – CHP Screening

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/.](http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/)

7 Project Funding and Incentives

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

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

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

7.1 SmartStart

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

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

Equipment with Prescriptive Incentives Currently Available:

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

Incentives

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

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

How to Participate

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

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

7.2 Direct Install

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

Incentives

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

How to Participate

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

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

7.3 Pay for Performance - Existing Buildings

Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures that results in at least 15% source energy savings, and lighting cannot make up the majority of the savings.

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

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

Incentives

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

How to Participate

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

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

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

7.4 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

7.5 Energy Savings Improvement Program

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

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

How to Participate

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

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

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

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

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

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

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

7.6 Transition Incentive (TI) Program

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

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

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

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

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

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

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

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

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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

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

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

8.2 Retail Natural Gas Supply Options

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

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

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Art Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1, 2	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,174	0.1	610	0	$74	$416	$150	3.6
Art Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$80	3.1
Art Room	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,150	1, 2	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,174	0.6	2,837	-1	$343	$982	$460	1.5
Art Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,174	0.1	513	0	$62	$262	$120	2.3
Basement storage area	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
Basement storage area	3	Incandescent: (1) 65W BR30 Screw-In Lamp	Wall Switch	S	65	500	1, 2	Relamp	Yes	3	LED Lamps: BR30 Lamps	Occupancy Sensor	10	345	0.1	96	0	$12	$342	$18	27.8
Basement storage area	18	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	500	2	None	Yes	18	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	345	0.0	31	0	$4	$540	$0	145.5
Basement storage area	8	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	500	2	None	Yes	8	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	345	0.0	14	0	$2	$270	$0	163.7
Basement storage area	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	500	1, 2	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	345	0.1	97	0	$12	$416	$80	28.7
Basement storage area	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	1, 2	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	345	0.1	69	0	$8	$380	$60	38.1
Boiler room	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Boiler room	8	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,150	1	Relamp	No	8	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	3,150	0.1	374	0	$45	$130	$48	1.8
Boiler room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,150	0.0	114	0	$14	$37	$20	1.2
Boiler room 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
Boiler room 2	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,150	0.2	915	0	$111	$292	$160	1.2
Cafetorium	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
Cafetorium	3	Incandescent: (36) 100W BR30 Screw-In Lamps	Wall Switch	S	3,600	3,150	1, 2	Relamp	Yes	3	LED Lamps: BR30 Lamps	Occupancy Sensor	540	2,174	7.0	33,549	-7	$4,057	$2,850	$718	0.5
Cafetorium	6	LED Lamps: (1) 20W PAR38 Screw-In Lamp	Wall Switch	S	20	3,150	2	None	Yes	6	LED Lamps: (1) 20W PAR38 Screw-In Lamp	Occupancy Sensor	20	2,174	0.0	129	0	$16	$270	$70	12.8
Cafetorium	15	Linear Fluorescent - T5HO: 4' T5HO (54W) - 4L	Wall Switch	S	234	3,150	1, 2	Relamp	Yes	15	LED - Linear Tubes: (4) 4' T5HO (25W) Lamps	Occupancy Sensor	102	2,174	1.8	8,504	-2	$1,028	$1,854	$670	1.2
Cafetorium	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	582	0	$70	$416	$150	3.8
Cafetorium	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$80	3.1
Child study Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$80	3.1
Classroom 1	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	516	0	$62	$270	$70	3.2
Classroom 10	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,150	0.0	61	0	$7	$18	$10	1.1
Classroom 10	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$80	3.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 10	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,150	1, 2	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,174	1.0	4,583	-1	$554	$1,690	$770	1.7
Classroom 11	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,150	1, 2	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,174	0.9	4,365	-1	$528	$1,635	$740	1.7
Classroom 12	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,150	1, 2	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,174	0.3	1,538	0	$186	$708	$310	2.1
Classroom 13	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 13	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	436	0	$53	$380	$130	4.7
Classroom 13	24	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,150	1, 2	Relamp	Yes	24	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,174	1.3	6,152	-1	$744	$2,293	$1,100	1.6
Classroom 14	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 15	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 16	15	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	15	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	644	0	$78	$270	$70	2.6
Classroom 16	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	3,150	0.0	47	0	$6	$16	$6	1.8
Classroom 17	1	LED Lamps: (3) 9W A19 Screw-In Lamps	Wall Switch	S	27	3,150		None	No	1	LED Lamps: (3) 9W A19 Screw-In Lamps	Wall Switch	27	3,150	0.0	0	0	$0	$0	$0	0.0
Classroom 17	13	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	13	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	559	0	$68	$270	$70	3.0
Classroom 17	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	3,150	0.0	47	0	$6	$16	$6	1.8
Classroom 18	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	3,150	2	None	Yes	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	2,174	0.0	21	0	$3	$116	$40	29.3
Classroom 18	17	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	17	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.2	730	0	$88	$540	$140	4.5
Classroom 18	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	3,150	0.0	47	0	$6	$16	$6	1.8
Classroom 2	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	516	0	$62	$270	$70	3.2
Classroom 20	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 21	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 22	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 23	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 24	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 25	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 26	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 27	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 28	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 3	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	516	0	$62	$270	$70	3.2
Classroom 30	4	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	S	40	2,200		None	No	4	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 30	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	3,150	0.0	47	0	$6	$16	$6	1.8
Classroom 4	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	516	0	$62	$270	$70	3.2
Classroom 5	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	516	0	$62	$270	$70	3.2
Classroom 6	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	516	0	$62	$270	$70	3.2
Classroom 7	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	12	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	516	0	$62	$270	$70	3.2
Classroom 8	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$80	3.1
Classroom 8	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,150	1, 2	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,174	0.9	4,147	-1	$501	$1,581	$710	1.7
Classroom 9	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$80	3.1
Classroom 9	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,150	1, 2	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,174	0.9	4,147	-1	$501	$1,581	$710	1.7
Computer room	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,150	1, 2	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,174	0.7	3,492	-1	$422	$1,416	$620	1.9
Copy eqp. Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$80	3.1
Elevator	24	Halogen Incandescent: Halogen-MR16-1W-1L-Can	Wall Switch	S	1	3,150	1	Relamp	No	24	LED Lamps: MR16 Lamps	Wall Switch	0	3,150	0.0	71	0	$9	$652	$48	70.7
Elevator machine room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	18	0	$2	$37	$20	7.5
Exterior lighting (building)	1	LED - Fixtures: 15W Canopy LED Fixture	Timeclock		15	4,380		None	No	1	LED - Fixtures: 15W Canopy LED Fixture	Timeclock	15	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior lighting (building)	1	LED - Fixtures: 40W Wall Pack LED Fixture	Timeclock		40	4,380		None	No	1	LED - Fixtures: 40W Wall Pack LED Fixture	Timeclock	40	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior lighting (building)	15	LED - Fixtures: 50W Wall Pack LED Fixtures	Timeclock		50	4,380		None	No	15	LED - Fixtures: 50W Wall Pack LED Fixtures	Timeclock	50	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior lighting (building)	3	LED Lamps: (2) 10W A19 Screw-In Lamps	Timeclock		20	4,380		None	No	3	LED Lamps: (2) 10W A19 Screw-In Lamps	Timeclock	20	4,380	0.0	0	0	$0	$0	$0	0.0
Gymnasium	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	Linear Fluorescent - T5HO: 4' T5HO (54W) - 3L	Wall Switch	S	179	3,150	1	Relamp	No	1	LED - Linear Tubes: (3) 4' T5HO (25W) Lamps	Wall Switch	77	3,150	0.1	355	0	$43	$81	$30	1.2
Gymnasium	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.2	727	0	$88	$453	$170	3.2
Gymnasium	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	436	0	$53	$380	$130	4.7
Janitorial Closet 1 (2nd flr)	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	S	12	500		None	No	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	12	500	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Janitorial Closet 2 (1st flr)	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	S	12	500		None	No	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	12	500	0.0	0	0	$0	$0	$0	0.0
Janitorial Closet 3 (1st flr)	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	S	12	500		None	No	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	12	500	0.0	0	0	$0	$0	$0	0.0
Janitorial Closet 4 (1st flr)	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	S	12	500		None	No	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	12	500	0.0	0	0	$0	$0	$0	0.0
Janitorial Closet 4 (1st flr)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	18	0	$2	$37	$20	7.5
Kitchen	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
Kitchen	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	3,150	2	None	Yes	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	2,174	0.0	43	0	$5	$270	$70	38.5
Kitchen	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	3,150		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	3,150	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	3,150	0.0	47	0	$6	$16	$6	1.8
Kitchen	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	3,150	1	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,150	0.0	55	0	$7	$33	$12	3.1
Kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,150	0.0	61	0	$7	$18	$10	1.1
Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$80	3.1
Kitchen	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.4	1,891	0	$229	$745	$330	1.8
Kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,150	0.0	114	0	$14	$37	$20	1.2
Library	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Library	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,150	1, 2	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,174	0.1	655	0	$79	$434	$160	3.5
Library	38	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,150	1, 2	Relamp	Yes	38	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,174	1.7	8,293	-2	$1,003	$2,891	$1,350	1.5
Library	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,150	1, 2	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,174	0.2	769	0	$93	$489	$190	3.2
Lobby - 1st floor classrooms	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lobby - 1st floor classrooms	18	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	3	None	Yes	18	LED - Fixtures: 40W Hard Ceiling LED Fixtures	High/Low Control	40	2,174	0.2	773	0	$94	$675	$0	7.2
Lobby - 2nd floor classrooms	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lobby - 2nd floor classrooms	16	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	3	None	Yes	16	LED - Fixtures: 40W Hard Ceiling LED Fixtures	High/Low Control	40	2,174	0.1	687	0	$83	$675	$0	8.1
Lobby - Cafetorium	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
Lobby - Cafetorium	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	3	None	Yes	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	High/Low Control	40	2,174	0.1	430	0	$52	$450	$0	8.7
Lobby - Class 11 to Class 13	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
Lobby - Class 11 to Class 13	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	3	None	Yes	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	High/Low Control	40	2,174	0.1	430	0	$52	$450	$0	8.7

TRC

BPU New Jersey's cleanenergy program™

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lobby - Main office to Kitchen	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 - Main office to Kitchen	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	3	None	Yes	10	LED - Fixtures: 40W Hard Ceiling LED Fixtures	High/Low Control	40	2,174	0.1	430	0	$52	$450	$0	8.7
Lobby - Rm 11 to Gym to Boiler room	4	Compact Fluorescent: (2) 13W Plug-In Lamps	Wall Switch	S	26	3,150	1, 3	Relamp	Yes	4	LED Lamps: (2) 10.5W Plug-In Lamps	High/Low Control	21	2,174	0.0	160	0	$19	$333	$16	16.4
Lobby - Rm 11 to Gym to Boiler room	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
Lobby - Rm 11 to Gym to Boiler room	36	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	3	None	Yes	36	LED - Fixtures: 40W Hard Ceiling LED Fixtures	High/Low Control	40	2,174	0.3	1,547	0	$187	$1,350	$0	7.2
Lobby - Rm 11 to Gym to Boiler room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,174	0.1	305	0	$37	$298	$40	7.0
Main Office area	9	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	9	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	387	0	$47	$270	$70	4.3
Main Office area	3	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	3	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.0	129	0	$16	$270	$70	12.8
Main Office area	1	LED Lamps: (3) 9W A19 Screw-In Lamps	Wall Switch	S	27	3,150		None	No	1	LED Lamps: (3) 9W A19 Screw-In Lamps	Wall Switch	27	3,150	0.0	0	0	$0	$0	$0	0.0
Main Office area	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	S	12	3,150		None	No	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	12	3,150	0.0	0	0	$0	$0	$0	0.0
Nurse office	6	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	6	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.1	258	0	$31	$270	$70	6.4
Restroom 1 Classroom Wing	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1, 2	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,174	0.0	229	0	$28	$325	$30	10.7
Restroom 10 Near Gym	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$40	4.2
Restroom 2 Classroom Wing	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1, 2	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,174	0.0	229	0	$28	$325	$30	10.7
Restroom 3 Classroom Wing	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1, 2	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,174	0.0	229	0	$28	$325	$30	10.7
Restroom 4 Classroom Wing	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1, 2	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,174	0.0	229	0	$28	$325	$30	10.7
Restroom 5 Classroom Wing	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,150	0.0	61	0	$7	$18	$10	1.1
Restroom 6 Classroom Wing	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,174	0.0	152	0	$18	$153	$20	7.2
Restroom 7 Near Gym	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	582	0	$70	$416	$150	3.8
Restroom 8 Near Gym	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	582	0	$70	$416	$150	3.8
Restroom 9 Near Gym	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,174	0.1	291	0	$35	$189	$40	4.2
Staff Lounge	5	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Wall Switch	S	40	3,150	2	None	Yes	5	LED - Fixtures: 40W Hard Ceiling LED Fixtures	Occupancy Sensor	40	2,174	0.0	215	0	$26	$270	$70	7.7
Staff Lounge	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,150	1	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	3,150	0.0	47	0	$6	$16	$6	1.8
Stairs near main office	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs near main office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,150	1, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,174	0.1	436	0	$53	$335	$270	1.2
	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Storage (opp. cls 17)	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	500		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	500	0.0	0	0	$0	$0	$0	0.0
Storage (opp. cls 17)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	18	0	$2	$37	$20	7.5

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Cafeteria UV units and fin tube units Pneumatic system	2	Air Compressor	2.0	78.5%	No	W	1,460		No	78.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room 1	Steam to Hot Water system pumps (VFDs)	2	Heating Hot Water Pump	1.5	88.5%	Yes	W	2,745		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room	boilers	2	Combustion Air Fan	1.5	82.5%	No	W	2,745	6	No	84.0%	Yes	2	0.9	2,882	0	$355	$7,091	$300	19.1
Boiler room 2	Lochinvar Boiler HHW pump motors	2	Heating Hot Water Pump	5.0	87.5%	No	W	2,745	5	No	89.5%	Yes	2	1.1	9,129	0	$1,125	$8,152	$3,600	4.0
Boiler room	Boiler feed water system	3	Boiler Feed Water Pump	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room	DHW circulation pumps	2	Heating Hot Water Pump	0.2	65.0%	No	W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room 2	DHW circulation pump	1	Heating Hot Water Pump	0.2	65.0%	No	W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 13	For classrooms 12 and 13	1	Supply Fan	3.0	84.0%	No	B	3,200	4	No	89.5%	Yes	1	0.9	3,551	0	$437	$3,884	$400	8.0
Roof	Library AHU	1	Supply Fan	1.5	84.0%	No	W	3,200	4	No	86.5%	Yes	1	0.4	1,682	0	$207	$3,391	$150	15.6
Classroom 1	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 11	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 14	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 15	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 16	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 17	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 18	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 2	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 20	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 21	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 22	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 23	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 24	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 25	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 26	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 27	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 28	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 3	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 30	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 4	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 5	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 6	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 7	Unit Ventilator	1	Supply Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Air Handling Unit	1	Supply Fan	2.0	86.5%	No	W	3,200	4	No	86.5%	Yes	1	0.6	2,070	0	$255	$3,261	$200	12.0
Roof	Large EF	3	Exhaust Fan	0.8	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Medium EF	9	Exhaust Fan	0.5	70.0%	No	W	3,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Small EF	6	Exhaust Fan	0.3	65.0%	No	W	3,200		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	DOAS 1	1	Supply Fan	1.0	85.5%	Yes	W	3,200		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	MUA 1C	1	Supply Fan	1.0	85.5%	Yes	W	3,200		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Possibly Make up air unit	1	Supply Fan	1.5	84.0%	No	B	3,200	4	No	86.5%	Yes	1	0.4	1,682	0	$207	$3,391	$150	15.6
Roof	Cafeteria RTU	1	Supply Fan	5.0	89.5%	No	W	3,200	4	No	89.5%	Yes	1	1.4	5,001	0	$616	$4,076	$1,800	3.7

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU 11A Gym	1	Supply Fan	2.0	86.5%	Yes	W	3,200		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 11B Gym	1	Supply Fan	2.0	86.5%	Yes	W	3,200		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 11A Gym	1	Exhaust Fan	3.0	89.5%	Yes	W	3,200		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 11B Gym	1	Exhaust Fan	3.0	89.5%	Yes	W	3,200		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Band / Music room unit	1	Split-System AC	10.00		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	Library AHU condensing unit	1	Split-System AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Possibly hallway	1	Split-System AC	10.00		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	Cafeteria RTU	1	Packaged AC	15.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 11A Gym	1	Packaged AC	8.00		N		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 11B Gym	1	Packaged AC	8.00		N		No							0.0	0	0	$0	$0	$0	0.0
Roof	Copy room 2nd floor	1	Ductless Mini-Split HP	0.75	10.90	N		No							0.0	0	0	$0	$0	$0	0.0
Roof	Main office	1	Ductless Mini-Split HP	1.50	22.00	N		No							0.0	0	0	$0	$0	$0	0.0
Roof	Principal's office	1	Ductless Mini-Split HP	0.75	10.90	N		No							0.0	0	0	$0	$0	$0	0.0
Copy eqp. Room	Room cooling	1	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	DOAS 1	1	Packaged AC	8.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	MUA 1C	1	Packaged AC	8.00		W		No							0.0	0	0	$0	$0	$0	0.0
Classrooms	Classrooms	12	Packaged Terminal AC	3.00		W		No							0.0	0	0	$0	$0	$0	0.0
Classrooms	Classrooms	11	Packaged Terminal AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room 2	1995 addition heating	2	Condensing Hot Water Boiler	470	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler room	old addition heating	2	Forced Draft Steam Boiler	3,348	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	Cafeteria RTU	1	Furnace	240	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	RTU 11A Gym	1	Furnace	120	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	RTU 11B Gym	1	Furnace	120	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	DOAS 1	1	Furnace	120	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	Possibly Make up air unit	1	Furnace	275	B	7	Yes	1	Furnace	275	90.00%	AFUE	0.0	0	17	$185	$6,231	$800	29.3

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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	Cafeteria RTU	8	2.00	15.00		240.00	0.0	369	7	$118	$2,719	$0	23.0

DHW Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	DHW system	1	Storage Tank Water Heater (> 50 Gal)	N		No						0.0	0	0	$0	$0	$0	0.0
Boiler room 2	DHW system	1	Storage Tank Water Heater (> 50 Gal)	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms	9	6	Faucet Aerator (Kitchen)	2.00	1.50	0.0	0	1	$9	$43	$24	2.1
Classrooms	9	6	Faucet Aerator (Kitchen)	2.00	1.50	0.0	245	0	$30	$43	$24	0.6

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Freezer Chest	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Glass Door (31 - 50 cu. ft.)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	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	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Gas Convection Oven (Half Size)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions			
Location	**Quantity**	**Equipment Description**	**Energy Rate (W)**	**ENERGY STAR Qualified?**
Staff Lounge	2	Coffee Machine	400	No
Multiple Locations	61	Desktop	75	No
Multiple Locations	2	Fan (Ceiling)	100	No
Multiple Locations	51	Fan (Portable)	100	No
Staff Lounge	2	Microwave	1,000	No
Multiple Locations	6	Portable AC	1,500	No
Multiple Locations	3	Printer (Medium/Small)	20	No
Multiple Locations	2	Printer/Copier (Large)	515	No
Multiple Locations	28	Projector	200	No
Nurse office	1	Refrigerator (Residential)	600	No
Kitchen	2	Serving Table (Chilled/Heated)	6,500	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	**Quantity**	**Vending Machine Type**	**ECM #**	**Install Controls?**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Total Installation Cost**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Staff Lounge	1	Refrigerated	10	Yes	0.2	1,612	0	$199	$230	$100	0.7

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

EUI is presented in terms of *site energy* and *source energy*. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Cliffwood Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 67,450
Built: 1958

For Year Ending: November 30, 2019
Date Generated: May 08, 2020

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Cliffwood Elementary School 422 Cliffwood Avenue Cliffwood, New Jersey 07721	Matawan-Aberdeen Regional School District One Crest Way Aberdeen, NJ 07747 (732) 705-4016	Adam Nasr One Crest Way Aberdeen, NJ 07747 (732) 705-4013 anasr@marsd.k12.nj.us

Property ID: 3760884

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
92.4 kBtu/ft²

Source EUI
136.6 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	4,707,652 (76%)
Electric - Grid (kBtu)	1,526,140 (24%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	81.9
National Median Source EUI (kBtu/ft²)	121
% Diff from National Median Source EUI	13%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	405

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 $1/8^{th}$ of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use
VAV	*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.