Local Government Energy Audit Report

Bayview Elementary School

February 14, 2024

Prepared for:
Middletown Township Public Schools
300 Leonardville Road
Belford, New Jersey 07718

Prepared by:
TRC
317 George Street
New Brunswick, New Jersey 08901

Disclaimer

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

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

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

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

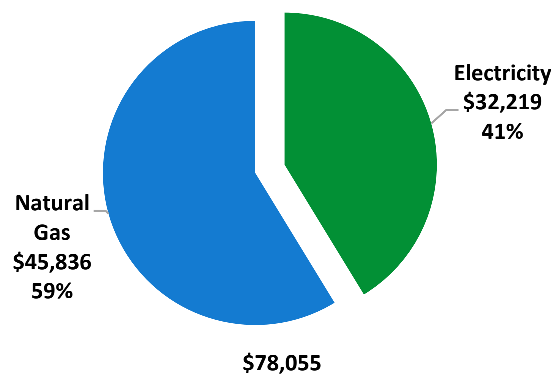
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state, and federal requirements.

Table of Contents

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Bayview 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: $78,055 Electricity: 366,159 kWh Natural Gas: 29,840 Therms	
ENERGY STAR® Benchmarking Score	51 *(1-100 scale)*	This building performs approximately at the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

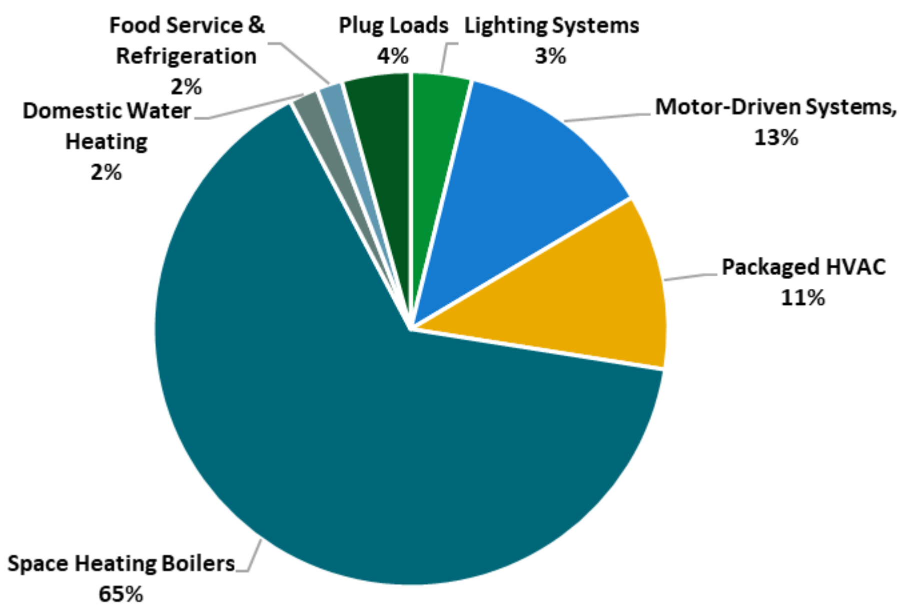


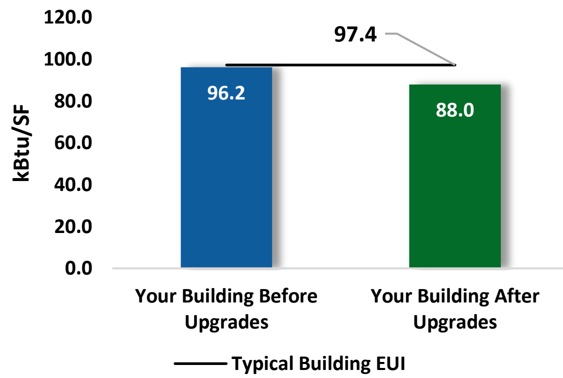
Figure 1 - Energy Use by System

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.

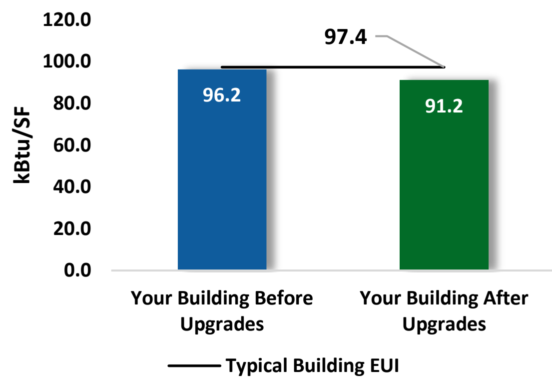
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$517,022
Potential Rebates & Incentives[1]	$21,571
Annual Cost Savings	$7,980
Annual Energy Savings	Electricity: 68,832 kWh Natural Gas: 1,252 Therms
Greenhouse Gas Emission Savings	42 Tons
Simple Payback	62.1 Years
Site Energy Savings (All Utilities)	9%



Scenario 2: Cost Effective Package[2]

Installation Cost	$55,496
Potential Rebates & Incentives	$3,819
Annual Cost Savings	$4,803
Annual Energy Savings	Electricity: 39,304 kWh Natural Gas: 876 Therms
Greenhouse Gas Emission Savings	25 Tons
Simple Payback	10.8 Years
Site Energy Savings (all utilities)	5%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**9,257**	**2.4**	**-2**	**$785**	**$3,725**	**$1,020**	**$2,705**	**3.4**	**9,095**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	9,257	2.4	-2	$785	$3,725	$1,020	$2,705	3.4	9,095
Lighting Control Measures			**1,371**	**0.3**	**0**	**$116**	**$2,932**	**$390**	**$2,542**	**21.9**	**1,347**
ECM 2	Install Occupancy Sensor Lighting Controls	No	1,371	0.3	0	$116	$2,932	$390	$2,542	21.9	1,347
Variable Frequency Drive (VFD) Measures			**43,495**	**12.8**	**0**	**$3,827**	**$83,859**	**$3,400**	**$80,459**	**21.0**	**43,799**
ECM 3	Install VFDs on Constant Volume (CV) Fans	Yes	37,270	10.5	0	$3,279	$48,216	$2,700	$45,516	13.9	37,530
ECM 4	Install VFDs on Heating Water Pumps	No	3,202	1.0	0	$282	$26,629	$500	$26,129	92.7	3,224
ECM 5	Install Boiler Draft Fan VFDs	No	3,023	1.2	0	$266	$9,014	$200	$8,814	33.1	3,044
Unitary HVAC Measures			**21,931**	**27.5**	**4**	**$1,994**	**$297,868**	**$10,662**	**$287,206**	**144.1**	**22,571**
ECM 6	Install High Efficiency Air Conditioning Units	No	21,931	27.5	4	$1,994	$297,868	$10,662	$287,206	144.1	22,571
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**34**	**$519**	**$125,082**	**$6,000**	**$119,082**	**229.4**	**3,957**
ECM 7	Install High Efficiency Steam Boilers	No	0	0.0	34	$519	$125,082	$6,000	$119,082	229.4	3,957
HVAC System Improvements			**0**	**0.0**	**7**	**$105**	**$239**	**$40**	**$199**	**1.9**	**802**
ECM 8	Install Pipe Insulation	Yes	0	0.0	7	$105	$239	$40	$199	1.9	802
Domestic Water Heating Upgrade			**0**	**0.0**	**6**	**$87**	**$151**	**$59**	**$91**	**1.0**	**663**
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	6	$87	$151	$59	$91	1.0	663
Custom Measures			**-7,222**	**0.0**	**77**	**$547**	**$3,166**	**$0**	**$3,166**	**5.8**	**1,743**
ECM 10	Replace Gas Fired Water Heater with Heat Pump Water Heater	Yes	-7,222	0.0	77	$547	$3,166	$0	$3,166	5.8	1,743
TOTALS (COST EFFECTIVE MEASURES)			**39,304**	**13.0**	**88**	**$4,803**	**$55,496**	**$3,819**	**$51,677**	**10.8**	**49,834**
TOTALS (ALL MEASURES)			**68,832**	**43.0**	**125**	**$7,980**	**$517,022**	**$21,571**	**$495,451**	**62.1**	**83,977**

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

Utility-run energy efficiency programs and 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.

Options from Your Utility Company

Prescriptive and Custom Rebates

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 Prescriptive and Custom Rebates 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 may be required for some incentives. Contact your utility company for more details prior to project installation.

Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized contractor. This program can provide incentives up to 70% or 80% of the cost of selected measures. A Direct Install contractor will assess and verify individual measure eligibility and perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Engineered Solutions

The Engineered Solutions program provides tailored energy-efficiency assistance and turnkey engineering services to municipalities, universities, schools, hospitals, and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. The program provides all professional services from audit, design, construction administration, to commissioning and measurement and verification for custom whole-building energy-efficiency projects. Engineered Solutions 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.

For more details on these programs please contact your utility provider.

Options from New Jersey's Clean Energy Program

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

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

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

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

Successor Solar Incentive Program (SuSI)

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

Ongoing Electric Savings with Demand Response

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

Large Energy User Program (LEUP)

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

For more details on these programs please visit New Jersey's Clean Energy Program website .

2 EXISTING CONDITIONS

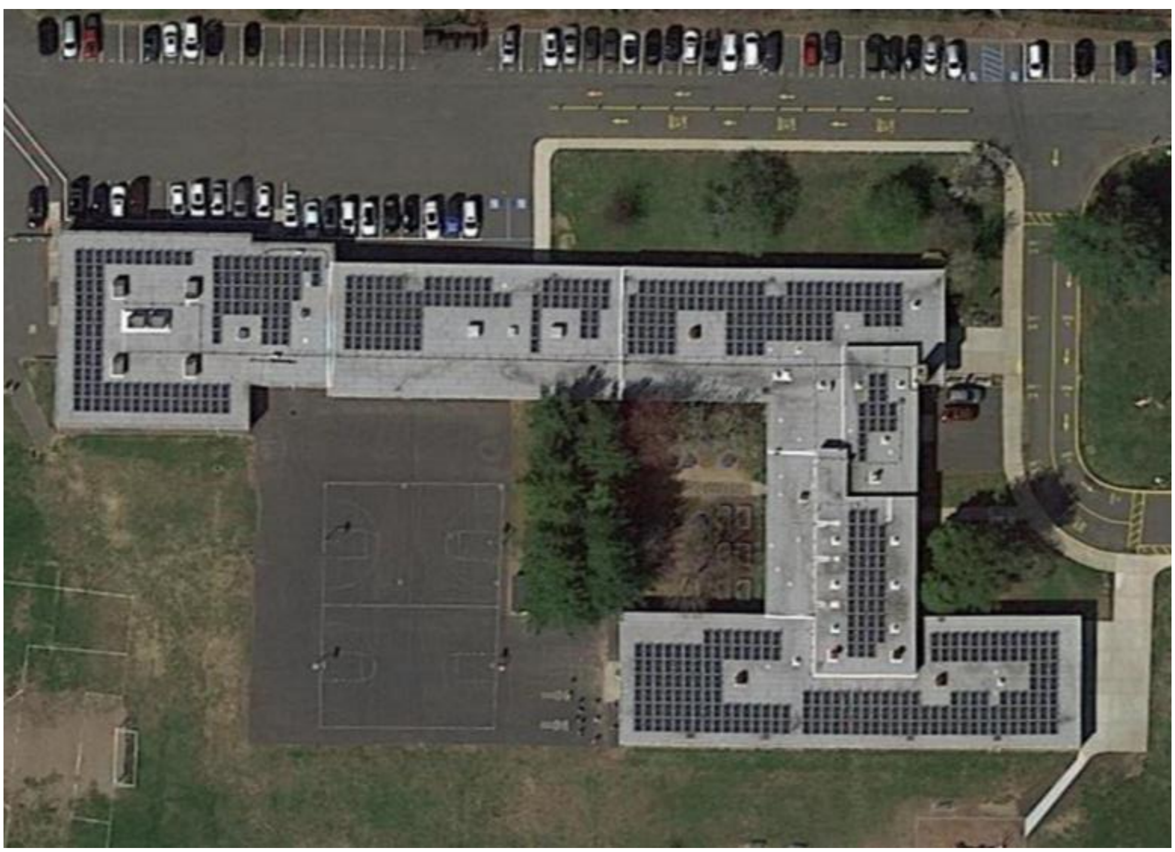
The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Bayview Elementary School. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides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

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

2.1 Site Overview

On June 22, 2023, TRC performed an energy audit at Bayview Elementary School located in Belford, New Jersey. TRC met with Ben Yennella to review the facility operations and help focus our investigation on specific energy-using systems.

Bayview Elementary School is a one-story, 44,000 square foot building built in 1956 and renovated in 1960. Spaces include classrooms, corridors, restrooms, kitchen, offices, and electrical and mechanical spaces. The facility is 100% heated by two forced draft steam boilers, roof top units (RTUs), fin tube radiators, heat pumps, and electric resistance heaters. Airedale units, window AC units, and a mini-split heat pump, cool 80% of the school. A solar panel array located on the roof helps meet the building's energy demand.



Aerial View of Facilities

Recent Improvements and Facility Concerns

Over the last five years, the facility has replaced existing fluorescent fixtures with LED technology. Facility staff are concerned with the classroom Airedale units which are in poor condition and often require maintenance.

It should be noted that since the time of the site visits many improvements have been made, which has resulted in better facility performance and higher ENERGY STAR scores.

2.2 Building Occupancy

Bayview is occupied for ten months out of the year. Class times begin at 8:55 AM and end at 3:05 PM. School maintenance hours extend from 6:30 AM to 10:30 PM. An average of 73 staff and 345 students occupies the school.

Building Name	Weekday/Weekend	Operating Schedule
Class Hours	Weekday	8:55 AM - 3:05 PM
	Weekend	N/A
Maintenance Hours	Weekday	6:30 AM - 10:30 PM
	Weekend	N/A

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Bayview's envelope is comprised of brick and is in good condition. The flat, built-up asphalt roof houses HVAC equipment, exhaust fans, and the PV array. The roof is in good condition.

Facility windows are operable double-paned glass windows with aluminum frames. All windows are in good condition. Exterior doors consist of solid metal and metal with glass windows, both of which are in good condition.

Building Envelope

Built Up Asphalt Roof

Facility Windows

Exterior Doors

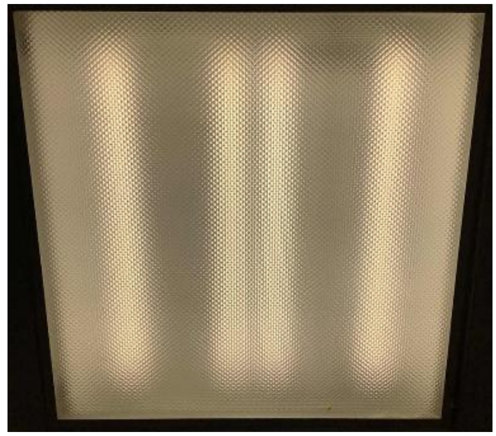
2.4 Lighting Systems

The primary lighting system for Bayview consists mainly of LED sources. Common indoor lighting includes 4-foot T8 equivalent LED linear tubes and 2-foot T8 equivalent LED linear tubes with 2-lamp, 3-lamp, and 4-lamps per fixture. Emergency exit signs are up to date with LED technology. A few areas are illuminated by 4-foot T8 linear fluorescent tubes or 2-foot T8 U-bend fluorescent tubes.

A mix of manual wall switches and occupancy sensors control the indoor lighting. Occupancy sensors are commonly installed in classrooms and some offices. Staff have reported that occupancy sensors have a short time delay to shut off. Overall, the current lighting system is in good condition with adequate light levels.

Exterior lighting is provided by LED wall packs, LED downlight surface mount fixtures, and LED floodlights. Photocells and time clocks control the lights, and the fixtures are in good condition.

4-Foot T8 Equivalent Linear LED Tube



2-Foot T8 Equivalent Linear LED Tube

LED Exit Sign

Ceiling Mounted Occupancy Sensor

LED Floodlight,

LED Downlight

LED Wall Pack with Photocell

Exterior Lighting Time Clock

2.5 Air Handling Systems

<u>Unitary Electric HVAC Equipment</u>

Bayview uses three air source heat pumps that serve the secretary offices and the child study room. Additional air source heat pumps are present on the roof; however, they are abandoned in place. These units' range in cooling capacity from 0.75 tons to 3.0 tons with heating capacities ranging from 12 MBh to 36 MBh. The seasonal energy efficiency ratio (SEER) ratings range from 19 to 26 and the heating seasonal performance factor (HSPF) ratings span from 9.7 to 13. The units are in good condition.

Air Source Heat Pump

Six window AC units provide cooling to various office areas at Bayview. Units range in cooling capacity from 0.75 tons to 1 ton with energy efficiency ratios (EERs) that range from 9.8 to 10.8. The units are in fair condition with two of the units having surpassed their rated useful life.

Window AC Unit

One portable AC unit located in the basement provides 0.83 tons of cooling and has an estimated EER rating of 10. According to facility staff, the equipment runtime is high for a unit located in a basement. The unit is old and is operating beyond its rated useful life.

Portable AC Unit

Unitary Heating Equipment

The open space is heated by three electric resistance cabinet heaters. These units provide an estimated 25 MBh (7 kW) of heating. Classrooms 25 and 26, also located in the open space, are each heated by one ceiling mounted electric resistance heater. Each unit provides an estimated 15 MBh (5 kW) of heating. All electric resistance heaters are in good condition and are operating within their rated useful life.

Electric Resistance Cabinet Heater

Ceiling Mounted Electric Resistance Heater

Packaged Units

Six RTUs provide both DX cooling and heating to the Open Space. Three of the six RTUs have been out of service for over a year. These three units consumed no gas or electricity during the historical billing period used in this study and, therefore, have not been accounted for as energy consuming equipment. The three units actively serving the Open Space each have a 7.5-ton cooling capacity and provide 144 MBh of gas heating. The units have a rated EER of 9 and a thermal efficiency of 80%. The units are equipped with constant speed motors and are controlled by thermostats. Manufactured in 2005, the RTUs are in good condition and operating beyond their rated useful life. All six units have been evaluated for replacement.

Refer to Appendix A for detailed information about each unit.

RTU – 4

A total of 23 Airedale units provide cooling and heating to classrooms throughout Bayview. Every unit is equipped with direct expansion (DX) coils, heating hot water (HHW) coils, and supply and exhaust fans with fractional horsepower, constant speed motors. Each unit has an estimated cooling capacity of 3 tons and is equipped with HHW coils rated at 30 MBh. Occupancy sensors control the units and turn them off when rooms are unoccupied. Room temperature is controlled by local thermostat. The units are in poor condition and experience frequent mechanical failures. They have been evaluated for replacement.

Airedale Unit

Local Thermostat

Air Handling Units (AHUs)

One air handling unit located in the multipurpose room closet provides HHW coil heating and ventilation for the multipurpose-stage area. The unit was inaccessible during the audit and has been estimated to use a 5 hp constant speed supply motor. The AHU is original to the building and is controlled by a pneumatic thermostat. Fin tube radiators provide HHW heating in some areas; they are also controlled by pneumatic thermostats.

Multipurpose Room AHU

2.6 Building General Exhaust Air Systems

Exhaust fans ventilate restrooms, corridors, offices, and other spaces. Fractional horsepower motors drive the fans, which are in good condition. The fans are controlled by manual switches.

Exhaust Fans

2.7 Heating Steam Systems

Two, 3000 MBh Easco FPS-90 forced draft steam boilers serve most of Bayview's heating demand. The boilers connect to a steam to hot water heat exchanger, where the heating hot water (HHW) is then distributed throughout the building by HHW pumps. Seven constant speed centrifugal pumps distribute the hot water. These pumps are controlled by switch and can allow for zone-based heating where each zone is controlled by a HHW pump. The HHW terminates at radiators, AHU, hydronic heater, and Airedale units. The boilers run at a nominal efficiency of 80% and pipes are well insulated. Industrial Combustion burners control the boilers. An air compressor runs continuously during the heating season and controls the boiler's pneumatic valve systems and the pneumatic thermostats located in hallways and other non-classroom spaces. The boilers are from 2009 and are in fair condition. They have been evaluated for replacement.

Two constant speed, 2.0 hp, forced draft combustion air fans serve the boilers along with two, 0.5 hp supplementary forced draft fans. The draft fan assemblies are in good condition. Overall, the steam heating system is in fair condition.

Steam Boilers

Forced Draft Combustion Fan

HHW Distribution Pump

HHW Zone Control

2.8 Domestic Hot Water

A 75-gallon, Rheem natural gas water heater serves the facility's domestic hot water (DHW) demand. The DHW pipes are partially insulated, and the installation of an estimated 20 feet of 0.75-inch insulation has been evaluated. One fractional horsepower DHW pump circulates the water through the facility. The unit is from 2014, in good condition, and is operating within its useful life.

Natural Gas DHW Tank

2.9 Food Service Equipment

The small warming kitchen uses a standard efficiency, full-size electric convection oven, and a standard efficiency, electric insulated food holding cabinet to warm meals for students. All food service equipment is in good condition.

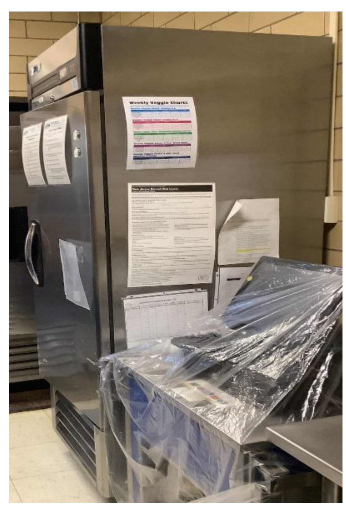
Electric Convection Oven

Electric Insulated Food Holding Cabinet

2.10 Refrigeration

The kitchen uses a high efficiency stand-up refrigerator and a standard efficiency stand up freezer with solid metal doors. A novelty milk cooler is also present in the kitchen. All refrigeration equipment is in good condition.

High Efficiency Refrigerator



Standard Efficiency Freezer

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

2.11 Plug Load and Vending Machines

Plug loads at Bayview include standard office and classroom equipment. Typical office loads include computers, printers, coffee machines, microwaves, and televisions. Classroom equipment include projectors, fans, smartboards, and projectors. There are 46 desktops and 345 laptops throughout the building.

There are three full-size, and eight mini residential refrigerators present in the school. Equipment condition and efficiencies vary.

Standard Plug Loads

There are numerous restrooms with toilets, urinals, and sinks at Bayview. Faucet flow rates are 2.0 gallons per minute (gpm) or lower. Toilets are rated at 2.5 gallons per flush (gpf) and urinals are rated at 2.5 gpf.

Restroom

Kitchen Style Faucet

2.12 On-Site Generation

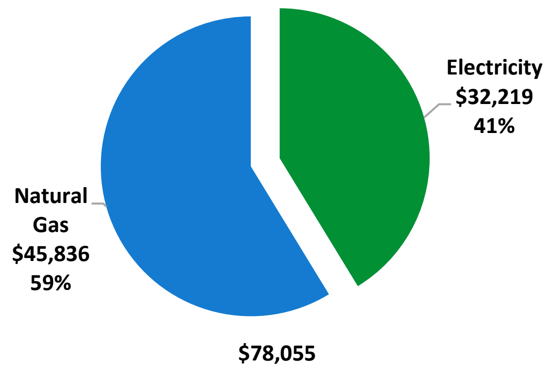
Bayview has a 156-kW photovoltaic (PV) array with a consumed annual generation of 154,928 kWh. The system provides approximately 42% of the electricity used. The array is leased.

PV Array

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	366,159 kWh	$32,219
Natural Gas	29,840 Therms	$45,836
Total		**$78,055**



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

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

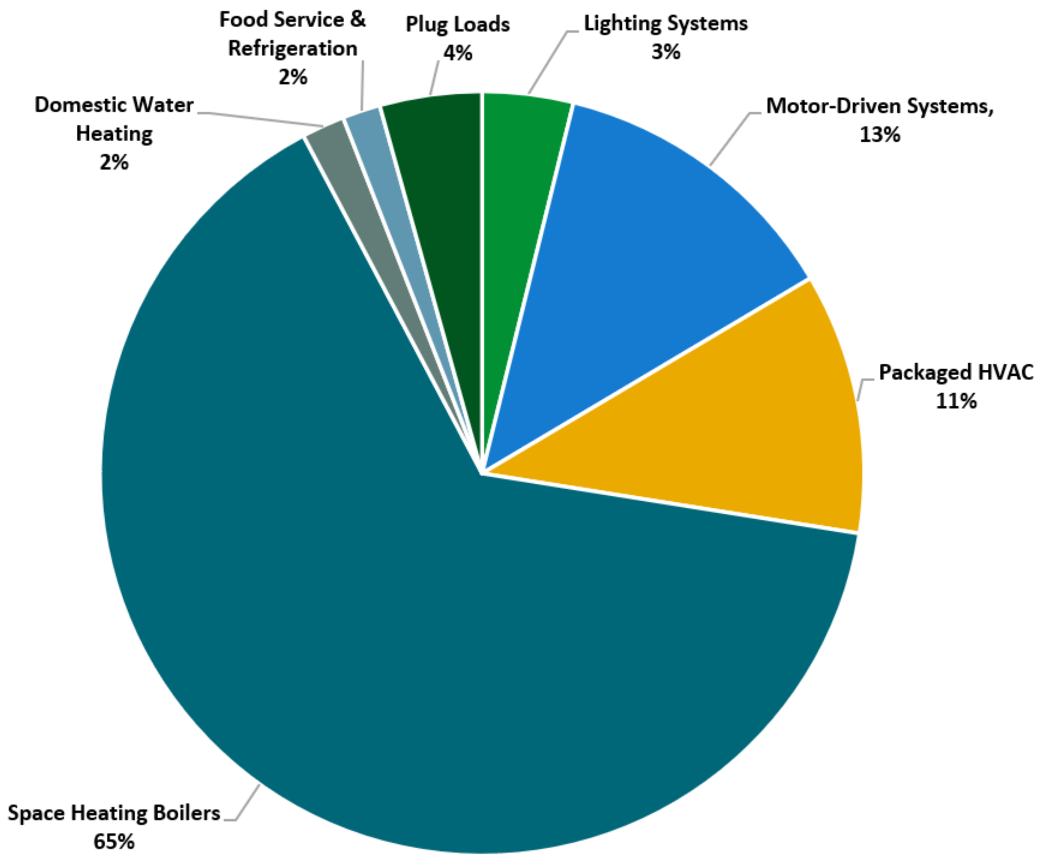
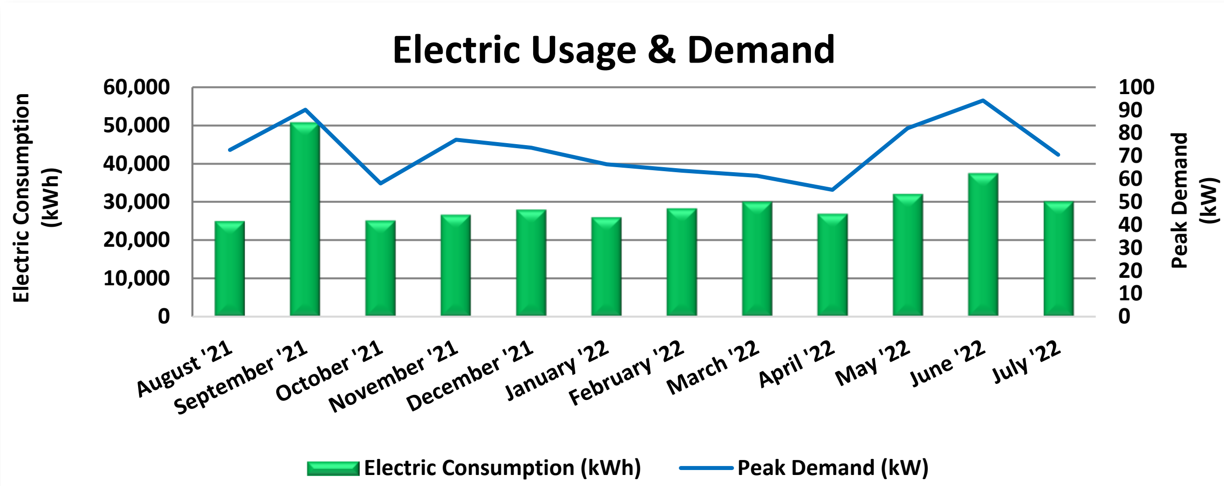


Figure 4 - Energy Balance

3.1 Electricity

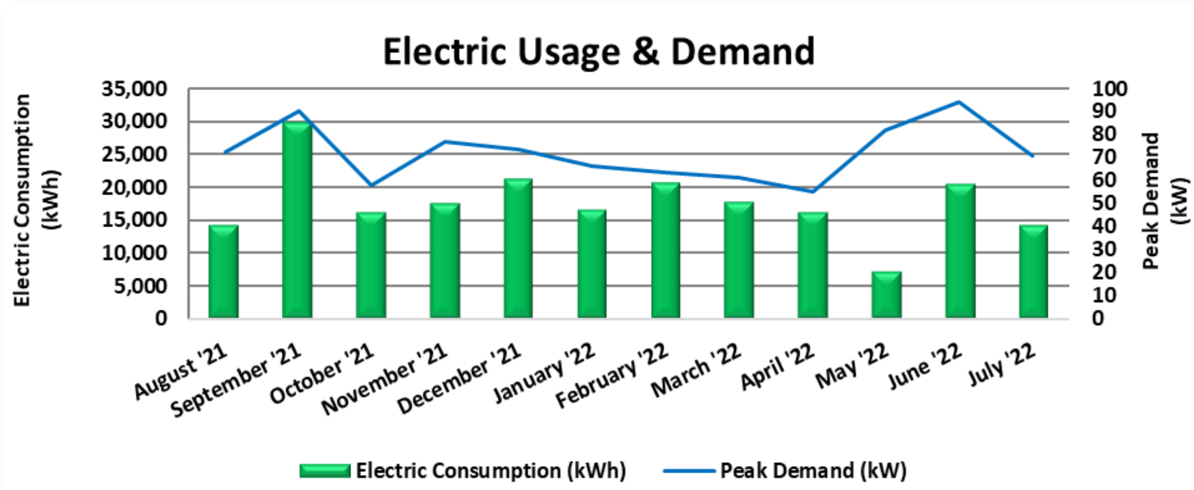
JCP&L delivers electricity under rate class general service secondary 3 phase to the site.



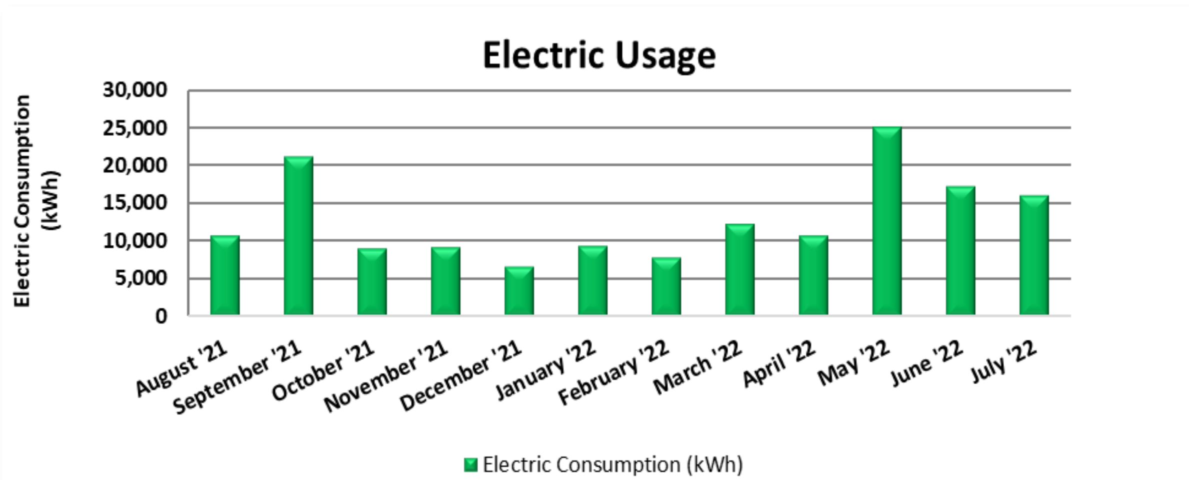
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
9/8/21	33	24,987	73	$481	$2,287
10/7/21	29	50,709	90	$557	$2,852
11/8/21	32	25,128	58	$375	$2,178
12/9/21	31	26,633	77	$499	$2,617
1/7/22	29	27,917	74	$476	$3,017
2/5/22	29	25,905	66	$430	$2,708
3/8/22	31	28,319	64	$469	$2,773
4/7/22	30	30,018	61	$453	$2,508
5/10/22	33	26,885	55	$408	$2,136
6/9/22	30	32,075	82	$606	$2,512
7/7/22	28	37,474	94	$695	$2,973
8/6/22	30	30,109	71	$479	$3,657
Totals	**365**	**366,159**	**94**	**$5,928**	**$32,219**
Annual	**365**	**366,159**	**94**	**$5,928**	**$32,219**

Notes:

- Peak demand of 94 kW occurred in June '22.
- Average demand over the past 12 months was 72 kW.
- The average electric cost over the past 12 months was $0.088/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.



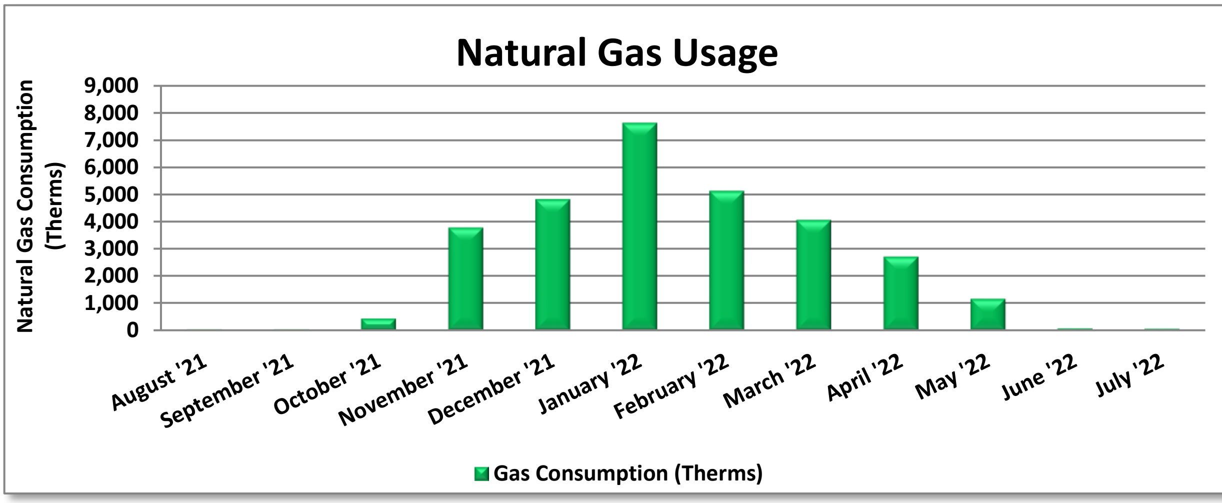
Purchased Electricity



Generated Electricity Used On-site

3.2 Natural Gas

NJ Natural Gas delivers natural gas under rate class GSL, with natural gas supply provided by Direct Energy, a third-party supplier.



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
8/27/21	29	13	$631
9/28/21	32	14	$685
10/27/21	29	434	$1,061
11/29/21	33	3,772	$3,972
12/29/21	30	4,821	$7,438
2/1/22	34	7,626	$10,742
3/2/22	29	5,124	$7,778
3/31/22	29	4,053	$6,164
4/29/22	29	2,705	$4,527
6/1/22	33	1,154	$2,608
6/29/22	28	68	$132
7/29/22	30	56	$99
Totals	**365**	**29,840**	**$45,836**
Annual	**365**	**29,840**	**$45,836**

Notes:

- The average gas cost for the past 12 months is $1.536/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

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

Benchmarking Score	51

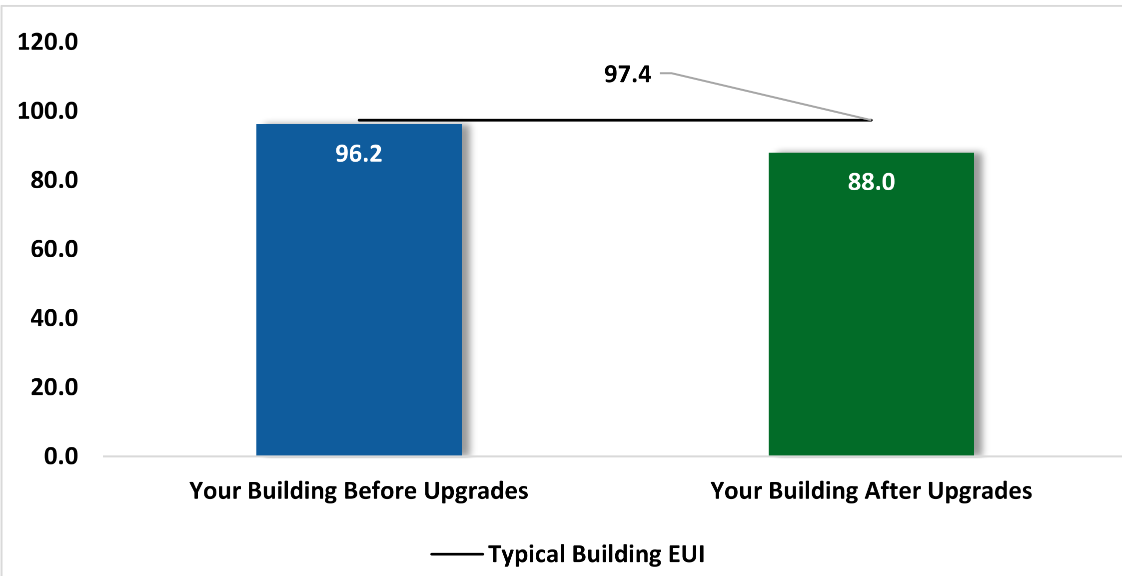


Figure 5 - Energy Use Intensity Comparison[3]

This building performs approximately at 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. Several factors can cause a building to vary from typical energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

4 Energy Conservation Measures

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

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

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

Financial incentives in this report are based on the previously run state rebate program SmartStart, which has been retired. Now, all investor-owned gas and electric utility companies are offering complementary energy efficiency programs directly to their customers. Some measures and proposed upgrades may be eligible for higher incentives than those shown below. The incentives in the summary tables should be used for high-level planning purposes. To verify incentives, reach out to your utility provider or visit the NJCEP website for more information.

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**9,257**	**2.4**	**-2**	**$785**	**$3,725**	**$1,020**	**$2,705**	**3.4**	**9,095**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	9,257	2.4	-2	$785	$3,725	$1,020	$2,705	3.4	9,095
Lighting Control Measures			**1,371**	**0.3**	**0**	**$116**	**$2,932**	**$390**	**$2,542**	**21.9**	**1,347**
ECM 2	Install Occupancy Sensor Lighting Controls	No	1,371	0.3	0	$116	$2,932	$390	$2,542	21.9	1,347
Variable Frequency Drive (VFD) Measures			**43,495**	**12.8**	**0**	**$3,827**	**$83,859**	**$3,400**	**$80,459**	**21.0**	**43,799**
ECM 3	Install VFDs on Constant Volume (CV) Fans	Yes	37,270	10.5	0	$3,279	$48,216	$2,700	$45,516	13.9	37,530
ECM 4	Install VFDs on Heating Water Pumps	No	3,202	1.0	0	$282	$26,629	$500	$26,129	92.7	3,224
ECM 5	Install Boiler Draft Fan VFDs	No	3,023	1.2	0	$266	$9,014	$200	$8,814	33.1	3,044
Unitary HVAC Measures			**21,931**	**27.5**	**4**	**$1,994**	**$297,868**	**$10,662**	**$287,206**	**144.1**	**22,571**
ECM 6	Install High Efficiency Air Conditioning Units	No	21,931	27.5	4	$1,994	$297,868	$10,662	$287,206	144.1	22,571
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**34**	**$519**	**$125,082**	**$6,000**	**$119,082**	**229.4**	**3,957**
ECM 7	Install High Efficiency Steam Boilers	No	0	0.0	34	$519	$125,082	$6,000	$119,082	229.4	3,957
HVAC System Improvements			**0**	**0.0**	**7**	**$105**	**$239**	**$40**	**$199**	**1.9**	**802**
ECM 8	Install Pipe Insulation	Yes	0	0.0	7	$105	$239	$40	$199	1.9	802
Domestic Water Heating Upgrade			**0**	**0.0**	**6**	**$87**	**$151**	**$59**	**$91**	**1.0**	**663**
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	6	$87	$151	$59	$91	1.0	663
Custom Measures			**-7,222**	**0.0**	**77**	**$547**	**$3,166**	**$0**	**$3,166**	**5.8**	**1,743**
ECM 10	Replace Gas Fired Water Heater with Heat Pump Water Heater	Yes	-7,222	0.0	77	$547	$3,166	$0	$3,166	5.8	1,743
TOTALS			**68,832**	**43.0**	**125**	**$7,980**	**$517,022**	**$21,571**	**$495,451**	**62.1**	**83,977**

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

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**9,257**	**2.4**	**-2**	**$785**	**$3,725**	**$1,020**	**$2,705**	**3.4**	**9,095**
ECM 1	Retrofit Fixtures with LED Lamps	9,257	2.4	-2	$785	$3,725	$1,020	$2,705	3.4	9,095
Variable Frequency Drive (VFD) Measures		**37,270**	**10.5**	**0**	**$3,279**	**$48,216**	**$2,700**	**$45,516**	**13.9**	**37,530**
ECM 3	Install VFDs on Constant Volume (CV) Fans	37,270	10.5	0	$3,279	$48,216	$2,700	$45,516	13.9	37,530
Unitary HVAC Measures		**0**	**0.0**	**0**	**$0**	**$0**	**$0**	**$0**	**0.0**	**0**
ECM 6	Install High Efficiency Air Conditioning Units	0	0.0	0	$0	$0	$0	$0	0.0	0
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**0**	**$0**	**$0**	**$0**	**$0**	**0.0**	**0**
ECM 7	Install High Efficiency Steam Boilers	0	0.0	0	$0	$0	$0	$0	0.0	0
HVAC System Improvements		**0**	**0.0**	**7**	**$105**	**$239**	**$40**	**$199**	**1.9**	**802**
ECM 8	Install Pipe Insulation	0	0.0	7	$105	$239	$40	$199	1.9	802
Domestic Water Heating Upgrade		**0**	**0.0**	**6**	**$87**	**$151**	**$59**	**$91**	**1.0**	**663**
ECM 9	Install Low-Flow DHW Devices	0	0.0	6	$87	$151	$59	$91	1.0	663
Custom Measures		**-7,222**	**0.0**	**77**	**$547**	**$3,166**	**$0**	**$3,166**	**5.8**	**1,743**
ECM 10	Replace Gas Fired Water Heater with Heat Pump Water Heater	-7,222	0.0	77	$547	$3,166	$0	$3,166	5.8	1,743
TOTALS		**39,304**	**13.0**	**88**	**$4,803**	**$55,496**	**$3,819**	**$51,677**	**10.8**	**49,834**

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

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

Figure 7 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**9,257**	**2.4**	**-2**	**$785**	**$3,725**	**$1,020**	**$2,705**	**3.4**	**9,095**
ECM 1	Retrofit Fixtures with LED Lamps	9,257	2.4	-2	$785	$3,725	$1,020	$2,705	3.4	9,095

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

ECM 1: Retrofit Fixtures with LED Lamps

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

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

Affected Building Areas: classrooms 16-22 and the student services room

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**1,371**	**0.3**	**0**	**$116**	**$2,932**	**$390**	**$2,542**	**21.9**	**1,347**
ECM 2	Install Occupancy Sensor Lighting Controls	1,371	0.3	0	$116	$2,932	$390	$2,542	21.9	1,347

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

We evaluated installing 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: book room, copy room, kitchen side room, multipurpose room, nurse's office, restrooms, and student services room

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**43,495**	**12.8**	**0**	**$3,827**	**$83,859**	**$3,400**	**$80,459**	**21.0**	**43,799**
ECM 3	Install VFDs on Constant Volume (CV) Fans	37,270	10.5	0	$3,279	$48,216	$2,700	$45,516	13.9	37,530
ECM 4	Install VFDs on Heating Water Pumps	3,202	1.0	0	$282	$26,629	$500	$26,129	92.7	3,224
ECM 5	Install Boiler Draft Fan VFDs	3,023	1.2	0	$266	$9,014	$200	$8,814	33.1	3,044

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 3: 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.

VAV system controls should not raise the supply air temperature at the expense of the fan power. A common mistake is to reset the supply air temperature to achieve DX energy savings, which can lead to additional air flow requirements. Supply air temperature should be kept low (e.g., 55°F) until the minimum fan speed (typically about 50%) is met. At this point, it is efficient to raise the supply air temperature as the load decreases, but not such that additional air flow and thus fan energy is required.

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 located in the multipurpose storage room

Affected Roof Top Units: all three operational RTUs

ECM 4: Install VFDs on Heating Water Pumps

We evaluated installing 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: all seven HHW pumps located in the boiler room

ECM 5: Install Boiler Draft Fan VFDs

We evaluated replacing the 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 require less maintenance than mechanical air volume control devices.

Affected Fans: two primary boiler draft fans

4.4 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**21,931**	**27.5**	**4**	**$1,994**	**$297,868**	**$10,662**	**$287,206**	**144.1**	**22,571**
ECM 6	Install High Efficiency Air Conditioning Units	21,931	27.5	4	$1,994	$297,868	$10,662	$287,206	144.1	22,571

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the Airedale units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 6: Install High Efficiency Air Conditioning Units

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

Affected Units: all Airedale units and RTUs, including non-operational units

4.5 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**34**	**$519**	**$125,082**	**$6,000**	**$119,082**	**229.4**	**3,957**
ECM 7	Install High Efficiency Steam Boilers	0	0.0	34	$519	$125,082	$6,000	$119,082	229.4	3,957

ECM 7: Install High Efficiency Steam Boilers

We evaluated replacing the older inefficient steam boilers with high-efficiency steam boilers. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

For the purpose of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load. In many cases installing multiple modular boilers, rather than one or two large boilers, will result in higher overall plant efficiency while providing additional system redundancy. It may be feasible to re-configure the heating system to operate using hot water boilers; this alternative could be evaluated as you begin the design process. Please refer to Section 4.9, Measures for Future Consideration" for further details.

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

4.6 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**7**	**$105**	**$239**	**$40**	**$199**	**1.9**	**802**
ECM 8	Install Pipe Insulation	0	0.0	7	$105	$239	$40	$199	1.9	802

ECM 8: Install Pipe Insulation

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

Affected Systems: DHW tank in the boiler room

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**6**	**$87**	**$151**	**$59**	**$91**	**1.0**	**663**
ECM 9	Install Low-Flow DHW Devices	0	0.0	6	$87	$151	$59	$91	1.0	663

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

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

Additional cost savings may result from reduced water usage.

4.8 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**-7,222**	**0.0**	**77**	**$547**	**$3,166**	**$0**	**$3,166**	**5.8**	**1,743**
ECM 10	Replace Gas Fired Water Heater with Heat Pump Water Heater	-7,222	0.0	77	$547	$3,166	$0	$3,166	5.8	1,743

ECM 10: Replace Gas Fired Water Heater with Heat Pump Water Heater

A gas fired water heater uses a burner to heat water. Air source heat pump water heaters (HPWH) use a refrigeration cycle to transfer heat from the surrounding air to the domestic water. Water heater efficiency is rated by the uniform energy factor (UEF). For a relative comparison of water heater UEFs, the criteria for certifying a water heater in the ENERGY STAR program are provided below. These values indicate that HPWH heaters are significantly more efficient than gas fired water heaters.

There are two types of HPWH: those integrated with the heat pump and storage tank in the same unit, and those that are split into two sections (with the storage tank separate from the heat pump). The measure considers an integrated HPWH.

ENERGY STAR Uniform Energy Factor (UEF) Criteria for Certified Water Heaters *

Water Heater Type	Minimum UEF	Other
Integrated HPWH	3.3	
Integrated HPWH	2.2	120 Volt, 15 Amp circuit
Split System HPWH	2.2	
Gas Fired Storage	0.64	≤ 55-gal, Medium Draw Pattern
Gas Fired Storage	0.68	≤ 55-gal, High Draw Pattern
Gas Fired Storage	0.78	> 55-gal, Medium Draw Pattern
Gas Fired Storage	0.80	> 55-gal, High Draw Pattern
Gas Fired Storage	0.80	Residential Duty
Gas Fired Instantaneous	0.87	

** Note: Uniform Energy Factor (UEF): The newest measure of water heater overall efficiency. The higher the UEF value is, the more efficient the water heater. UEF is determined by the Department of Energy's test method outlined in 10 CFR Part 430, Subpart B, Appendix E.*[4]

[4] https://www.energy.gov/sites/prod/files/2014/06/f17/rwh_tp_final_rule.pdf

HPWH reject cold air. As such, they need to be installed in an unconditioned space of about 750 cubic feet with good ventilation[5]. Ideal locations are garages, large enclosed, unconditioned storage areas, or areas with excess heat such as a furnace or boiler room. The HPWH will also produce condensate so accommodations for draining the condensate need to be provided.

Most HPWH operate effectively down to an air temperature of 40 °F. Below that temperature, an electric resistance booster heater is typically required to achieve full heating capacity. It is critical that the HPWH controls are set up so that the electric resistance heat only engages when the air temperature is too cold for the HPWH to extract heat from it. HPWHs have a slow recovery. During periods of high demand, the electric resistance heating element, if enabled, may be energized to maintain set point, thus reducing the overall efficiency of the unit. It is recommended that a careful analysis of the hot water demand be conducted to determine if the application makes economic sense, and the HPWH heating capacity and storage are properly sized.

HPWH operate most effectively when the temperature difference between the incoming and outgoing water is high. Generally, this means that cold make-up water should be piped to the bottom of the tank and return water should be piped to the top of the tank in order to maintain stratification within the storage tank. Water should be drawn from the bottom of the tank to be heated. If there is a DHW recirculation pump, it should only be operated during high hot water demand periods.

Switching from a gas fired water heater to a HPWH has the potential to reduce the sites overall greenhouse gas emissions. If the electricity for the HPWH is provided by an on-site photovoltaic (PV) system, then there are essentially no greenhouse gas (GHG) emissions. A 2016 study conducted at Cornell [6]calculated the kg of methane (CH_4) and carbon dioxide (CO_2) produced per GJ of water heated. The study compared HPWH to gas and electric fired, storage and tankless water heaters. The study also considered electricity produced from natural gas and coal fired electric plants. In all cases the study found that HPWHs produced less methane than all of the other water heaters. The study also found that HPWH produced less carbon dioxide than electric resistance water heaters but more carbon dioxide than tankless gas water heaters and about the same amount of carbon dioxide as storage gas water heaters. The summary tables provide the reduction in CO2 equivalent emissions based on the typical New Jersey electric utility.

[5] https://basc.pnnl.gov/code-compliance/heat-pump-water-heaters-code-compliance-brief#:~:text=HPWH%20must%20have%20unrestricted%20airflow,depending%20on%20size%20of%20system

[6] Greenhouse gas emissions from domestic hot water: Heat pumps compared to most commonly used systems. Bongghi Hong, Robert W. Howarth. Department of Ecology and Evolutionary Biology, Cornell University. Energy Science and Engineering 2016.

4.9 Measures for Future Consideration

There are additional opportunities for improvement that Middletown Township 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.

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

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

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

Installation of a Building Automation System

Most larger facilities have some type of building automation system (BAS), which provides for centralization, remote control, and monitoring of HVAC equipment and sometimes lighting or other building systems. A BAS 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. Pneumatics controls have largely been replaced by direct digital control (DDC) systems, but many pneumatic systems remain. Contemporary DDC systems afford tighter controls and enhanced monitoring and trending capabilities as compared to the older systems.

Often smaller facilities are not equipped with central controls. For many small sites, it has been less costly to install distributed local controls, such as programmable thermostats and timeclocks, rather than centralized DDC. Local controls do a reasonably good job of scheduling equipment and maintaining operating conditions by relying on controls integral to HVAC units, such as logic for compressor staging, to manage the equipment operating algorithms.

Even for smaller sites, inefficiencies arise when temperature sensors and thermostat schedules are not maintained, when there are separate systems for heating and cooling, and especially when equipment is added, or the facility is reconfigured or repurposed.

Based on our survey, it appears that the installation of a BAS at your site could increase the efficiency of your building HVAC system operation.

A controls upgrade would enable automated equipment start and stop times, temperature setpoints, and lockouts and deadbands to be programmed remotely using a graphic interface. Controls can be configured to optimize ventilation and outside air intake by adjusting economizer position, damper function, and fan speed. Existing chilled and hot water distribution system controls are typically tied in, including associated pumps and valves. 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 BAS 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.

Heating System Conversion from Steam to Hot Water

This type of system upgrade/conversion has significant up-front capital costs. However, there are benefits with modular hot water boiler system designs with advanced control strategies. Advantages associated with configuring a boiler plant around several modular boilers include the better system performance at low load conditions, and the modular boilers will often take less space than multiple old large boilers.

As the existing boilers are approaching the end of their useful life, it is recommended that reconfiguring the boiler plant be further evaluated. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load.

Replacing the boilers has a long payback, and it may not be justifiable based simply on energy considerations. However, the boilers are nearing the end of their normal useful life. We also recommend working with your mechanical design team to determine whether a hot water heating system can operate with return water temperatures below 130°F, which would allow for operating condensing boilers at efficiencies above 90%. Energy savings results from improved combustion efficiency and reduced standby losses at low loads. Further analysis should be conducted for the feasibility of this measure. This measure is a capital improvement measure for future consideration.

5 Energy Efficient Best Practices

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

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

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

Energy Tracking with ENERGY STAR Portfolio Manager

You've heard it before—you cannot manage what you do not measure. ENERGY STAR Portfolio Manager is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[7]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Weatherization

Caulk or weather strip leaky doors and windows to reduce drafts and loss of heated or cooled air. Sealing cracks and openings can reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. Materials used may include caulk, polyurethane foam, and other weather-stripping materials. There is an energy savings opportunity by reducing the uncontrolled air exchange between the outside and inside of the building. Blower door assisted comprehensive building air sealing will reduce the amount of air exchange, which will in turn reduce the load on the buildings heating and cooling equipment, providing energy savings and increased occupant comfort.

Doors and Windows

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

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

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.

Motor Controls

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

Motor 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.

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.

Label HVAC Equipment

For improved coordination in maintenance practices, we recommend labeling or re-labeling the site HVAC equipment. Maintain continuity in labeling by following labeling conventions as indicated in the facility drawings or BAS building equipment list. Use weatherproof or heatproof labeling or stickers for permanence, but do not cover over original equipment nameplates, which should be kept clean and readable whenever possible. Besides equipment, label piping for service and direction of flow when possible. Ideally, maintain a log of HVAC equipment, including nameplate information, asset tag designation, areas served, installation year, service dates, and other pertinent information.

This investment in your equipment will enhance collaboration and communication between your staff and your contracted service providers and may help you with regulatory compliance.

Optimize HVAC Equipment Schedules

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

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

Water Heater Maintenance

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

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

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

Compressed Air System Maintenance

Compressed air systems require periodic maintenance to operate at peak efficiency. A maintenance plan for compressed air systems should include:

- Inspection, cleaning, and replacement of inlet filter cartridges.
- Cleaning of drain traps.
- Daily inspection of lubricant levels to reduce unwanted friction.
- Inspection of belt condition and tension.
- Check for leaks and adjust loose connections.
- Overall system cleaning.
- Reduce pressure setting to minimum needed for air operated equipment.
- Turn off compressor if not routinely needed.
- Use low pressure blower air rather than high pressure compressed air.

Contact a qualified technician for help with setting up periodic maintenance schedule.

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[8] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[9] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

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

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

Procurement Strategies

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

6 ON-SITE GENERATION

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

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

6.1 Solar Photovoltaic

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

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

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

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

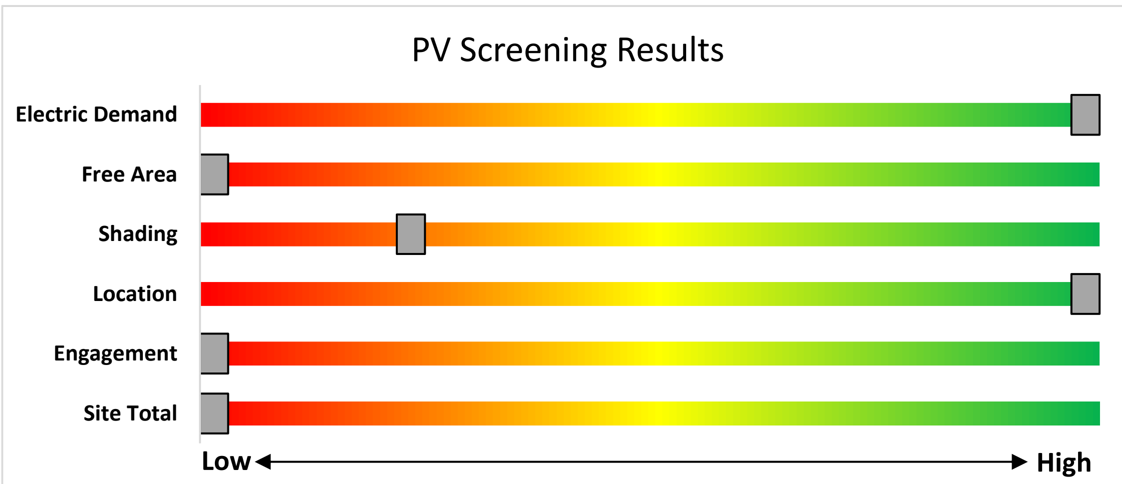


Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

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

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

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

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

6.2 Combined Heat and Power

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

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

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

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

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

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

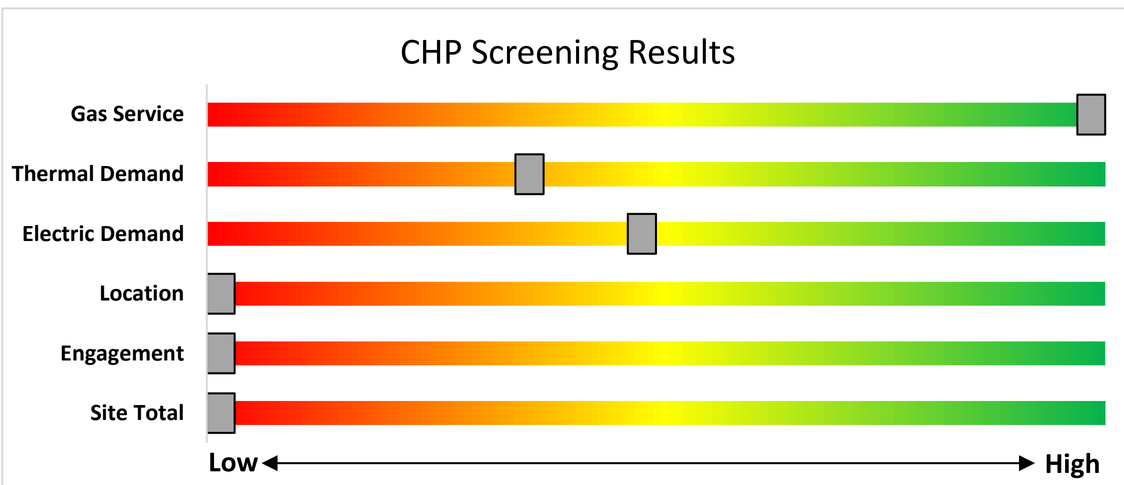


Figure 9 - Combined Heat and Power Screening

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

7 Electric Vehicles (EV)

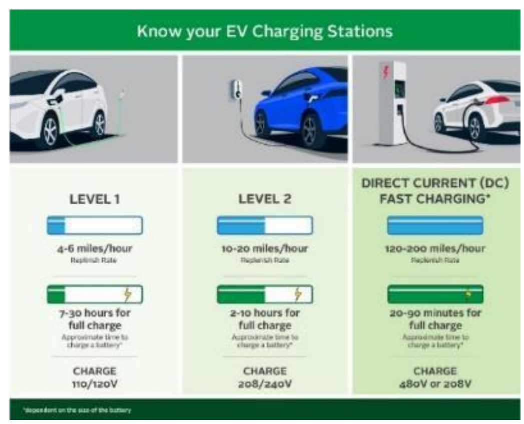
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes all-electric vehicles as zero-emission vehicles because they produce no direct exhaust or tailpipe emissions.

EVs are typically more expensive than similar conventional and hybrid vehicles, although some cost can be recovered through fuel savings, federal tax credit, or state incentives.

7.1 Electric Vehicle Charging

EV charging stations provide a means for electric vehicle operators to recharge their batteries at a facility. While many EV drivers charge at home, others do not have access to regular home charging, and the ability to charge at work or in public locations is critical to making EVs practical for more drivers. Charging can also be used for electric fleet vehicles, which can reduce fuel and maintenance costs for fleets that replace gas or diesel vehicles with EVs.

EV charging comes in three main types. For this assessment, the screening considers addition of Level 2 charging, which is most common at workplaces and other public locations. Depending on the site type and usage, other levels of charging power may be more appropriate.



The preliminary assessment of EV charging at the facility shows that there is medium potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

The primary costs associated with installing EV charging are the charger hardware and the cost to extend power from the facility to parking spaces. This may include upgrades to electric panels to serve increased loads.

The type and size of the parking area impact the costs and feasibility of adding EV charging. Parking structure installations can be less costly than surface lot installations as power may be readily available, and equipment and wiring can be surface mounted. Parking lot installations often require trenching through concrete or asphalt surface. Large parking areas provide greater flexibility in charger siting than smaller lots.

The location and capacity of facility electric panels also impact charger installation costs. A Level 2 charger generally requires a dedicated 208-240V, 40 Amp circuit. The electric panel nearest the planned installation may not have available capacity and may need to be upgraded to serve new EV charging loads. Alternatively, chargers could be powered from a more distant panel. The distance from the panel to the location of charging stations ties directly to costs, as conduits, cables, and potential trenching costs all increase on a per-foot basis. The more charging stations planned, the more likely it is that additional electrical capacity will be needed.

Other factors to consider when planning for EV charging at a facility include who the intended users are, how long they park vehicles at the site, and whether they will need to pay for the electricity they use.

The graphic below displays the results of the EV charging assessment conducted as part of this audit. The position of each slider indicates the impact each factor has on the feasibility of installing EV charging at the site.

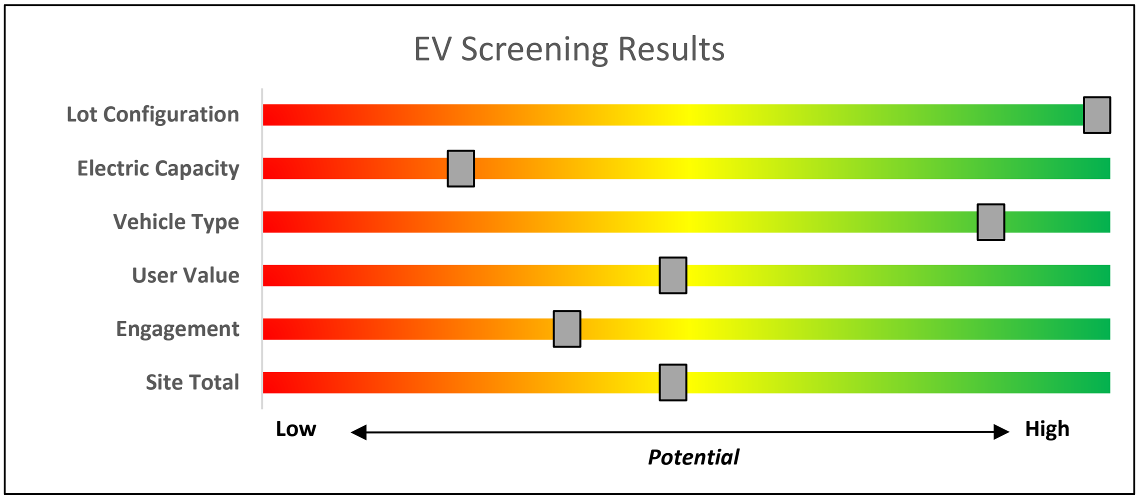


Figure 10 – EV Charger Screening

Electric Vehicle Programs Available

New Jersey is leading the way on electric vehicle (EV) adoption on the East Coast. There are several programs designed to encourage EV adoption in New Jersey, which is crucial to reaching a 100% clean energy future.

NJCEP offers a variety of EV programs for vehicles, charging stations, and fleets. Certain EV charging stations that receive electric utility service from Atlantic City Electric Company (ACE) or Public Service Electric & Gas Company (PSE&G), may be eligible for additional electric vehicle charging incentives directly from the utility. Projects may be eligible for both the incentives offered by this BPU program and incentives offered by ACE or PSE&G, up to 90% of the combined charger purchase and installation costs. Please check ACE or PSE&G program eligibility requirements before purchasing EV charging equipment, as additional conditions on types of eligible chargers may apply for utility incentives.

Both Jersey Central Power & Light (JCP&L) and Rockland Electric (RECO) have filed proposals for EV charging programs. BPU staff is currently reviewing those proposals.

For more information and to keep up to date on all EV programs please visit https://www.njcleanenergy.com/commercial-industrial/programs/electric-vehicle-programs.

8 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? New Jersey's Clean Energy Programs and Utility Energy Efficiency Programs can help. Pick the program that works best for you. This section provides an overview of currently available incentive programs in.

8.1 Utility Energy Efficiency Programs

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

Prescriptive and Custom

The Prescriptive and Custom rebate program through your utility provider 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.

Equipment Examples

Lighting
Lighting Controls
HVAC Equipment
Refrigeration
Gas Heating
Gas Cooling
Commercial Kitchen Equipment
Food Service Equipment
Variable Frequency Drives
Electronically Commutate Motors
Variable Frequency Drives
Plug Loads Controls
Washers and Dryers
Agricultural
Water Heating

The Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type. The Custom program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives.

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 or less 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.

How to Participate

To participate in Direct Install, you will work with a participating contractor. 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 Direct Install program, subject to program rules and eligibility, while the remaining percent of the cost is paid to the contractor by the customer.

Engineered Solutions

The Engineered Solutions Program provides tailored energy-efficiency assistance and services to municipalities, universities, schools, hospitals and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. Customers receive expert guided services, including investment-grade energy auditing, engineering design, installation assistance, construction administration, commissioning, and measurement and verification (M&V) services to support the implementation of cost-effective and comprehensive efficiency projects. Engineered Solutions is generally a good option for medium to large sized facilities with a peak demand over 200 kW looking to implement as many measures as possible under a single project to achieve deep energy savings. Engineered Solutions 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. Incentives for this program are based on project scope and energy savings achieved.

For more information on any of these programs, contact your local utility provider or visit https://www.njcleanenergy.com/transition.

8.2 New Jersey's Clean Energy Programs

Save money while saving the planet! New Jersey's Clean Energy Program is a statewide program that offers incentives, programs, and services that benefit New Jersey residents, businesses, educational, non-profit, and government entities to help them save energy, money, and the environment.

Large Energy Users

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

Incentives

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

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

How to Participate

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

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

Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

Successor Solar Incentive Program (SuSI)

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

Administratively Determined Incentive (ADI) Program

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

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

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

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

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

The ADI Program online portal is now open to new registrations.

Competitive Solar Incentive Program

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

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan. If you are considering installing solar photovoltaics on your building, visit the following link for more information: https://njcleanenergy.com/renewable-energy/programs/susi-program.

Energy Savings Improvement Program

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

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

How to Participate

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

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

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

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

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

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

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

9 PROJECT DEVELOPMENT

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

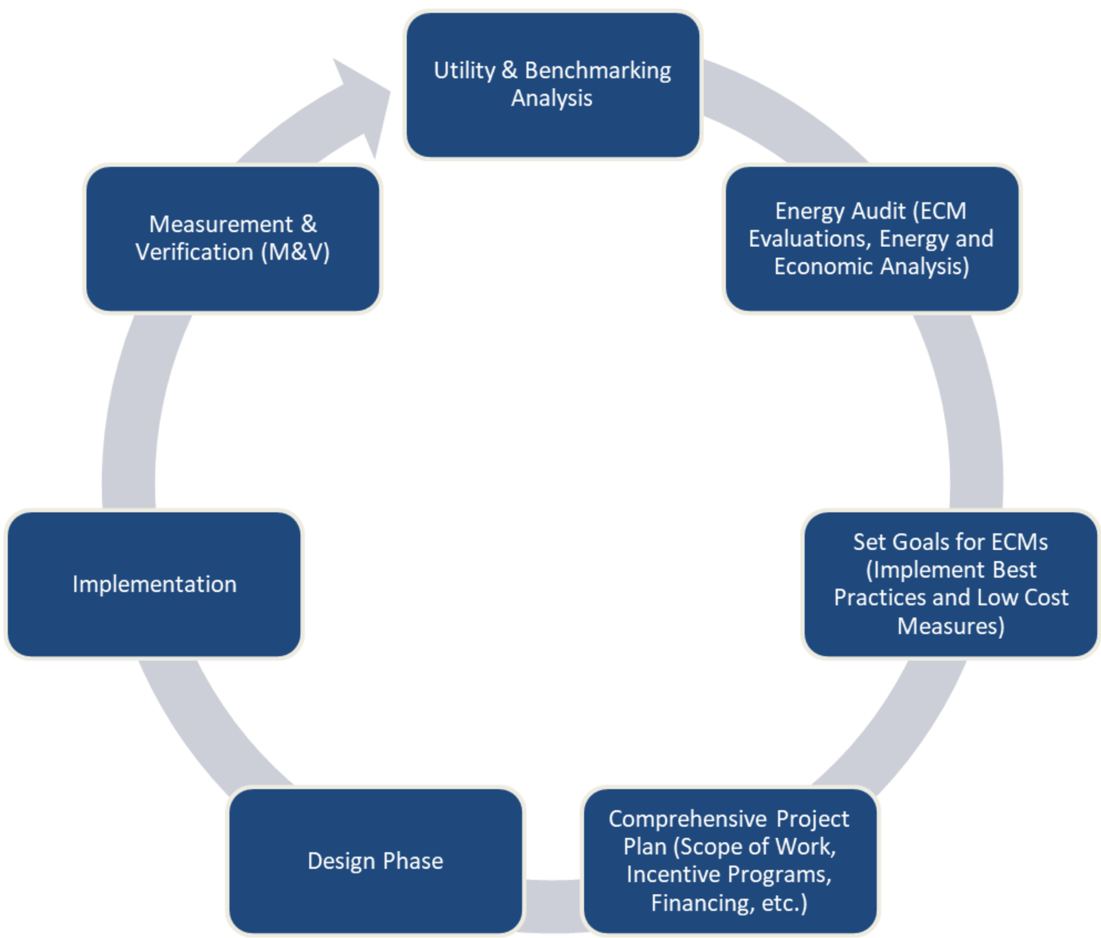


Figure 11 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 Retail Electric Supply Options

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

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

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

10.2 Retail Natural Gas Supply Options

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

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

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

A list of licensed third-party natural gas suppliers is available at the NJBPU website[11].

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
ADA Restroom	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,700		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,700	0.0	0	0	$0	$0	$0	0.0
Art Room	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Basement	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Basement	96	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,000		None	No	96	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,000	0.0	0	0	$0	$0	$0	0.0
Boiler Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Boiler Room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,520		None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,520	0.0	0	0	$0	$0	$0	0.0
Book Room	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,000	2	None	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,380	0.0	40	0	$3	$270	$35	70.1
Boys Restroom	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,700	2	None	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,863	0.0	40	0	$3	$270	$35	69.2
Boys Restroom	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,700	2	None	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,863	0.0	67	0	$6	$270	$35	41.5
Boys Restroom	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	S	9	2,700		None	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,700	0.0	0	0	$0	$0	$0	0.0
Boys Restroom 2	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,700	2	None	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,863	0.0	67	0	$6	$270	$35	41.5
Child Study Room	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 1	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 10	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 11	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 12	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 13	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 14	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 15	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 16	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,500	1	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,500	0.3	1,271	0	$108	$511	$140	3.4
Classroom 17	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,500	1	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,500	0.3	1,271	0	$108	$511	$140	3.4
Classroom 18	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,500	1	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,500	0.3	1,271	0	$108	$511	$140	3.4
Classroom 19	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,500	1	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,500	0.3	1,271	0	$108	$511	$140	3.4
Classroom 2	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 20	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,500	1	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,500	0.3	1,271	0	$108	$511	$140	3.4

Location	Existing Conditions: Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	Proposed Conditions: ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Energy Impact & Financial Analysis: Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 21	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,500	1	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,500	0.3	1,271	0	$108	$511	$140	3.4
Classroom 22	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,500	1	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,500	0.3	1,271	0	$108	$511	$140	3.4
Classroom 25	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 26	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 27	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 3	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 3 Restroom	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	S	9	1,500		None	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,500	0.0	0	0	$0	$0	$0	0.0
Classroom 4	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 4 Restroom	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	S	9	1,500		None	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,500	0.0	0	0	$0	$0	$0	0.0
Classroom 5	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 6	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 7	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 8	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Classroom 9	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Copy Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Copy Room	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,500	2	None	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,725	0.0	25	0	$2	$116	$20	45.8
Copy Room	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,500		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	0.0	0	0	$0	$0	$0	0.0
Corridor Exit 10	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
Corridor Exit 10	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	4,380		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,380	0.0	0	0	$0	$0	$0	0.0
Corridor Kindergarten	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
Corridor Kindergarten	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	4,380		None	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,380	0.0	0	0	$0	$0	$0	0.0
Corridor Kindergarten	4	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	S	34	4,380		None	No	4	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	4,380	0.0	0	0	$0	$0	$0	0.0
Corridor Main	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
Corridor Main	27	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	4,380		None	No	27	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,380	0.0	0	0	$0	$0	$0	0.0
Corridor Middle	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

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Corridor Middle	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	4,380		None	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,380	0.0	0	0	$0	$0	$0	0.0
Corridor Middle	1	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	S	34	4,380		None	No	1	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	4,380	0.0	0	0	$0	$0	$0	0.0
Custodian Closet	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	1,500		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,500	0.0	0	0	$0	$0	$0	0.0
Custodian Office	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	3,500		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,500	0.0	0	0	$0	$0	$0	0.0
Electrical Closet	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,500		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,500	0.0	0	0	$0	$0	$0	0.0
Exit 7	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,520		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,520	0.0	0	0	$0	$0	$0	0.0
Exterior Flood	1	LED - Fixtures: Flood Fixture	Photocell		75	4,380		None	No	1	LED - Fixtures: Flood Fixture	Photocell	75	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior LED Panel	4	LED - Fixtures: Downlight Surface Mount	Timeclock		35	4,380		None	No	4	LED - Fixtures: Downlight Surface Mount	Timeclock	35	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Recessed	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Timeclock		10	4,380		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Timeclock	10	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	10	LED - Fixtures: Wall Pack	Photocell		35	4,380		None	No	10	LED - Fixtures: Wall Pack	Photocell	35	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	4	LED - Fixtures: Wall Pack	Timeclock		45	4,380		None	No	4	LED - Fixtures: Wall Pack	Timeclock	45	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	1	LED - Fixtures: Wall Pack	Photocell		45	4,380		None	No	1	LED - Fixtures: Wall Pack	Photocell	45	4,380	0.0	0	0	$0	$0	$0	0.0
Girls Restroom	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,700	2	None	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,863	0.0	67	0	$6	$270	$35	41.5
Girls Restroom	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	S	9	2,700		None	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,700	0.0	0	0	$0	$0	$0	0.0
Girls Restroom 2	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,700	2	None	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,863	0.0	67	0	$6	$270	$35	41.5
Girls Restroom 3	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,700	2	None	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,863	0.0	40	0	$3	$270	$35	69.2
Gym Office	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,700		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,700	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,000		None	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,000	0.0	0	0	$0	$0	$0	0.0
Kitchen Restroom	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	1,000		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,000	0.0	0	0	$0	$0	$0	0.0
Kitchen Side Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Kitchen Side Room	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,000	2	None	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,380	0.0	20	0	$2	$116	$20	57.3
Main Entrance	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	2,429		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,429	0.0	0	0	$0	$0	$0	0.0
Multipurpose Room	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
Multipurpose Room	12	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,000	2	None	Yes	12	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	2,070	0.2	761	0	$65	$270	$35	3.6
Multipurpose Room Storage	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,000		None	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,000	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Music Room	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	2,500		None	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,500	0.0	0	0	$0	$0	$0	0.0
Nurse's Office	6	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,700	2	None	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,863	0.0	80	0	$7	$270	$35	34.6
Nurse's Restroom	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	S	9	1,700		None	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,700	0.0	0	0	$0	$0	$0	0.0
Office	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	3,000		None	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,000	0.0	0	0	$0	$0	$0	0.0
Office Storage	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	3,000		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	0	0	$0	$0	$0	0.0
Open Space	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
Open Space	66	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	3,000		None	No	66	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,000	0.0	0	0	$0	$0	$0	0.0
Open Space Storage	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	1,500		None	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,500	0.0	0	0	$0	$0	$0	0.0
Principals Office	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	3,000		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,000	0.0	0	0	$0	$0	$0	0.0
Psychologist Room	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0
Secretary Office 1	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	3,000		None	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,000	0.0	0	0	$0	$0	$0	0.0
Secretary Office 2	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	3,000		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,000	0.0	0	0	$0	$0	$0	0.0
Stage	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
Stage	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,000		None	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	0	0	$0	$0	$0	0.0
Student Services	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	1, 2	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,725	0.1	462	0	$39	$416	$75	8.7
Teachers Lounge	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,000		None	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,000	0.0	0	0	$0	$0	$0	0.0
Teachers Lounge Closet	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	500		None	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	500	0.0	0	0	$0	$0	$0	0.0
Teachers Lounge Women's Restroom	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	1,700		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,700	0.0	0	0	$0	$0	$0	0.0
Teachers Restroom 1	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	S	9	1,700		None	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,700	0.0	0	0	$0	$0	$0	0.0
Teachers Restroom 2	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	S	9	1,700		None	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,700	0.0	0	0	$0	$0	$0	0.0
Therapist Room	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,500		None	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,500	0.0	0	0	$0	$0	$0	0.0

Motor Inventory & Recommendations

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Air Compressor	1	Air Compressor	3.0	89.5%	No			W	3,500		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler HHW Pump	2	Heating Hot Water Pump	1.5	84.0%	No	A.O Smith	E101	B	1,000	4	No	86.5%	Yes	2	0.3	1,051	0	$92	$7,774	$150	82.4
Boiler Room	Boiler HHW Pump	2	Heating Hot Water Pump	1.5	84.0%	No	Techtop	BL3-AL-TF-145T-4-B-D-1.5	B	1,000	4	No	86.5%	Yes	2	0.3	1,051	0	$92	$7,774	$150	82.4
Boiler Room	Boiler HHW Pump	1	Heating Hot Water Pump	0.8	81.1%	No	Dayton	31TT14	W	500	4	No	81.1%	Yes	1	0.1	129	0	$11	$3,308	$50	286.3
Boiler Room	Boiler HHW Pump	2	Heating Hot Water Pump	1.5	86.5%	No	WEG		W	1,000	4	No	86.5%	Yes	2	0.3	970	0	$85	$7,774	$150	89.3
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.3	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	6	Exhaust Fan	0.1	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.1	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.1	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.3	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.1	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.1	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	2	Exhaust Fan	0.3	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.3	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.1	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.1	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.3	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.5	70.0%	No			W	2,300		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	2	Exhaust Fan	0.3	65.0%	No			W	2,300		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF - Bayview Elementary	1	Exhaust Fan	0.1	65.0%	No			W	2,300		No	65.0%	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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Multipurpose Room Storage	AHU Motor	1	Supply Fan	5.0	84.0%	No			W	3,300	3	No	89.5%	Yes	1	1.6	6,103	0	$537	$5,028	$900	7.7
Roof	RTU Supply Motor	3	Supply Fan	3.0	80.0%	No	Johnson Controls	1VM50	B	2,800	3	No	89.5%	Yes	3	3.0	10,496	0	$924	$13,664	$600	14.1
Roof	RTU Exhaust Motor	6	Supply Fan	3.0	80.0%	No			B	2,800	3	No	88.5%	Yes	6	6.0	20,671	0	$1,819	$29,524	$1,200	15.6
Boiler Room	Boiler Combustion Fan	2	Combustion Air Fan	2.0	84.0%	No	Industrial Combustion	ZE56T34D5577A	W	2,200	5	No	85.5%	Yes	2	1.2	3,023	0	$266	$9,014	$200	33.1
Boiler Room	Boiler Combustion Supplementary Fan	2	Combustion Air Fan	0.5	70.0%	No	Marathon	ZVF56734D5326B	W	2,200		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Exhaust Fan	2	Exhaust Fan	1.0	85.5%	No			W	2,500		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Classrooms	Airedale Supply Motors	23	Supply Fan	0.5	70.0%	No			B	2,800		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Classrooms	Airedale Exhaust Motors	46	Exhaust Fan	0.3	70.0%	No			B	2,800		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	DHW Circulation Pump	1	Other	0.1	65.0%	No			W	3,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement	Hydronic Unit Heater	1	Supply Fan	0.1	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 25	Electric Resistance Heat	1	Electric Resistance Heat		15.00		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 26	Electric Resistance Heat	1	Electric Resistance Heat		15.00		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 1	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 10	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 11	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 12	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 13	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 14	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 15	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 16	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 17	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 18	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 19	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 2	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 20	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 21	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 22	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 3	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 4	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 5	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 6	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 7	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 8	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Classroom 9	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Music Room	Airedale Unit	1	Package Unit	3.00	30.00	9.70		Airedale		B	6	Yes	1	Package Unit	3.00	30.00	16.00		0.7	767	0	$68	$8,875	$309	126.9
Roof	Heat Pump - Secretary Office 1	1	Packaged Air-Source HP	1.50	21.00	19.00	10 HSPF	Fujitsu	AOU18RLXFW	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Heat Pump - Child Study Room	1	Packaged Air-Source HP	3.00	36.00	22.00	9.7 HSPF	Friedrich	MR36TQY3JMA	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Heat Pump - Secretary Office 2	1	Packaged Air-Source HP	0.75	12.00	26.00	13 HSPF	Fujitsu	AOUG09LMAS1	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 1	1	Package Unit	7.50	144.00	9.00	0.8 Et	Johnson Controls	DL-07N18NTAAA4	B	6	Yes	1	Package Unit	7.50	144.00	14.00	0.82 Et	1.8	1,429	1	$147	$15,622	$593	102.3
Roof	RTU 2	1	Package Unit	7.50	144.00	9.00	0.8 Et	Johnson Controls	DL-07N18NTAAA5	B	6	Yes	1	Package Unit	7.50	144.00	14.00	0.82 Et	1.8	1,429	1	$147	$15,622	$593	102.3
Roof	RTU 3	1	Package Unit	7.50	144.00	9.00	0.8 Et	Johnson Controls	DL-07N18NTAAA6	B	6	Yes	1	Package Unit	7.50	144.00	14.00	0.82 Et	1.8	1,429	1	$147	$15,622	$593	102.3
Roof	RTU 4	1	Package Unit	7.50	144.00	9.00	0.8 Et	Johnson Controls	DL-07N18NTAAA7	B	6	Yes	1	Package Unit	7.50	144.00	14.00	0.82 Et	1.8	0	0	$0	$15,622	$593	0.0
Roof	RTU 5	1	Package Unit	7.50	144.00	9.00	0.8 Et	Johnson Controls	DL-07N18NTAAA8	B	6	Yes	1	Package Unit	7.50	144.00	14.00	0.82 Et	1.8	0	0	$0	$15,622	$593	0.0
Roof	RTU 6	1	Package Unit	7.50	144.00	9.00	0.8 Et	Johnson Controls	DL-07N18NTAAA9	B	6	Yes	1	Package Unit	7.50	144.00	14.00	0.82 Et	1.8	0	0	$0	$15,622	$593	0.0
Basement	Portable AC Unit	1	Window AC	0.83		10.00		Movin Cool		B		No							0.0	0	0	$0	$0	$0	0.0
Open Space	Electric Resistance Heating Cabinets	3	Electric Resistance Heat		25.00		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Nurse's Office	Window AC Unit	1	Window AC	0.75		9.80				B		No							0.0	0	0	$0	$0	$0	0.0
Office	Window AC Unit	1	Window AC	0.83		10.80				W		No							0.0	0	0	$0	$0	$0	0.0
Principals Office	Window AC Unit	1	Window AC	0.83		10.80				W		No							0.0	0	0	$0	$0	$0	0.0
Secretary Office 2	Window AC Unit	1	Window AC	0.83		10.80				W		No							0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Teachers Lounge	Window AC Unit	1	Window AC	0.83		10.80		Frigidaire / Electrolux	FAC107S1A	W		No							0.0	0	0	$0	$0	$0	0.0
Therapist Room	Window AC Unit	1	Window AC	1.00		10.20		Frigidaire / Electrolux	FAC125P1A1	B		No							0.0	0	0	$0	$0	$0	0.0

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	School Heating Steam System	2	Forced Draft Steam Boiler	3,000	Easco	FPS-90	W	7	Yes	2	Forced Draft Steam Boiler	3,000	81.00%	Et	0.0	0	34	$519	$125,082	$6,000	229.4

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	DHW Pipes	8	20	0.75	0.0	0	7	$105	$239	$40	1.9

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	DHW - Bayview	1	Storage Tank Water Heater (> 50 Gal)	Rheem	PRO G75	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms	9	10	Faucet Aerator (Kitchen)	1.80	1.50	0.0	0	2	$26	$72	$20	2.0
Restrooms	9	11	Faucet Aerator (Lavatory)	1.80	0.50	0.0	0	4	$61	$79	$39	0.6

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Master Bilt	F23-S	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Saturn	S49R	Yes		No	0.0	0	0	$0	$0	$0	0.0

Novelty Cooler Inventory & Recommendations

	Existing Conditions				Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	Manufacturer	Model	ECM #	Install Automatic Shutoff Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Milk Cooler				No	0.00	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	Manufacturer	Model	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Electric Convection Oven (Full Size)	Garland		No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Metro	C5 3 Series	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?	Manufacturer	Model
Bayview Elementary	1	Air Dryer	180	No		
Bayview Elementary	1	Air Purifier	120	No		
Bayview Elementary	3	Coffee Machine	900	No		
Bayview Elementary	46	Desktop	270	No		
Bayview Elementary	2	Drop-In Cold Food Well	700	Yes		
Bayview Elementary	1	Laminator	1,600	No		
Bayview Elementary	345	Laptop	45	No		
Bayview Elementary	9	Microwave	1,000	No		
Bayview Elementary	2	Paper Shredder	150	No		
Bayview Elementary	11	Printer (Medium/Small)	200	No		
Bayview Elementary	2	Printer/Copier (Large)	600	No		
Bayview Elementary	11	Projector	500	No		
Bayview Elementary	8	Refrigerator (Mini)	150	No		
Bayview Elementary	3	Refrigerator (Residential)	220	No		
Bayview Elementary	1	Server	1,000	No		
Bayview Elementary	28	Smart Board	150	No		
Bayview Elementary	2	Television	70	No		
Bayview Elementary	40	Wall Mounted Fan	85	No		
Bayview Elementary	2	Water Fountain	350	No		

APPENDIX B: ENERGY STAR STATEMENT OF ENERGY PERFORMANCE

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

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ENERGY STAR® Statement of Energy Performance

51

ENERGY STAR® Score[1]

Bayview Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 44,000
Built: 1956

For Year Ending: June 30, 2022
Date Generated: July 30, 2023

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
Bayview Elementary School 300 Leonardville Road Belford, New Jersey 07718	Middletown Township Public Schools 63 Tindall Road Middletown, NJ 07748 (732) 706-6061	Adam Nasr 63 Tindall Road Middletown, NJ 07748 (732) 706-6061 X 1362 nasra@middletownk12.org

Property ID: 26000607

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
95.8 kBtu/ft²

Source EUI
128.3 kBtu/ft²

Annual Energy by Fuel	
Electric - Solar (kBtu)	520,582 (12%)
Electric - Grid (kBtu)	713,419 (17%)
Natural Gas (kBtu)	2,979,258 (71%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	97.4
National Median Source EUI (kBtu/ft²)	130.5
% Diff from National Median Source EUI	-2%
Annual Emissions	
Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	266

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 (II)	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of $1/8^{th}$ 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.